Mitutoyo

# Surface Roughness Measuring Instrument SURFTEST

## SJ-220



# User's Manual

## - Instructions for use -

Read this document thoroughly before operating the product.
After reading, retain it close at hand for future reference.
This English language version of the document contains the original instructions.

● For the related User's Manuals, see "■ Positioning of this document, document map" on page 1.

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## ■ Product names and model numbers covered in this document

| Product name | Model number |
|---|---|
| Surface Roughness Measuring Instrument SURFTEST | SJ-220 |

## ■ Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the product, caused by its use not conforming to the procedure described in this document.
- In the event of loss or damage to this document, immediately contact the agent where you purchased the product or a Mitutoyo sales office.
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety" on page 6.
- The contents of this document are based on information current as of May 2025.
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# About This Document

## ■ Positioning of this document, document map

This describes the positioning of this document and its relationship with other installments.

| | | |
|---|---|---|
| Surface Roughness Measuring Instrument SURFTEST SJ-220 User's Manual (This document) | Explains the overview, function of each part, usage, maintenance, specifications, and troubleshooting of this product. |  |
| Surface Roughness Measuring Instrument SURFTEST SJ-220 Basic Operation Guide | The contents of the explanation focus on helping you understand the basic operations of this product.<br>Useful functions are also introduced. |  |
| Surface Roughness Measuring Instrument SURFTEST SJ-220 Instruction Manual | Explains the safety precautions, overview, components, maintenance and inspection, troubleshooting, specifications, etc. of this product that are excerpted from the User's Manual. |  |
| Surface Roughness Measuring Instrument SURFTEST SJ-220 Surface Roughness Parameters | Explains the roughness standards and the roughness parameters. |  |
| Surface Roughness Measuring Instrument SURFTEST SJ-220 Cases of Troubleshooting | Explains problems that are likely to occur during measurement work, from setup work to measurement data output, and the solutions to those problems. |  |

: Included with the product as a printed document

: Included with the product as a printed document (English only)

: Included with the product on a CD-ROM

## ■ Intended readers and purpose of this document

### ● Intended readers

This document is intended for operators using the surface roughness measuring instrument for the first time.

The readers are assumed to have been familiar with basic operations on a PC and Windows.

They are also assumed to be able to understand individual instructions by reading the described drawings.

### ● Purpose

The purpose of this document is to help you to understand the overview, functions of each part, and maintenance details of this product, and the operating procedures based on the fundamentals and basic workflow of surface roughness measurement.

# Conventions Used in This Document

## ■ Safety reminder conventions warning against potential hazards

| | |
|---|---|
| WARNING | Indicates a hazard with a medium level of risk which, if not avoided, **could result in death or serious injury**. |
| CAUTION | Indicates a hazard with a low level of risk which, if not avoided, **could result in minor or moderate injury**. |
| NOTICE | Indicates a situation which, if not avoided, **may result in property damage**. |
|  | **Electricity**<br>Alerts the user to a specific hazardous situation that means "Caution, risk of electric shock". |
|  | **Flammable material**<br>Alerts the user to a specific hazardous situation that means "Caution, risk of igniting gas". |

## ■ Conventions indicating prohibited and mandatory actions

| | |
|---|---|
|  | Indicates concrete information about prohibited actions. |
|  | Indicates concrete information about mandatory actions. |

## ■ Conventions indicating referential information or reference location

| | |
|---|---|
| **IMPORTANT** | Indicates information that must be known when using the product. |
| **Tips** | Indicates further information and details relevant for the operating methods and procedures that are explained in that section. |
|  | Indicates reference location if there is information that should be referred to in this document or an extraneous User's Manual.<br>Example: For details about XX, see "1 Overview" on page A-1 in "PART A Overview". |

## ■ Other conventions

| | |
|---|---|
| ( ): Round brackets | Represent a paraphrase of an immediately preceding phrase or a supplementary explanation. |
| " ": Double quotation marks | Represent a highlighted phrase. They also indicate an index where information to be referenced is described. |
| [ ]: Square brackets | Represent a menu name on the screen, screen name, dialog name, button, display item, tab name, or the names of the operation keys. |
| 1, 2, 3<br>1, 2, 3, ... | Indicates the order and the contents of tasks.<br>(1: indicates main tasks, 1: indicates detailed tasks) |
| » | Indicates the action resulted from some operation(s). |

## ■ Example of conventions use

PART B : 4 Attaching and Removing the Detector

### 4.1 Attaching the Detector

**NOTICE**

**There is a possibility that the detector or drive unit may malfunction.**

- Connect the drive/detector unit connection plug to the connector on the rear of the drive/detector unit so that the notch on the plug is aligned with the protrusion inside the connector.
- When inserting the detector into the opening of the drive unit, do not forcibly push in the detector. Doing so may damage the detector or drive unit.

**IMPORTANT**

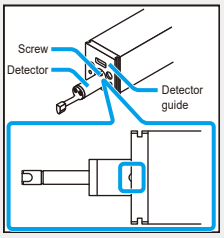
The connectors in the detector and drive unit are engaged in the following order.

1. The guides on both connectors are fitted together.
2. The connector pins and pin holes on both connectors are fitted together.

So, when you insert the detector into the drive unit, the detector moves smoothly at first. As you insert the detector further, the detector becomes harder to move.
After the detector becomes harder to move, continue to insert the detector until it cannot be inserted any further.

At this point, do not try to forcibly push the detector in further.

When the detector is correctly inserted into a standard type drive unit or a retractable type drive unit, half of the screw on the detector is inserted into the end of the detector guide. (See the figure on the right.)




Use the following procedure to attach the detector.

**1 Move the detector to the origin position.**

If the detector is already in the origin position, proceed to step 2.

**Tips**

If the detector is in the retracted state (*1), release the retracted state.

*1 The retracted state is where the detector is not in the origin position (where the detector is inside the drive unit with only the stylus outside).

For details about the retracted state and how to release the retracted state, see "1.2.1 Retracting the Detector" on page G-4 in "PART G Maintenance and Troubleshooting".

1 Press the [POWER/DATA] key.
» The power turns on.

2 Press the [START/STOP] key.
» The connector in the drive unit moves to the origin position.

**Tips**

When the detector is already in the origin position, the detector returns to the origin position after measurement.



No. 99MBB794A

Safety reminder convention
Indicates a warning against potential hazards.

"NOTICE"
Indicates a situation which, if not avoided, may result in property damage.

Indicates important information you must know

The numbers and the sentences that follow them indicate the order and the contents of tasks respectively.

Indicates further information and detailed information.

A sentence with the "»" mark at the beginning indicates the action resulted from some operation(s).

# Personal Protective Equipment

Personal protective equipment is useful for preventing operators from being exposed to safety hazards that lie within their workplaces.

Operators must wear personal protective equipment while being engaged in various works using this product.

In addition to the protective equipment stipulated herein, operators must wear protective equipment that is specified by the operating company and that is required by their job fields.

The following explains the requirements for personal protective equipment.



**Protective clothing**

Use protective clothing that fits your body, has narrow sleeve openings and no protrusions, and is made of materials with low resistance to tearing.



**Protective goggles**

Use protective goggles that protect your eyes from flying parts or splashing liquid.



**Safety gloves**

Use safety gloves that protect your hands from scratches, puncture wounds, deeper injuries, and contact with a hot surface.



**Inspection gloves**

Use inspection gloves in order to prevent workpieces from being adversely affected by body temperature or rust that is caused by oily substance, and protect external injuries.



**Safety shoes**

Use safety shoes that protect your feet from injuries due to crushing, falling parts, and slipping on a slippery surface.

# Requirement for Operators

Operators must be employees of the operating company that uses this product and are required to understand the contents of this document to perform various works using this product. Before using this product, operators must resolve any ambiguity regarding the works by making inquiries to the agent where you purchased the product or Mitutoyo sales representative ("SERVICE NETWORK" on page App-1) if necessary.

**⚠CAUTION**

**If work is done by operators who are unable to meet the requirements, there are risks of injures.**



- All work must be done by operators who have appropriate qualifications.
- For details about the work area and the hazardous area around this product, see "■ About the work area and the hazardous area" on page 7.

# Safety

## Intended purpose

This product can be used only for the purpose of performing surface roughness measurement on a workpiece.

Handling this product according to the descriptions in this document is one of the intended purposes.

Here, use that is not included in the intended purposes or that is regarded as incorrect use is referred to as "improper use".

### ■ Improper use

Improper use of this product may lead to a dangerous situation.

**⚠WARNING**

**If there are hazardous items near this product, there are risks of electric shocks, fire, or burns.**
**If an abnormal condition occurs on this product, immediately turn off the power, and remove the AC adapter from the power outlet.**

- Check that there is no water, oil, chemical solutions, organic solvents, or erosive gases around this product.
- Do not install this product in the following places.
  - Places where there are risks of explosion
  - Places at a high or low temperature that is beyond the operation-guaranteed temperature range
  - Places where noise is generated due to static electricity, etc.
  - Places where there is strong electrical field intensity
  - Places where power cables and power transmission lines are running through nearby
  - Places where there are risks of radiation being irradiated
  - Places where there are risks of corrosive gases, etc., being generated

**⚠CAUTION**

**There are risks of electric shocks or failure of this product.**

Do not disassemble or modify this product. Doing so may cause unexpected accidents such as electric shocks.
Measurement accuracy or the product functionality may be also adversely affected, which will void the warranty.

For inspection or repair of internal parts, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).

**NOTICE**

**Disassembling this product may cause physical damage.**

- In cases where this product is disassembled by the user, any damage will not be covered under Mitutoyo's warranty.
- Do not make modifications to hardware or software without Mitutoyo's permission.

For having the product repaired, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).

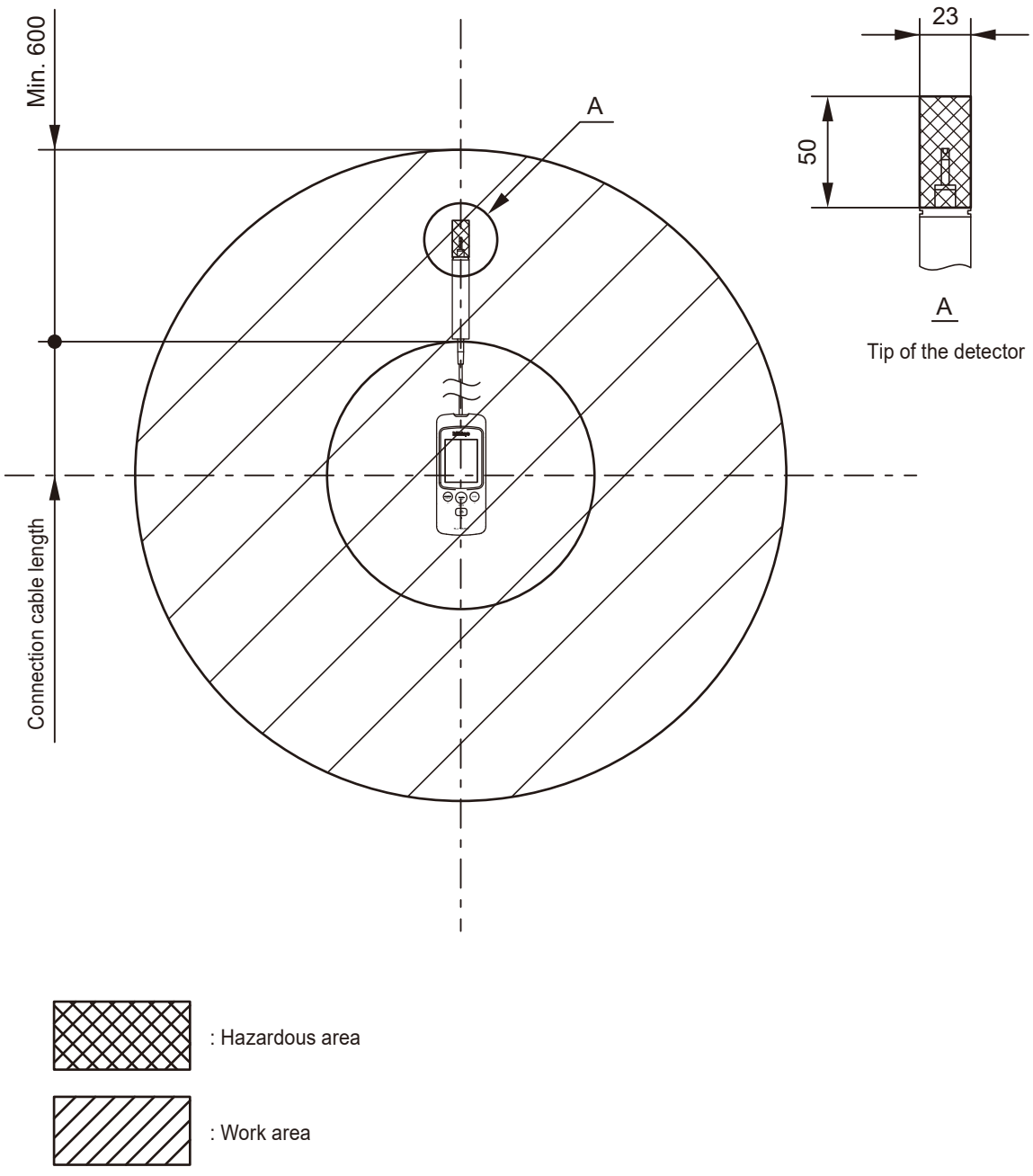
# Residual Risk

"Residual risk" is the risk that remains even after efforts are made to identify and eliminate all expected risks. This section explains the residual risk of this product.

## ■ About the work area and the hazardous area

The following figure shows the work area (maintenance space) and the hazardous area of this product.
The work area (maintenance space) is the area extending to the front, rear, and sides of this product.
The hazardous area is the area around a moving part.

Unit: mm



## ■ About the risks of electricity

### ● Electric current

**⚠WARNING** 

**Improper power supply may pose risks of electric shocks.**



When using an AC adapter, be sure to use the AC adapter supplied with this product.

**⚠WARNING** 

**Touching live parts, damaged insulation, or damaged parts may pose risks of electric shocks.**



- Do not remove the covers of the measuring instrument main unit or the display unit while the power to this product is on.
- During cleaning, do not let water or other liquid get in this product.
- Do not use a high-pressure cleaning machine to clean this product.

If there is something wrong with the AC adapter, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1) to have the product repaired.

## ■ About the measures for abnormal conditions

**⚠WARNING** 

**If you continue using this product even after an abnormal condition has occurred, there are risks of causing electric shocks, fire, or failure of this product.**



- If abnormal conditions, such as heat generation, smoke, or foreign odor, occur on this product, immediately turn off the power, and remove the power plug of the AC adapter from the power outlet. Continuing using this product may cause electric shocks or fire. After that measure is taken, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1) to have the product repaired.
- If a foreign object (water, a piece of metal) gets in this product, immediately turn off the power, and remove the power plug of the AC adapter from the power outlet. After that measure is taken, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1) to have the product repaired.
- If the frame body of this product is damaged by being struck with a hard object, turn off the power to this product, and remove the power plug of the AC adapter from the power outlet. After that measure is taken, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1) to have the product repaired.

## ■ About the power and connection cables

**⚠ WARNING**

**Neglecting the following may pose risks of electric shocks or fire.**

- If the supplied AC adapter or the USB 2.0 cable that is connected to this product is damaged, immediately stop using this product. Continuing using this product may cause electric shocks or fire. If there is something wrong with the USB 2.0 cable, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).
- Do not connect or disconnect the terminal of the USB 2.0 cable or the power plug of the AC adapter with wet hands.
  Electric shock may result.
- Do not touch the USB 2.0 cable terminal metallic parts while the power plug is connected to the power outlet.
  Electric shock may result.
- Do not use any AC adapter other than the AC adapter supplied with this product or the specified one.
  Damage to the internal circuitry, fire, or a bodily injury may result.

- If there is thunder or lightning nearby, remove the power plug of the AC adapter from the power outlet, or disconnect the terminal of the USB 2.0 cable from the USB connector of this product. Continuing using this product may cause malfunctioning, electric shocks, or fire.
- Connect the AC adapter to a power source separate from a power source that supplies high electric current, for example to machine tools or large CNC measuring instruments. Also, do not use a power strip or multi-tap.
- With a dry cloth, thoroughly wipe off dust, water, oil, etc., from the metallic parts of the USB connector of this product and the power outlet where the power plug is connected, and then use them after they have dried.
  Continuing using this product may cause fire due to a short circuit, etc.
- When connecting the terminal of the USB 2.0 cable or the power plug of the AC adapter, firmly connect it as far as it will go.
  Otherwise, fire or product failure may result.
- When disconnecting the terminal of the USB 2.0 cable or the power plug of the AC adapter, be sure to disconnect it while holding its main body. Trying to disconnect while holding the cable may cause core wire exposure or cable cut, and moreover, electric shocks or fire.

## ■ Restriction on the drive range of the drive unit

The drive unit drive range is mechanically and electrically restricted.

## ■ About use of this product

**⚠WARNING**



**Neglecting the following may pose risks of electric shocks or fire.**

- Do not let a foreign object, such as a piece of metal, water, or other liquid get in this product from the slots (around the connectors on the rear).
- Do not subject the touch panel to strong impacts. Also, do not strongly press on it with a sharp-pointed tool.
  The touch panel may crack.
  In cases where the touch panel is damaged and the liquid contents flow out and get on your skin, clean your skin with running water for at least 15 minutes. If the liquid gets in your eyes, wash them with running water for at least 15 minutes, and then consult a physician.
  The inside of the touch panel contains irritants.
- Do not use this product under abnormal conditions, for instance, when nothing is displayed on the touch panel even when the power is turned on.
  Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1) to have the product repaired.

**⚠CAUTION**

**There is a risk of injuring your hands and fingers.**

- The detector has a pointed tip (stylus). While operating this product, wear hand protection such as inspection gloves to prevent injuries to your hands and fingers.
- While replacing the detector, be sure to hold the detector body. If you hold the stylus of the detector while replacing the detector, your hands or fingers may be injured by the pointed tip of the stylus.
- When measurement is started, the detector starts moving.
  Do not touch the detector until it comes to a complete halt.

**NOTICE**

**There is a possibility that this product may malfunction.**

- Before replacing the detector of this product, be sure to turn off the power to this product. If the detector is replaced while the power is on, the detector or drive unit may malfunction.
- When inserting the detector into the attachment hole of the drive unit, do not forcibly push it in. Doing so may damage the detector or drive unit.
- Do not apply excessive force to the tip of the stylus of the detector. The stylus tip is precisely machined. Be very careful not to break it.
- Do not directly touch the connector pins on the rear of the display unit with your hand. When you are not using the connectors, leave the connector cover attached. Static electricity may cause malfunction or internal circuitry failures.
- Before setting the internal battery switch to ON or OFF, ensure that the power to this product is off and also the USB 2.0 cable is disconnected. If the internal battery switch is set to ON or OFF while the power to this product is on and also/or the USB 2.0 cable is connected, this product may malfunction.
- Before disconnecting the external power source, turn off the power to this product. If the external power source is disconnected while the power to this product is on, this product may malfunction.
- Press operation keys with your fingers. Do not use a sharp-pointed object (the tip of a pencil or ballpoint pen, a piece of metal with a sharp tip, etc.) to press the operation keys. The operation key may be damaged.
- After measurement starts, if the movement of the detector is forcibly interrupted, malfunction or damage may result.
- When replacing the detector, perform the replacement while the detector is located in the origin position. If the detector is replaced while it is not located in the origin position, the replacement cannot be done correctly and the detector or drive unit may be damaged.
- While attaching or removing the detector, hold it firmly. If you accidentally drop the detector, the detector may be damaged.
- While replacing the detector, be sure to hold the detector body. If you perform the replacement work holding the tip of the detector or the stylus, the detector or stylus may be damaged.
- Do not remove the detector while it is moving. The drive unit or detector may malfunction.
- When attaching the drive/detector unit, connect the drive/detector unit connection plug to the connector on the rear of the drive/detector unit so that the notch on the plug is aligned with the convex part inside the connector.

## ■ About workpieces

**⚠CAUTION**

**There are risks of injuries with sharp corners of a workpiece.**

When handling a workpiece, wear protective equipment specified in 📖 "Personal Protective Equipment" on page 5.

## ■ About other risks

### ● Insufficient lighting

**⚠CAUTION**

**There are risks of injuries due to insufficient lighting in the operating environment.**

| | |
|---|---|
|  | • Check that the lighting in operating environment is sufficient.<br>• Immediately replace defective lighting devices. |
|  | If a lighting device is malfunctioning or missing, do not use this product. |

### ● Failure of the display unit

**⚠CAUTION**

**Failure of the display unit may lead to a misjudgment, resulting in an injury to the operator.**

| | |
|---|---|
|  | • Before starting measurement, check that the Home screen is displayed on the display unit.<br>• If the display unit breaks, it must be replaced. For replacement, please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |

For details about the functions of the display unit, see 📖 "2.17 Touch Panel (LCD) and Operation Key Test" on page F-63 in "PART F Environment Settings".

# Handling the Battery

This product uses a Ni-MH (nickel-metal hydride) battery (hereinafter referred to as the internal battery) as its main power source. Observe the following precautions when using the battery.

**⚠ WARNING**

**If the internal battery is not handled properly, there are risks of serious injuries due to liquid leakage, heat generation, bursting, or fire ignition.**

Be sure to observe the following to prevent liquid leakage, heat generation, bursting, and fire ignition from occurring on the internal battery.

- Do not throw the battery into fire or heat it.
- Do not connect the positive terminal (+) of the internal battery to the negative terminal (-) with a metallic object such as a piece of wire.
  Also, do not store the battery with metallic parts.
- Do not disassemble the battery.
- Do not modify the battery.
  The internal battery contains circuitry for protecting against hazards. Modifying the battery may impair the functionality of the protective circuitry.
- The connector for connecting the internal battery to the main unit has a positive pin and a negative pin. If the connector does not fit smoothly to the main unit when connecting it, do not force it.
  Doing so may damage the internal circuitry of the display unit, cause an abnormal reaction inside the internal battery, or cause an abnormal current upon discharge.
- Do not use the internal battery with any equipment other than this display unit.
- Do not expose the internal battery or the connector to water, saltwater, etc.
  Heat generation or rusting may result.
- Do not tear off or scratch the internal battery casing.
  Doing so increases the likelihood that the battery will short-circuit.
- If you notice abnormalities such as liquid leakage, discoloration, or deformation in the battery, do not use this product.

Be sure to observe the following to prevent liquid leakage, heat generation, bursting, and fire ignition from occurring on the internal battery.

- Charge the internal battery while the battery is in the display unit.
  If you use a different battery charger, excessive current may prevent charging or charging control.
- If battery liquid gets in your eyes due to liquid leakage or bursting, do not rub them, but wash them thoroughly with clean water such as tap water, and receive medical treatment immediately.
  Otherwise, you may become blind.
- When the internal battery life runs out, discharge it, use plastic tape to isolate the connector portion, and dispose of it as noncombustible waste. Further, comply with local regulations regarding waste disposal.
- While charging, if charging does not complete within the predetermined charging time, stop charging.
  If you continue charging the internal battery, the battery may be overcharged.
- If battery liquid gets on your skin or clothes due to liquid leakage or bursting, wash off the liquid with clean water such as tap water immediately. Your skin could get burned or inflamed.
- When the usable time of the internal battery becomes very short, the battery has reached its end-of-life. Replace the battery with a new one (Part No. 12AAZ222).

**⚠CAUTION**

**If the internal battery is not handled properly, there are risks of injuries due to liquid leakage, heat generation, bursting, or fire ignition.**

- Do not apply a severe shock to the internal battery or throw it.
  Heat generation, bursting, or fire ignition may result.
- Do not carry the battery while holding the connector or the lead wire.

- Store the internal battery where infants and children cannot access it.
- When charging the internal battery, keep the battery temperature and the ambient temperature within the range of 5 °C to 40 °C.
  If you charge the battery at temperatures outside this range, the battery could leak liquid or overheat. Additionally, the performance and life span of the battery could be reduced. Also, if the ambient temperature is high, the battery may not be charged sufficiently.
- For details about how to charge the internal battery, see "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".
  The fully charged battery can perform measurement approx. 1,000 times, though this figure depends on usage conditions and operating environment.
  If the charge capacity is reduced, replace the internal battery with a new one (Part No. 12AAZ222).
- If this product will not be used for a long time (30 days or more), remove the internal battery from the display unit, and store it in a location with low humidity and a temperature from -20 °C to 30 °C.

## Responsibilities of the Operating Company

Installation of this product is performed in an industrial environment. Therefore, statutory requirements related to work safety will apply to a company that operates this product.

In addition to the safety guidelines described in this document, the company must meet the requirements related to occupational safety and environment of the region where this product is operated.

In particular, the following requirements will apply.

- The operating company must collect information on health and safety regulations that are to be applied. In terms of risk assessment, it must identify unknown risks, which arise from special work conditions that may lie in the site of operation. The operating company must put the instructions of this document into practice when operating this product.
- During the entire period in which this product operates, the operating company must check whether the contents of this document are up-to-date with the current valid regulations, and it must adapt the check results to the current situation if necessary.
- The operating company must clarify and determine where responsibilities lie for installation, operation, troubleshooting, maintenance, and cleaning of this product.
- The operating company must ensure that all workers who are to operate this product have read this document and have understood the contents. Also, the operating company must provide periodic training to operators in charge and convey information on hazards.
- The operating company must provide operators in charge with necessary protective equipment, putting emphasis on the obligation of wearing the protective equipment.

The operating company also bears the responsibility for storing this product in a technically-appropriate condition.

# Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive and the UK Electromagnetic Compatibility Regulations; however, if this receives electromagnetic interference that exceeds these requirements, it will be out of warranty and require appropriate measures.

This product is an industrial product, and is not intended to be used in residential environment. If this product is used in residential environment, this product may cause electromagnetic interference with other instruments. In such a case, it is required to take appropriate measures for preventing such electromagnetic interference.

# Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of Export Trade Control Order or under Category 16 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country.

Also, if an option is added or modified to add a function to this product, this product may fall under the category of List-Control Goods, List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of Export Trade Control Order or under Category 1 - 15 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. In that case, if you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country. Please contact Mitutoyo in advance.

# Notes on Export to European Countries

When you intend exporting of this product to any of the European countries, it may be required to provide User's Manual(s) in English and Declaration of Conformity in English (in some cases, the official language of the country to be exported). For detailed information, please contact Mitutoyo in advance.

# Disposal of Products outside the European Countries

Please follow the official instruction in each community and country.

# Disposal of Old Electrical & Electronic Equipment (Applicable in the European Countries with Separate Collection Systems)



This symbol on the product or on its packaging is based on WEEE Directive (Directive on Waste Electrical and Electronic Equipment), and this symbol indicates that this product shall not be treated as household waste.

To reduce the environmental impact and minimize the volume of landfills, please cooperate in reuse and recycle.

For how to dispose of the product, please contact the agent where you purchased the product or a Mitutoyo sales office.

# Disposal of Waste Batteries and Accumulators (Applicable in the European Countries with Separate Collection Systems)




Batteries and accumulators containing heavy metals such as mercury, lead, and cadmium may contaminate the environment if improperly discarded. When incinerated, certain chemicals are released into the air or concentrated in the ash residue from the combustion process; this may lead to a health risk to humans, animals and the environment in general.

In compliance with legal requirements, the symbol of a 'crossed-out wheeled bin' is either applied on the battery or on its packaging. This symbol indicates that disposal of the batteries in household waste is strictly prohibited; instead the batteries have to be disposed of by separate collection and recycling means. Additional marking identifies the heavy metal content (i.e. Cd =cadmium, Hg = mercury, Pb = lead) as contained within the battery if over prescribed levels.

End users are obliged by law to comply with the discarding procedure for waste batteries. At Mitutoyo facilities, or at its appointed distributors, receptacles will be provided to accept, at no charge, the disposal of previously supplied batteries.

# China RoHS Compliance Information

This product meets China RoHS requirements. See the table below.

产品中有害物质的名称及含量

| 部件名称 | 有害物质 | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 本体 | × | ○ | ○ | ○ | ○ | ○ |
| 配件 | × | ○ | ○ | ○ | ○ | ○ |

| 部件名称 | 有害物质 | | | |
|---|---|---|---|---|
| | 邻苯二甲酸二正丁酯 (DBP) | 邻苯二甲酸二异丁酯 (DIBP) | 邻苯二甲酸丁基苄酯 (BBP) | 邻苯二甲酸二(2-乙基已)酯 (DEHP) |
| 本体 | ○ | ○ | ○ | ○ |
| 配件 | ○ | ○ | ○ | ○ |

本表格依据 SJ/T 11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。




环保使用期限标识是根据《电器电子产品有害物质限制使用管理办法》以及《电器电子产品有害物质限制使用标识要求(SJ/T11364–2024)》制定的,适用于中国境内销售的电子电气产品的标识。

电器电子产品只要按照安全及使用说明内容在正常使用情况下,从生产日期算起,在此期限内产品中含有的有毒有害物质不致发生外泄或突变,不致对环境造成严重污染或对其人身、财产造成严重损害。

产品使用后,要废弃在环保使用年限内或者刚到年限的产品,请根据国家标准采取适当的方法进行处置。

另外,此期限不同于质量/功能的保证期限。

# Disassembling and Disposal

## ■ Disassembling

**Before disassembling this product**

- Disconnect the USB 2.0 cable from the USB connector to disconnect the external power supply.
- Bring all components of this product to a complete halt.

Then, clean the main unit and all parts, and then disassemble them in accordance with local safety and health regulations and instructions related to the protection of the environment.

## ■ Disposal

When this product is disposed of by the user, separately dispose of the components as follows.

- Pick out metallic components, and scrap them.
- Take out plastic for recycling
- Remove the motor and attached accessories, and appropriately dispose of them.
- Sort the remaining components by material or with their disposal methods.

For further disposal, dispose of them in accordance with local safety and health regulations and instructions related to the protection of the environment.

**NOTICE**

**Improper waste disposal harms the environment.**

- For disposal of electric and electronic components, lubricants, and similar materials, request an authorized waste disposal processor.
- Batteries contain harmful substances. Do not put them in a household trash can, but dispose of them in accordance with appropriate disposal methods of each local governing body or region.
- If there is a component or material that you are not clear on how to dispose of, contact an authorized waste disposal processor or a waste disposal company.

# Warranty

This product has been manufactured under strict quality management, but should it develop problems within one year of the date of purchase in normal use, repair shall be performed free of charge. Please contact the agent where you purchased the product or a Mitutoyo sales representative ("SERVICE NETWORK" on page App-1).

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

- Failure or damage owing to fair wear and tear
- Failure or damage owing to inappropriate handling, maintenance or repair, or to unauthorized modification
- Failure or damage owing to transport, dropping, or relocation of the product after purchase
- Failure or damage owing to fire, salt, gas, abnormal voltage, lightning surge, or natural disaster
- Failure or damage owing to use in combination with hardware or software other than those designated or permitted by Mitutoyo
- Failure or damage owing to use in ultra-hazardous activities

This warranty is effective only where the product is properly installed and operated in conformance with the instructions in this document within the original country of the installation.

EXCEPT AS SPECIFIED IN THIS WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES OF ANY NATURE WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OR WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE, ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT ALLOWED BY APPLICABLE LAW.

You assume responsibility for all results due to the selection of this product to achieve your intended results.

# Disclaimer

IN NO EVENT WILL MITUTOYO, ITS AFFILIATED AND RELATED COMPANIES AND SUPPLIERS BE LIABLE FOR ANY LOST REVENUE, PROFIT, OR DATA, OR FOR SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGES HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY ARISING OUT OF THE USE OF OR INABILITY TO USE THIS PRODUCT EVEN IF MITUTOYO OR ITS AFFILIATED AND RELATED COMPANIES AND/OR SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

If, notwithstanding the foregoing, Mitutoyo is found to be liable to you for any damage or loss which arises out of or is in any way connected with use of this product by you, in no event shall Mitutoyo's and/or its affiliated and related companies' and suppliers' liability to you, whether in contract, tort (including negligence), or otherwise, exceed the price paid by you for the product only. The foregoing limitations shall apply even if the above-stated warranty fails of its essential purpose.

BECAUSE SOME COUNTRIES, STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR THE LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, IN SUCH COUNTRIES, STATES OR JURISDICTIONS, MITUTOYO'S LIABILITY SHALL BE LIMITED TO THE EXTENT PERMITTED BY LAW.

# PART A
# Overview


1 Overview..... A-1
2 Operation Keys and the Touch Panel..... A-8
3 Quick Reference Table for Useful Functions..... A-43


No. 99MBB794A

# 1 Overview

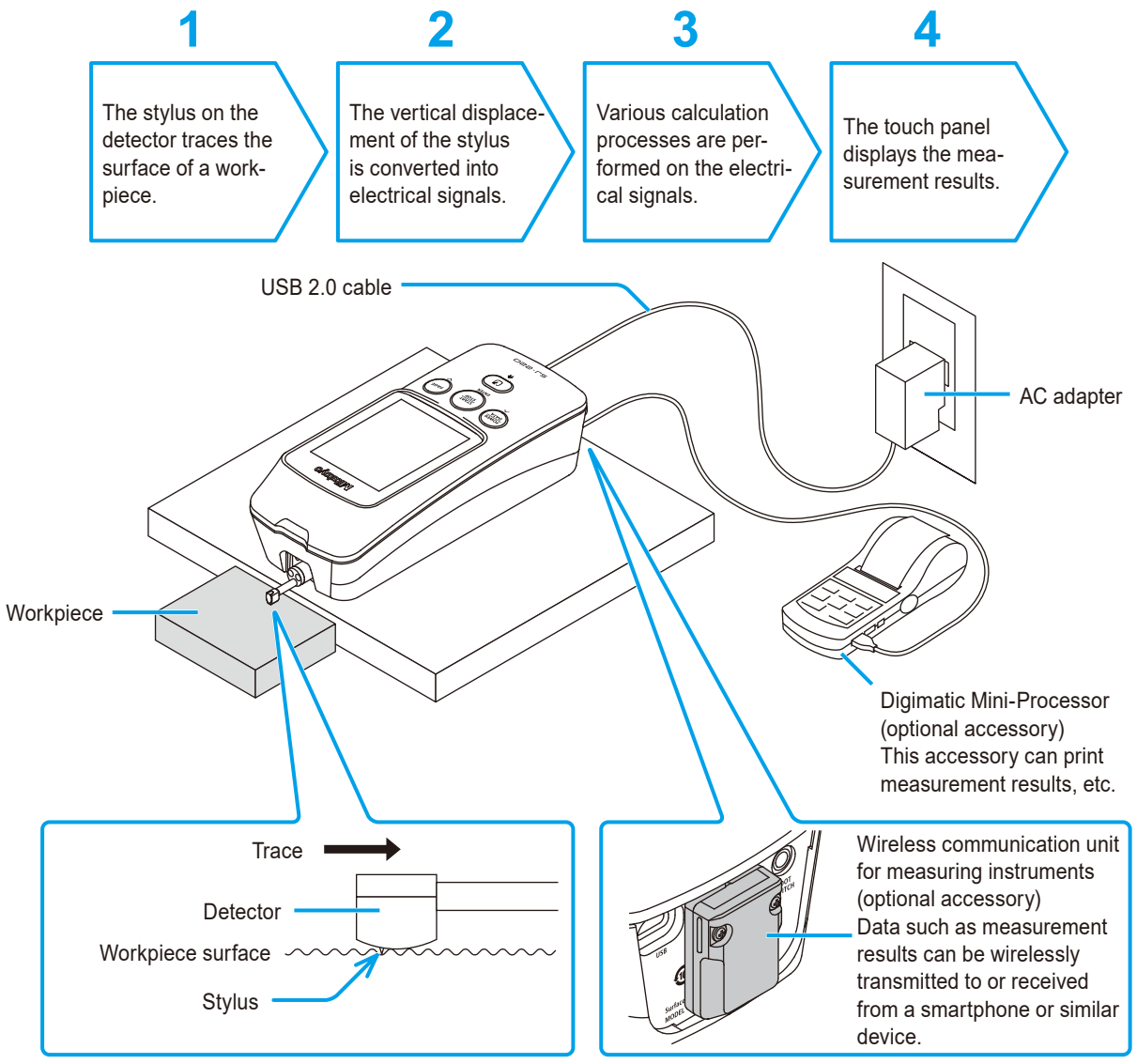
This chapter explains the structures and the features of this product.

## 1.1 Roughness Measurement Process and Features of This Product

This product is a portable surface roughness measuring instrument, which traces the surfaces of various machine components with the detector, calculates their surface roughness based on roughness standards, and then displays the calculation results.

As shown in the figure below, the stylus on the detector traces the surface of a workpiece to detect minute irregularities on the surface as the vertical displacement of the stylus, and the calculation results for the parameters based on roughness standards are displayed on the touch panel.

Measurement results (calculation results, the evaluation profile, BAC/ADC graphs, GO/NG judgment results, etc.) can be transmitted to a smartphone or similar device with a wireless communication unit for measuring instruments (optional accessory), or they can be printed with a Digimatic Mini-Processor (optional accessory).



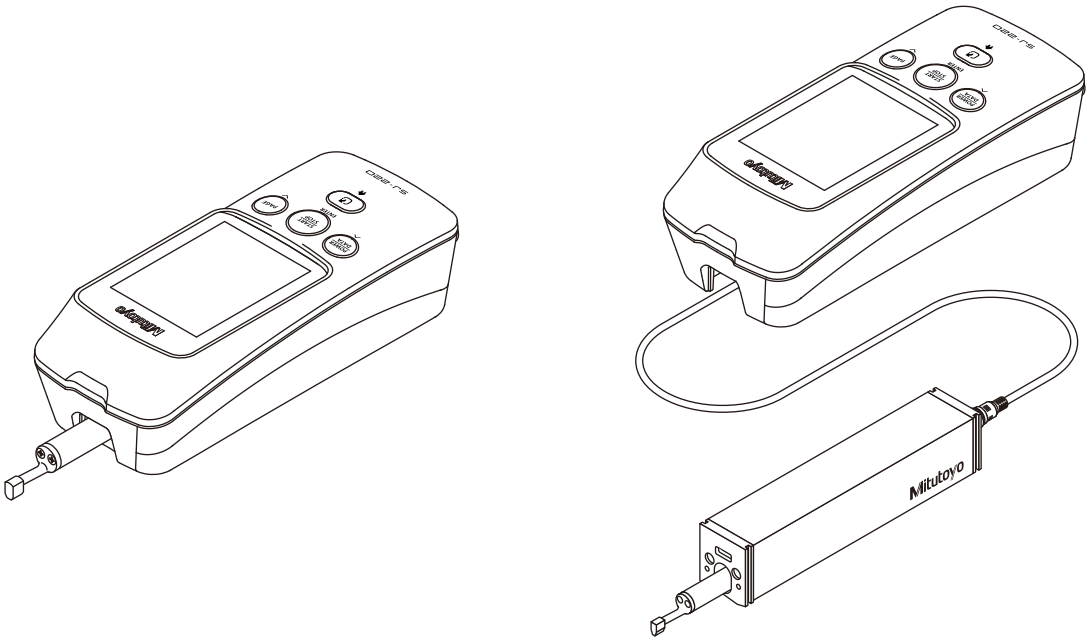



No. 99MBB794A

# 1.2 Features

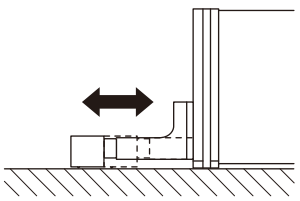
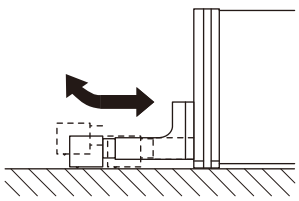
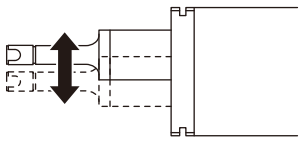
## ■ Detachable drive/detector unit

This product can be used with the drive/detector unit housed in the display unit or with the drive/detector unit detached from the display unit.




## ■ Three types of drive/detector units to match the workpiece shape

Three types of drive/detector units enable the measurement of various types of workpieces.

| Standard type | Retractable type | Transverse-tracing type |
|---|---|---|
|  |  |  |
| This type is the standard drive/detector unit. | This type is a drive/detector unit with a detector that retracts in a forward direction after measurement. This type can be set without the detector tip being in contact with the workpiece, so it can be mounted on automated measuring equipment. | The detector on this type moves horizontally. This type can measure surface roughness even on a narrow workpiece such as a crankshaft to which the other two types of drive/detector units have no access. |

## ■ Intuitive touch panel operation

With the touch panel, you can perform measurement and setting operations intuitively.

By flicking or swiping the screen, you can also easily switch between parameters and select menus.

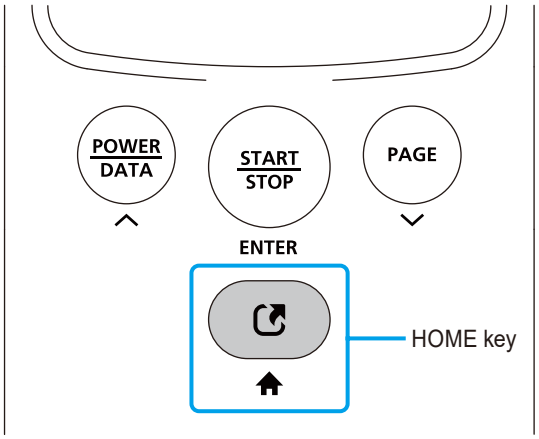
**Tips**

For details about flicking and swiping operations, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18.

## ■ HOME key shortcut function

When a screen other than the Home screen is displayed, pressing the HOME key quickly returns you to the Home screen.

Pressing the HOME key while on the Home screen displays the Daily menu screen where you can perform various operations with the keys, such as calibration measurement and recalling of saved measurement conditions.




## ■ Portable type

This product is compact and lightweight (approx. 0.5 kg) enough to be easily portable. This product is palm-sized, so it can be held and operated in one hand. In addition, the internal battery makes it easy to perform roughness measurement on the shop floor or other sites where an external power source is not easily accessible.

**Tips**

No power is drawn from the internal battery during measurement while power to this product is being supplied from an external power source.

For details about the internal battery, see 📖 "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".

## ■ Two-way power system

This product is driven by the internal battery or an external power source (via USB connection with the supplied AC adapter or a PC, etc.). For USB connection, use the supplied USB 2.0 cable.

For details about the external power source and applicable USB standards, see 📖 "■ External power source (via USB connection with the supplied AC adapter, a PC, etc.)" on page B-2 in "PART B Setting Up".

## ■ Wide measurement range and calculation of various roughness parameters

This product has a measuring range of up to 360 µm (-200 µm to +160 µm), and it can display surface roughness with various roughness parameters.

## ■ Power saving Auto-OFF function

When this product has not been operated for a given length of time, the power turns off automatically (Auto-OFF function).

You can set the length of time that this product waits before entering the auto-off state.

Even when the power turns off, measurement conditions you have set and measurement results will not be deleted.

## ■ Backlit color LCD (liquid crystal display) screen and external output function

A color LCD (liquid crystal display) screen with a backlight is used to ensure clear visibility even in poorly-lit places.

Measurement results can be output to a Digimatic Mini-Processor (optional accessory) via SPC and printed, or they can be transmitted to or received from a smartphone or similar device with a wireless communication unit for measuring instruments.

Also, you can remotely control the product via USB communication (for controlling output or measurement commands) while this product is connected to a PC.

## ■ Ability to save measurement conditions and measurement results

Up to 10 sets of measurement conditions can be saved in the internal memory of this product.
Up to 500 sets of measurement conditions and up to 10,000 sets of measurement data can be saved on a memory card (optional accessory).

You can recall data saved in the internal memory or memory card and display it on the touch panel or print it with a Digimatic Mini-Processor (optional accessory), etc.

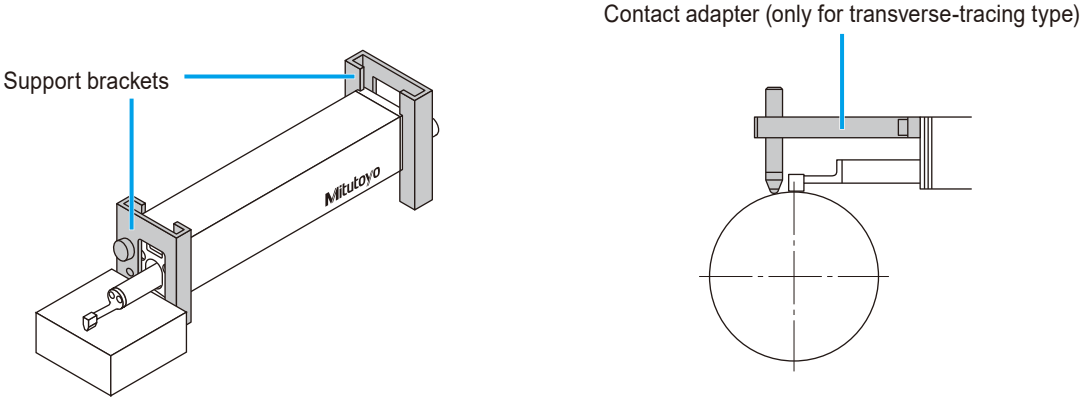
## ■ Conformance with roughness standards

This product conforms to the following roughness standards: JIS (JIS B 0601, JIS B 0671:2002, JIS B 0631:2000, JIS B 0601:1994, JIS B 0601:1982), VDA, ISO (ISO 12085:1996, ISO 13565:1996, ISO 4287, ISO 21920), and ASME B46.1.

## ■ Wide array of attachments for measuring workpieces of various shapes

You can measure workpieces of various shapes by using attachments (optional accessories).

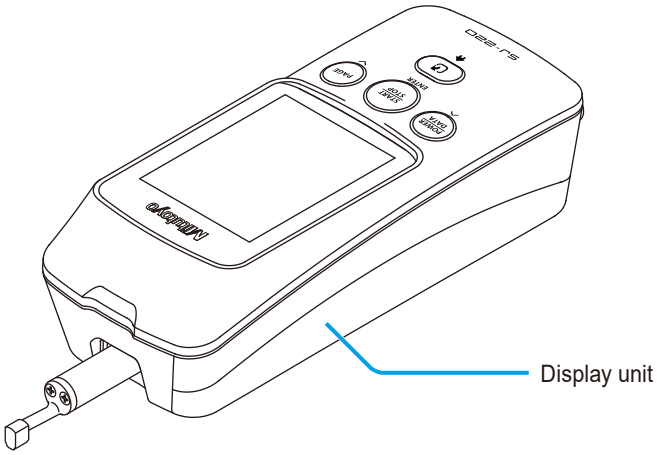
For details about attachments (optional accessories), see 📖 "3.2.2 When This Product Cannot Be Directly Placed on the Workpiece" on page C-46 in "PART C Measurement".



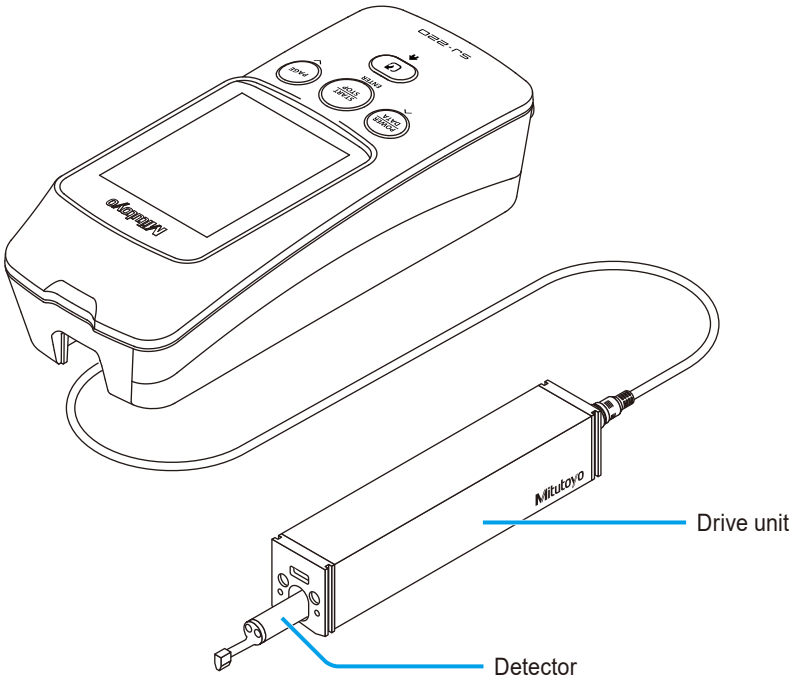
# 1.3 Name of Each Part

This product is composed of a display unit and a drive/detector unit. As a result, you can use the drive/detector unit detached from the display unit. Select an appropriate way to use it according to the work-piece shape.

- Using this product with the drive/detector unit housed in the display unit




- Using this product with the drive/detector unit detached from the display unit

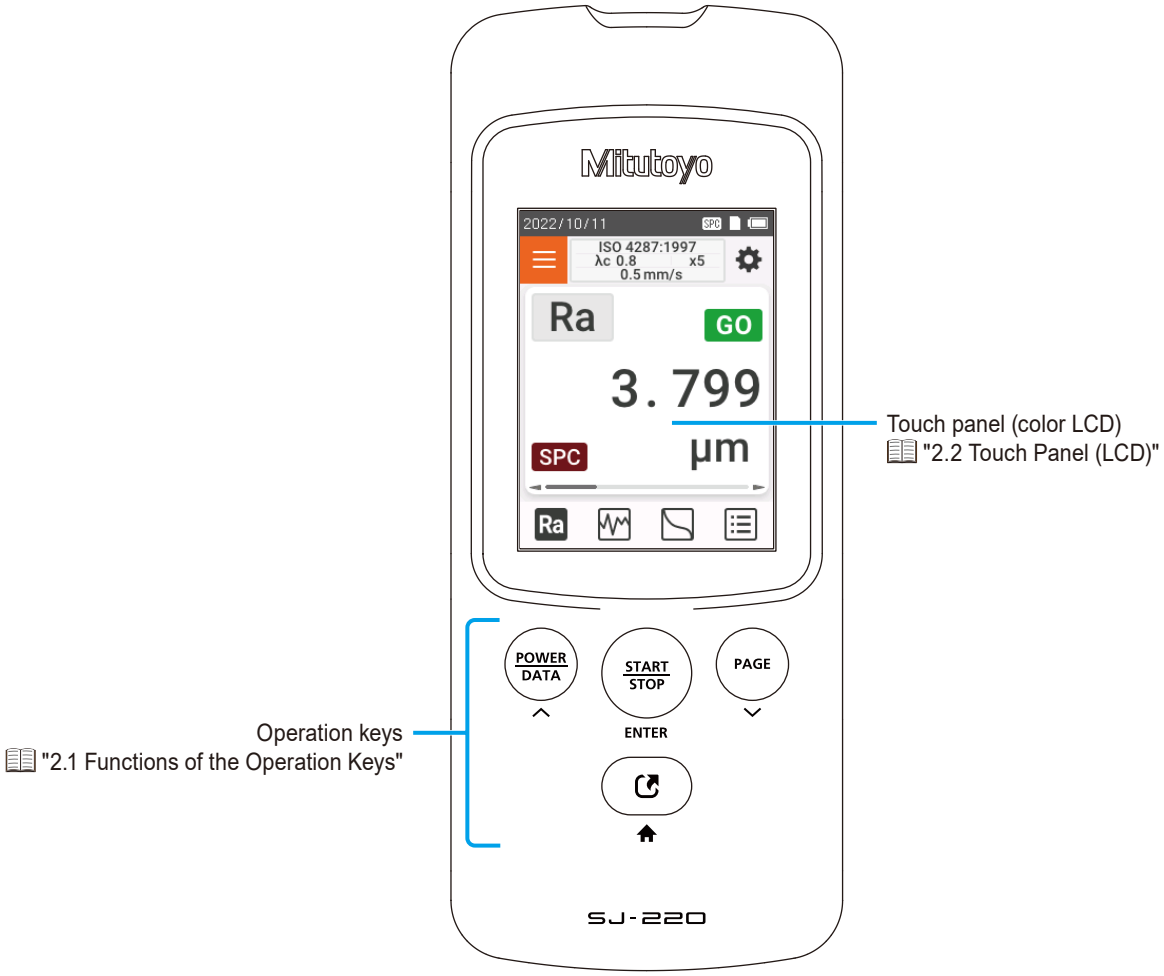



**Tips**

For details about attaching and detaching the drive/detector unit, see "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38 in "PART B Setting Up".

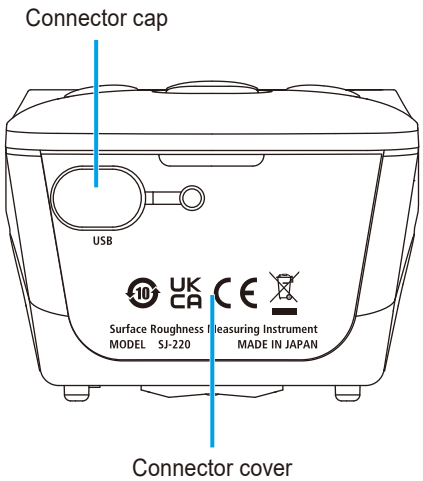
## 1.3.1 Display Unit

### ■ Front face

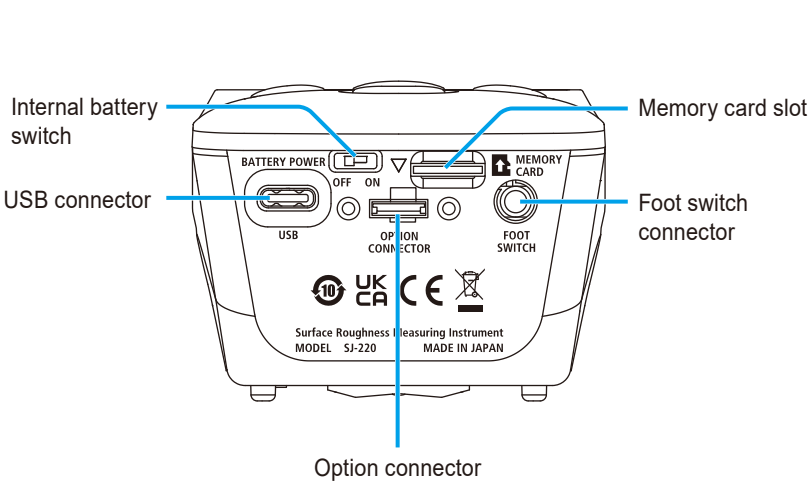



### ■ Rear face

With the connector cover attached

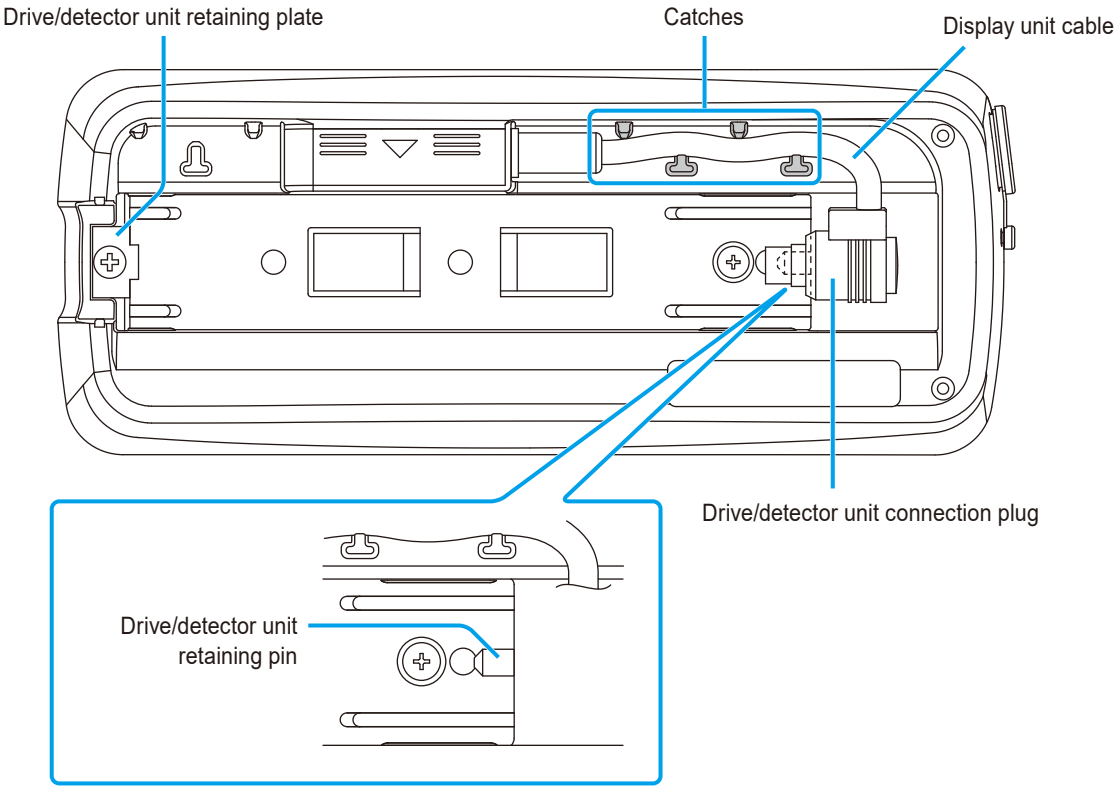



With the connector cover removed

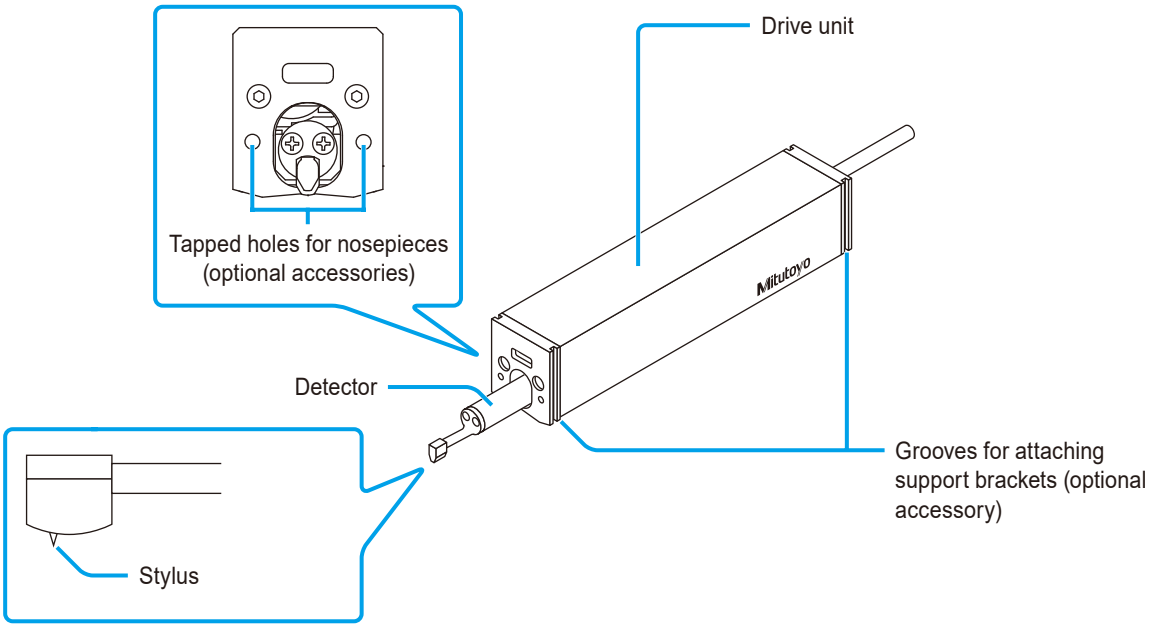


## ■ Bottom face

**IMPORTANT**
When housing the drive/detector unit connection plug in the bottom of the display unit, use the catches to fasten the display unit cable.




## 1.3.2 Drive/Detector Unit



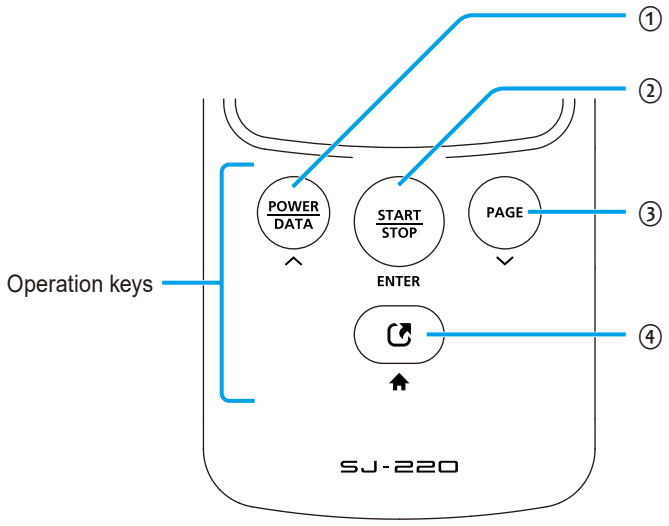
# 2 Operation Keys and the Touch Panel

Use the touch panel and the operation keys to operate this product. This chapter explains the basic functions of the operation keys as well as the screens and icons that are displayed on the touch panel.

## 2.1 Functions of the Operation Keys

Use the operation keys to operate this product (starting measurement, recalling saved measurement conditions, outputting data, etc.). This section explains the function of each operation key.

### ■ Operation keys on the display unit and their functions




| No. | Name | Description |
|---|---|---|
| ① | [POWER/DATA] key | Turn the power on or off.<br>Depending on the data output settings, you can output data to a connected device or save the contents of the screen on a memory card as bitmap data.<br>On the [Daily menu] screen, pressing this key moves the menu selection frame upward (^). |
| ② | [START/STOP] key | Start or stop measurement.<br>On the [Daily menu] screen, pressing this key confirms the selected item (ENTER). |
| ③ | [PAGE] key | Display calculation results, evaluation profiles, graphs, and conditions lists of other set parameters.<br>Pressing and holding this key disables the touch panel.<br>On the [Daily menu] screen, pressing this key moves the menu selection frame downward (v). |
| ④ | [HOME] key | Display the Home screen. On the Home screen, pressing this key displays the [Daily menu] screen. |

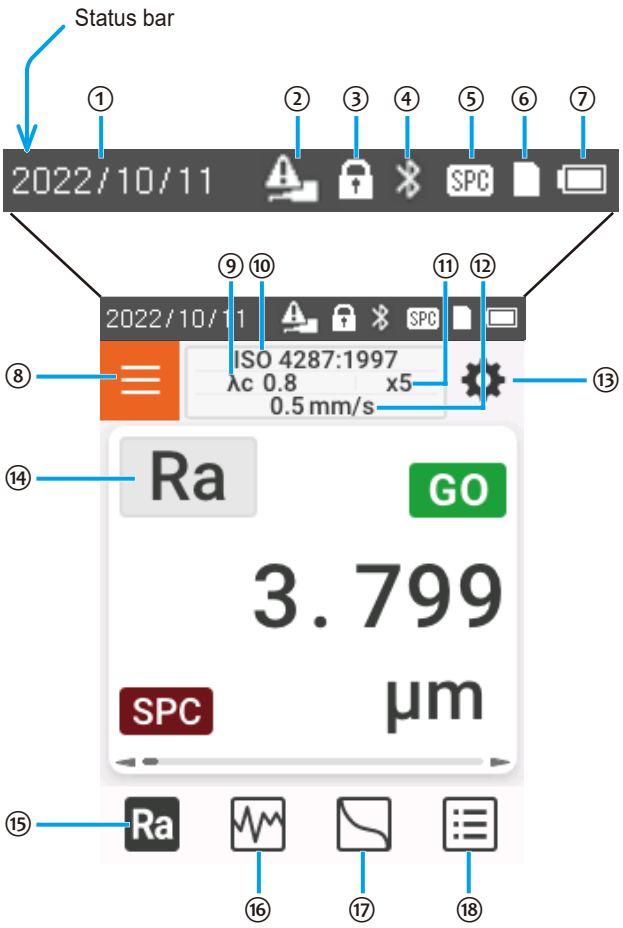
# 2.2 Touch Panel (LCD)

## 2.2.1 Home Screen

When the power to this product is turned on, the Home screen is displayed on the touch panel of the display unit.

This section explains the icons and other items displayed on the Home screen.

The status bar, which displays the date and the product status, is displayed at the top of all screens.




| No. | Description | |
|---|---|---|
| ① | Date | |
| ② | Stylus alarm icon | |
| ③ | Function restriction<br>For details about the icon, see 📖 "● Function restriction". | |
| ④ | Communication status<br>For details about the icon, see 📖 "● Communication status". | |
| ⑤ | Data output<br>For details about the icon, see 📖 "● Data output". | |
| ⑥ | Memory card insertion status, formatting status<br>For details about the icon, see 📖 "● Memory card status". | |
| ⑦ | Internal battery status<br>For details about the icon, see 📖 "● Internal battery status". | |
| ⑧ | Main menu button | |
| ⑨ | Cutoff value | Measurement conditions |
| ⑩ | Standard | |
| ⑪ | Number of sections | |
| ⑫ | Measuring speed | |
| ⑬ | Set system button | |
| ⑭ | Parameter | |
| ⑮ | Measurement result display button | |
| ⑯ | Evaluation profile button | |
| ⑰ | Graph button | |
| ⑱ | Conditions list button | |

## 2.2.2 Indicator and Icons that Show the Status and Functions

The icons that are displayed on the status bar indicate the product status.
The icons that are displayed on each screen indicate the product functions and menus items.

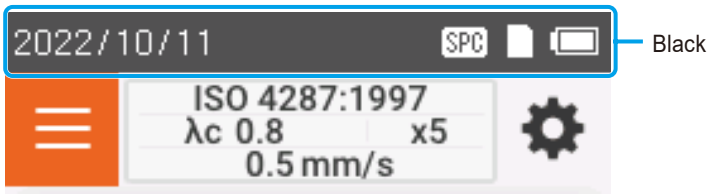
**Tips**
For details about the status bar, see "2.2.1 Home Screen" on page A-9.

### ■ Indicator and icons on the status bar (status display)

#### ● Measurement-ready indicator

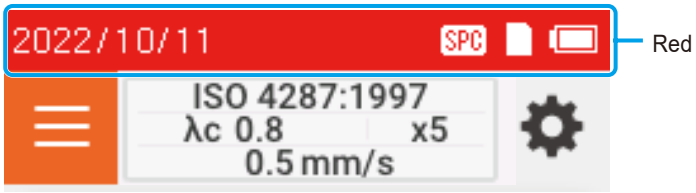
When the detector is attached to the drive/detector unit, you can check on the Home screen whether the detector is in the measurement-ready position (whether the detector is in contact with the roughness specimen or workpiece).
When the detector is in the measurement-ready position, the status bar turns black. When the detector is not in the measurement-ready position, the status bar turns red.

**When the detector is in the measurement-ready position**




**When the detector is not in the measurement-ready position**

**Tips**
For the retractable type drive/detector unit, the contact status is not displayed.



## ● Internal battery status

The icons below indicate the status of the internal battery.

**Tips**

For details about how to charge the battery, see 📖 "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".

| Icon | Description |
|---|---|
|  | Indicates that the battery is being charged. |
|  | Indicates that the internal battery switch is off or that there is an abnormality in the internal battery.<br>**Tips**<br>• For details about the internal battery switch, see 📖 "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14 in "PART B Setting Up".<br>• If the icon shown to the left remains displayed even when the internal battery switch is turned on, please contact the agent where you purchased this product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |
|  | Indicates that the internal battery is fully charged or that the internal battery is at 80 % or more capacity. |
|  | Indicates that the internal battery is at 80 % to 60 % capacity. |
|  | Indicates that the internal battery is at 60 % to 40 % capacity. |
|  | Indicates that the internal battery is at 40 % to 20 % capacity.<br>**Tips**<br>When the internal battery status icon indicates that the remaining capacity is at 40 % to 20 %, connect this product to an external power source as soon as possible. |
|  | Indicates that the internal battery is at 20 % to 0 % capacity.<br>**IMPORTANT**<br>When the internal battery status icon indicates that the internal battery is at 20 % to 0 % capacity, connect this product to an external power source immediately.<br>If this product is left with the internal battery at 20 % to 0 % capacity, measurement results or other data may be erased. |

## ● Memory card status

The icons below indicate the memory card insertion status.

| Icon | Description |
|---|---|
|  | Indicates that a memory card has been inserted and recognized. |
|  | Indicates that the inserted memory card has not been formatted. |

## ● Data output

The icons below indicate information about the data output.

| Icon | Description |
|---|---|
|  | Indicates that data will be output via SPC when the [POWER/DATA] key is pressed. Parameters for which this icon is displayed on the Home screen can be output via SPC. |
|  | Indicates that data will be output to a printer when the [POWER/DATA] key is pressed. |
|  | Indicates that data will be output to a memory card when the [POWER/DATA] key is pressed. |
|  | Indicates that a hard copy of the displayed contents (screenshot) will be saved on the memory card as bitmap data when the [POWER/DATA] key is pressed. |

## ● Communication status

The icons below indicate the communication status.

| Icon | Description |
|---|---|
|  | Indicates that command transmission has been established with a PC.<br>In this case, no data is output even when the [POWER/DATA] key is pressed. |
|  | Indicates that a wireless communication unit for measuring instruments (optional accessory) is connected. |
|  | Indicates that a wireless communication unit for measuring instruments (optional accessory) is advertising its information (waiting to be connected). |
|  | Indicates that the power to a wireless communication unit for measuring instrument (optional accessory) has been turned off. |

### ● Function restriction

The icons below indicate restrictions on touch panel operations or on functions.

| Icon | Description |
|---|---|
|  | Indicates that touch panel operations have been disabled. |
|  | Indicates that functions have been restricted by a password. |

## ■ Icons on each screen (display of functions and menus)

### ● Main menu

The icons below indicate the top-level items for operating and setting various functions.
These icons are displayed on the [Main menu] screen.

| Icon | Description |
|---|---|
|  | Execute calibration measurement. Or, set the calibration measurement conditions. |
|  | Set the measurement conditions. |
|  | Manage measurement data. |
|  | Set parameters. |
|  | Display the Set Environ. menu. |
|  | Change the screen display. |
|  | Display the section length results. |
|  | Retract the detector. |

## ● Calib.Meas.

The icons below indicate functions and operations related to calibration measurement.
These icons are displayed on the calibration measurement screen.

| Icon | Description |
|---|---|
|   | Start the calibration measurement. |
|   | Stop the calibration measurement. |
|  | Update the calibration value. |
|  | Indicates the nominal value of the roughness specimen. |
|  | Indicates the calibration measurement result. |
|  | Set the nominal value. |

## ● Calibration menu

The icons below indicate calibration conditions and other items.
These icons are displayed on the [Cal. Menu] screen.

| Icon | Description |
|---|---|
|  | Set the calibration measurement conditions. |
|  | Display the calibration history. |
|  | Display the stylus alarm (cumulative distance). Or, set the threshold value. |
|  | Touch this icon to return to the Home screen.<br>This icon is displayed on the [Cal.Condition] screen. |

## ● Daily menu

The icons below indicate items related to the Daily menu.
These icons are displayed on the [Daily menu] screen.

| Icon | Description |
|---|---|
|  | Display the calibration measurement screen. |
|  | Display the [Read Cond.] screen. |
|  | Delete all the saved trace data. |

## ● Meas.Cond., Meas.data

The icons below indicate items related to measurement conditions and measurement data.
These icons are displayed on the [Meas.Cond.] screen and [Meas.data] screen.

| Icon | Description |
|---|---|
|  | Set the measurement conditions. |
|  | Recall measurement conditions or measurement data. |
|  | Save the measurement data. |
|  | Manage the files for measurement conditions and measurement data. |
|  | Manage the main folder where measurement data is saved. |

## ● Set Environ.

The icons below indicate items related to the product configuration and status.
These icons are displayed on the [Set Environ.] screen.

| Icon | Description |
|---|---|
|  | Set the date and time. |
|  | Set the data output. |
|  | Change the language. |
|  | Set the drive/detector unit type, and perform speed calibration. |

| Icon | Description |
|---|---|
|  | Change the units. |
|  | Change the decimal separator. |
|  | Adjust the sound volume (operation sound). |
|  | Set the function restriction. |
|  | Set items related to the memory card. |
|  | Set the Auto-OFF function. |
|  | Set the self-timer function. |
|  | Adjust the brightness of the backlight. |
|  | Set items related to wireless communication. |
|  | Set items related to communication with a PC and items related to RS-232C. |
|  | Display the detector position. |
|  | Perform a response test on the LCD and the operation keys. |
|  | Initialize all settings. |
|  | Display the product version information. |

## ● Set System

The icons below indicate items related to the product configuration and status.
The Set System menu is a menu where you can quickly set the nine most frequently used Set Environ. items.
These icons are displayed on the [Set System] screen.

| Icon | Description |
|---|---|
|  | Switch wireless communication ON and OFF. |
|  | Select the data output items. |
|  | Set the SPC parameters, and set Auto-Output ON or OFF. |
|  | Switch the self-timer function ON and OFF. |
|  | Adjust the brightness of the touch panel backlight. |
|  | Adjust the sound volume (operation sound). |
|  | Switch the Auto-OFF function ON and OFF. |
|  | Change the units. |
|  | Display the product version information. |

## ■ Messages

| Icon | Description |
|---|---|
|  | Indicates a message about the product status or information, such as [Processing]. |
|  | Indicates a warning message. |
|  | Indicates a more severe warning message. |

# 2.3 Touch Panel Operations and Input Operations

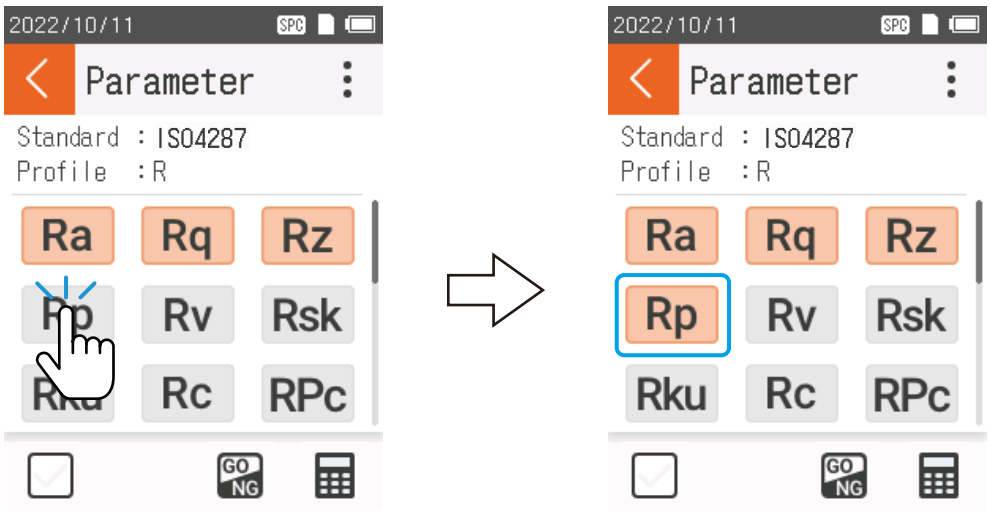
## ■ Touch panel operations

Touch the screen to operate this product and to input alphanumeric characters.
You can flick or swipe the screen to change screens, just as you would on your smartphone.
This section explains touch, flick, and swipe operations.

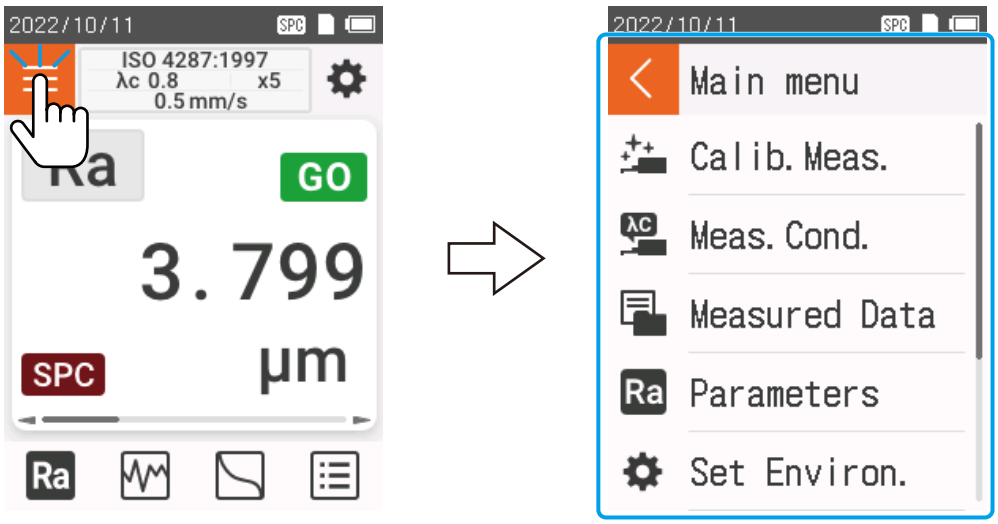
### ● Touch

Touch the screen to select an item or display a menu.

Selection of items




Menu display

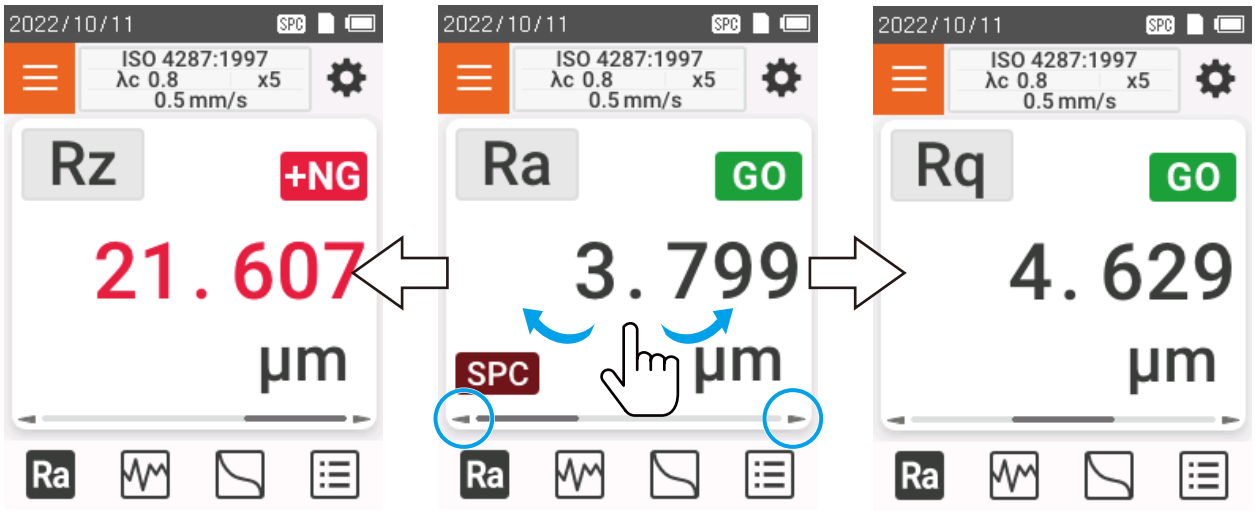


## ● Flick

First touch your finger to the screen, and then quickly slide your finger vertically or horizontally as if you are pushing the screen away.
Use this action to change the screen vertically or horizontally.

**Tips**

Flicking is available when the triangle-shaped marks (the circled marks in the figure below) are displayed at both ends of the scroll bar.

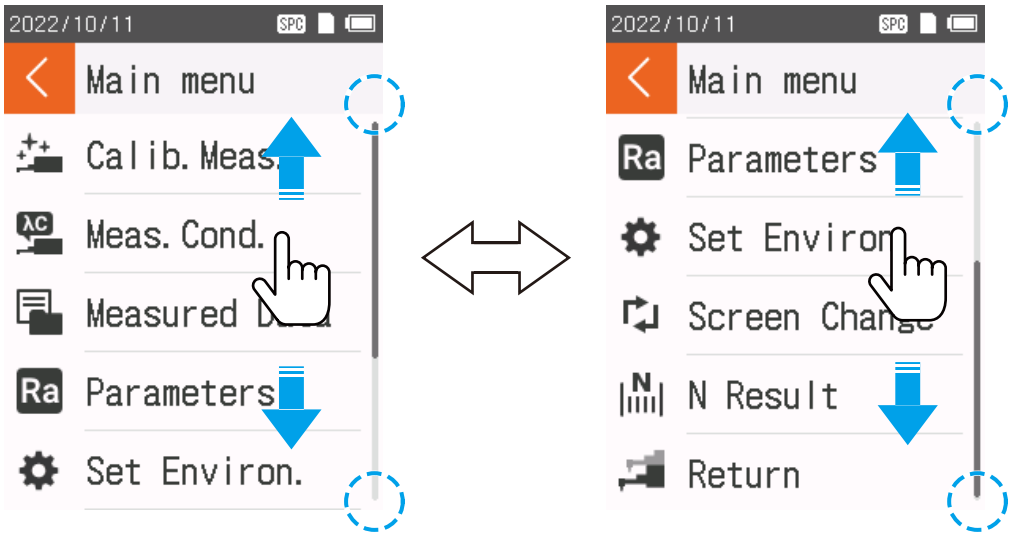



## ● Swipe

While touching your finger to the screen, slide your finger vertically or horizontally as if you are stroking the screen.
Use this action to scroll the screen vertically or horizontally to display menus.

**Tips**

Swiping is available when the scroll bar is displayed. (Triangle-shaped marks are not displayed.)






No. 99MBB794A

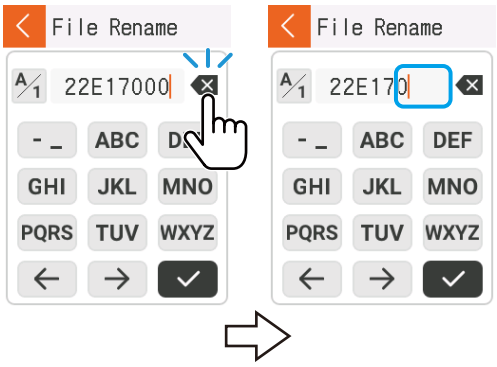
## ■ Input operations for alphanumeric characters

When changing measurement conditions, you input alphanumeric characters (including a hyphen and underscore).

Here as an example, this section explains the procedure for changing the file name from "22E17000" to "22E170R3" when creating new measurement conditions.

### 1 Touch ⌫ (backspace) two times.

» The last two digits are deleted.



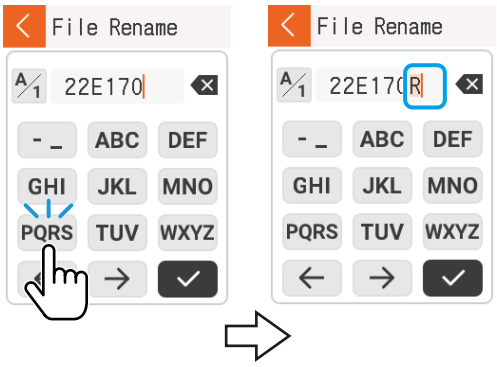

**Tips**

Touching the input field displays AC (all clear). To clear the entire input value, touch AC (all clear).

For details, see 📖 "● Clearing the entire input value (AC)" on page A-21.

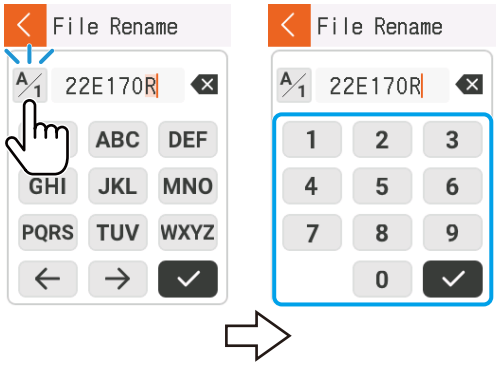
### 2 Touch PQRS three times.

» "R" is input in the input field.



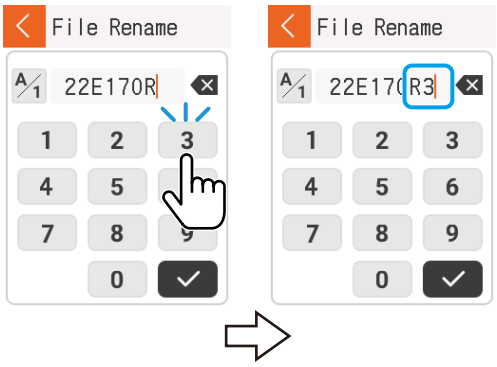

### 3 Touch A/1.

» The input buttons change from alphabetic to numeric buttons.



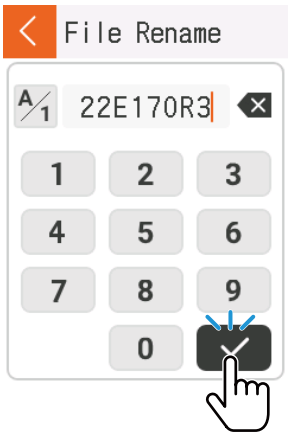
**4** **Touch** 3 .

» "3" is input at the end of the input value.




**5** **Touch** ✓ **(confirm).**

» The value you input is confirmed.

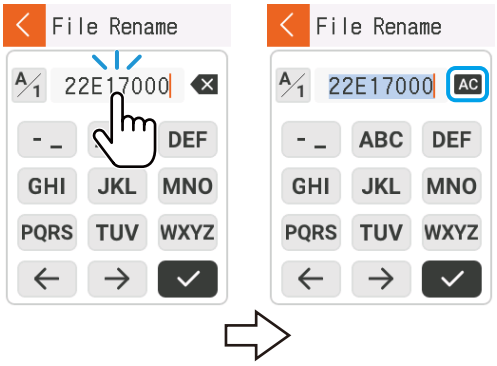



## ● Clearing the entire input value (AC)

To clear the entire input value, touch AC (all clear).
The AC (all clear) button is displayed in the same place as ✕ (backspace) when you touch the input field.

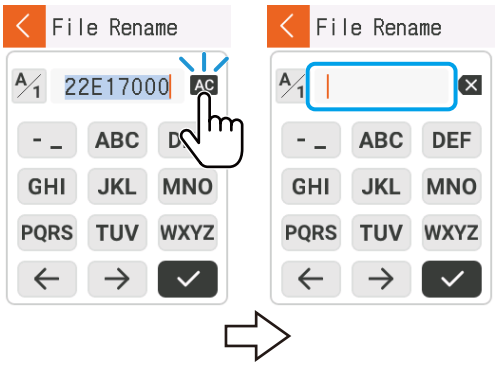
**1** **Touch the input field.**

» The input field is selected, and the AC (all clear) button is displayed.



**2** **Touch AC (all clear).**

» The entire input value is cleared.

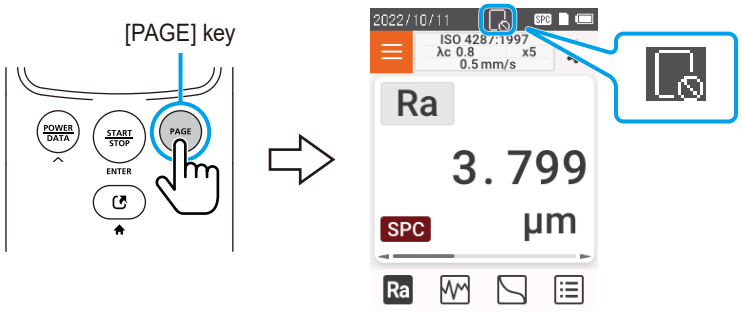



## ■ Disabling the touch panel

Press and hold the [PAGE] key to disable touch panel operation.

While touch panel operations are disabled, the status bar displays an icon that indicates that touch panel operations are disabled.

To enable operations again after touch panel operations have been disabled, touch and hold the [PAGE] key.



# 2.4 Changing the Contents of the Measurement Display Screen

You can change the orientation (portrait, landscape) of the screen and the number of parameters displayed on one screen.

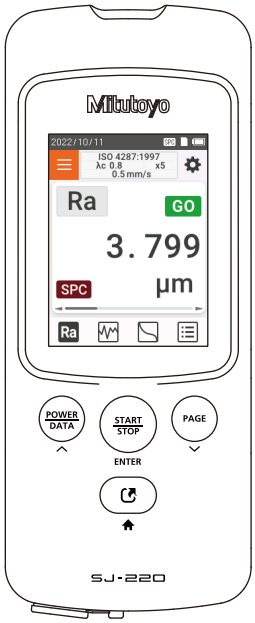
The contents of the following screens can be changed: the calculation results screen, the evaluation profile screen, the graph display screen, the conditions list screen, and the roughness standard setting screen.

## ■ Display orientation

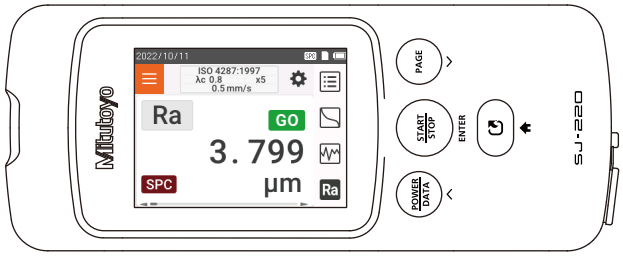
When using this product sideways, select either the right-handed landscape display or the left-handed landscape display as the display orientation. (Holding this product sideways while the display orientation is set to portrait does not change the orientation to landscape.)

For details about the setting method, see "2.4.2 Display Orientation" on page A-27.

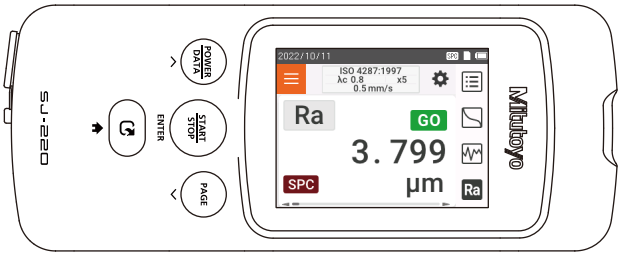
Portrait display




Landscape display (right-handed)



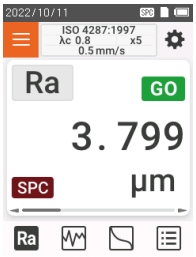
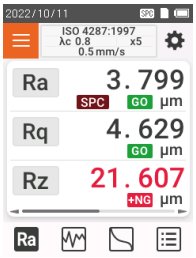
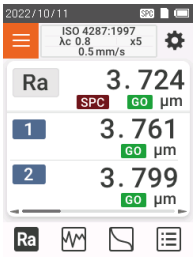
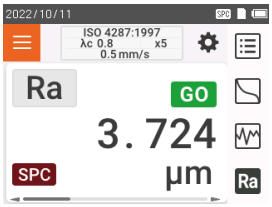
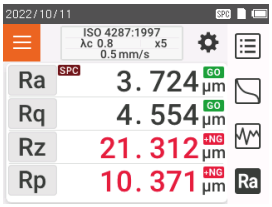
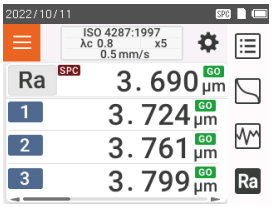

Landscape display (left-handed)



## ■ Calculation result display

Select one of the following six display patterns.

For details about the setting method, see "2.4.3 Calculation Results Screen" on page A-29.

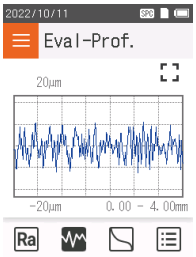
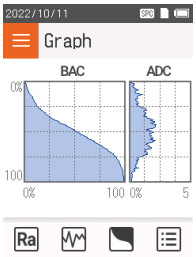
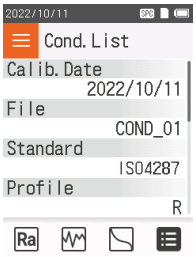
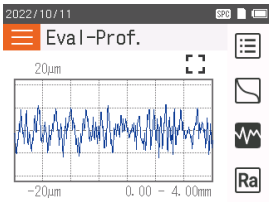
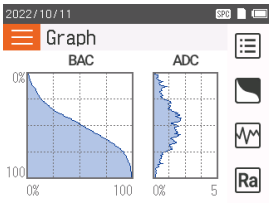
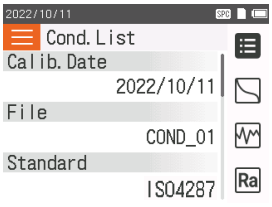
| | 1 parameter | 3 parameters (portrait)<br>4 parameters (landscape) | Trace |
|---|---|---|---|
| Portrait display |  |  |  |
| Landscape display |  |  |  |

## ■ Evaluation profile, graph, and conditions list displays

Select portrait display, landscape display, or hide the screen.

The display orientation (portrait/landscape) selected on the [Disp. Ori.] screen is automatically applied to the [Eval-Prof.] screen, the [Graph] screen, and the [Cond.List] screen.

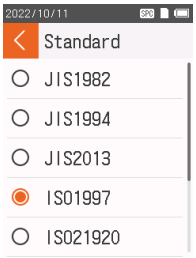
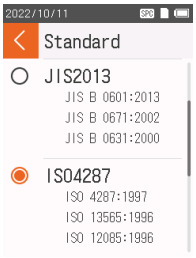
For details about how to display or hide the screen, see "2.4.4 Evaluation Profile Screen" on page A-31, "2.4.5 Graph Display Screen" on page A-32, and "2.4.6 Conditions List Display Screen" on page A-33.

| | Evaluation profile | Graphs | Conditions list |
|---|---|---|---|
| Portrait display |  |  |  |
| Landscape display |  |  |  |

## ■ Display of the roughness standard setting screen

Select the simple display or the detailed display.

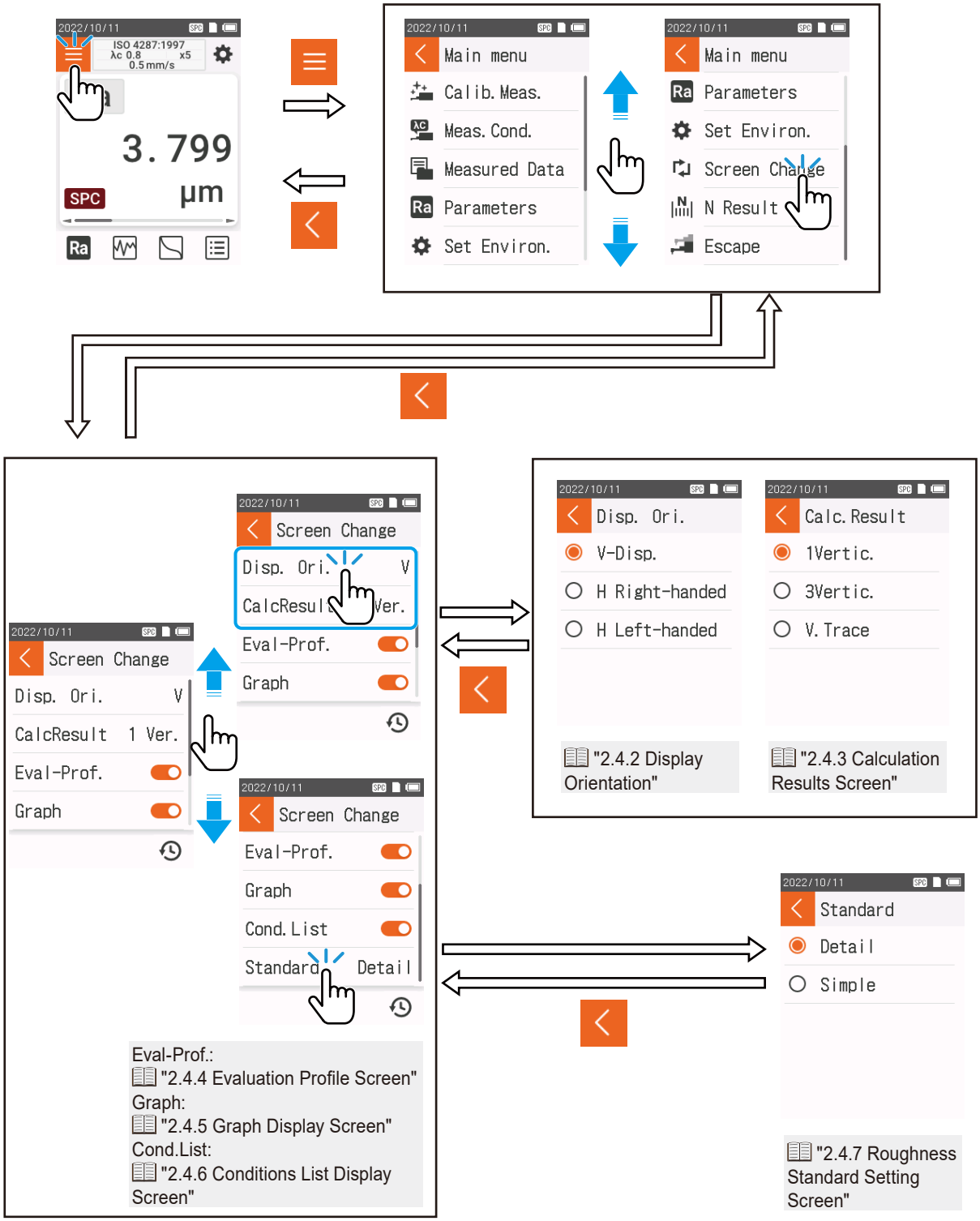
For details about the setting method, see "2.4.7 Roughness Standard Setting Screen" on page A-34.

| Simple display | Detailed display |
|---|---|
|  |  |

## 2.4.1 Screen Transitions for Measurement Display Screens

**Tips**

To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.



## 2.4.2 Display Orientation

You can change the orientation of the screen to portrait or landscape.

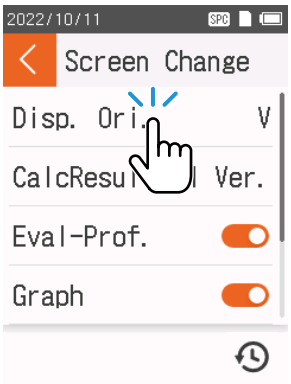
When changing the display orientation to landscape, you can select the "right-handed" landscape display, where the operation keys are located to the right of the screen, or the "left-handed" landscape display, where the operation keys are located to the left of the screen.

**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

**2 Touch [Disp. Ori.].**

» The [Disp. Ori.] screen is displayed.




**Tips**

The current settings are displayed to the right side of each button.

**3 Touch the desired display orientation.**

**(Example: Touch [H Right-handed].)**

| | |
|---|---|
| V-Disp. | The screen is displayed in portrait orientation. (Initial setting) |
| H Right-handed | The screen is displayed in landscape orientation.<br>The operation keys are located to the right of the screen. |
| H Left-handed | The screen is displayed in landscape orientation.<br>The operation keys are located to the left of the screen. |



**4** **Touch (return).**

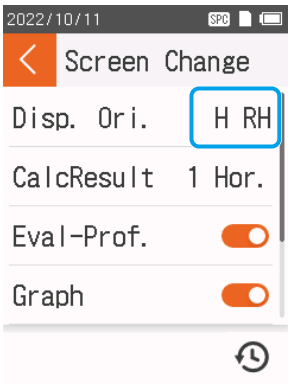
» The screen returns to the [Screen Change] screen.




**5** **Check that the set item is reflected on the [Screen Change] screen.**

### Tips

- See "■ Display orientation" on page A-23 to confirm the display after changing the setting.
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.



## 2.4.3 Calculation Results Screen

Set the contents that are displayed on the [Calc.Result] screen.

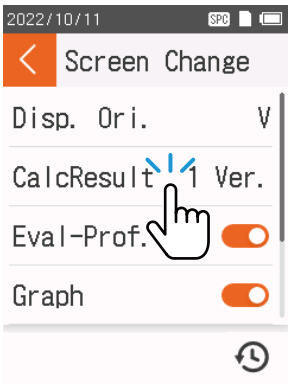
The orientation (portrait/landscape) selected on the [Disp. Ori.] screen is automatically applied to the [Calc.Result] screen.

**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

**2 Touch [CalcResult].**

» The [Calc.Result] screen is displayed.




**Tips**

The current settings are displayed to the right side of each button.

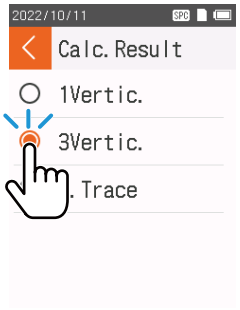
**3 Touch the desired option button.**

**(Example: Select [3Vertic.].)**

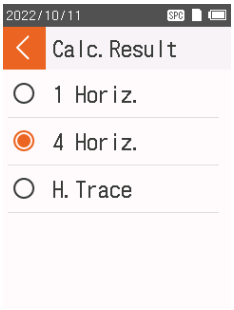
For the display settings and descriptions of the display patterns, see the following table.

| Setup item | Description | |
|---|---|---|
| | Display orientation | Number of displayed parameters |
| 1Vertic. | Portrait | 1 |
| 3Vertic. | | 3 |
| V.Trace | | 1 |
| 1 Horiz. | Landscape | 1 |
| 4 Horiz. | | 4 |
| H.Trace | | 1 |

For portrait display




For landscape display

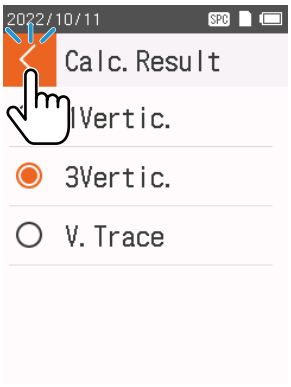



**Tips**

For the vertical trace and horizontal trace display, see "3.5.7 Trace Display" on page C-70 in "PART C Measurement".

**4** **Touch (return).**

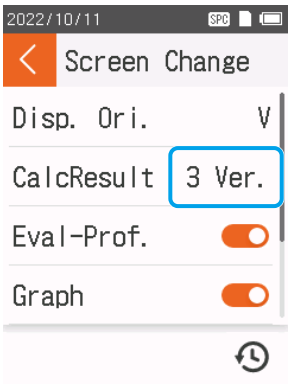
» The screen returns to the [Screen Change] screen.




**5** **Check that the set item is reflected on the [Screen Change] screen.**

### Tips

- See 📖 "■ Calculation result display" on page A-24 to confirm the display after changing the setting.
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.



## 2.4.4 Evaluation Profile Screen

Set whether to display or hide the [Eval-Prof.] screen.

The orientation (portrait/landscape) selected on the [Disp. Ori.] screen is automatically applied to the [Eval-Prof.] screen.

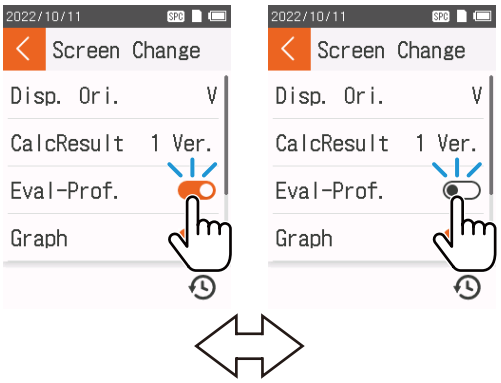
**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

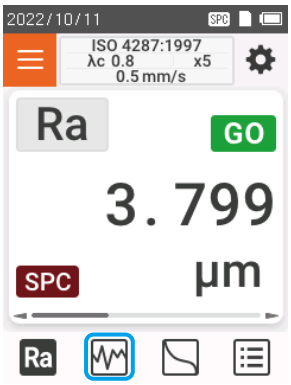
**2 Touch the ON/OFF button for [Eval-Prof.] to switch between ON ( ) and OFF ( ).**

**Tips**

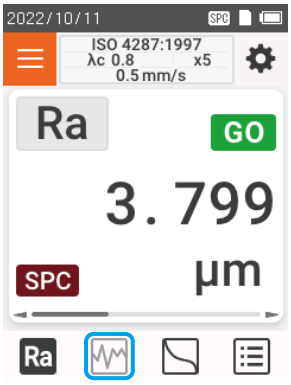
- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.




» When ON ( ) is selected, the evaluation profile button on the Home screen is enabled. Touch the button to display the [Eval-Prof.] screen.




» When OFF ( ) is selected, the evaluation profile button on the Home screen is disabled.



## 2.4.5 Graph Display Screen

Set whether to display or hide the [Graph] screen.

The orientation (portrait/landscape) selected on the [Disp. Ori.] screen is automatically applied to the [Graph] screen.

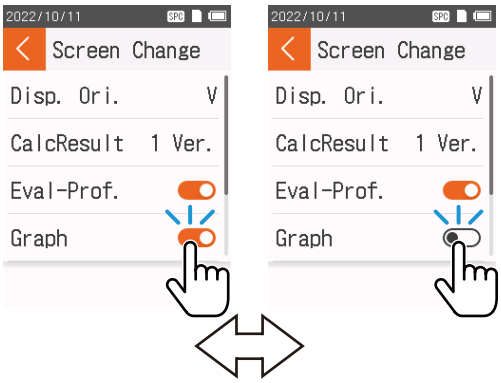
**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

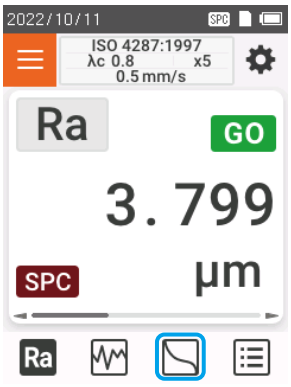
**2 Touch the ON/OFF button for [Graph] to switch between ON ( ) and OFF ( ).**

**Tips**

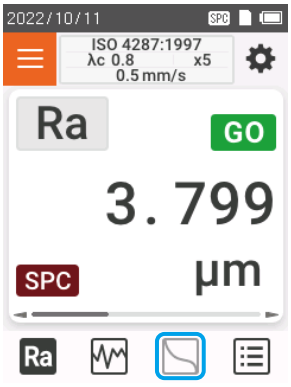
- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.




» When ON ( ) is selected, the graph button on the Home screen is enabled. Touch the button to display the [Graph] screen.




» When OFF ( ) is selected, the graph button on the Home screen is disabled.



## 2.4.6 Conditions List Display Screen

Set whether to display or hide the [Cond.List] screen.

The orientation (portrait/landscape) selected on the [Disp. Ori.] screen is automatically applied to the [Cond.List] screen.

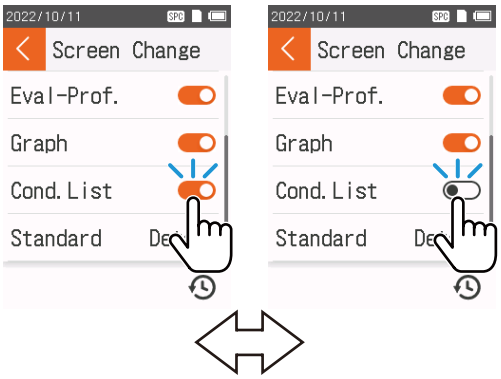
**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

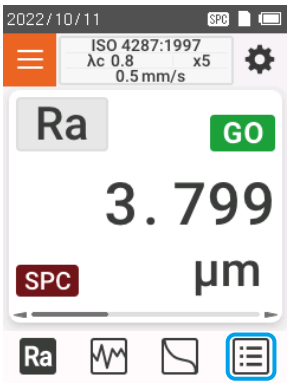
**2 Touch the ON/OFF button for [Cond.List] to switch between ON ( ) and OFF ( ).**

**Tips**

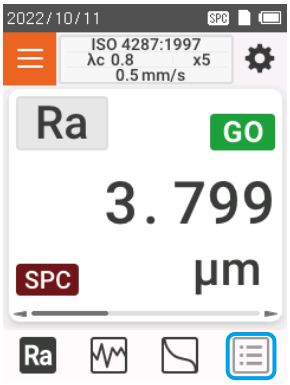
- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.




» When ON ( ) is selected, the conditions list button on the Home screen is enabled. Touch the button to display the [Cond.List] screen.




» When OFF ( ) is selected, the conditions list button on the Home screen is disabled.



## 2.4.7 Roughness Standard Setting Screen

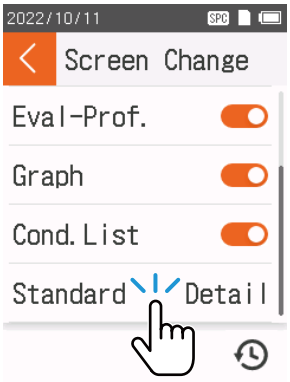
Set the simple display or the detailed display for the [Standard] screen.

**1 Touch (main menu) on the Home screen and then [Screen Change].**

» The [Screen Change] screen is displayed.

**2 Touch [Standard].**

» The [Standard] screen is displayed.




**Tips**

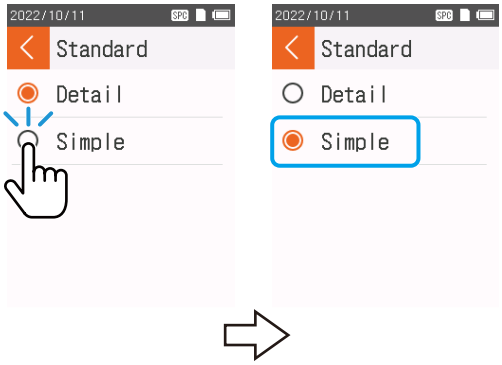
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18.

**3 Touch the desired option button.**

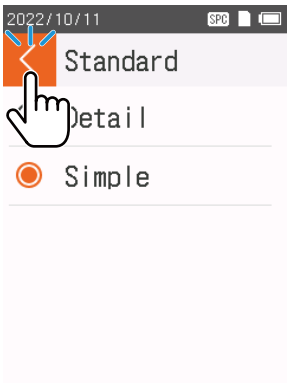
**(Example: Select [Simple].)**

» The option button you touched is selected.




**4 Touch (return).**

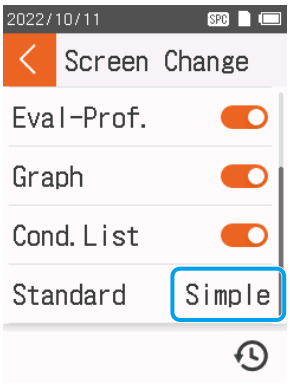
» The screen returns to the [Screen Change] screen.



**5** **Check that the set item is reflected on the [Screen Change] screen.**

### Tips

- See "■ Display of the roughness standard setting screen" on page A-25 to confirm the display after changing the setting.
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.
- To return the settings to their initial values, touch (initialize), and then touch (confirm) on the next screen.



# 2.5 Screen Hierarchy

This section gives an outline of the hierarchy of the screens that are displayed on the touch panel.

## ■ Confirming measurement results from the Home screen

For details about confirming measurement results, see 📖 "3.5 Measurement Results Display" on page C-61 in "PART C Measurement".

| Screen hierarchy | Reference location |
|---|---|
| Home screen | – |
| Screens for the displaying each parameter calculation result | 📖 "3.5.2 Changing the Parameter Display" in "PART C Measurement" |
| [Eval-Prof.] screen | 📖 "3.5.3 Evaluation Profile Display" in "PART C Measurement" |
| [Graph] screen | 📖 "3.5.4 Graph Display" in "PART C Measurement" |
| [Cond.List] screen | 📖 "3.5.5 Conditions List Display" in "PART C Measurement" |

## ■ Configuring settings from the Home screen

| Screen hierarchy | Reference location |
|---|---|
| Home screen | – |
| [Main menu] screen | – |
| Calibration measurement screen | 📖 "2.3 Calibration Measurement" in "PART C Measurement" |
| [Meas.Cond.] screen | 📖 "1 Measurement Conditions" in "PART D Measurement Conditions and Parameters" |
| [Meas.data] screen | 📖 "1 Saving/Recalling/Deleting/Renaming Measurement Data" in "PART E Measurement Data Management" |
| [Parameter] screen | 📖 "2 Setting the Parameters" in "PART D Measurement Conditions and Parameters" |
| [Set Environ.] screen | 📖 "PART F Environment Settings" |
| [Screen Change] screen | 📖 "2.4 Changing the Contents of the Measurement Display Screen" in "PART A Overview" |
| [N Result] screen | 📖 "3.5.8 Displaying the Calculation Results at Each Section Length" in "PART C Measurement" |
| Escape screen | 📖 "1.2.1 Retracting the Detector" in "PART G Maintenance and Troubleshooting" |
| [Set System] screen | 📖 "3 Set System Menus" in "PART F Environment Settings" |
| [Wireless] ON/OFF button | 📖 "3.1 Wireless" in "PART F Environment Settings" |
| [DataOut.] selection button | 📖 "3.2 DataOut." in "PART F Environment Settings" |
| [SPC] output parameter selection button | 📖 "3.3 SPC" in "PART F Environment Settings" |
| [Timer] ON/OFF button | 📖 "3.4 Timer" in "PART F Environment Settings" |

| Screen hierarchy | Reference location |
|---|---|
| [Light] adjustment button | 📖 "3.5 Light" in "PART F Environment Settings" |
| [Sound] adjustment button | 📖 "3.6 Sound" in "PART F Environment Settings" |
| [Auto-OFF] adjustment button | 📖 "3.7 Auto-OFF" in "PART F Environment Settings" |
| [Unit] selection button | 📖 "3.8 Unit" in "PART F Environment Settings" |
| [Version] display button | 📖 "3.9 Version" in "PART F Environment Settings" |
| [Daily menu] screen | 📖 "4 Daily Menu" in "PART C Measurement" |
| Calibration measurement screen | 📖 "2.3 Calibration Measurement" in "PART C Measurement" |
| [Read Cond.] screen | 📖 "1.3.3 Recalling Measurement Conditions" in "PART D Measurement Conditions and Parameters" |
| [Trace Reset] screen | 📖 "■ Clearing the trace data" in "PART C Measurement" |

## ■ Screen hierarchy from the calibration measurement screen

**Tips**

For details about calibration, see 📖 "2 Calibration" on page C-4 in "PART C Measurement".

| Screen hierarchy | Reference location |
|---|---|
| Calibration measurement screen | – |
| [Nom Val.] screen | 📖 "2.4 Setting the Nominal Value of the Roughness Specimen" in "PART C Measurement" |
| [Cal.Condition] screen | – |
| [Meas.No.] screen | 📖 "2.5.1 Number of Measurements" in "PART C Measurement" |
| [Standard] screen | 📖 "2.5.2 Roughness Standard" in "PART C Measurement" |
| [Filter] screen | 📖 "2.5.3 Filter" in "PART C Measurement" |
| [λc] (cutoff value) screen | 📖 "2.5.4 Cutoff Value (λc)" in "PART C Measurement" |
| [λs] (cutoff value) screen | 📖 "2.5.5 Cutoff Value (λs)" in "PART C Measurement" |
| [N] screen | 📖 "2.5.6 Number of Sections (N)" in "PART C Measurement" |
| [Opt Length] screen | 📖 "2.5.7 Evaluation Length" in "PART C Measurement" |
| [M-Speed] screen | 📖 "2.5.8 Measuring Speed" in "PART C Measurement" |
| [Range] screen | 📖 "2.5.9 Measurement Range" in "PART C Measurement" |
| [Calib.History] screen | 📖 "2.6 Confirmation and Deletion of the Calibration History" in "PART C Measurement" |
| [Stylus Alarm] screen | 📖 "2.7 Stylus Alarm Function" in "PART C Measurement" |
| [Threshold] screen | |

## ■ Screen hierarchy from the Measurement condition menu screen

**Tips**

For details about the measurement conditions settings, see 📖 "1.1 Modifying the Measurement Conditions" on page D-1 in "PART D Measurement Conditions and Parameters".

| Screen hierarchy | Reference location |
|---|---|
| [Meas.Cond.] screen | – |
| [Meas.Condition] screen | – |
| [Standard] screen | 📖 "1.1.2 Roughness Standard" in "PART D Measurement Conditions and Parameters" |
| [Profile] screen | 📖 "1.1.3 Evaluation Profile" in "PART D Measurement Conditions and Parameters" |
| [Parameter] screen | 📖 "2.2 Setting the Parameters to Display (Parameter Customization)" in "PART D Measurement Conditions and Parameters" |
| [Filter] screen | 📖 "1.1.5 Filter" in "PART D Measurement Conditions and Parameters" |
| [λc] (cutoff value) screen | 📖 "1.1.6 Cut-Off Related Items" in "PART D Measurement Conditions and Parameters" |
| [λs] (cutoff value) screen | |
| [N] screen | 📖 "1.1.7 Number of Sections" in "PART D Measurement Conditions and Parameters" |
| [Opt Length] screen | 📖 "1.1.8 Evaluation Length" in "PART D Measurement Conditions and Parameters" |
| [Pre/Post] screen | 📖 "1.1.9 Pre-Travel/Post-Travel" in "PART D Measurement Conditions and Parameters" |
| [M-Speed] screen | 📖 "1.1.10 Measuring Speed" in "PART D Measurement Conditions and Parameters" |
| [Range] screen | 📖 "1.1.11 Measurement Range" in "PART D Measurement Conditions and Parameters" |
| [Save] screen | – |
| [Save Cond.] (main unit) screen | 📖 "■ Saving to the internal memory" on page D-30 in "PART D Measurement Conditions and Parameters" |
| [Save Cond.] (memory card) screen | 📖 "■ Saving to a memory card" in "PART D Measurement Conditions and Parameters" |
| [Save New] screen | |
| [Read] screen | 📖 "1.3.3 Recalling Measurement Conditions" in "PART D Measurement Conditions and Parameters" |
| [Read Cond.] (Direct) screen | |
| [Read Cond.] (Memory card) screen | |
| [File mgmt.] screen | 📖 "1.1.4 Parameters to Display" and "1.3.5 Renaming Measurement Conditions Files" in "PART D Measurement Conditions and Parameters" |
| [File mgmt.] (Direct) screen | |
| [File mgmt.] (Memory card) screen | |

## ■ Screen hierarchy from the Measurement data menu screen

**Tips**

For details about measurement data management, see 📖 "1 Saving/Recalling/Deleting/Renaming Measurement Data" on page E-1 in "PART E Measurement Data Management".

| Screen hierarchy | Reference location |
|---|---|
| [Meas.data] screen | – |
| [Read] screen | 📖 "1.4 Recalling Measurement Data Saved on a Memory Card" in "PART E Measurement Data Management" |
| [Read Data] screen | |
| [Search] screen | |
| [Save] screen | 📖 "1.5 Saving Measurement Data to a Memory Card" in "PART E Measurement Data Management" |
| [Save Data] screen | |
| [Save New] screen | |
| [Search] screen | |
| [File mgmt.] screen | 📖 "1.6 Deleting Measurement Data Saved on the Memory Card", "1.7 Renaming Measurement Data Files Saved on the Memory Card" in "PART E Measurement Data Management" |
| [File mgmt.] screen | |
| [File Rename] screen | |
| [Search] screen | |
| [Folder mgmt.] screen | 📖 "1.3 Management of Folders on a Memory Card" in "PART E Measurement Data Management" |
| [Folder Rename] screen | |
| [Read(SJ-210)] screen | 📖 "1.4 Recalling Measurement Data Saved on a Memory Card" in "PART E Measurement Data Management" |
| [Read Data] screen | |
| [Search] screen | |

## ■ Screen hierarchy from the Parameter setting screen

**Tips**

For details about the parameter settings, see 📖 "2 Setting the Parameters" on page D-45 in "PART D Measurement Conditions and Parameters".

| Screen hierarchy | Reference location |
|---|---|
| [Parameter] screen | 📖 "2 Setting the Parameters" in "PART D Measurement Conditions and Parameters" |
| [Tol.Judge] screen | 📖 "2.3 GO/NG Judgment" in "PART D Measurement Conditions and Parameters" |
| [JudgeRules] screen | |
| [Toler.value] screen | |
| [Up Limit] screen | |
| [LowLimit] screen | |
| [Param. Details] screen | – |
| [Sm/Pc/Rc...] screen | 📖 "2.4.1 When Sm, Pc, Rc, etc., Is Selected" in "PART D Measurement Conditions and Parameters" |
| [ProfileElement] screen | |
| [Unit] screen | |
| [Count Level] screen | |
| [HSC] screen | 📖 "2.4.2 When HSC Is Selected" in "PART D Measurement Conditions and Parameters" |
| [Referance] screen | |
| [Unit] screen | |
| [Count Level] screen | |
| [mr] screen | 📖 "2.4.3 When mr Is Selected" in "PART D Measurement Conditions and Parameters" |
| [Mode] screen | |
| [Slice points] screen | |
| [Reference Line] screen | |
| [Slice depth] screen | |
| [mr(c)] screen | 📖 "2.4.4 When mr(c) (tp for ASME) Is Selected" in "PART D Measurement Conditions and Parameters" |
| [Referance] screen | |
| [Unit] screen | |
| [Slice points] screen | |
| [Slice Level-1] screen | |
| [δc] screen | 📖 "2.4.5 When δc (Htp for ASME) Is Selected" in "PART D Measurement Conditions and Parameters" |
| [Reference Line] screen | |
| [Slice Level-1] screen | |
| [AnnexA] screen | 📖 "2.4.6 When the Motif Measurement Profile (R-Motif) Is Selected" in "PART D Measurement Conditions and Parameters" |

## ■ Screen hierarchy from the Set environment menu screen

**Tips**

For details about the environment settings, see 📖 "PART F Environment Settings".

| Screen hierarchy | Reference location |
|---|---|
| [Set Environ.] screen | – |
| [Date/Time] screen | 📖 "2.2 Date Setting" in "PART F Environment Settings" |
| [Year] screen | |
| [Mon/Date] screen | |
| [Time] screen | |
| [Format] screen | |
| [Data Output] screen | 📖 "2.3 Data Output Setting" in "PART F Environment Settings" |
| [SPC parameter] screen | 📖 "2.3.1 SPC Output" in "PART F Environment Settings" |
| [Set Printer] screen | 📖 "■ Setting which items to print" in "PART F Environment Settings" |
| V-scale setting screen | 📖 "■ Setting the print scale" in "PART F Environment Settings" |
| H-scale setting screen | |
| [SelectLanguage] screen | 📖 "2.4 Setting the Display Language" in "PART F Environment Settings" |
| [Drive] screen | 📖 "2.5 Setting the Drive Unit (Speed Calibration)" in "PART F Environment Settings" |
| Speed calibration screen | |
| [Nom Val.] screen | |
| [Switch unit] screen | 📖 "2.6 Measurement Unit Setting" in "PART F Environment Settings" |
| [Decimal Point] screen | 📖 "2.7 Decimal Separator Setting" in "PART F Environment Settings" |
| [Sound] screen | 📖 "2.8 Sound Volume (Operation Sound) Adjustment" in "PART F Environment Settings" |
| [Func.Restrict] screen | 📖 "2.9 Function Restriction (Setting a Password)" in "PART F Environment Settings" |
| [PasswordChange] screen | |
| [Memory Card] screen | 📖 "2.10 Memory Card Formatting and File Management" in "PART F Environment Settings" |
| [Use Cond.] screen | 📖 "■ Confirming the number of saved files" in "PART F Environment Settings" |
| [Backup] screen | 📖 "■ Backups" in "PART F Environment Settings" |
| [Auto-OFF] screen | 📖 "2.11 Auto-OFF Function Setting" in "PART F Environment Settings" |
| [Wait time] screen | |
| [Self-timer] screen | 📖 "2.12 Self-Timer Function Setting" in "PART F Environment Settings" |
| [Wait time] screen | |
| [Backlight] screen | 📖 "2.13 Backlight Adjustment" in "PART F Environment Settings" |
| [Wireless] screen | 📖 "2.14 Wireless Communication Settings" in "PART F Environment Settings" |
| [Device Name] screen | |

| Screen hierarchy | Reference location |
|---|---|
| [Comm. PC] screen | 📖 "2.15 PC Communication Setting" in "PART F Environment Settings" |
| [Speed] screen | |
| [Parity] screen | |
| [Detect. Pos.] screen | 📖 "2.16 Detector Position Display" in "PART F Environment Settings" |
| [LCD/key test] screen | 📖 "2.17 Touch Panel (LCD) and Operation Key Test" in "PART F Environment Settings" |
| [Version] screen | 📖 "2.19 Version Confirmation" in "PART F Environment Settings" |

## ■ Screen hierarchy from the Screen change menu screen

**Tips**

For details about changing the display of measurement screens, see 📖 "2.4 Changing the Contents of the Measurement Display Screen" on page A-23.

| Screen hierarchy | Reference location |
|---|---|
| [Screen Change] screen | – |
| [Disp. Ori.] screen | 📖 "2.4.2 Display Orientation" in "PART A Overview" |
| [Calc.Result] screen | 📖 "2.4.3 Calculation Results Screen" in "PART A Overview" |
| [Standard] screen | 📖 "2.4.7 Roughness Standard Setting Screen" in "PART A Overview" |

## ■ Screen hierarchy from the N Result screen

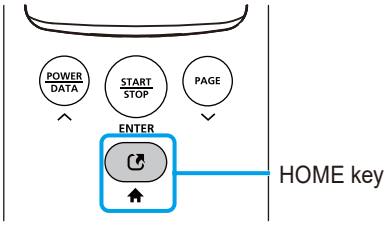
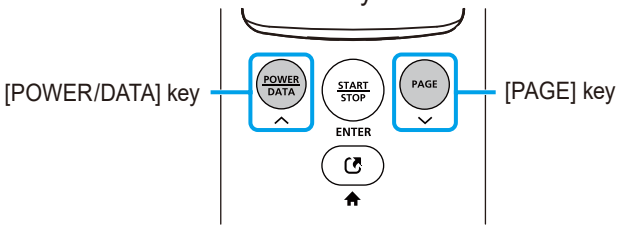
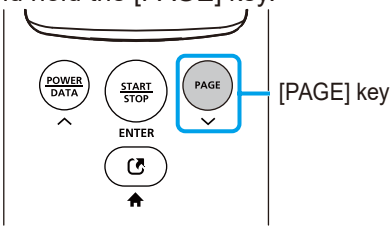
**Tips**

For details about the display of section lengths, see 📖 "3.5.8 Displaying the Calculation Results at Each Section Length" on page C-72 in "PART C Measurement".

| Screen hierarchy | Reference location |
|---|---|
| [N Result] screen | 📖 "3.5.8 Displaying the Calculation Results at Each Section Length" in "PART C Measurement" |
| [Toler.value] screen | |
| [Up Limit] screen | |
| [LowLimit] screen | |

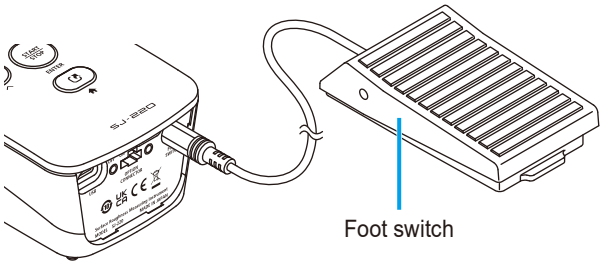
# 3 Quick Reference Table for Useful Functions

- Operations on the Home screen and other screens

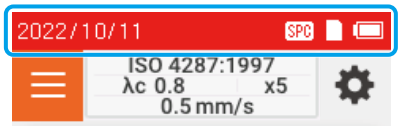
| Desired operation | Description |
|---|---|
| I want to return to the Home screen quickly. | Press the HOME key to return to the Home screen.<br> |
| I want to take a screenshot. | <Method 1><br>While the screen you want to capture is displayed, simultaneously press the [POWER/DATA] key and the [PAGE] key to save the screen data to the memory card.<br><br><Method 2><br>Touch (set system) on the Home screen, then [DataOut.], and finally the option button for (screen copy) to configure the data output settings.<br>After you have configured the data output settings, display the screen you want to capture, and press the [POWER/DATA] key to save the screen data to the memory card.<br>**Tips**<br>You can also configure the data output settings on the [Data Output] screen that is displayed by touching (main menu) on the Home screen, then [Set Environ.], and finally [Data Output]. |
| I want to disable the touch panel operations. | Press and hold the [PAGE] key to disable the touch panel operation.<br>To enable operations again after touch panel operations have been disabled, touch and hold the [PAGE] key.<br> |

## ● Operations for measurement, calibration measurement, and measurement data

| Desired operation | Description |
|---|---|
| I want to perform calibration measurement. | On the Home screen, press the HOME key to display the [Daily menu] screen.<br>While [Calib. Meas.] is selected, press the [START/STOP] key to display the calibration measurement screen.<br>**Tips**<br>You can also display the calibration measurement screen by touching ☰ (main menu) on the Home screen and then [Calib.Meas.]. |
| I want to recall measurement conditions saved in the internal memory. | On the Home screen, press the HOME key to display the [Daily menu] screen.<br>Press the [PAGE] key to select [Read Cond.], and then press the [START/STOP] key to recall the measurement conditions saved in the internal memory.<br>**Tips**<br>You can also recall measurement conditions saved in the internal memory or on a memory card by touching ☰ (main menu) on the Home screen, then [Meas.Cond.], and finally [Read]. |
| I want to save measurement results automatically. | Touch ☰ (main menu) on the Home screen, then [Set Environ.], and finally [Memory Card] to display the [Memory Card] screen, and then set [Auto-Save] to ON (⬤).<br>After measurement, the measurement results are automatically saved to the memory card. |
| I want to print out measurement results automatically. | Connect a Digimatic Mini-Processor (optional accessory) or a user-supplied printer to this product.<br>After you configure either of the following settings (① or ②), the measurement results will be printed out automatically upon completion of measurement.<br>① For a Digimatic Mini-Processor (optional accessory)<br>Touch ☰ (main menu) on the Home screen, then [Set Environ.], [Data Output], and finally the option button for [SPC] to display the [SPC parameter] screen, and then set [Auto-Output] to ON (⬤).<br>**Tips**<br>You can also display the [SPC parameter] screen by touching ⚙ (set system) on the Home screen and then > in the [SPC] field.<br>② For a printer (optional accessory)<br>Touch ☰ (main menu) on the Home screen, then [Set Environ.], [Data Output], and finally the option button for [Printer] to display the [Set Printer] screen, and then set [Auto-print] to ON (⬤). |
| I want to display the calculation results of continuous measurement. | Touch ☰ (main menu) on the Home screen, then [Screen Change], [CalcResult], and finally the option button for [V.Trace] or [H.Trace].<br>**Tips**<br>[V.Trace] or [H.Trace] is displayed according to the setting for the screen orientation. |

| Desired operation | Description |
|---|---|
| I want to clear the calculation results for continuous measurement. | While the calculation results are set to display trace data, press the HOME key on the Home screen.<br>Press the [PAGE] key to select [Trace Reset], and then press the [START/STOP] key. A message screen is displayed.<br>Touch ✓ (confirm) to clear all the calculation results other than the latest calculation result. |
| I want to use a foot switch to start and stop measurement. | Connect a foot switch (optional accessory) to the foot switch connector on the rear of the display unit.<br>Press the foot switch whenever you want to start or stop measuring.<br><br> |

## ● Operations for the detector and stylus

| Desired operation | Description |
|---|---|
| I want to know whether the detector is in contact with the workpiece. | When the detector is not in contact with the workpiece (when the detector is not in the measurement-ready position), the status bar is displayed in red as follows.<br><br>**Tips**<br>For the retractable type drive/detector unit, the contact status is not displayed. |
| I want to retract the detector. | Touch ☰ (main menu) on the Home screen and then [Escape] to retract the detector. |
| I want to set the replacement period (cumulative measuring distance) of the stylus. | On the Home screen, press the HOME key to display the [Daily menu] screen.<br>While [Calib. Meas.] is selected, press the [START/STOP] key to display the calibration measurement screen.<br>You can set the threshold for the cumulative measuring distance on the [Stylus Alarm] screen that is displayed by touching ⋮ (calibration menu) on the calibration measurement screen and then [Stylus Alarm].<br>**Tips**<br>You can also display the calibration measurement screen by touching ☰ (main menu) on the Home screen -> [Calib.Meas.]. |

## ● Operations for function restriction

| Desired operation | Description |
|---|---|
| I want to restrict access to functions such as measurement conditions so that only the administrator can modify them. | Touch ☰ (main menu) on the Home screen, then [Set Environ.], and finally [Func.Restrict] to display the [Func.Restrict] screen, and then set the functions to which you want to restrict access to ON ().<br>You can restrict access to the following four functions: calibration measurement, measurement conditions, file management, and environment settings.<br>Change the password on the [PasswordChange] screen that is displayed by touching 🔒 (function restriction) at the bottom of the screen.<br>**Tips**<br>The default password is "0000". |

## ● Operations for the system settings of this product

When you touch the set system button (⚙) on the Home screen, the frequently used Set Environ. menu items (shown in the table below) are displayed.

For details about the set system menu, see 📖 "3 Set System Menus" on page F-69 in "PART F Environment Settings".

| Desired operation | Description |
|---|---|
| I want to switch wireless communication ON or OFF. | Touch the ON/OFF field for [Wireless] to switch between [ON] and [OFF]. |
| I want to change the data output method easily. | Touch > in the [DataOut.] field to display the [Data Output] screen, and then touch the option button for the desired data output.<br>**Tips**<br>Advanced settings such as the auto-print setting can be set on the [Data Output] screen available from the [Set Environ.] menu. |
| I want to change the parameter for SPC output. | Touch > in the [SPC] field to display the [SPC parameter] screen, and then touch a parameter.<br>You can also set Auto-Output to ON or OFF. |
| I want to switch the self-timer function ON or OFF. | Touch the ON/OFF field for [Timer] to switch between [ON] and [OFF]. |
| I want to adjust the brightness of the backlight. | Touch (graduations) for [Light] to adjust the brightness. (The brightness can be adjusted from level 1 to 5.) |
| I want to adjust the sound volume. | Touch (graduations) for [Sound] to adjust the volume. (The volume can be muted or adjusted from level 1 to 5.) |
| I want to switch the Auto-OFF function ON or OFF. | Touch the ON/OFF field for [Auto-OFF] to switch between [ON] and [OFF]. |
| I want to change the units. (inch/millimeter specification only) | Touch the button for [Unit] to change the unit between [mm] and [inch]. |
| I want to check the product version information. | Touch > in the Version field to display the product version information, code No., and serial No. |

## MEMO

# PART B
# Setting Up


| | | |
|---|---|---|
| 1 | Operating Environment | B-1 |
| 2 | Flow for Setup Work | B-3 |
| 3 | Checking the Product and Included Items | B-4 |
| 4 | Attaching and Removing the Detector | B-8 |
| 5 | Supplying Power | B-13 |
| 6 | Initial Settings | B-29 |
| 7 | Other Setup Work | B-33 |


No. 99MBB794A

# 1 Operating Environment

To achieve the best performance with this product and measure safely, use this product within the usage conditions below.

## ■ Operating temperature / humidity

| | |
|---|---|
| Operating temperature range | 5 °C to 40 °C |
| Operating humidity range | 85 %RH or below (with no condensation) |

## ■ Altitude

| | |
|---|---|
| Altitude | A place at an altitude of 2,000 m or less |

**IMPORTANT**
If you use this product in a place at an altitude over 2,000 m, the measurement performance may be impaired.

## ■ Other usage conditions

- Use this product in a place with minimal vibration.
  Using the product over a long period of time in a place subject to frequent vibrations may cause malfunctions in the precision parts used in the product and impair the measurement performance.
- Use this product in a place with no dust or dirt.
  Dust or dirt will adversely affect the electronic and mechanical components used in the product.

## ■ External power source (via USB connection with the supplied AC adapter, a PC, etc.)

The supplied AC adapter or a PC can be used as an external power source.

Check that the specifications of the PC and USB 2.0 cable to use meet the power source specifications shown in the table below before connecting them to this product.

Use only the supplied AC adapter.

| | |
|---|---|
| Distribution method | Single-phase with two lines |
| Voltage | AC100 V to 240 V±10 % |
| | Overvoltage category II |
| | Pollution degree 2 |
| Frequency | 50 Hz / 60 Hz |
| Electric power consumption | Max. 6.5 VA |
| Number of power outlets | 1 |
| Supported USB standard | USB 2.0 (Full speed) |
| USB charging standard | BC1.2<br>This product supports the following ports.<br>• SDP (Standard Downstream Port)<br>• CDP (Charging Downstream Port)<br>• DCP (Dedicated Charging Port) |

## ■ Noise

Connect the AC adapter to a power source separate from a power source that supplies high electric current, for example to machine tools or large CNC measuring instruments. Also, use this product well away from equipment that generates electromagnetic noise, such as a welding machine or electric discharge machine.

# 2 Flow for Setup Work

Set up this product to get it ready for measurement.

PART B explains the procedures for starting up this product and configuring the initial settings such as the display language and date.

| | |
|---|---|
| Check the product and the included items.<br>📖 "3 Checking the Product and Included Items" on page B-4 | Check the product and the included items.<br>The drive unit is housed in the display unit inside the package. |
| Attach the detector.<br>📖 "4.1 Attaching the Detector" on page B-10 | Attach the detector to the drive unit.<br>At the time of purchase, the detector is unattached. |
| Supply power.<br>📖 "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14<br>📖 "5.2 Preparing the AC Adapter (Changing the AC Pin Adapter)" on page B-16<br>📖 "5.3 Charging the Internal Battery" on page B-19<br>📖 "5.4 Operation Using an External Power Source" on page B-22 | Supply the power to the product.<br>Use the internal battery or an external power source. |
| Start up the product.<br>📖 "5.5 Turning the Power ON/OFF" on page B-24 | Start up the product. |
| Set the display language and date (first time only).<br>📖 "6 Initial Settings" on page B-29 | Set the display language and date. |

**Tips**

For details about attaching and removing the connection cable (1 m), removing the detector, and replacing the drive/detector unit, see the following pages.

📖 "7.1 Attaching and Removing the Connection Cable (1 m)" on page B-33

📖 "4.2 Removing the Detector" on page B-12

📖 "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38

# 3 Checking the Product and Included Items

After unpacking, refer to the following pages and check the product you purchased.

If any of the product components or included items are missing or damaged, please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1).

**⚠CAUTION**

**There is a risk of injuring your hands and fingers.**

| | |
|---|---|
|  | At the time of purchase, this product and the standard accessories are vacuum-sealed in a plastic bag and placed in the packaging box.<br>Cut open the plastic bag with a pair of scissors. |
|  | Do not use a box-cutter or other cutting tools to open the plastic bag. You may injure your hands or fingers. |

**NOTICE**

**There is a possibility that this product may malfunction.**

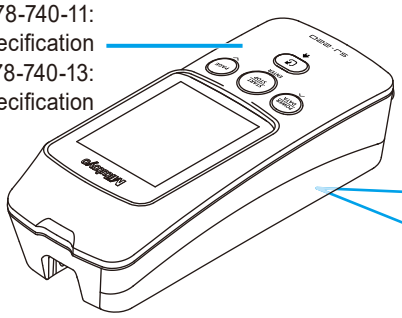
Be sure to use only the supplied AC adapter.
If you use an AC adapter other than the supplied one, this product may malfunction.

# 3.1 Standard Type

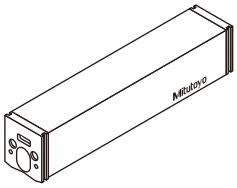
Check that the following items are included with the standard type.

| Name | Set code No. | Measuring force |
|---|---|---|
| SJ-220 standard type | 178-741-11: millimeter specification | 0.75 mN |
| SJ-220 standard type | 178-741-13: inch/millimeter specification | 0.75 mN |
| SJ-220 standard type | 178-742-11: millimeter specification | 4 mN |
| SJ-220 standard type | 178-742-13: inch/millimeter specification | 4 mN |

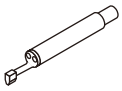
Display unit
No. 178-740-11:
millimeter specification
No.178-740-13:
inch/millimeter specification

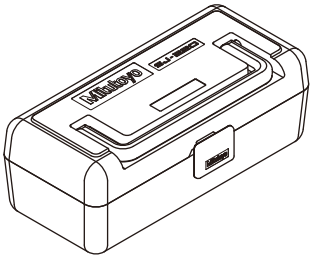


Standard drive unit
No.178-747

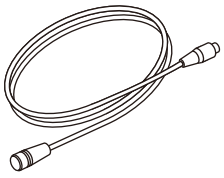


Detector
No.178-296
(Measuring force: 0.75 mN)
No.178-390
(Measuring force: 4 mN)

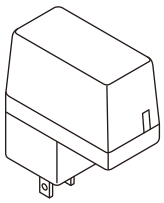




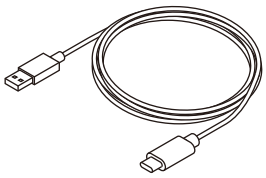
Handy case
No. 12AAY583



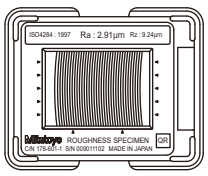
Connection cable (1 m)
No. 12BAA303



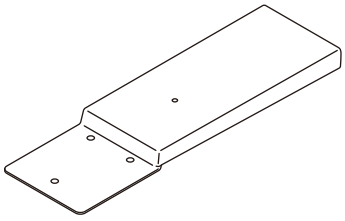
AC adapter
No. 12BAS450



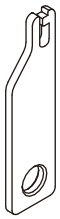
USB 2.0 cable
No. 12BAS451



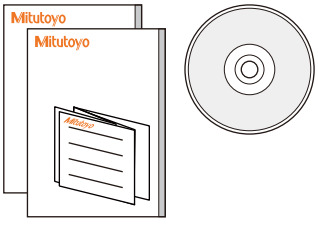
Roughness specimen
(with a case)
No. 178-601-1
(millimeter specification)
No. 178-602-1
(inch/millimeter specification)



Calibration stage
No. 12BAK700



Tool for operating the
internal battery switch
No. 12BAS476



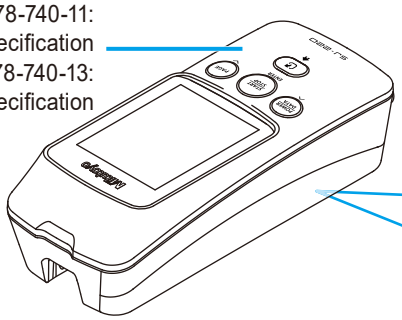

- Instruction Manual (English)
  No. 99MBB796A
- Basic Operation Guide
  (Japanese, English,
  Simplified Chinese)
  No. 99MBB795M
- Troubleshooting List
  No. 99MBB797M
- Manual CD-ROM
  No. 12BAT002
- The EU Declaration of Conformity
  No. DC019-0339
- The UK Declaration of Conformity
  No. DC049-0339
- Warranty
  No. 472730

# 3.2 Retractable Type

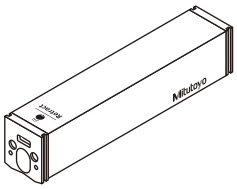
Check that the following items are included with the retractable type.

| Name | Set code No. | Measuring force |
|---|---|---|
| SJ-220 retractable type | 178-743-11: millimeter specification | 0.75 mN |
| SJ-220 retractable type | 178-743-13: inch/millimeter specification | 0.75 mN |
| SJ-220 retractable type | 178-744-11: millimeter specification | 4 mN |
| SJ-220 retractable type | 178-744-13: inch/millimeter specification | 4 mN |

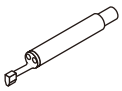
Display unit
No. 178-740-11:
millimeter specification
No.178-740-13:
inch/millimeter specification

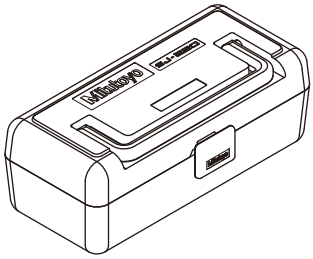


Retractable drive unit
No.178-748

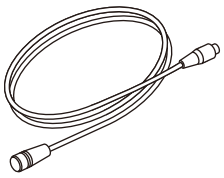


Detector
No.178-296
(Measuring force: 0.75 mN)
No.178-390
(Measuring force: 4 mN)

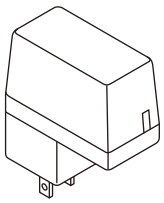




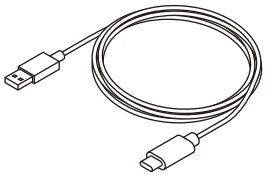
Handy case
No. 12AAY583



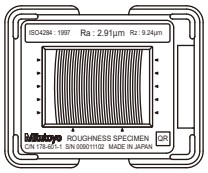
Connection cable (1 m)
No. 12BAA303



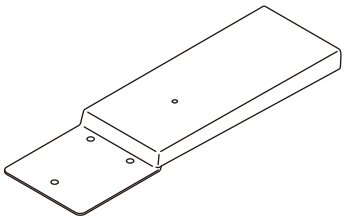
AC adapter
No. 12BAS450



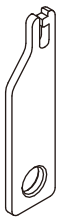
USB 2.0 cable
No. 12BAS451



Roughness specimen
(with a case)
No. 178-601-1
(millimeter specification)
No. 178-602-1
(inch/millimeter specification)



Calibration stage
No. 12BAK700



Tool for operating the
internal battery switch
No. 12BAS476



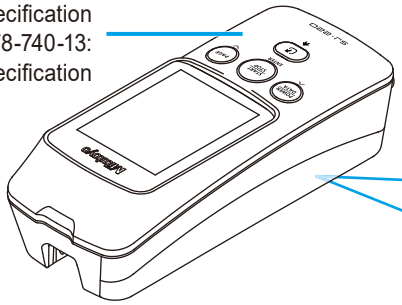

- Instruction Manual (English)
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  (Japanese, English,
  Simplified Chinese)
  No. 99MBB795M
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  No. DC019-0339
- The UK Declaration of Conformity
  No. DC049-0339
- Warranty
  No. 472730

# 3.3 Transverse-Tracing Type

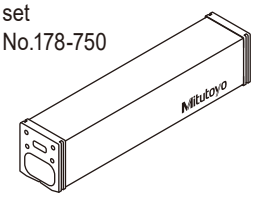
Check that the following items are included with the transverse-tracing type.

| Name | Set code No. | Measuring force |
|---|---|---|
| SJ-220 transverse-tracing type | 178-745-11: millimeter specification | 0.75 mN |
| SJ-220 transverse-tracing type | 178-745-13: inch/millimeter specification | 0.75 mN |
| SJ-220 transverse-tracing type | 178-746-11: millimeter specification | 4 mN |
| SJ-220 transverse-tracing type | 178-746-13: inch/millimeter specification | 4 mN |

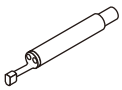
Display unit
No. 178-740-11:
millimeter specification
No.178-740-13:
inch/millimeter specification

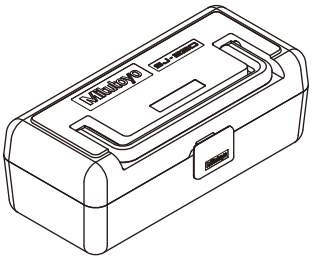


Transverse-tracing drive unit
No.178-749
Transverse-tracing drive unit set
No.178-750

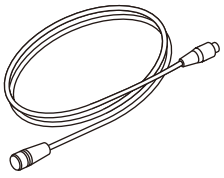


Detector
No.178-387
(Measuring force: 0.75 mN)
No.178-386
(Measuring force: 4 mN)

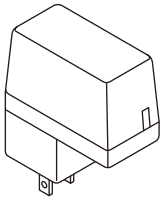




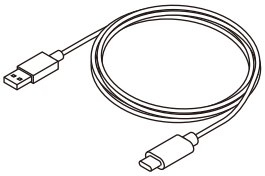
Handy case
No. 12AAY583



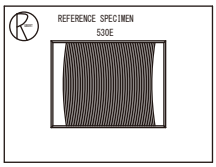
Connection cable (1 m)
No. 12BAA303



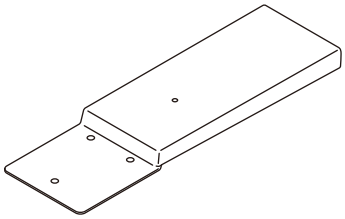
AC adapter
No. 12BAS450



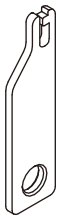
USB 2.0 cable
No. 12BAS451




Roughness specimen
(with a case)
No. 178-605
(millimeter specification)
No. 178-606
(inch/millimeter specification)



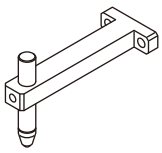
Calibration stage
No. 12BAK700



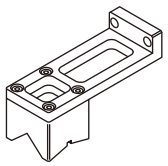
Tool for operating the
internal battery switch
No. 12BAS476



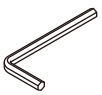

- Instruction Manual (English)
  No. 99MBB796A
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  (Japanese, English,
  Simplified Chinese)
  No. 99MBB795M
- Troubleshooting List
  No. 99MBB797M
- Manual CD-ROM
  No. 12BAT002
- The EU Declaration of Conformity
  No. DC019-0339
- The UK Declaration of Conformity
  No. DC049-0339
- Warranty
  No. 472730



Contact adapter
No. 12AAE643



V-shaped adapter
No. 12AAE644



Hexagonal wrench
Nominal size 2.5:
No. 538615
Nominal size 1.5:
No. 538613



Hex-socket
head screw
M3 × 8 (×4):
No. 390151

# 4 Attaching and Removing the Detector

At the time of purchase, the detector is unattached to the drive unit inside the package. To attach the detector to the drive unit, see "4.1 Attaching the Detector" on page B-10.

Each time you have completed measurements, be sure to store the detector only after it has been removed from the drive unit to prevent the detector from being damaged by contact with another object.

To replace the detector with a detector listed as an optional accessory or a new detector, see "4.1 Attaching the Detector" on page B-10 and "4.2 Removing the Detector" on page B-12.

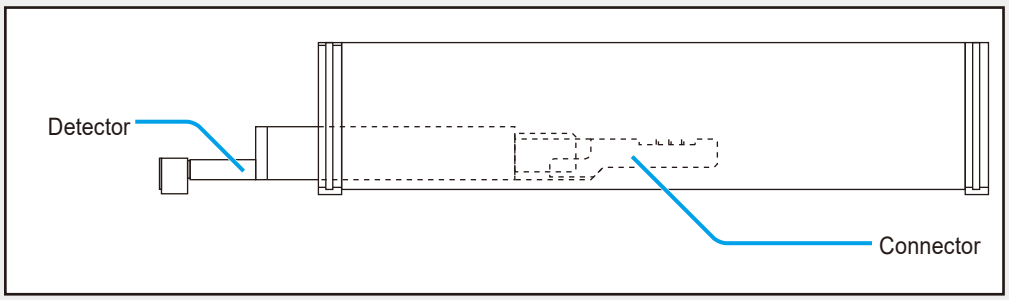
Before replacement, move the detector to the origin position and then turn off the power.

**NOTICE**

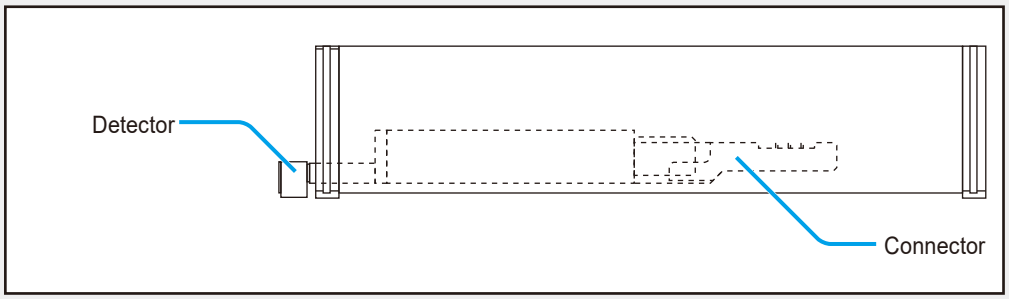
**There is a possibility of damage to the detector or drive unit.**

- Be sure to attach or remove the detector while the power to this product is turned off. If the detector is attached or removed while the power is on, the detector or drive unit may be damaged.
- Attaching and removing of the detector is to be performed while the detector is in the origin position and by referring to the following figure. If the detector is attached or removed while it is not in the origin position, it cannot be replaced properly and the detector or drive unit may be damaged.

**When the detector is in the origin position**




**When the detector is not in the origin position (retracted position, etc.)**



● How to hold the detector

**⚠CAUTION**

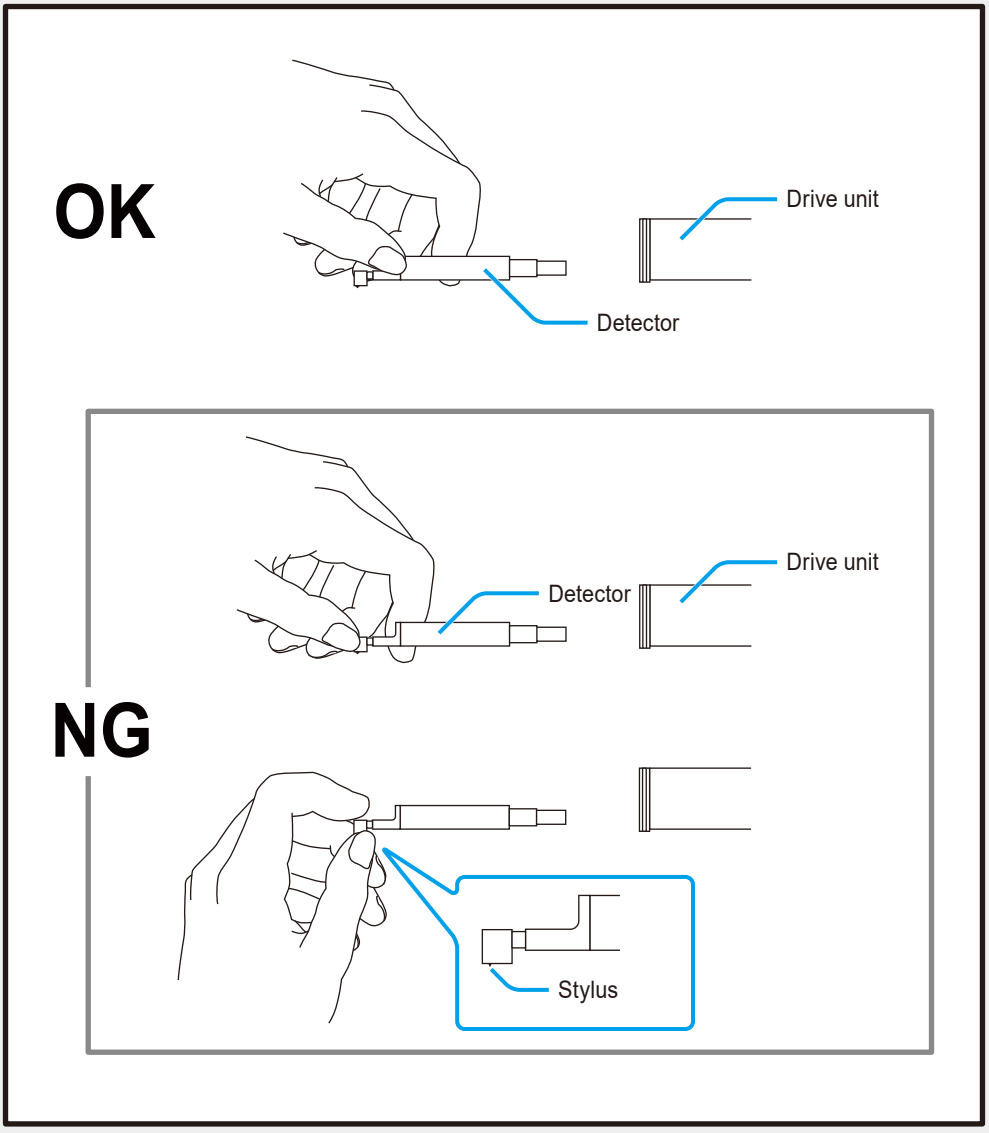
**There is a risk of injuring your hands and fingers.**

- The detector has a pointed tip (stylus). While operating this product, wear hand protection such as inspection gloves to prevent injuries to your hands and fingers.
- While attaching or removing the detector, be sure to hold the detector body. If you hold the stylus of the detector while replacing the detector, your hands or fingers may be injured by the pointed tip of the stylus.

**NOTICE**

**There is a possibility of damage to the detector or stylus.**

While attaching or removing the detector, be sure to hold the detector body. If you hold the tip of the detector while replacing the detector, the detector or stylus may be damaged.



# 4.1 Attaching the Detector

**NOTICE**

**There is a possibility that the detector or drive unit may malfunction.**

- Connect the drive/detector unit connection plug to the connector on the rear of the drive/detector unit so that the notch on the plug is aligned with the protrusion inside the connector.
- When inserting the detector into the opening of the drive unit, do not forcibly push in the detector. Doing so may damage the detector or drive unit.

**IMPORTANT**

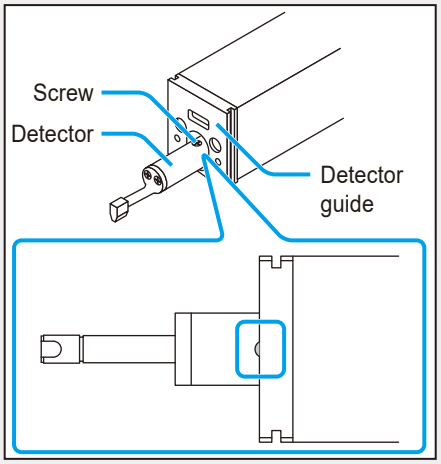
The connectors in the detector and drive unit are engaged in the following order.

1. The guides on both connectors are fitted together.
2. The connector pins and pin holes on both connectors are fitted together.

So, when you insert the detector into the drive unit, the detector moves smoothly at first. As you insert the detector further, the detector becomes harder to move.
After the detector becomes harder to move, continue to insert the detector until it cannot be inserted any further.

At this point, do not try to forcibly push the detector in further.

When the detector is correctly inserted into a standard type drive unit or a retractable type drive unit, half of the screw on the detector is inserted into the end of the detector guide. (See the figure on the right.)




Use the following procedure to attach the detector.

## 1 Move the detector to the origin position.

If the detector is already in the origin position, proceed to step 2.

**Tips**

If the detector is in the retracted state (*1), release the retracted state.

*1 The retracted state is where the detector is not in the origin position (where the detector is inside the drive unit with only the stylus outside).

For details about the retracted state and how to release the retracted state, see "1.2.1 Retracting the Detector" on page G-4 in "PART G Maintenance and Troubleshooting".

1 Press the [POWER/DATA] key.
» The power turns on.

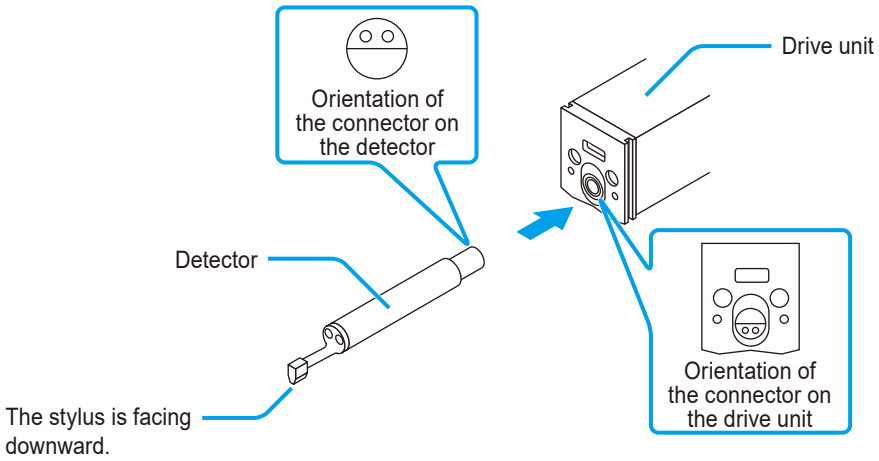
2 Press the [START/STOP] key.
» The connector in the drive unit moves to the origin position.

**Tips**

When the detector is already in the origin position, the detector returns to the origin position after measurement.

3 Press and hold the [POWER/DATA] key.
» The power turns off.

**2 Check the orientation (pin positions) of connectors on both the detector and drive unit first, and then hold the detector body and slowly insert the detector straight into the opening of the drive unit as shown in the following figure.**



# 4.2 Removing the Detector

Use the following procedure to remove the detector.

## 1 Move the detector to the origin position.

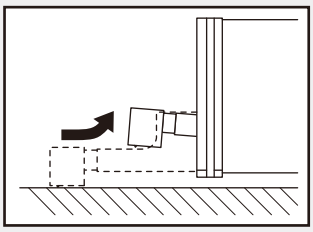
If the detector is already in the origin position, proceed to step 2.

### Tips

If the detector is in the retracted state (*1), release the retracted state.

*1 The retracted state is where the detector is not in the origin position (where the detector is inside the drive unit with only the stylus outside).

For details about the retracted state and how to release the retracted state, see "1.2.1 Retracting the Detector" on page G-4 in "PART G Maintenance and Troubleshooting".



1 Press the [POWER/DATA] key.
» The power turns on.

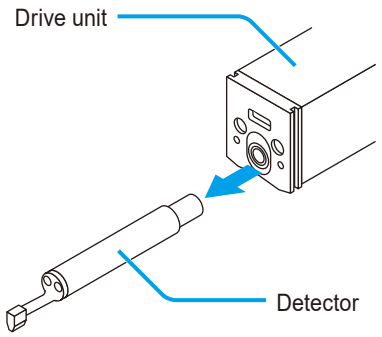
2 Press the [START/STOP] key.
» The detector moves to the origin position.

### Tips

When the detector is already in the origin position, the detector returns to the origin position after measurement.

3 Press and hold the [POWER/DATA] key.
» The power turns off.

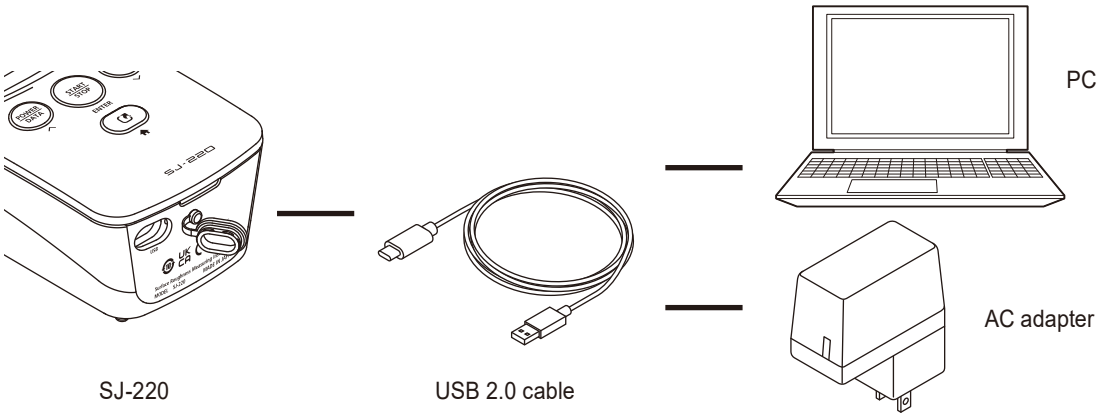
## 2 While holding the detector body, slowly pull it straight out of the drive unit.



# 5 Supplying Power

This product is driven by the internal battery or an external power source (via USB connection with the supplied AC adapter or a PC, etc.). For USB connection, use the supplied USB 2.0 cable.

For details about the external power source and applicable USB standards, see "■ External power source (via USB connection with the supplied AC adapter, a PC, etc.)" on page B-2.



# 5.1 Setting the Internal Battery Switch ON or OFF

At the time of purchase, the internal battery switch is set to OFF. Before using this product, be sure to set the internal battery switch to ON.

**NOTICE**

**There is a possibility that this product may malfunction. Before using this product, fully understand the following precautions for safe use.**

- Before setting the internal battery switch to ON or OFF, ensure that the power to this product is off and also the USB 2.0 cable is disconnected. If the internal battery switch is set to ON or OFF while the power to this product is on and also/or the USB 2.0 cable is connected, this product may malfunction.
- While the connector cover is removed, do not bring the terminal of the USB 2.0 cable into contact with any connector (option connector, etc.) other than the USB connector on the display unit.

**IMPORTANT**

- If you set the internal battery switch to OFF, the measurement results and measurement conditions will be cleared. Leave the internal battery switch ON except when the product will not be used for a long period of time (more than two or three weeks).
- Even if you set the internal battery switch to OFF, the following items will be retained in the internal memory of this product.
  - Detector calibration factor
  - Drive unit measuring speed calibration factors
  - Drive unit type
  - Language
  - Units
  - Decimal separator type
  - Date format
- If this product is not connected to an external power source and the internal battery switch is OFF, the power will not be on.
- When turning the internal battery switch OFF and ON again, wait approximately 30 seconds.

Use the following procedure to set the internal battery switch to ON.

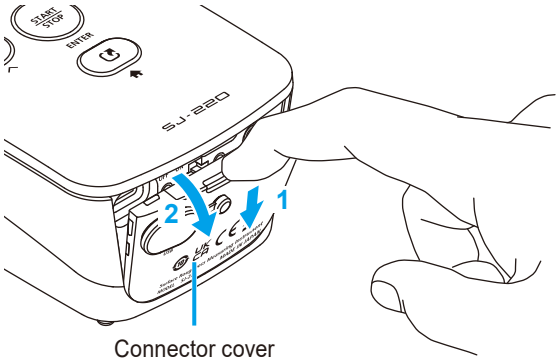
**1 Check that the power to this product is off (the display on the display unit is turned off) and the USB 2.0 cable is disconnected from this product.**

**2 Remove the connector cover from the display unit.**

1 Insert a fingernail into the recess located at the top of the connector cover and push down the connector cover in the direction indicated by the arrow.

2 Open the connector cover in the direction indicated by the arrow.

» The connector cover comes off the display unit.



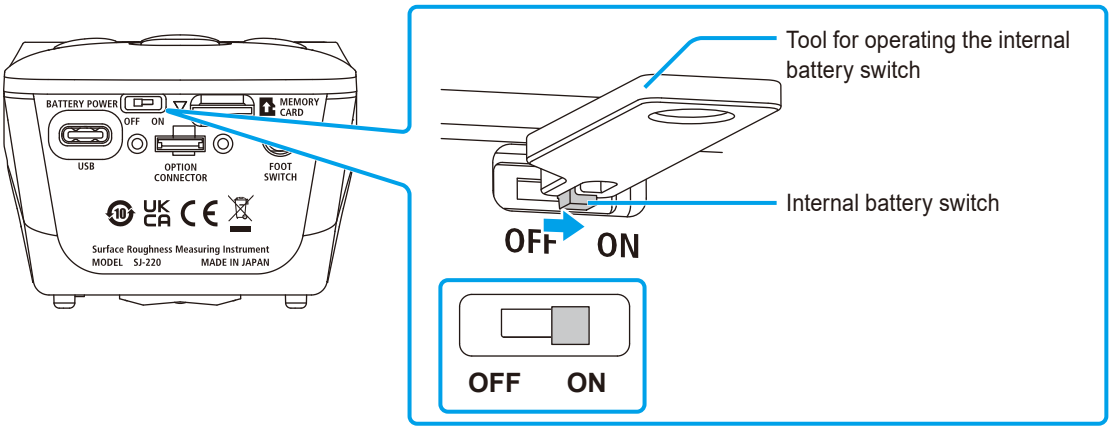

Connector cover

**3** **Use the supplied tool for operating the internal battery switch to set the internal battery switch to ON.**

**Tips**

If the tool for operating the internal battery switch is missing, use an object with a similarly sharp end such as a mechanical pencil instead.

The tool for operating the internal battery switch (No. 12BAS476) is available for purchase. Please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1) if you would like to purchase it.

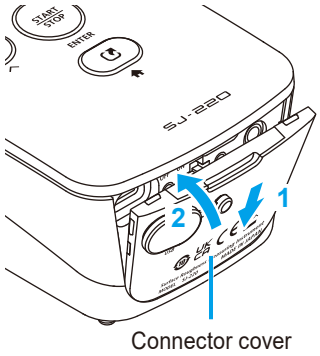



**4** **Attach the connector cover to the display unit.**

1 Align the connector cover with the recesses on the rear of the display unit, and then insert the connector cover in the direction indicated by the arrow.

2 Close the connector cover in the direction indicated by the arrow.

» The connector cover is secured on the display unit.

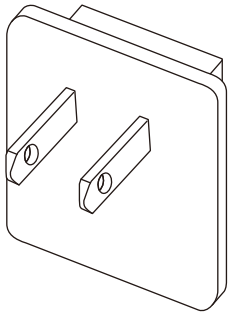
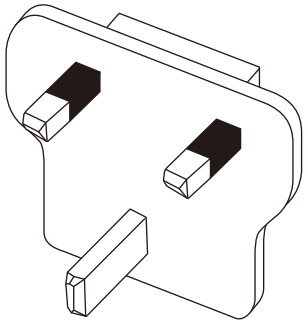
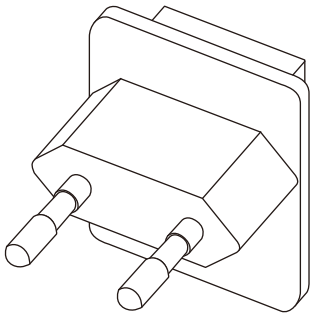
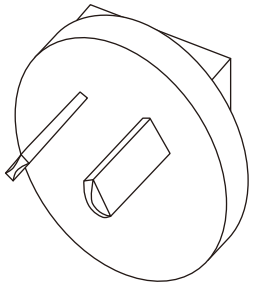
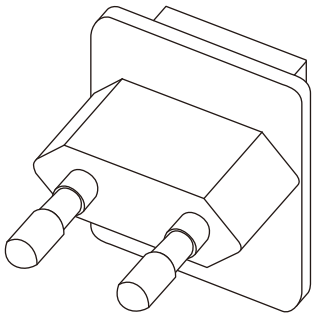
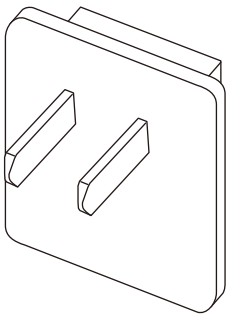


# 5.2 Preparing the AC Adapter (Changing the AC Pin Adapter)

At the time of purchase, the six AC pin adapters shown in the following table are included with this product.

By changing the AC pin adapter, this product can be adapted to the supply voltage in each region.

**List of AC pin adapters**

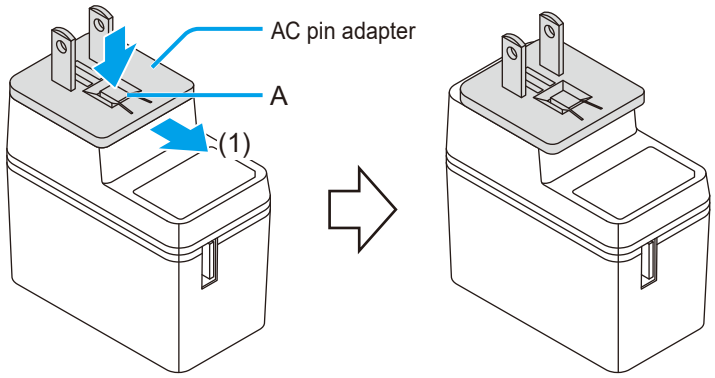
| Region | Shape of AC pin adapter | Region | Shape of AC pin adapter |
|---|---|---|---|
| Japan<br>Taiwan<br>USA |  | UK |  |
| Europe |  | Australia |  |
| Korea |  | China |  |

## 5.2.1 Removing the AC Pin Adapter

Use the following procedure to remove the AC pin adapter.

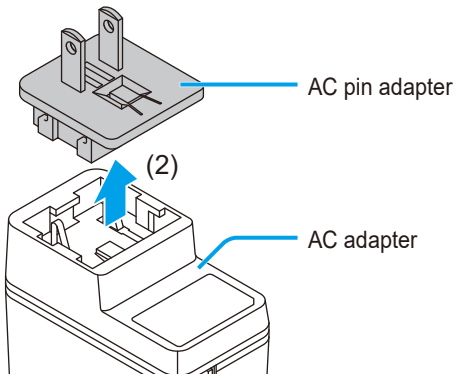
**1** **While pushing down section A on the AC pin adapter with your thumb, slide the AC pin adapter in the direction indicated by (1).**

» The AC pin adapter is unlocked and can be slid in the direction indicated by (1).




**2** **Lift up the AC pin adapter in the direction indicated by (2).**

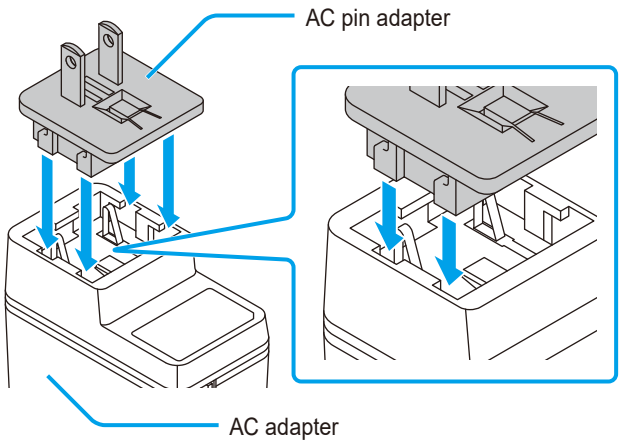
» The AC pin adapter comes off the AC adapter.



## 5.2.2 Attaching the AC Pin Adapter

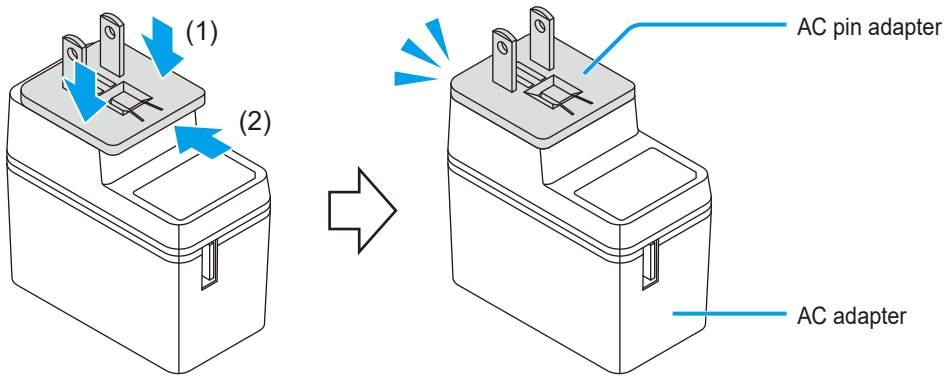
Use the following procedure to attach the AC pin adapter.

**1 Fit the four protrusions on the sides of the AC pin adapter into the four grooves on the sides of the AC adapter.**




**2 While pushing down on the AC pin adapter in the direction indicated by (1), slide it in the direction indicated by (2).**

» The AC pin adapter is secured to the AC adapter when you hear a click sound.



# 5.3 Charging the Internal Battery

At the time of purchase, the internal battery is not fully charged. Before using this product, charge the battery with an external power source (via a USB connection with the supplied AC adapter, a PC, etc.).

**NOTICE**

**There is a possibility that this product may malfunction.**

- Be sure to use only the supplied AC adapter.
  If you use an AC adapter other than the supplied one, this product may malfunction.
- Before disconnecting the external power source, turn off the power to this product. If the external power source is disconnected while the power to this product is on, this product may malfunction.

**IMPORTANT**

- If the internal battery is charged in a high-temperature environment, the battery will become hot.
  If the internal battery temperature rises to a certain level, the charging process may be interrupted to prevent injuries and damage.
  To ensure that the internal battery fully charges, make sure that the ambient temperature and workpiece temperature are from 5 °C to 40 °C, and then start charging again.
- When the internal battery status icon indicates that the remaining capacity is 40 % to 20 %, connect this product to an external power source as soon as possible.
- When the internal battery status icon indicates that the remaining capacity is 0 %, connect this product to an external power source immediately. If the internal battery is left at 0 % capacity, saved measurement results or other data may be erased.
- Do not set the internal battery switch to OFF during charging. Charging will stop.
- If you connect or disconnect the USB 2.0 cable during charging, charging may be interrupted before the battery is fully charged.
- When charging the battery, check the status icon on the screen or the displayed message to confirm that charging has started.

**Tips**

- When the battery is charged with the supplied AC adapter, the charging time is approximately 4 hours.
  When the battery is charged via a USB connection with a PC, etc., charging may take more than 4 hours to complete.
- When the charging process is complete, the charging status displayed on the touch panel changes from [Charging] to [Charge is Filled], and the power turns off after a short while.

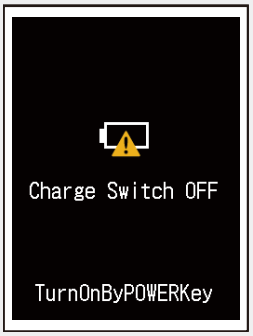
Use the following procedure to charge the internal battery.

**1 Check that the power to this product is off (the display on the display unit is turned off).**

**2 Check that the internal battery switch is ON. If it is OFF, set it to ON.**

**IMPORTANT**

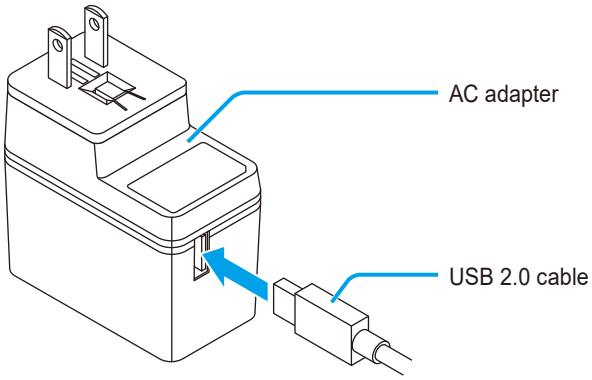
- The battery cannot be charged while the internal battery switch is OFF. Before charging, be sure to set the internal battery switch to ON according to the procedure described in "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14.
- If this product is connected to an external power source while the internal battery switch is OFF, the [Charge Switch OFF] screen will be displayed on the touch panel. Disconnect the USB 2.0 cable, set the internal battery switch to ON, and then connect the USB 2.0 cable again.




**Use step 3 or 4 below to connect this product to the power source.**

**3 To charge the battery with the AC adapter, use the following steps to connect the AC adapter.**

1 Connect the supplied USB 2.0 cable to the AC adapter.

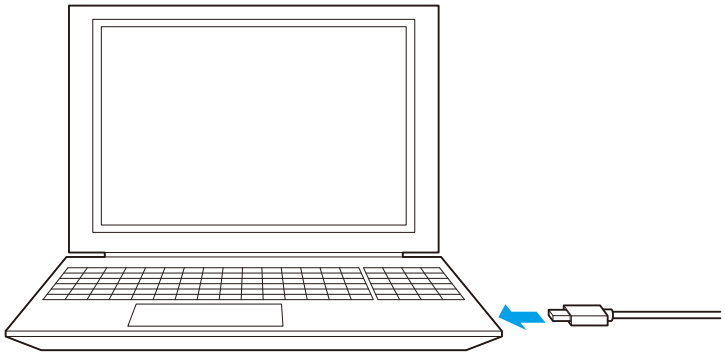



2 Plug the AC adapter into a power outlet.

**Tips**

For details about changing the AC pin adapter, see "5.2 Preparing the AC Adapter (Changing the AC Pin Adapter)" on page B-16.

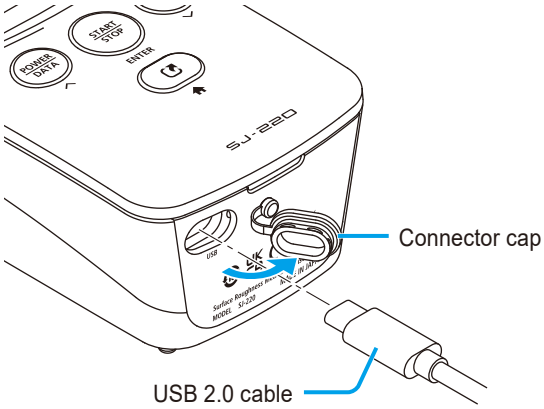
**4 To charge the battery via a USB connection with a device such as a PC, turn on the power to the device, and then connect the USB 2.0 cable to the device.**



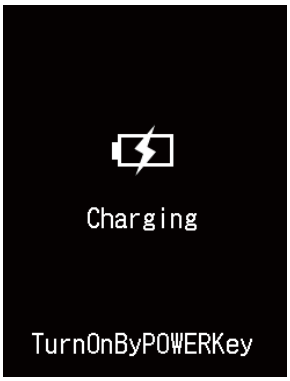
## 5 Remove the connector cap of the connector cover, and connect the USB 2.0 cable.

### IMPORTANT

- If power is not supplied from the external power source properly, the charging status icon on the screen changes every few seconds: (charging) -> (internal battery status icon) -> (charging). In this case, reconnect the product to an external power source that supplies power properly.
- If you disconnect the USB 2.0 cable from this product and then reconnect it in no time, this product may fail to recognize the USB signals and charging may not start. Before reconnecting the USB 2.0 cable, wait approx. 10 seconds after disconnecting the cable.

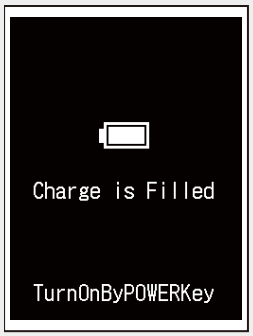



» Charging starts automatically, and the [Charging] screen is displayed on the touch panel. (The word [Charging] blinks.)




### Tips

- When the internal battery is fully charged or almost fully charged, charging does not start even when you connect this product to an external power source.
  Right after you connect this product to an external power source, the [Charge is Filled] screen is displayed for a few seconds on the touch panel. After that, the touch panel returns to the power-off state (nothing is displayed).
- English is the default display language at the time of purchase, so the charging status screen is displayed in English during setup.




## 6 When charging is complete (the battery is fully charged), disconnect the USB 2.0 cable from this product.

# 5.4 Operation Using an External Power Source

**NOTICE**

**There is a possibility that this product may malfunction.**

Be sure to use only the supplied AC adapter.
If you use an AC adapter other than the supplied one, this product may malfunction.

**IMPORTANT**

- When using the AC adapter to power this product, do not use a power source from a power line that generates a lot of noise.
  Although this product has reasonable protection against electrical interference from noise from a power source, correct measurement may not be possible if power is supplied from a power source with noisy power lines.
- If you insert the USB 2.0 cable too slowly, this product may fail to correctly recognize the USB power source. In such cases, you will not be able to start up the product or charge the battery because power cannot be supplied through the USB cable to this product. If you are unable to start up the product or charge the battery, swiftly reinsert the cable into the USB connector.

Use the following procedure to connect this product to an external power source.

**1 Check that the power to this product is off (the display on the display unit is turned off).**

**2 Set the internal battery switch to ON.**

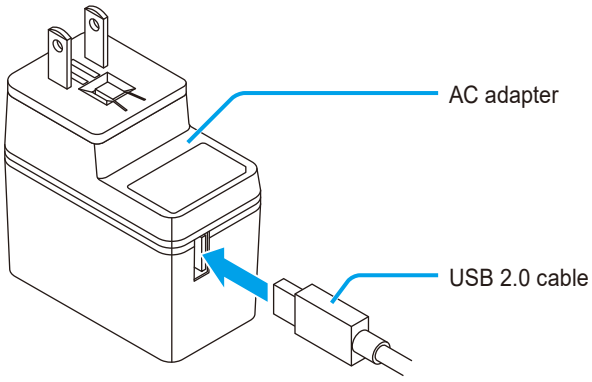
**Tips**

For details about setting the internal battery switch to ON or OFF, see "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14.

**Use step 3 or 4 below to connect this product to the power source.**

**3 To power this product with the AC adapter, follow the steps below to connect the AC adapter.**

1 Connect the supplied USB 2.0 cable to the AC adapter.

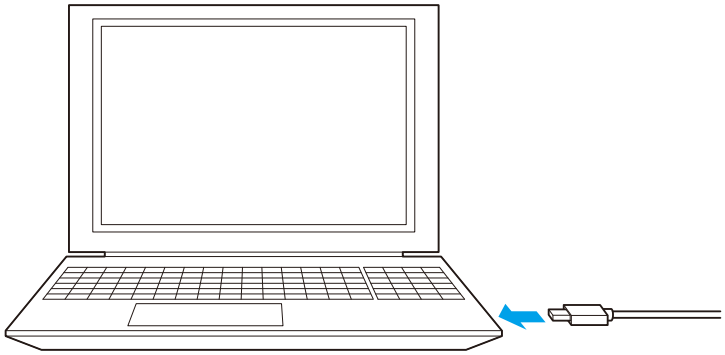



2 Plug the AC adapter into a power outlet.

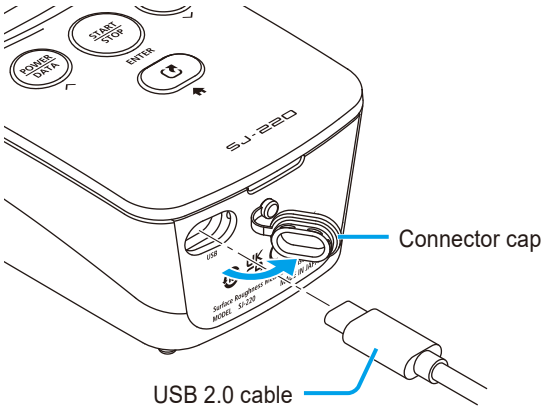
**Tips**

For details about changing the AC pin adapter, see "5.2 Preparing the AC Adapter (Changing the AC Pin Adapter)" on page B-16.

**4** **To power this product via a USB connection with a device such as a PC, turn on the power to the device and then connect the USB 2.0 cable to the device.**

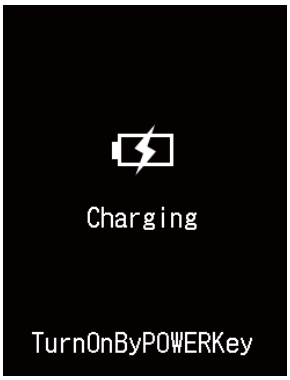


**5** **Remove the connector cap of the connector cover, and connect the USB 2.0 cable.**



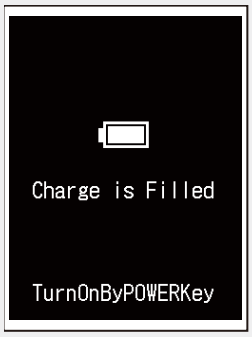

» The product will now be powered from the external power source.

» The [Charging] screen is displayed on the touch panel. (The word [Charging] blinks.)




## Tips

- When the internal battery is fully charged or almost fully charged, charging does not start even when you connect this product to an external power source.
  Right after you connect this product to an external power source, the [Charge is Filled] screen is displayed for a few seconds on the touch panel. After that, the touch panel returns to the power-off state (nothing is displayed).
- English is the default display language at the time of purchase, so the charging status screen is displayed in English during setup.



# 5.5 Turning the Power ON/OFF

**IMPORTANT**

If the power to this product is forcibly turned off while data is being written to the internal memory (for example, while calibration values are being updated after calibration measurement), the contents of the internal memory may be corrupted.

If the contents of the internal memory have been corrupted, reset all settings immediately after turning the power back on.
For details about resetting all settings, see "2.18 Reset to Default (State at the Time of Purchase)" on page F-65 in "PART F Environment Settings".

When you try to reset all settings, the message shown to the right is displayed on the touch panel. Touch ✓ (confirm) to reset all settings. Then, be sure to perform calibration measurement and speed calibration for the connected drive/detector unit.



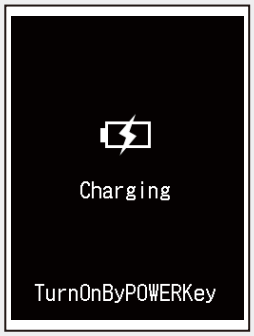

## 5.5.1 Turning the Power On

Use the following procedure to turn the power on.

### ■ When this product is connected to an external power source

**Tips**

While the internal battery is charging, the [Charging] screen is displayed even when the power is off. (The word [Charging] blinks.)

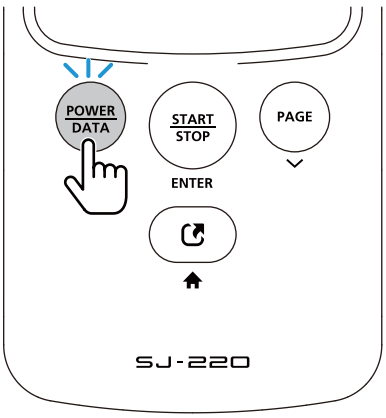



**1 Press the [POWER/DATA] key.**

**IMPORTANT**

While the [Charging] screen is displayed, the power will not be turned on when you press and hold the [POWER/DATA] key for 2 seconds or more. The screen remains displayed.

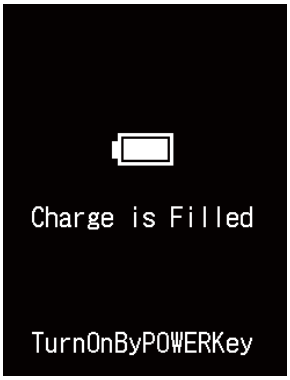
To turn on the power, release your finger from the key immediately after pressing the [POWER/DATA] key.



» The Home screen is displayed (when the [Charging] screen has been displayed).
» The [Charge is Filled] screen is displayed (when the internal battery has been fully charged or almost fully charged).

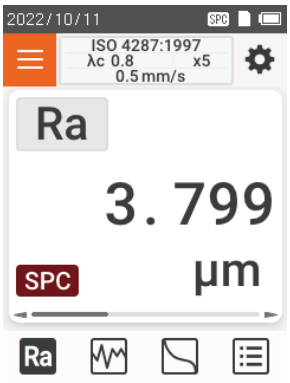
**Tips**

Pressing and holding the [POWER/DATA] key for 2 seconds or more displays the Home screen instead of the [Charge is Filled] screen.



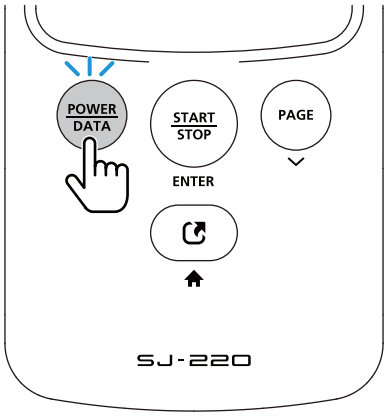

**2 When the [Charge is Filled] screen is displayed, press the [POWER/DATA] key again.**

» The Home screen is displayed.

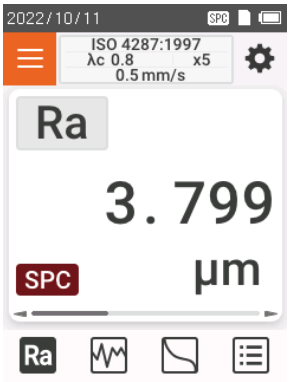


## ■ When this product is not connected to an external power source

**1** **Press the [POWER/DATA] key.**




» The Home screen is displayed.



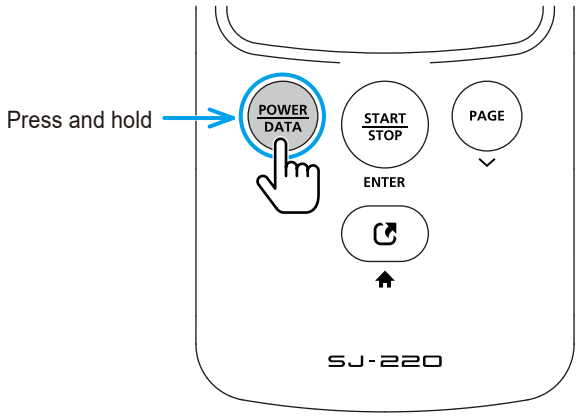
## 5.5.2 Turning the Power Off

Use the following procedure to turn the power off.

### ■ When this product is connected to an external power source

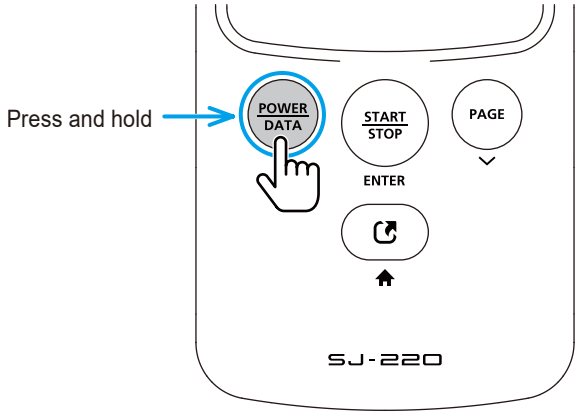
- When the internal battery is fully charged

  Press and hold the [POWER/DATA] key to turn the power off.

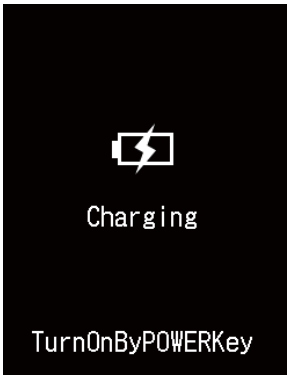



- When the internal battery is charging

**1 Press and hold the [POWER/DATA] key.**




» The [Charging] screen is displayed. (The word [Charging] blinks.)



» When the battery is fully charged, the power automatically turns off.

**Tips**

To abort charging and turn the power off while the [Charging] screen is still being displayed, disconnect the USB 2.0 cable from this product and then press and hold the [POWER/DATA] key to turn the power off.

## ■ When this product is not connected to an external power source

### ● When the Auto-OFF function is set

The Auto-OFF function turns off the power automatically when no operations have been performed with the touch panel or the keys for a set period of time.

The Auto-OFF function is enabled when the internal battery is used and the Auto-OFF function is set to ON ( ).

Even when the Auto-OFF function turns the power off, the measurement conditions and measurement results are retained and will be displayed next time the power is turned on.

**IMPORTANT**

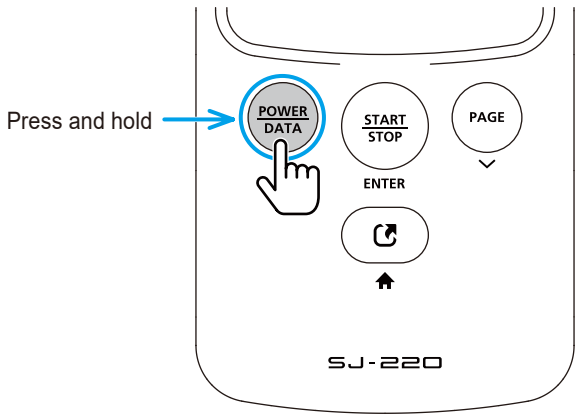
- If a request signal (REQUEST signal) is input from an external device during [SPC] data output, this product considers the input as an operation. Once a set period of time has passed after the signal was input, this product turns off automatically.
- The Auto-OFF function is disabled when this product is connected to an external power source. To turn the power off, press and hold the [POWER/DATA] key.

**Tips**

For details about setting the Auto-OFF function, see "2.11 Auto-OFF Function Setting" on page F-48 in "PART F Environment Settings".

### ● When the Auto-OFF function is not set

Press and hold the [POWER/DATA] key to turn the power off.



# 6 Initial Settings

Before using this product, set the date, time and the display language.

At the time of purchase, English is set as the default value of the display language.

To use a language other than English, after you connect this product to an external power source and turn the power on, first set the display language, and then set the date and other items.

**IMPORTANT**

- To prevent the power supply from turning off while configuring the initial settings, be sure to connect this product to an external power source.
- Although you can configure the initial settings while the product is being powered by the internal battery, be aware of the remaining capacity of the internal battery. If this product is operated when the remaining capacity of the internal battery power is low, the power to this product may turn off during operation.

This chapter briefly explains the procedure for setting the display language, and the date and time.

For details about these settings and other settings such as for the decimal separator, see "1 Settable Items on the Set Environ. Screen (Quick Reference Table)" on page F-1 in "PART F Environment Settings", and set the necessary items.

Use the following procedure to set the display language and date.

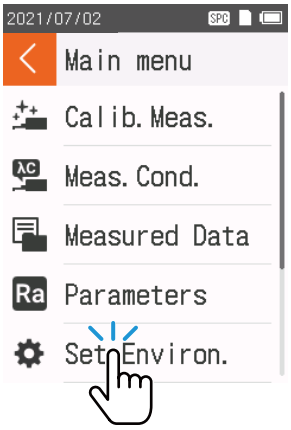
**1 On the Home screen, touch (main menu).**

» The [Main menu] screen is displayed.




**2 Touch [Set Environ.].**

» The [Set Environ.] screen is displayed.

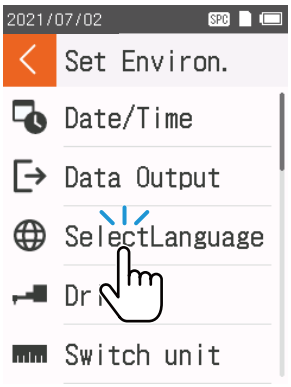




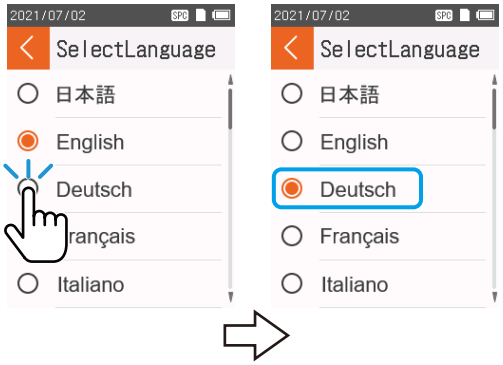

No. 99MBB794A

## 3 Set the language to display.

1 Touch [SelectLanguage].
» The [SelectLanguage] screen is displayed.




2 Touch the option button for the desired language. (Example: Select [Deutsch] (German).)
» The option button for the language you touched is selected.




### Tips

Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

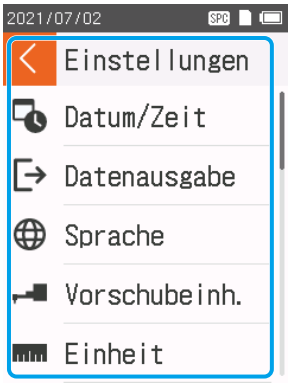
3 Touch (return).
» The [Set Environ.] screen is displayed.




4 Check that the displayed language is the language you set.

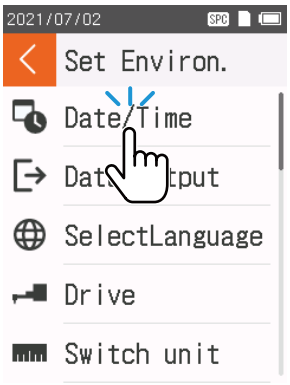
### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

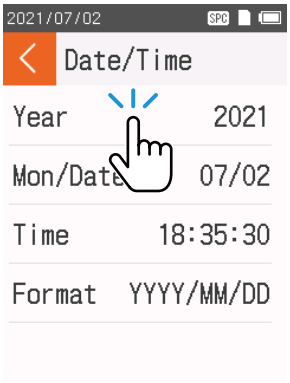


## 4 Set the date and time.

1 Touch [Date/Time].
» The [Date/Time] screen is displayed.



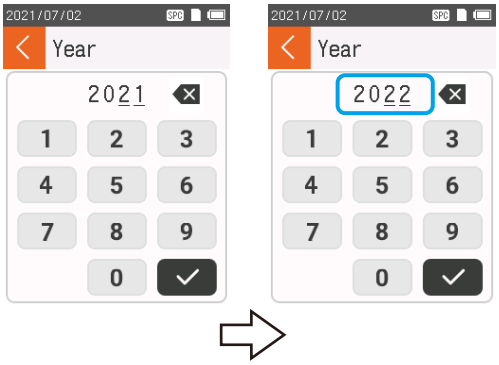

2 Touch [Year].
» The [Year] screen is displayed.




3 Set the year.
(Example: Change the year from 2021 to 2022.)

**Tips**

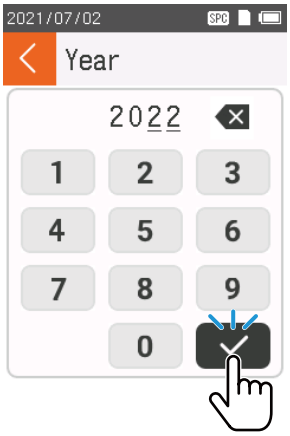
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".
- For [Year], set the last two digits of the year.




4 Touch ✓ (confirm).
» The [Date/Time] screen is displayed.
» [Year] is set.

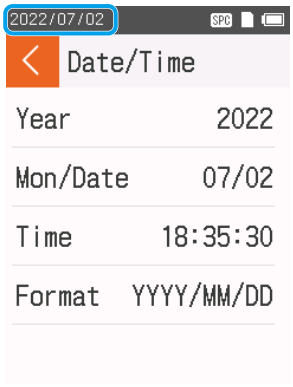
**Tips**

To cancel the input operation, touch ‹ (return).



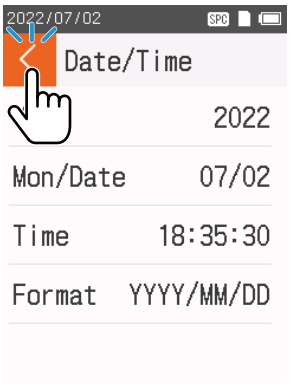

5 To configure the settings for [Mon/Date] and [Time], follow steps 2 to 4 to set them in the same way as [Year].
» [Mon/Date] and [Time] are set.

6 Check that the date you set is correctly displayed on the status bar.




7 Touch (return).

» The [Set Environ.] screen is displayed.



# 7 Other Setup Work

This chapter explains the setup work shown in the table below.

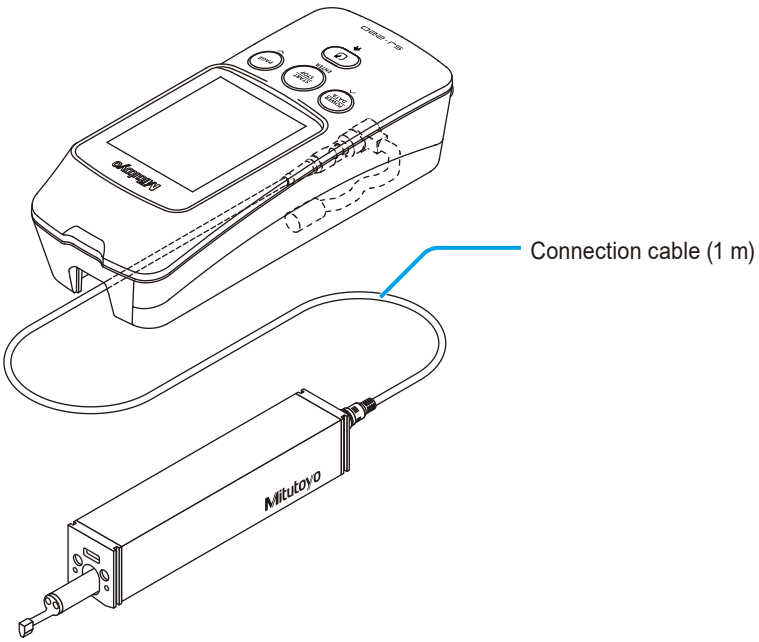
| Item | Description | Reference location |
|---|---|---|
| Attaching and removing the connection cable (1 m) | By attaching the supplied connection cable (1 m), you can perform measurement with the drive/detector unit detached from the display unit. | "7.1 Attaching and Removing the Connection Cable (1 m)" |
| Replacing the drive/detector units | Replace the drive/detector unit when, for example, you want to use a different type of drive/detector unit. | "7.2 Attaching and Detaching the Drive/Detector Unit" |

**Tips**

For details about attaching and removing the detector, see "4 Attaching and Removing the Detector" on page B-8.

## 7.1 Attaching and Removing the Connection Cable (1 m)

To use the drive/detector unit detached from the display unit, attach the supplied connection cable (1 m) between the display unit cable and the drive/detector unit as shown below.



## 7.1.1 Attaching the Connection Cable (1 m)

Use the following procedure to attach the connection cable (1 m) to the drive/detector unit and the display unit.

### 1 Detach the drive/detector unit from the display unit.

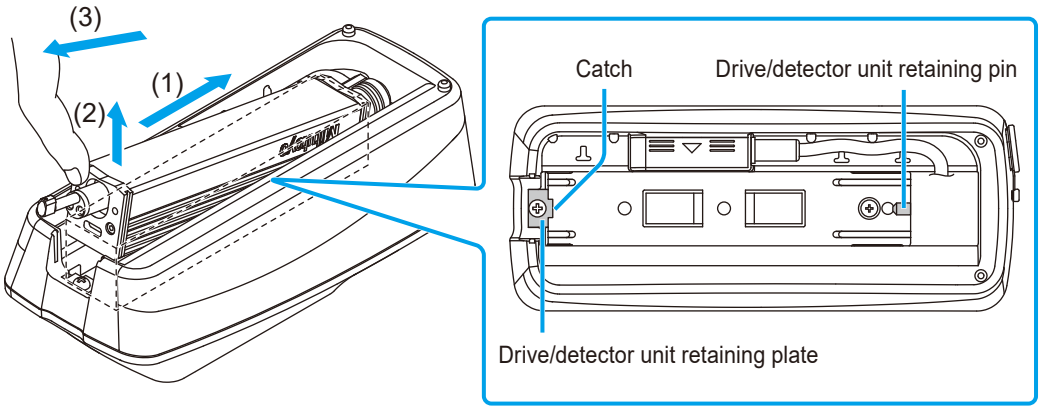
1 Turn the display unit over.

2 While pushing the end of the detector of the drive/detector unit in the direction of arrow (1), lift it up in the direction of arrow (2).

» The drive/detector unit is released from the catch on the drive/detector unit retaining plate of the display unit.

3 While holding the drive/detector unit body, pull it out in the direction of arrow (3).

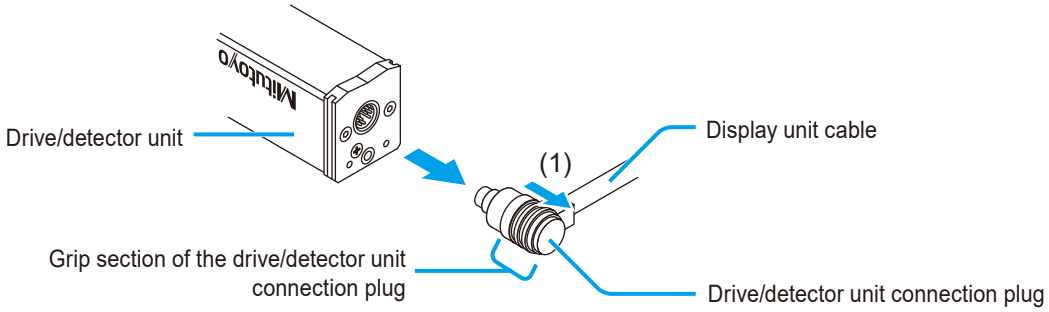
» The drive/detector unit is released from the drive/detector unit retaining pin of the display unit.




### 2 Remove the display unit cable from the drive/detector unit.

1 Slide the grip section in the direction of arrow (1), and remove the drive/detector unit connection plug from the connector on the rear of the drive/detector unit.

» The drive/detector unit is detached from the display unit.




### 3 Attach the connection cable (1 m).

1 While holding the grip section on the drive/detector unit connection plug, fit the plug into the connector of the connection cable (1 m).

**IMPORTANT**

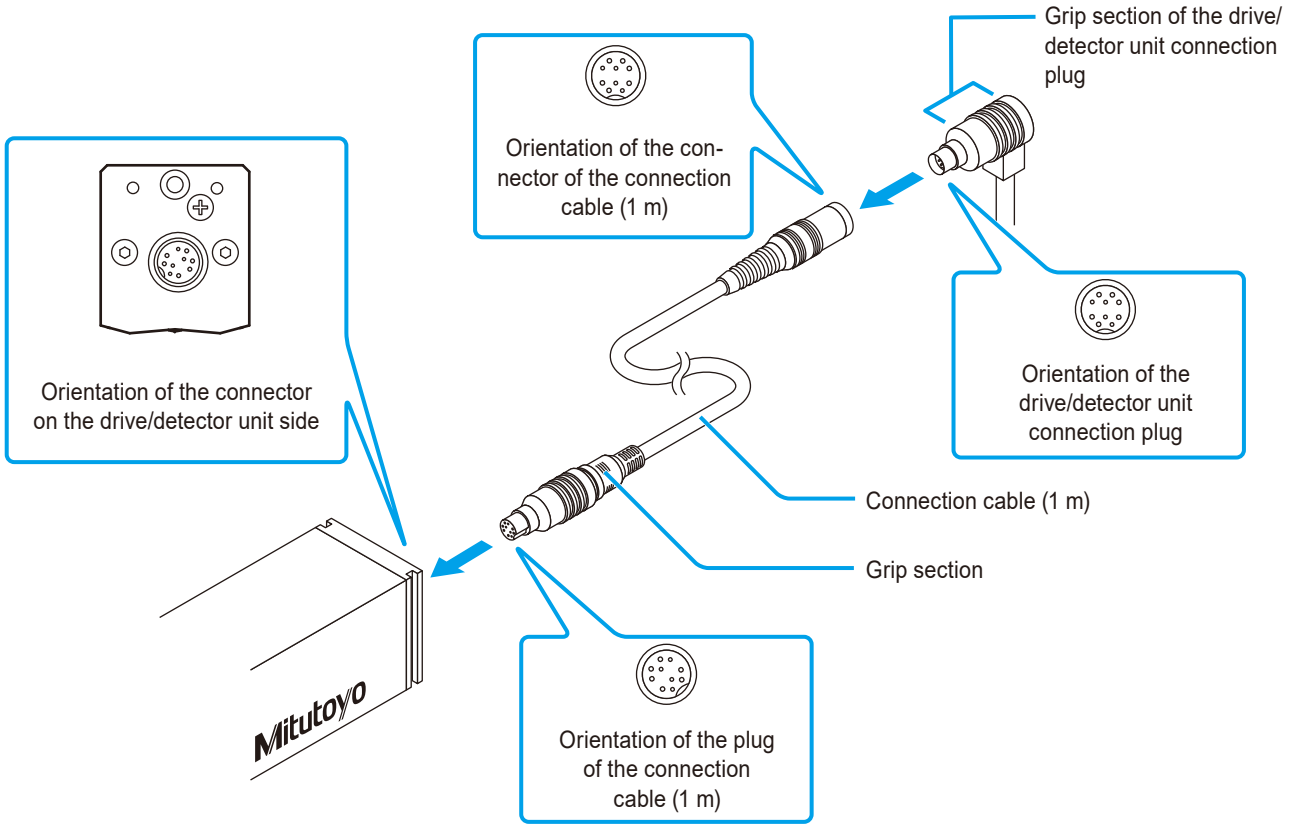
While connecting the drive/detector unit connection plug to the connector of the connection cable (1 m), make sure that the notch on the plug is aligned with the protrusion inside the connector.

2 While holding the grip section on the plug of the connection cable (1 m), fit the plug into the connector of the drive/detector unit.

» The display unit and the drive/detector unit are connected with the connection cable (1 m).

**IMPORTANT**

While connecting the plug of the connection cable (1 m) to the connector of the drive/detector unit, make sure that the notch on the plug of the cable is aligned with the protrusion inside the connector.



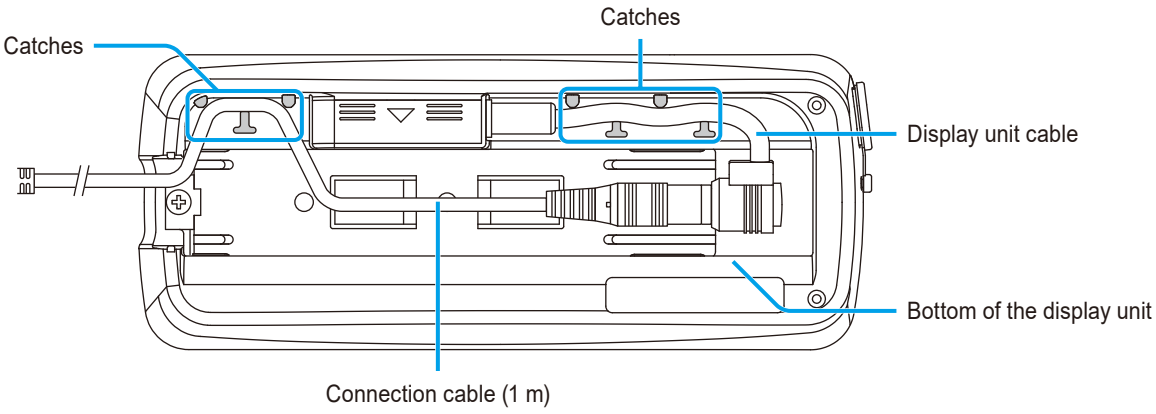

## 4 House the connection cable (1 m) in the display unit.

1 Use the catches at the bottom of the display unit to fasten the connection cable (1 m).

» The connection cable (1 m) is housed in the bottom of the display unit.

**Tips**

If the display unit cable is unfastened, fasten it with the catches and house it in the bottom of the display unit.



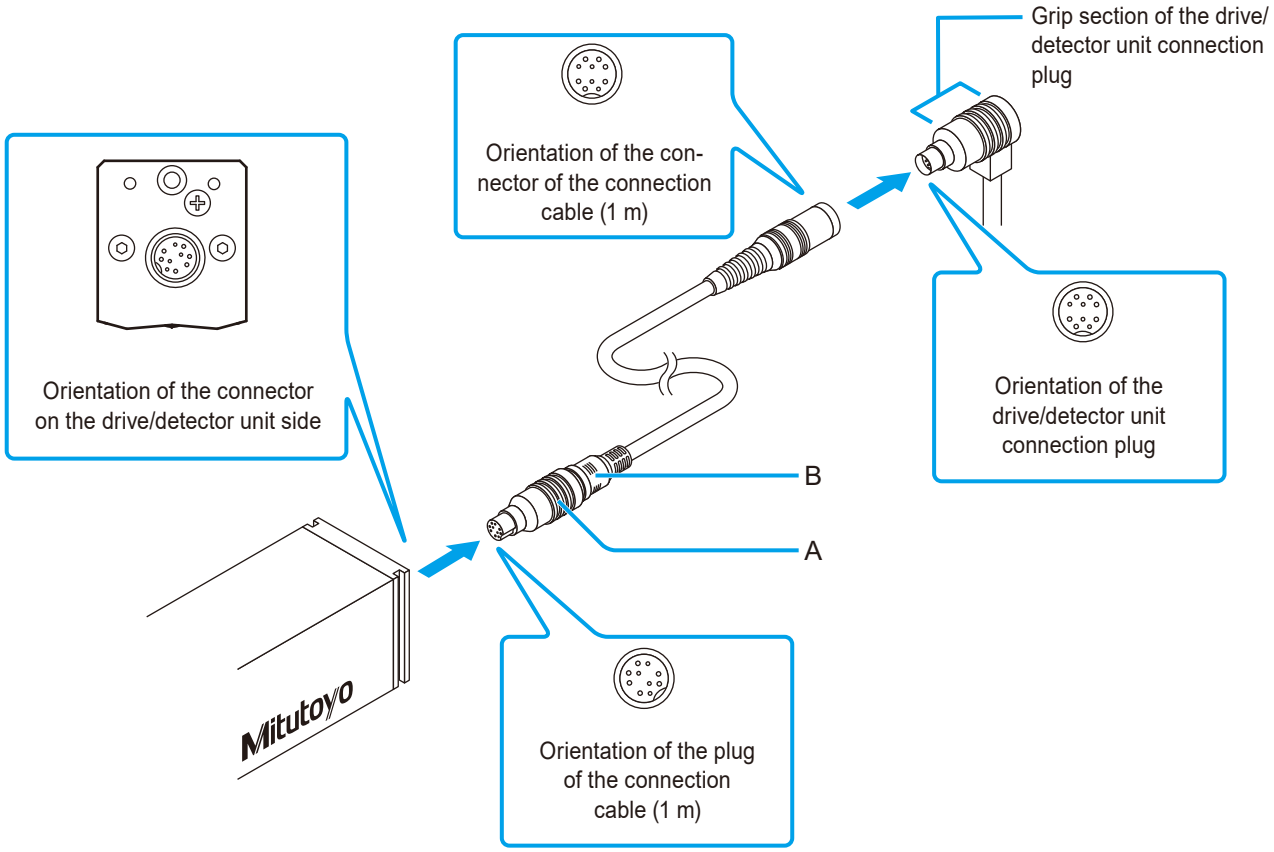
## 7.1.2 Removing the Connection Cable (1 m)

Use the following procedure to remove the connection cable (1 m) from the drive/detector unit and display unit.

### 1 Remove the connection cable (1 m).

1. Turn the display unit over.
2. Unfasten the connection cable (1 m) from the catches on the display unit.
3. While firmly holding section A on the plug of the connection cable (1 m), slightly slide section A towards section B, and then remove the plug from the connector of the drive/detector unit.
4. While holding the grip section on the drive/detector unit connection plug, remove the plug from the connector of the connection cable (1 m).

» The connection cable (1 m) is removed from the drive/detector unit and display unit.



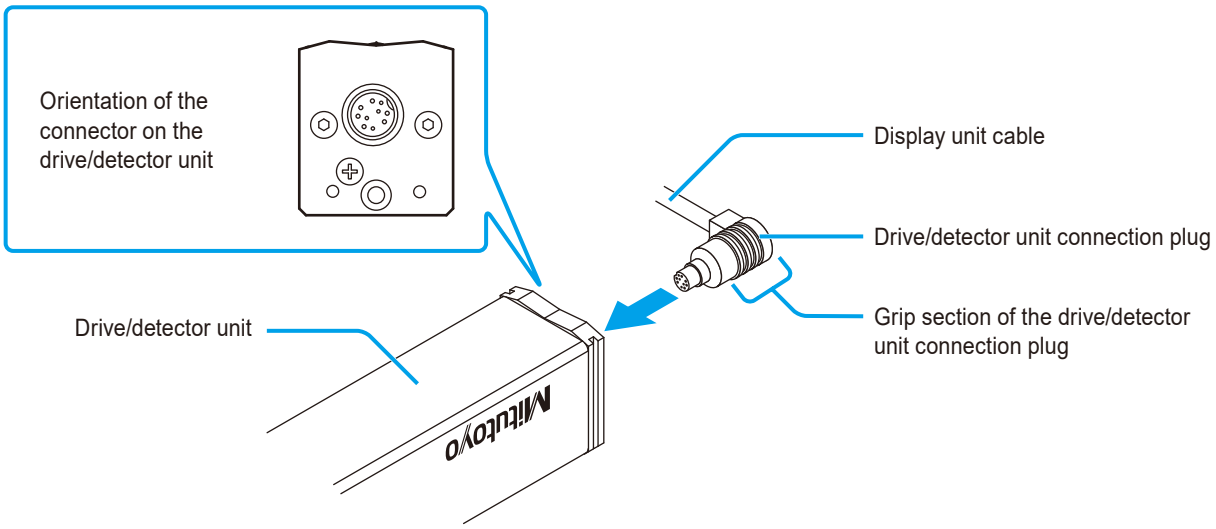
## 2 Attach the display unit cable to the drive/detector unit.

1 Fit the drive/detector unit connection plug into the connector of the drive/detector unit.

» The drive/detector unit is connected to the display unit.

**IMPORTANT**

While connecting the drive/detector unit connection plug to the connector on the rear of the drive/detector unit, make sure that the notch on the plug is aligned with the protrusion inside the connector.




## 3 Attach the drive/detector unit to the display unit.

1 Insert the drive/detector unit so that the drive/detector unit retaining pin of the display unit fits into the pin hole on the connector side of the drive/detector unit.

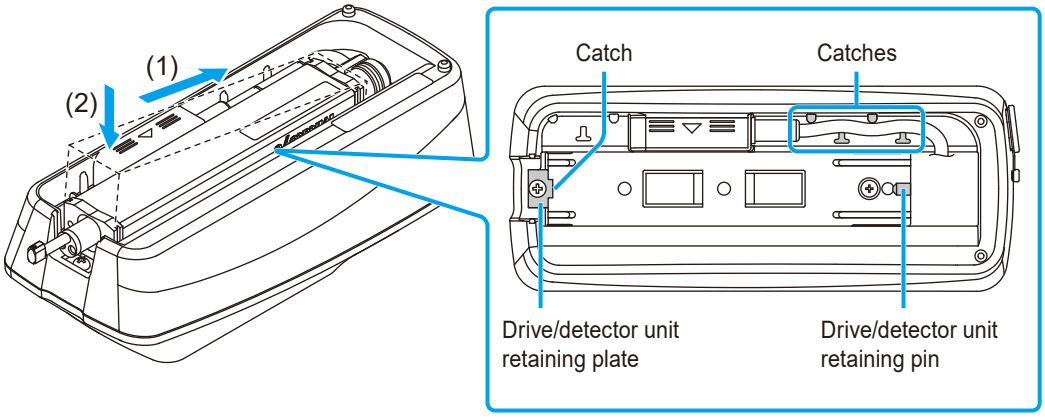
» The drive/detector unit retaining pin of the display unit is inserted into the drive/detector unit.

2 While pushing the drive/detector unit in the direction of arrow (1), lower it in the direction of arrow (2) to put the drive/detector unit in the display unit so that the catch on the drive/detector unit retaining plate fits into the slot on the detector side of the drive/detector unit.

» The drive/detector unit is secured in the display unit.

3 Fasten the display unit cable with the catches at the bottom of the display unit.

» The display unit cable is housed in the bottom of the display unit.



# 7.2 Attaching and Detaching the Drive/Detector Unit

This section explains how to attach and detach the drive/detector unit.

Here as an example, this section explains the procedure for replacing the standard type drive/detector unit with a different drive/detector unit.

## 1 Detach the standard type drive/detector unit from the display unit.

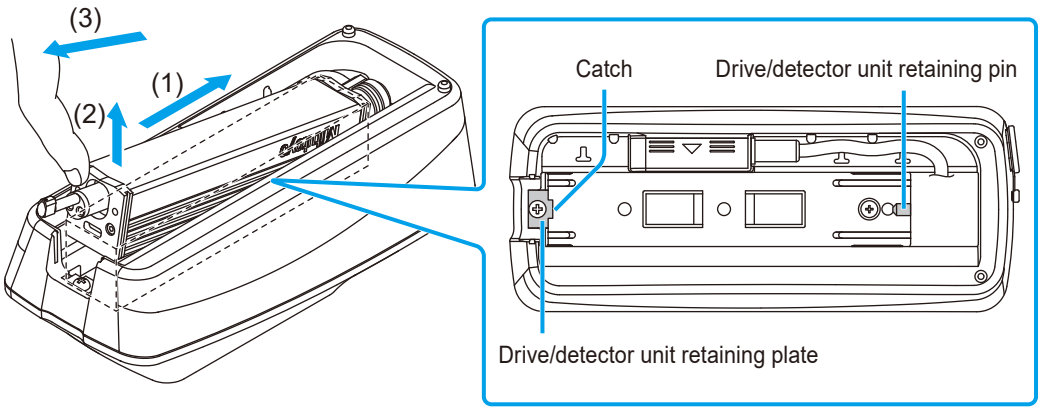
1 Turn the display unit over.

2 While pushing the detector side of the standard type drive/detector unit in the direction of arrow (1), lift it up in the direction of arrow (2).

» The drive/detector unit is released from the catch on the drive/detector unit retaining plate of the display unit.

3 While holding the standard type drive/detector unit body, pull it out in the direction of arrow (3).

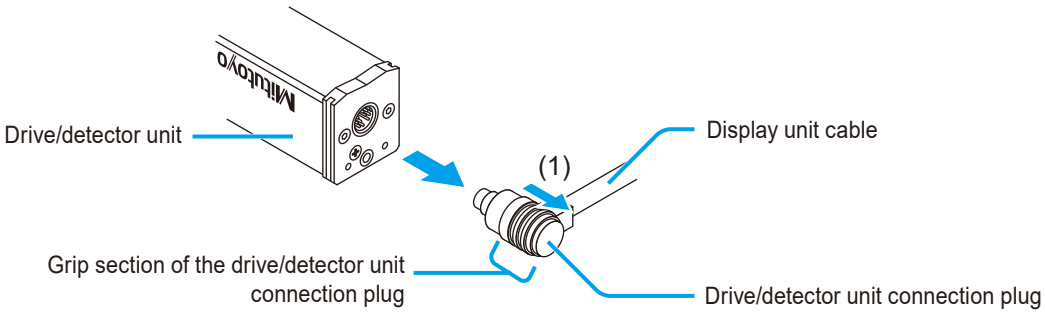
» The standard type drive/detector unit is released from the drive/detector unit retaining pin of the display unit.




## 2 Remove the display unit cable from the standard type drive/detector unit.

1 Slide the grip section in the direction of arrow (1), and remove the drive/detector unit connection plug from the connector on the rear of the standard type drive/detector unit.

» The standard type drive/detector unit is detached from the display unit.



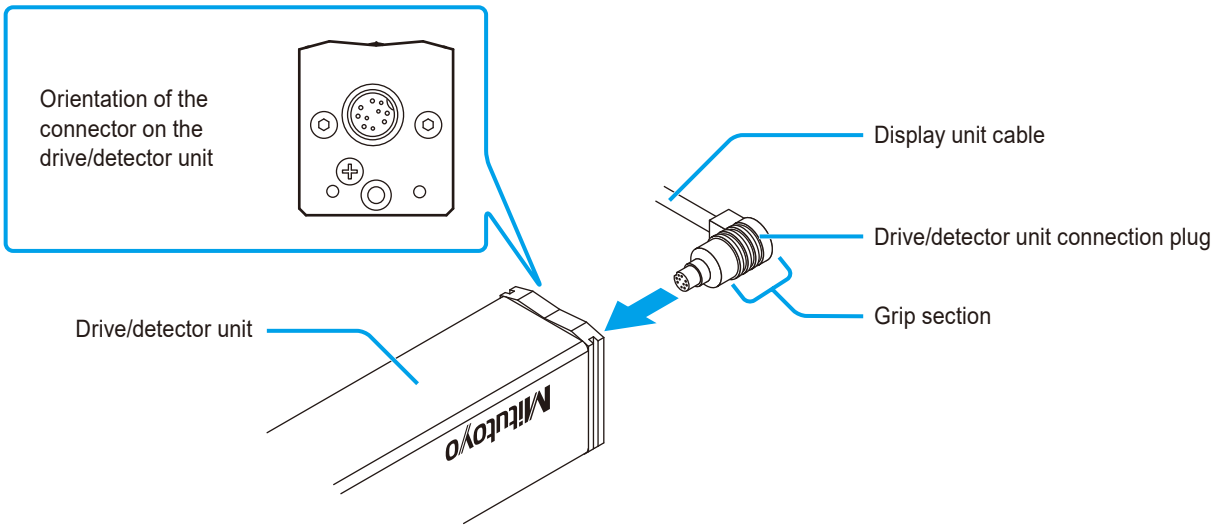
## 3 Attach the display unit cable to the replacement drive/detector unit.

1 Fit the drive/detector unit connection plug into the connector of the replacement drive/detector unit.

» The drive/detector unit is connected to the display unit.

**IMPORTANT**

While connecting the drive/detector unit connection plug to the connector on the rear of the drive/detector unit, make sure that the notch on the plug is aligned with the protrusion inside the connector.




## 4 Attach the drive/detector unit to the display unit.

1 Insert the drive/detector unit so that the drive/detector unit retaining pin of the display unit fits into the pin hole on the connector side of the drive/detector unit.

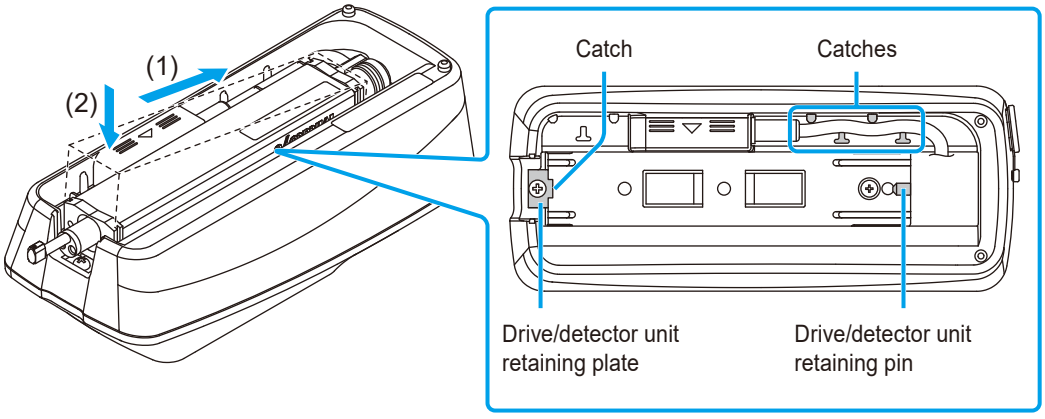
» The drive/detector unit retaining pin of the display unit is inserted into the drive/detector unit.

2 While pushing the drive/detector unit in the direction of arrow (1), lower it in the direction of arrow (2) to put the drive/detector unit in the display unit so that the catch on the drive/detector unit retaining plate fits into the slot on the detector side of the drive/detector unit.

» The drive/detector unit is secured in the display unit.

3 Fasten the display unit cable with the catches at the bottom of the display unit.

» The display unit cable is housed in the bottom of the display unit.



## MEMO

# PART C
# Measurement


| | | |
|---|---|---|
| 1 | Overall Measurement Workflow | C-1 |
| 2 | Calibration | C-4 |
| 3 | Measurement | C-42 |
| 4 | Daily Menu | C-74 |


No. 99MBB794A

# 1 Overall Measurement Workflow

This chapter explains the overall workflow of measurement with this product.

There are two types of operations: general operations and operations on demand. The former is performed regularly and the latter is performed as required. Perform the operations in the solid line frames regularly. Perform the operations in the dashed line frames as required.

| | |
|---|---|
| Set up the product.<br>📖 "PART B Setting Up" | Set up the product (attaching and detaching the drive unit and detector, cable connections, etc.) according to the shape of the workpiece. |
| Supply power.<br>📖 "5 Supplying Power" in "PART B Setting Up" | Use either external power or the internal battery as the power supply. Charge the internal battery as necessary. |
| Perform calibration.<br>📖 "2 Calibration" | Calibration is a means of adjusting the detector gain so that the product can yield correct measurement results. You can easily perform calibration by measuring the supplied roughness specimen. |
| Modify measurement conditions.<br>📖 "1.1 Modifying the Measurement Conditions" | Modify the measurement conditions.<br>For details about the modifiable measurement conditions, see 📖 "■ Modifiable measurement conditions" on page C-2. |
| Attach the attachments.<br>📖 "3.2.2 When This Product Cannot Be Directly Placed on the Workpiece" | When this product cannot be directly placed on the workpiece, use an attachment. |
| Perform measurement.<br>📖 "3 Measurement" | Measure the workpiece to obtain the calculation result for each parameter. You can also display evaluation profiles and graphs, modify measurement conditions, and perform recalculations. |
| Record the measurement results.<br>📖 "3.4 Measurement Data Management" | You can save and print measurement results, perform SPC data output, and perform communication with a PC. |
| Daily care<br>📖 "1 Maintenance and Inspection" in "PART G Maintenance and Troubleshooting" | After you finish measurement, perform cleanup work such as detaching the drive/detector unit, clean the product, and store it. |

## ■ Modifiable measurement conditions

The following table shows the measurement conditions you can modify with this product. At the time of purchase, the values in the following table are set as default.

**Tips**

For details about modifying measurement conditions, see "1.1 Modifying the Measurement Conditions" on page D-1 in "PART D Measurement Conditions and Parameters".

| Measurement conditions | Description | Default value | Reference location |
|---|---|---|---|
| Nominal value | Enter the value of the precision roughness specimen. | 2.950 µm (116.14 µin) | "2.4 Setting the Nominal Value of the Roughness Specimen" in "PART C Measurement" |
| Surface roughness standard | Select the standard to apply. | ISO 4287 | "1.1.2 Roughness Standard" in "PART D Measurement Conditions and Parameters" |
| Evaluation profile | Select the evaluation profile. | R profile | "1.1.3 Evaluation Profile" in "PART D Measurement Conditions and Parameters" |
| Surface roughness parameter | Select the parameters. | Ra, Rq, Rz only | "2.2 Setting the Parameters to Display (Parameter Customization)" in "PART D Measurement Conditions and Parameters" |
| Filters | Select the filter. | GAUSS | "1.1.5 Filter" in "PART D Measurement Conditions and Parameters" |
| Cutoff value (section length) | Select the cutoff value (λc). | 0.8 mm (0.03 in) | "1.1.6 Cut-Off Related Items" in "PART D Measurement Conditions and Parameters" |
| λs | This value is automatically set according to the selected cutoff value (λc). | 2.5 µm (100 µin) | |
| Number of sections | Set the number of sections. | ×5 | "1.1.7 Number of Sections" in "PART D Measurement Conditions and Parameters" |
| Evaluation length (arbitrary length) | When measurement is performed with a cutoff value and number of sections that cannot be set with this product, set the evaluation length to an arbitrary length. | None | "1.1.8 Evaluation Length" in "PART D Measurement Conditions and Parameters" |

| Measurement conditions | Description | Default value | Reference location |
|---|---|---|---|
| Pre-travel/ post-travel | Since the roughness standards require the pre-travel/post-travel lengths to be included in measurement, set this setting to [ON] in most cases. However, when the pre-travel/ post-travel lengths cannot be traced due to a small measurement surface, set this setting to [OFF]. | ON | 📖 "1.1.9 Pre-Travel/ Post-Travel" in "PART D Measurement Conditions and Parameters" |
| Measuring speed | Select the measuring speed (drive speed) for the detector. | 0.5 mm/s (0.020 in/s) | 📖 "1.1.10 Measuring Speed" in "PART D Measurement Conditions and Parameters" |
| Measurement range | Select the measurement range. | AUTO | 📖 "1.1.11 Measurement Range" in "PART D Measurement Conditions and Parameters" |
| GO/NG judgment and tolerance values | Set the upper or lower roughness limit for GO/NG judgment and screening for workpieces. | None | 📖 "2.3 GO/NG Judgment" in "PART D Measurement Conditions and Parameters" |
| Drive unit | Set the drive unit type. | Standard | 📖 "2.5 Setting the Drive Unit (Speed Calibration)" in "PART F Environment Settings" |
| Communication speed | Specify this setting when performing communication with a PC. Select 9600 bps, 19200 bps, or 38400 bps. | 38400 bps | 📖 "2.15 PC Communication Setting" in "PART F Environment Settings" |
| Parity | Select EVEN, ODD, or NONE. | NONE | |
| Auto-OFF | Set the Auto-OFF function to ON or OFF when the internal battery is used. | ON | 📖 "2.11 Auto-OFF Function Setting" in "PART F Environment Settings" |

# 3 Measurement

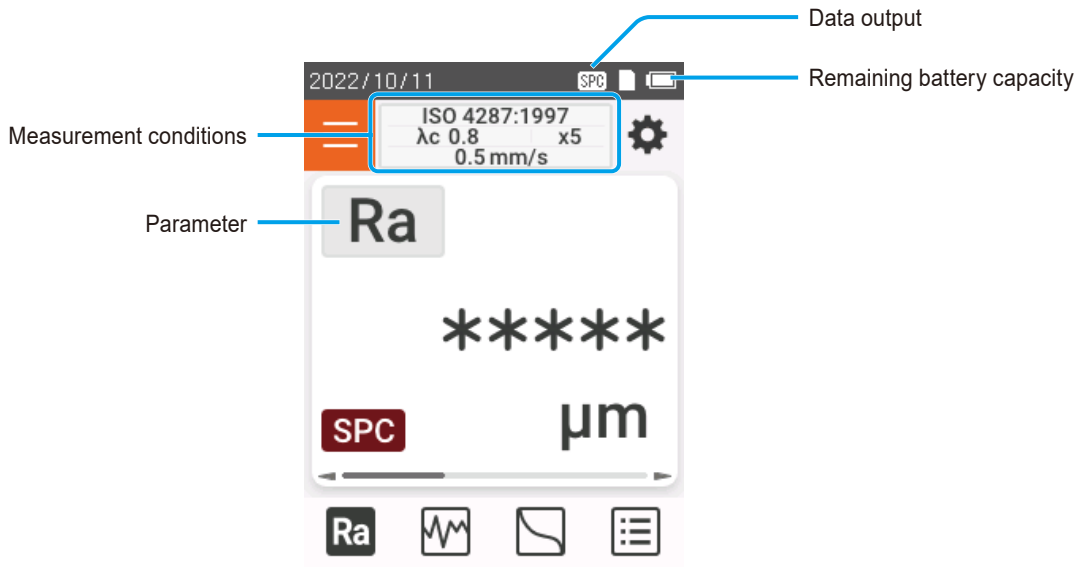
Place this product on the workpiece, and then press the [START/STOP] key to start measuring. During measurement, the measured profile is displayed. After measurement has been completed, the measurement results are displayed for confirmation.

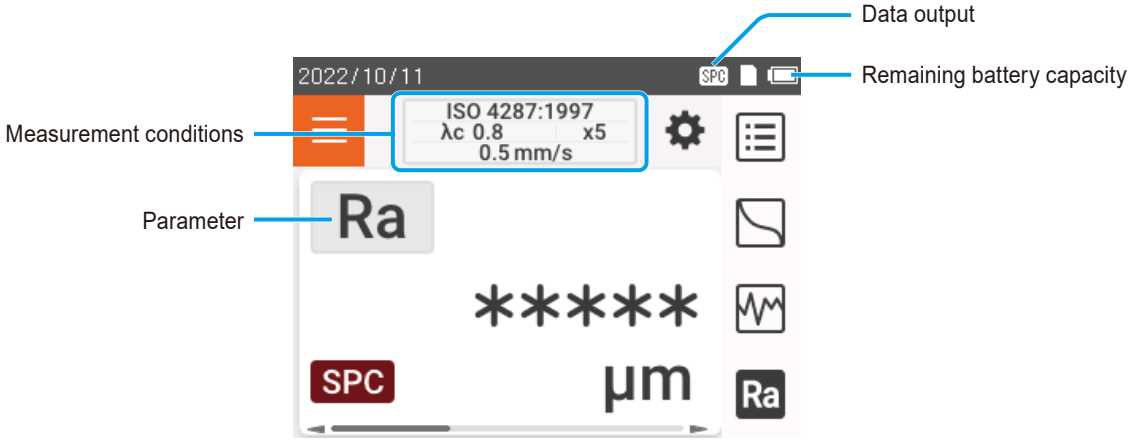
## 3.1 Confirmation of Measurement Conditions and Parameters

Before starting measurement, check that the settings for measurement conditions, parameters, data output, etc., are correctly configured on the Home screen.

When the remaining capacity of the internal battery is low, connect this product to an external power source.

- For details about the settings for measurement conditions, see "1 Measurement Conditions" on page D-1 in "PART D Measurement Conditions and Parameters".
- For details about the parameter settings, see "2 Setting the Parameters" on page D-45 in "PART D Measurement Conditions and Parameters".
- For details about the data output settings, see "2.3 Data Output Setting" on page F-6 in "PART F Environment Settings".
- For details about the power supply, see "5 Supplying Power" on page B-13 in "PART B Setting Up".



# 3.2 Arranging This Product and the Workpiece

## 3.2.1 When This Product Can Be Directly Placed on the Workpiece

If the measurement surface of the workpiece is larger than this product, place this product on the workpiece.

**IMPORTANT**

For surface roughness measurement to be successful, it should be performed on a firm base that is insulated as well as possible from all sources of vibration. If measurement is performed in places subject to significant vibrations, you cannot obtain correct measurement results.

**Tips**

If the measurement surface of the workpiece is smaller than this product, or if the measurement surface is curved (cylindrical, etc.), place the product using an attachment. For details about the attachments, see "3.2.2 When This Product Cannot Be Directly Placed on the Workpiece" on page C-46.

**1** **Remove dirt on the measurement surface.**

**IMPORTANT**

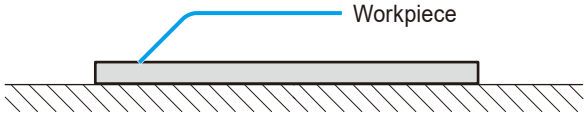
Before starting measurement, wipe off dirt such as dust and oil from the measurement surface with a lint-free soft cloth or lens paper.

If dirt is left on the measurement surface, you may not obtain correct measurement results.

**2** **Place the workpiece so that the measurement surface is horizontal.**

**IMPORTANT**

If the measurement surface is tilted, use a fixture to support the workpiece or this product.

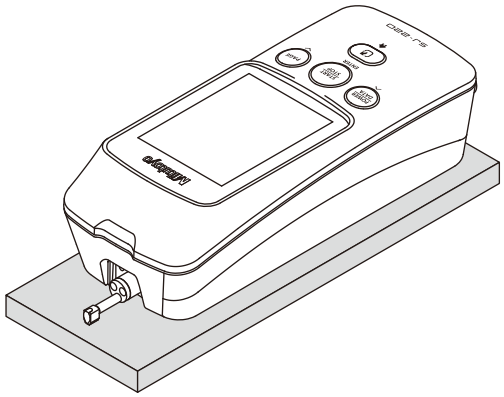


## 3 Place this product on the workpiece.

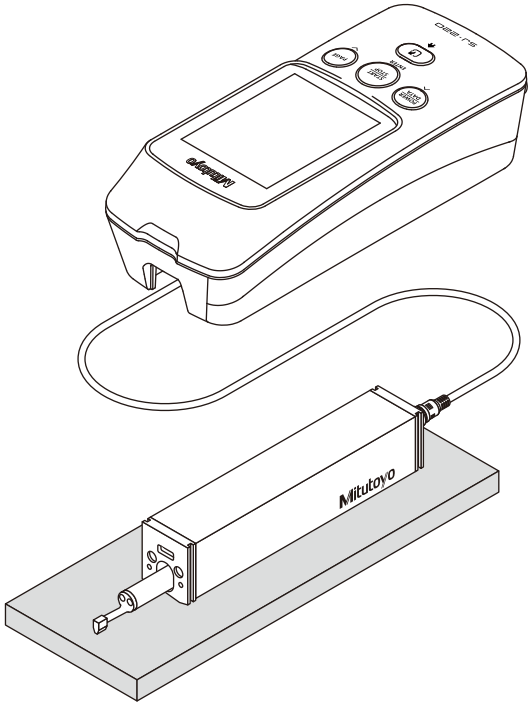
**IMPORTANT**

If this product can be directly placed on the workpiece, use the reference surfaces A and B (see the figure below) at the bottom face of the drive/detector unit as fulcrums.

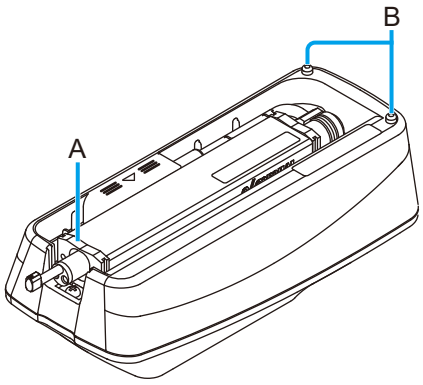
- Using this product with the drive/detector unit housed in the display unit



- Using this product with the drive/detector unit detached from the display unit

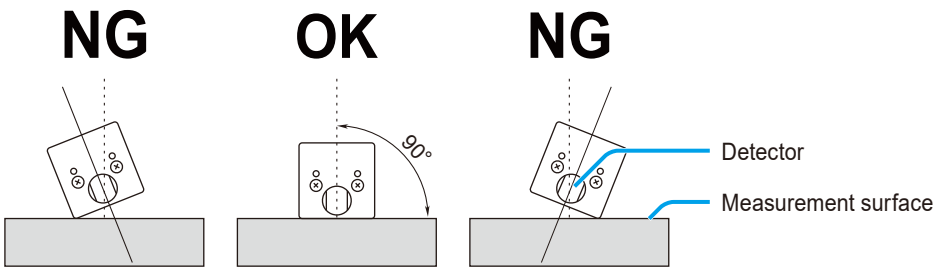



- Bottom face

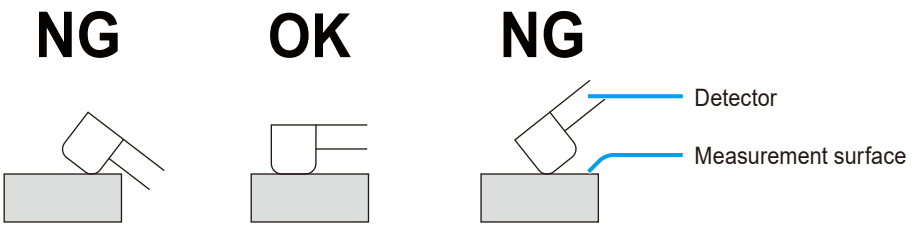


**4 Check that the stylus is correctly in contact with the measurement surface and that the detector is almost horizontal to the measurement surface.**

- Front view of detector



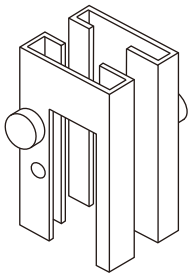
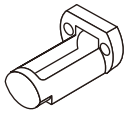
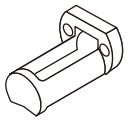
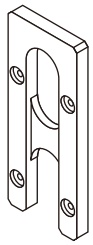
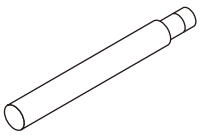

- Side view of detector

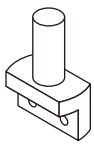
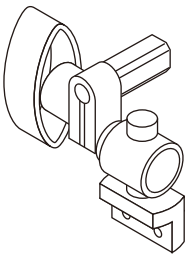
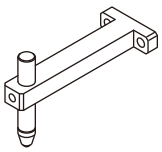
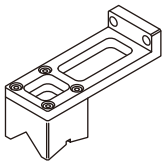


## 3.2.2 When This Product Cannot Be Directly Placed on the Workpiece

If the measurement surface of the workpiece is smaller than this product, or when measuring a cylindrical workpiece, etc., use an attachment (optional accessory)*1.

*1 The contact adapter and V-shaped adapter are standard accessories only for the transverse-tracing type.

| Attachment | Drive/detector unit | | | Description | Reference |
|---|---|---|---|---|---|
| | Standard | Retractable | Transverse-tracing | | |
|  Support brackets | ✓ | ✓ | – | Used to measure small workpieces.<br>Attach the support brackets and adjust the height of the drive/detector unit. | 📖 "■ Support brackets" on page C-48 |
|  Nosepiece for flat surface | ✓ | ✓ | – | Used to measure small workpieces with a flat measurement surface.<br>Used to protect the detector. | 📖 "■ Nosepiece for flat surface" on page C-49 |
|  Nosepiece for cylinder | ✓ | ✓ | – | Used to measure cylindrical workpieces.<br>Used to guide and protect the detector. | 📖 "■ Nosepiece for cylinder" on page C-50 |
|  Adapter for vertical application | ✓ | ✓ | – | Used to measure vertical grooves, etc. | 📖 "■ Adapter for vertical application" on page C-51 |
|  Extension rod | ✓ | ✓ | – | Used to measure deep holes.<br>Attach it to extend the length of the detector.<br>**IMPORTANT**<br>Extension is possible with only one extension rod. Multiple extension rods cannot be used. | 📖 "■ Extension rod" on page C-52 |

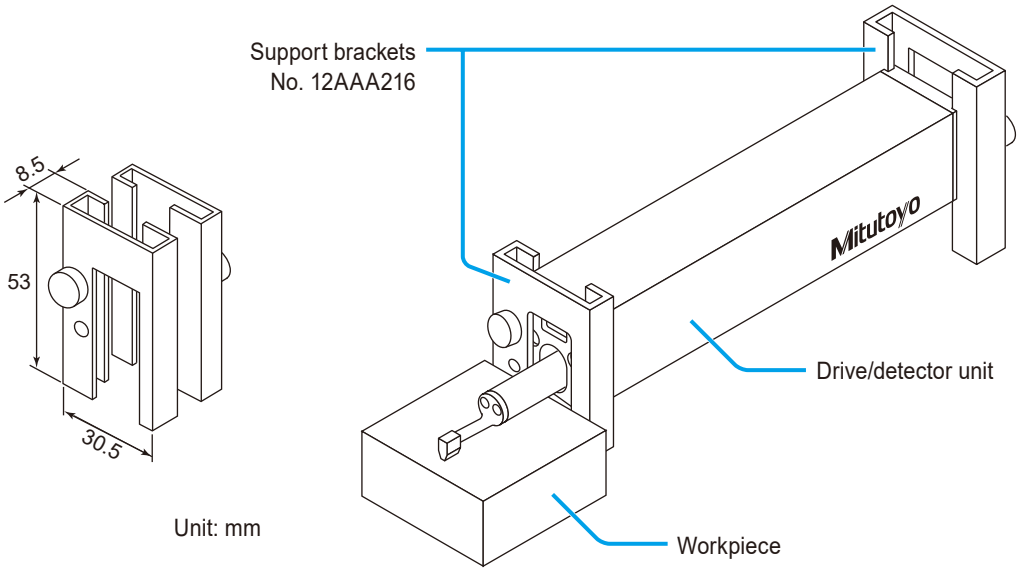
| Attachment | Drive/detector unit | | | Description | Reference |
|---|---|---|---|---|---|
| | Standard | Retractable | Transverse-tracing | | |
|  Adapter for magnetic stand | ✓ | ✓ | ✓ | Used to secure the drive/detector unit to the stand. Use the stand when there is no space to place this product or the drive/detector unit, or when the drive/detector unit cannot be supported with your hands. | 📖 "■ Adapter for magnetic stand" on page C-54 |
|  Adapter for Height Gage | ✓ | ✓ | ✓ | Used to secure the drive/detector unit to the Height Gage. Use the Height Gage when setting the height of a measurement point arbitrarily, or when the drive/detector unit cannot be supported with your hands. | 📖 "■ Adapter for Height Gage" on page C-55 |
|  Contact adapter | – | – | ✓ | An attachment only for the transverse-tracing type. It can be used for workpieces with narrow widths. The height of the measurement point can be set arbitrarily. | 📖 "■ Contact adapter (only for the transverse-tracing type drive/detector unit)" on page C-56 |
|  V-shaped adapter | – | – | ✓ | An attachment only for the transverse-tracing type. Before placing the drive/detector unit, align the V-shaped grooves of the V-shaped adapter with the cylindrical workpiece. | 📖 "■ V-shaped adapter (only for the transverse-tracing type drive/detector unit)" on page C-57 |

## ■ Support brackets

Used to measure workpieces smaller than the drive/detector unit.

### ● Dimensions and application example

By using the support brackets, you can adjust the height of the drive/detector unit as shown in the figure below.




### ● Attaching the support brackets

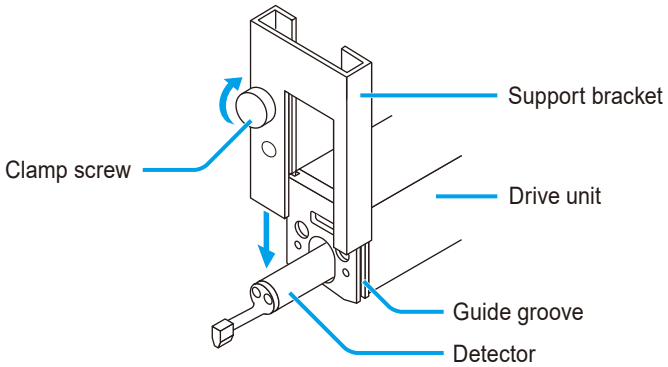
**1** **Fit the two support brackets into the grooves of the two drive unit guides.**

**2** **Adjust the height of the drive unit so that the detector is parallel to the workpiece.**

**3** **After adjusting the height, secure the brackets by tightening the clamp screw clockwise.**

**Tips**

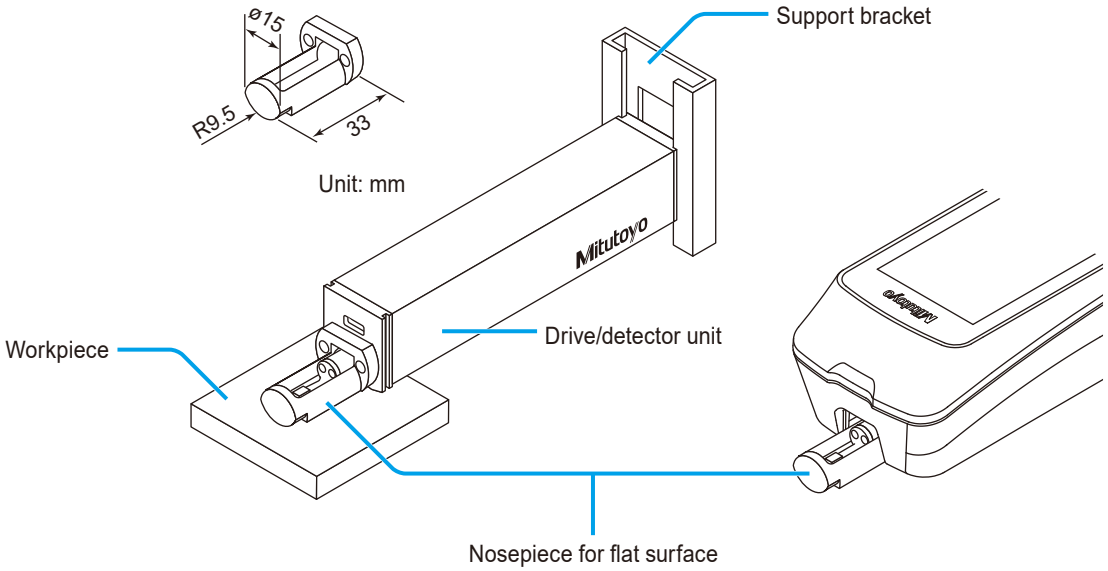
For details about placing the drive/detector unit, see 📖 "3.2 Arranging This Product and the Workpiece" on page C-43.



## ■ Nosepiece for flat surface

Used to protect the detector when measuring workpieces that are smaller than the drive/detector unit and that have flat measurement surfaces.

### ● Dimensions and application example



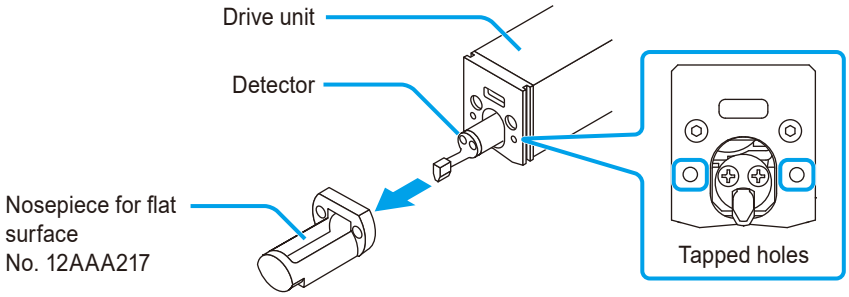

### ● Attaching the nosepiece for flat surface

**NOTICE**

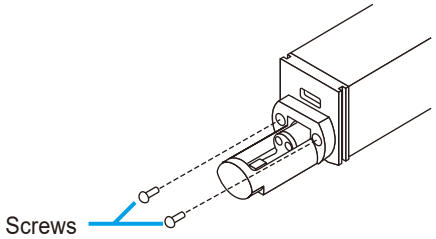
**There is a risk of damaging the detector.**

While attaching the nosepiece for flat surface, keep it away from the detector of this product.

**1 Insert the detector into the opening of the nosepiece for flat surface.**



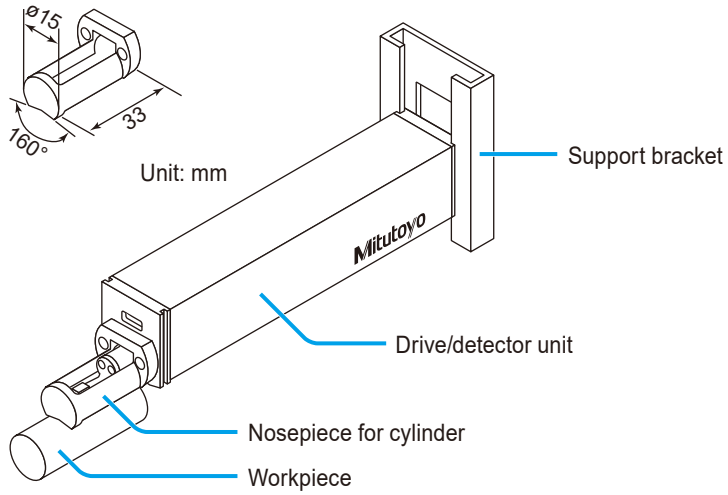

**2 Use the supplied hexagonal wrench to tighten the supplied screws at the two points shown in the figure below.**



## ■ Nosepiece for cylinder

Used to protect and guide the detector when measuring cylindrical workpieces where the drive/detector unit cannot be directly placed.

### ● Dimensions and application example



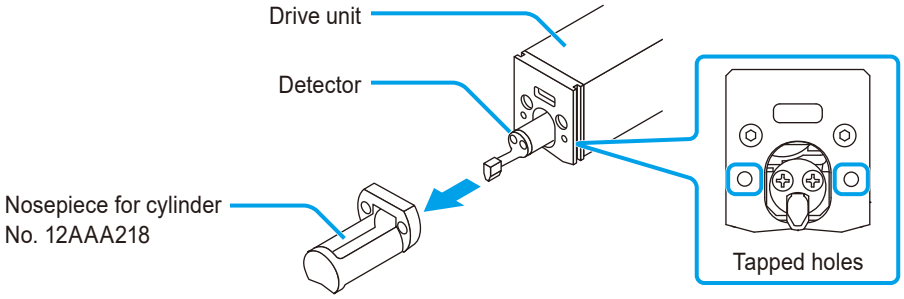

### ● Attaching the nosepiece for cylinder

**NOTICE**

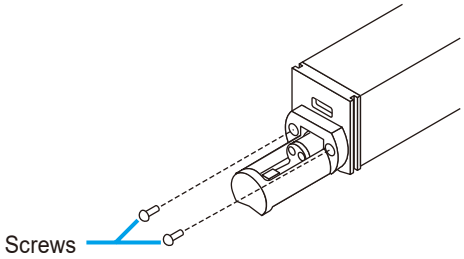
**There is a risk of damaging the detector.**

While attaching the nosepiece for cylinder, keep it away from the detector of this product.

**1 Insert the detector into the opening of the nosepiece for cylinder.**



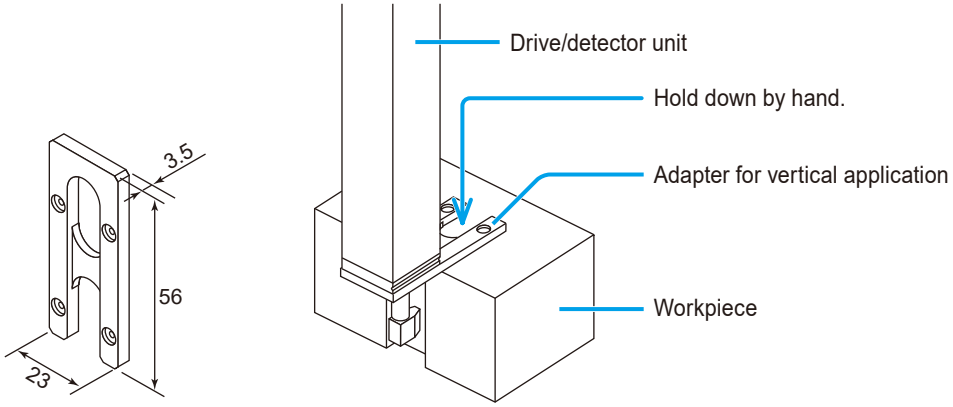

**2 Use the supplied hexagonal wrench to tighten the supplied screws at the two points shown in the figure below.**



## ■ Adapter for vertical application

Used to measure vertical grooves, etc., with measurement points where the drive/detector unit cannot be placed.

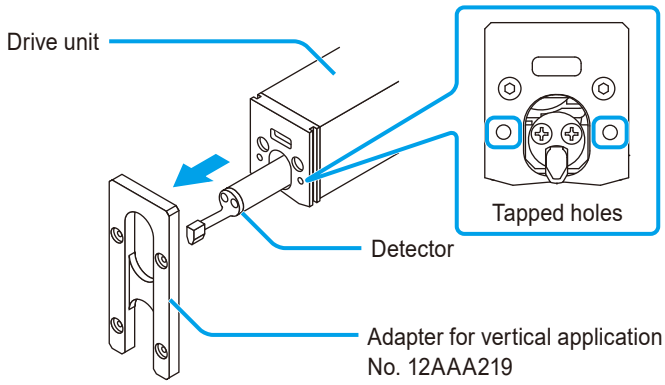
### ● Dimensions and application example



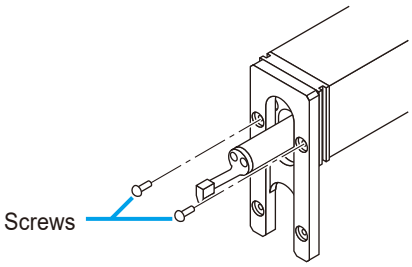

Unit: mm

### ● Attaching the adapter for vertical application

**1 Insert the detector into the opening of the adapter for vertical application.**




**2 Use the supplied hexagonal wrench to tighten the supplied screws at the two points shown in the figure below.**

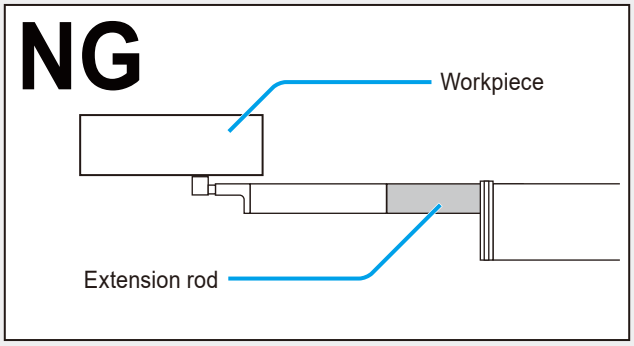


## ■ Extension rod

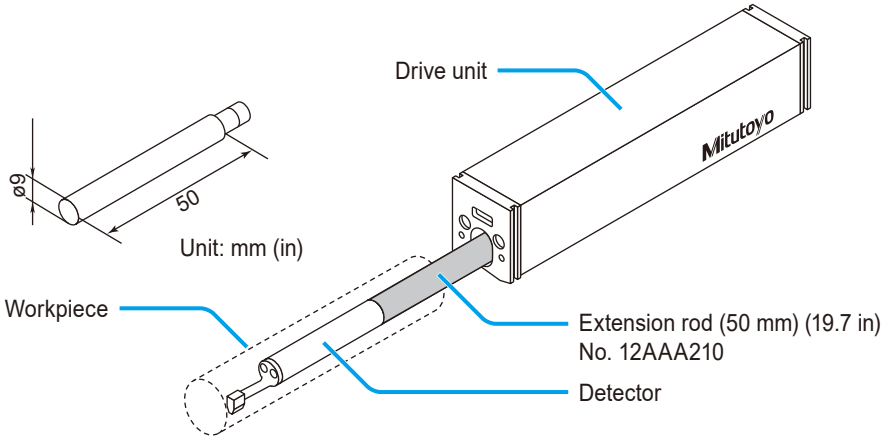
Used to measure the inside surface of a deep hole.

**IMPORTANT**

- Extension is possible with only one extension rod. Multiple extension rods cannot be used.
- Be sure to perform calibration after attaching and detaching the extension rod.
- When an extension rod is used, measurement is not possible with the stylus facing up.

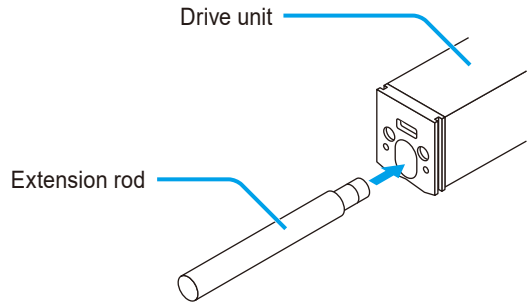



### ● Dimensions and application example

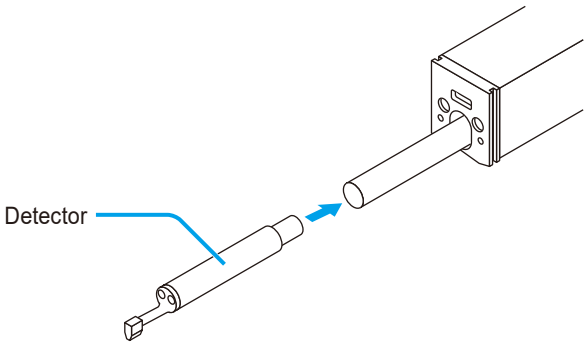


● Attaching the extension rod

**1** **Insert the extension rod into the opening of the drive unit.**




**2** **Attach the detector to the extension rod.**

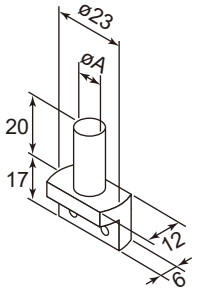


## ■ Adapter for magnetic stand

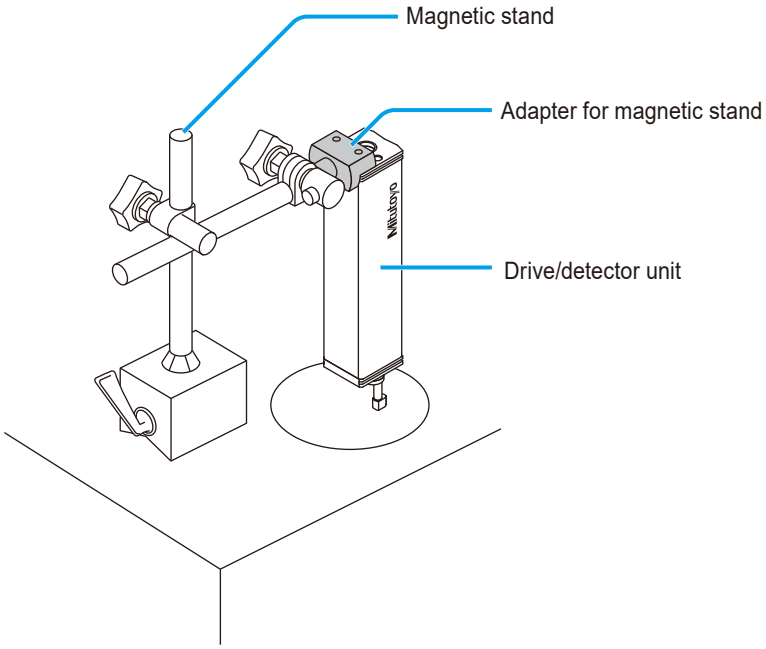
Used to secure the drive/detector unit to the stand.

Used this attachment when there is no space to place this product or the drive/detector unit, or when the drive/detector unit cannot be supported with your hands.

### ● Dimensions and application example



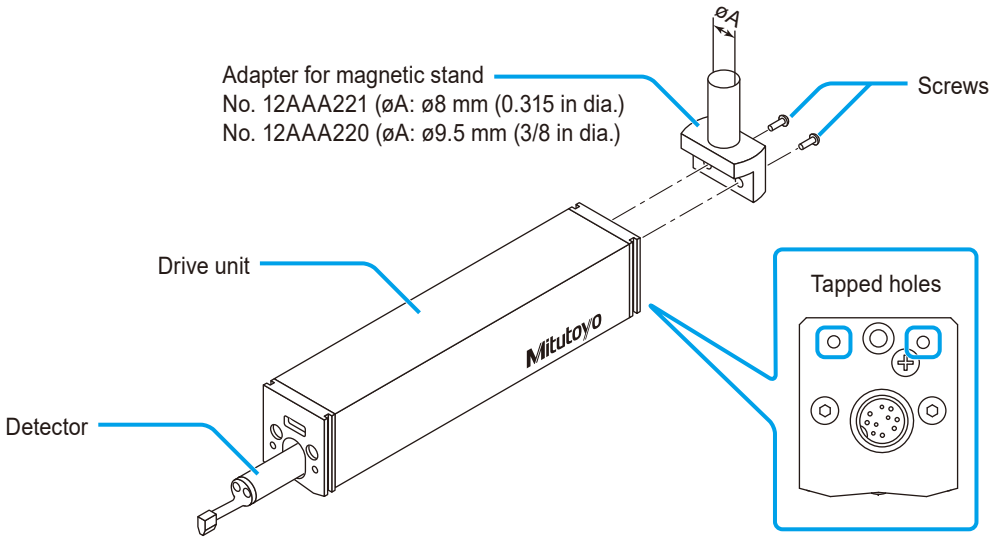

øA: 8 mm (0.315 in) /
9.5 mm (3/8 in)




### ● Attaching the adapter for magnetic stand

**1 Attach the adapter for magnetic stand to the rear of the drive unit.**

**2 Use the supplied hexagonal wrench to tighten the supplied screws at the two points shown in the figure below.**

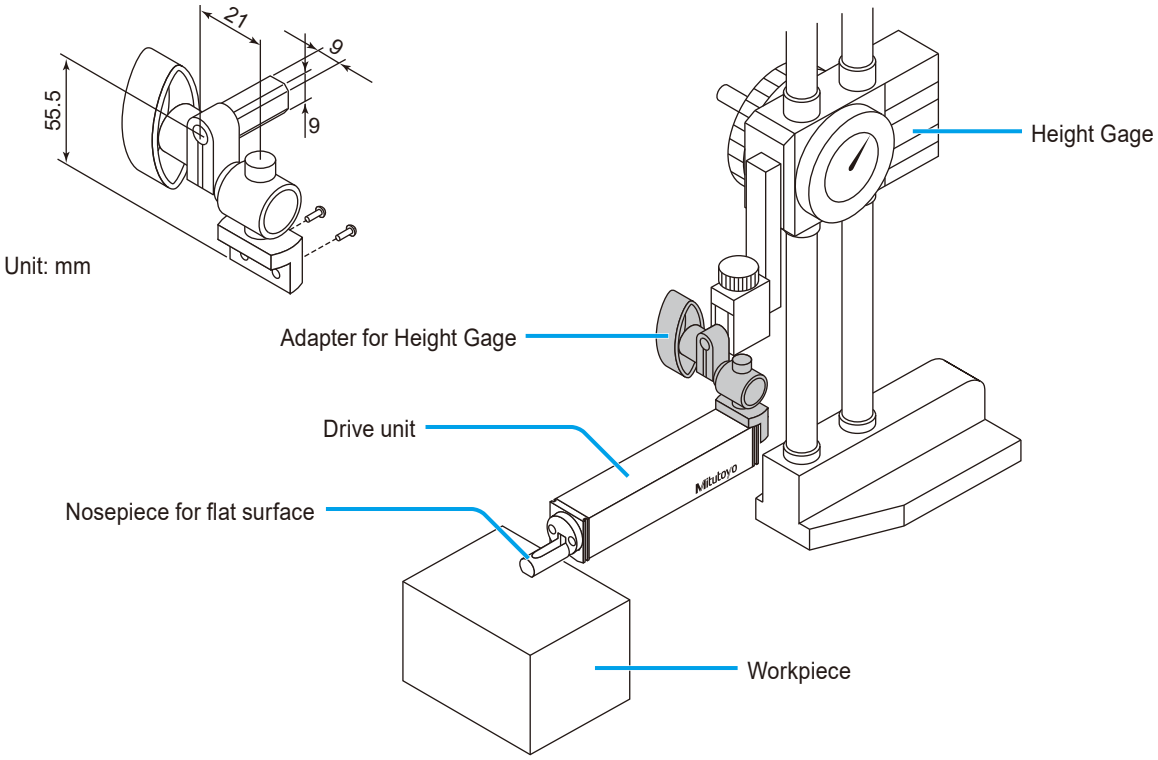


## ■ Adapter for Height Gage

Used to secure the drive/detector unit to the Height Gage.

Use the Height Gage when setting the height of a measurement point arbitrarily, or when the drive/detector unit cannot be supported with your hands.

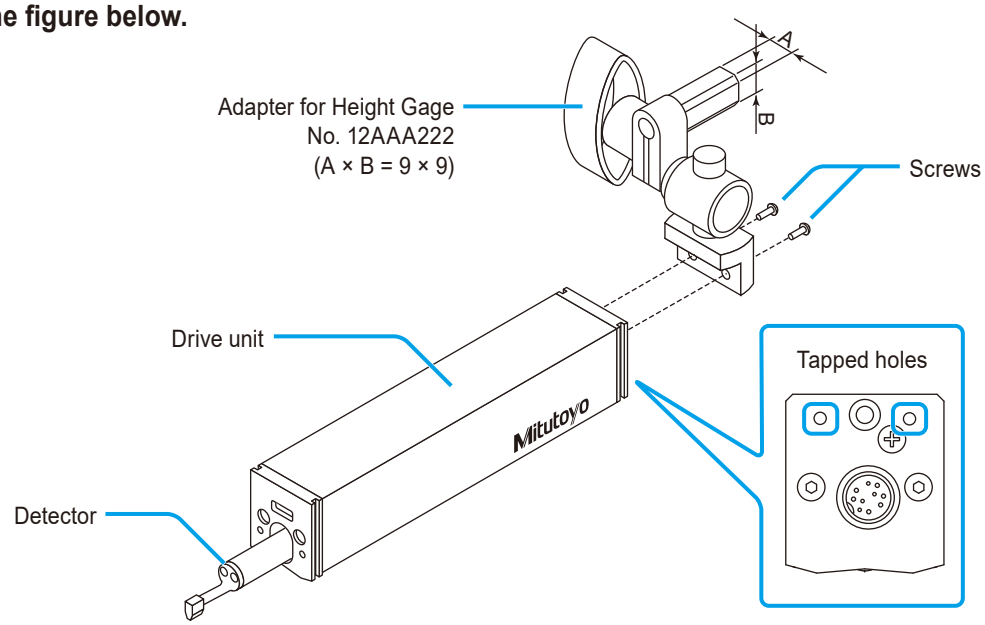
### ● Dimensions and application example




### ● Attaching the adapter for the Height Gage

**1** **Attach the adapter for Height Gage to the rear of the drive unit.**

**2** **Use the supplied hexagonal wrench to tighten the supplied screws at the two points shown in the figure below.**



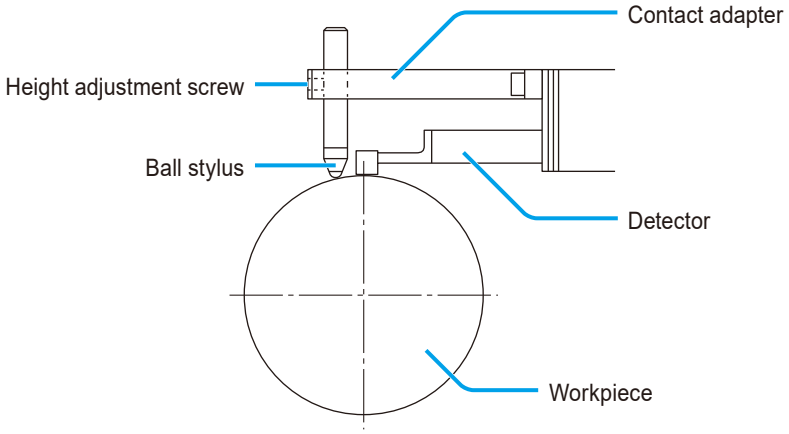
## ■ Contact adapter (only for the transverse-tracing type drive/detector unit)

An attachment only for the transverse-tracing type drive/detector unit.

Use this attachment to place the drive/detector unit on a workpiece with a narrow width.

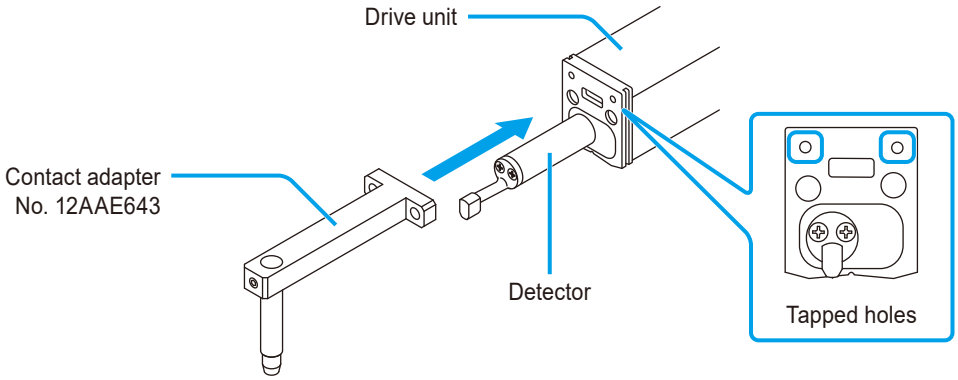
Touch the ball stylus of the contact adapter to a point on the workpiece, and then adjust the height adjustment screw to bring the detector/drive unit to an arbitrary measuring point (height).

### ● Dimensions and application example

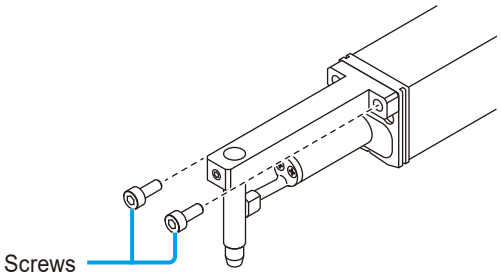



### ● Attaching the contact adapter

**1 Align the tapped holes on the contact adapter with the tapped holes on the detector side of the drive/detector unit.**




**2 Tighten the supplied screws with the supplied hexagonal wrench to secure the contact adapter to the drive/detector unit.**



## ■ V-shaped adapter (only for the transverse-tracing type drive/detector unit)

An attachment only for the transverse-tracing type drive/detector unit.

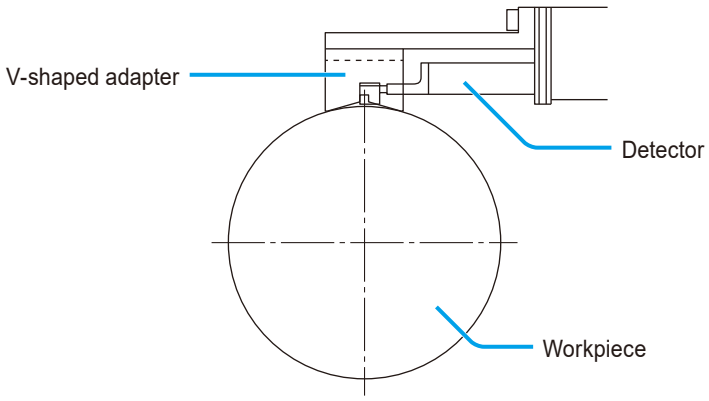
Use this attachment to measure cylindrical workpieces.

The drive/detector unit can be placed just by aligning the V-shaped grooves of the V-shaped adapter with the cylindrical measurement surface.

This adapter can be placed on cylindrical workpieces with diameters in the following range.

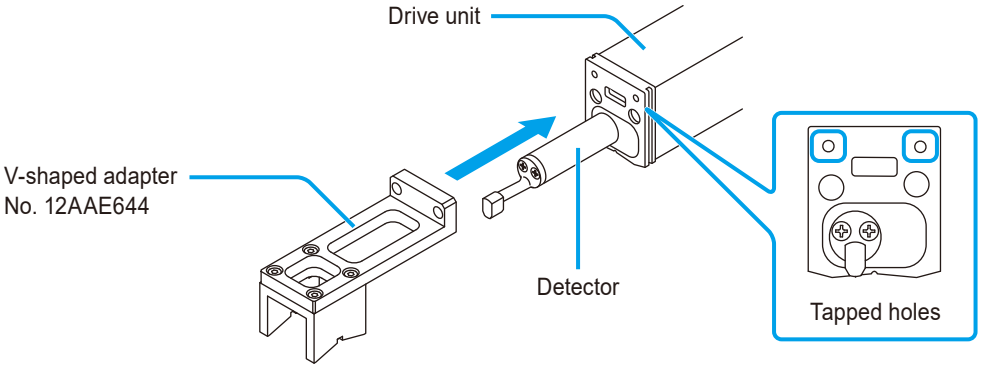
- Maximum diameter for placement: ø72 mm (2.83 in dia.)
- Minimum diameter for placement: ø8 mm (0.31 in dia.)

### ● Dimensions and application example

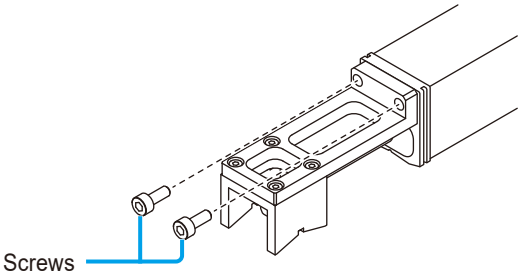



### ● Attaching the V-shaped adapter

**1 Align the tapped holes on the V-shaped adapter with the tapped holes on the detector side of the drive/detector unit.**




**2 Tighten the supplied screws with the supplied hexagonal wrench to secure the V-shaped adapter to the drive/detector unit.**



# 3.3 Starting Measurement

This section explains the operation procedure for measuring a workpiece.

**⚠CAUTION**

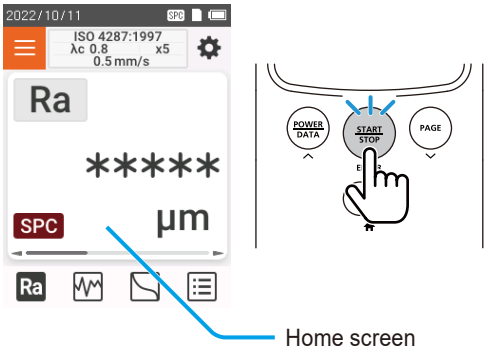
**There is a risk of injuring your hands and fingers.**

When measurement is started, the detector starts moving.
Do not touch the detector until it comes to a complete halt.
Injuries may result. Also, forcibly interrupting the movement of the detector may result in malfunction or damage.

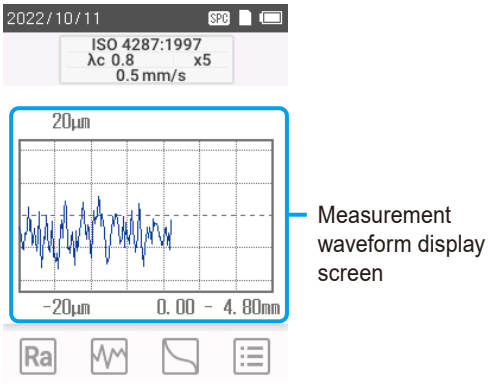
## IMPORTANT

- When the internal battery status icon indicates that the internal battery is at 60 % capacity or less, connect this product to an external power source.
  If measurement is started when the remaining capacity of the internal battery is low, an error message may be displayed.
  For details, see "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".
- Check that measurement conditions and parameters are correctly set for the workpiece to measure.
  For details about how to confirm measurement conditions and parameters on the Home screen, see "3.1 Confirmation of Measurement Conditions and Parameters" on page C-42.

### 1 While the Home screen is displayed, press the [START/STOP] key.



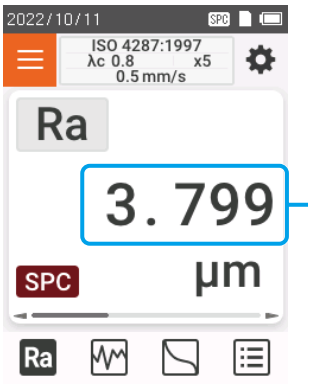

» The detector starts moving to perform measurement.




### Tips

- While measurement is being performed (detector is traversing), the measurement waveform display screen is displayed.
- If it is necessary to stop the measurement before completion, press the [START/STOP] key.

» When measurement is complete, the calculation result is displayed on the Home screen.




**Tips**

For details about measurement results, see "3.5 Measurement Results Display" on page C-61.

# 3.4 Measurement Data Management

The most recent measurement data is retained in the internal memory. By using a memory card (optional accessory), this product can save up to 10,000 sets of measurement data.

## 3.4.1 Recalling/Saving/Deleting/Renaming a Measurement Data File

Here as an example, this section explains the operation flow for saving measurement data.

**Tips**

- A memory card (optional accessory) is required to recall, save, delete, or rename a measurement data file.
- For details, see "1 Saving/Recalling/Deleting/Renaming Measurement Data" on page E-1 in "PART E Measurement Data Management".

**1** **After measurement, touch ☰ (main menu) on the Home screen and then [Measured Data].**

**2** **Touch [Save].**

**3** **Touch the folder where you want to save the data.**

**4** **Touch [Save New].**

**5** **Enter a file name, and then touch ✓ (confirm).**

» The measurement data is saved.

**Tips**

For details about how to enter a file name, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

## 3.4.2 Outputting Measurement Data

This product can output the measurement data saved in the internal memory or on a memory card to a Mitutoyo Digimatic Mini-Processor (optional accessory) or PC.

**Tips**

For details about outputting measurement data, see "2 Saving or Outputting Measurement Results Using the [POWER/DATA] Key" on page E-30 in "PART E Measurement Data Management".

# 3.5 Measurement Results Display

This product can display measurement results in various patterns.

After measurement, the Home screen displays the calculation results, conditions, etc., shown in the following table.

To switch between the measurement results for each parameter, flick the Home screen. (You can also switch between the measurement results for each parameter by pressing the [PAGE] key.)

You can also touch the icons on the Home screen to display the measurement conditions, evaluation profile, etc.

**Tips**

For details about flicking and swiping operations, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

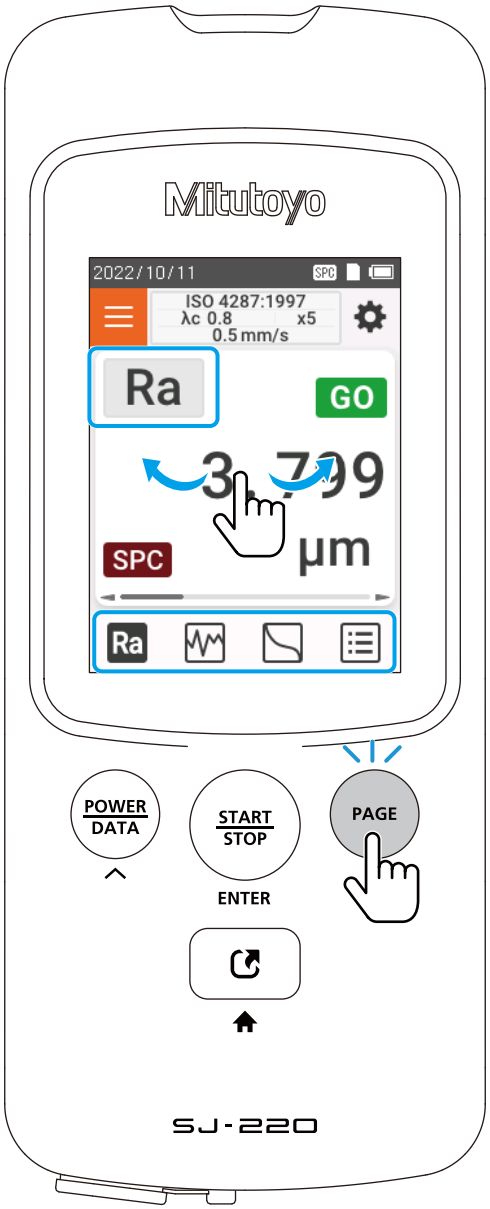
| Display contents | Description |
|---|---|
| Parameter calculation results | • Portrait display, landscape display, or display of multiple parameters on one screen can be set.<br>• With the tracing function, this product can memorize the calculation results of the most recent 10 measurements and display them in a list.<br>• The GO/NG judgment result for a parameter calculation is displayed. |
| Evaluation profile | • You can set whether to display or hide this screen.<br>• A waveform or a zoomed-in or zoomed-out waveform (both vertically and horizontally) is displayed. |
| BAC/ADC graph | You can set whether to display or hide this screen. |
| Measurement conditions list | You can set whether to display or hide this screen. |

## 3.5.1 Changing the Measurement Results Display

The Home screen displays the calculation results of customized parameters.

By touching the icons on the Home screen, you can easily display the evaluation profile, graph, and measurement conditions list.

To switch between the calculation results of the customized parameters, flick the Home screen horizontally, or press the [PAGE] key.



## 3.5.2 Changing the Parameter Display

To switch between the calculation results of the customized parameters, flick the Home screen horizontally, or press the [PAGE] key. (Using the [PAGE] key switches the displayed results in one direction.)

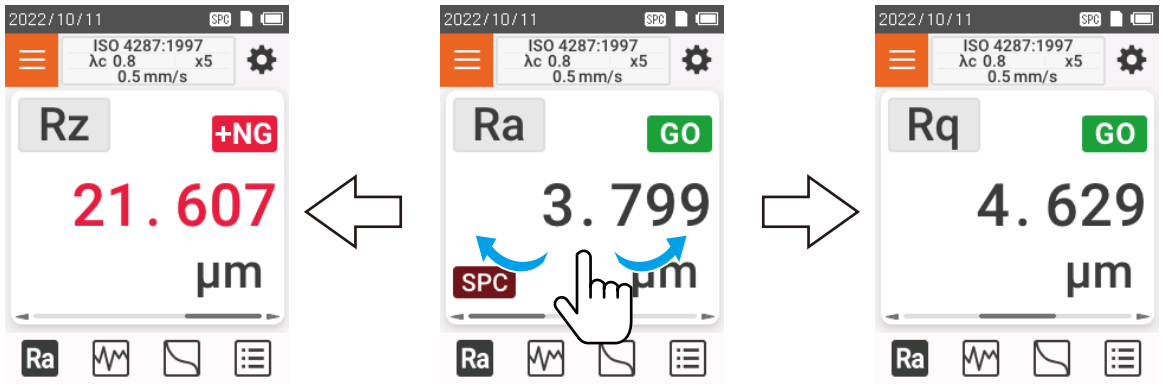
The display orientation can be changed to portrait or landscape, and multiple parameters can also be displayed on one screen.

In addition, the calculation results of the most recent 10 measurements can be displayed with the tracing function.

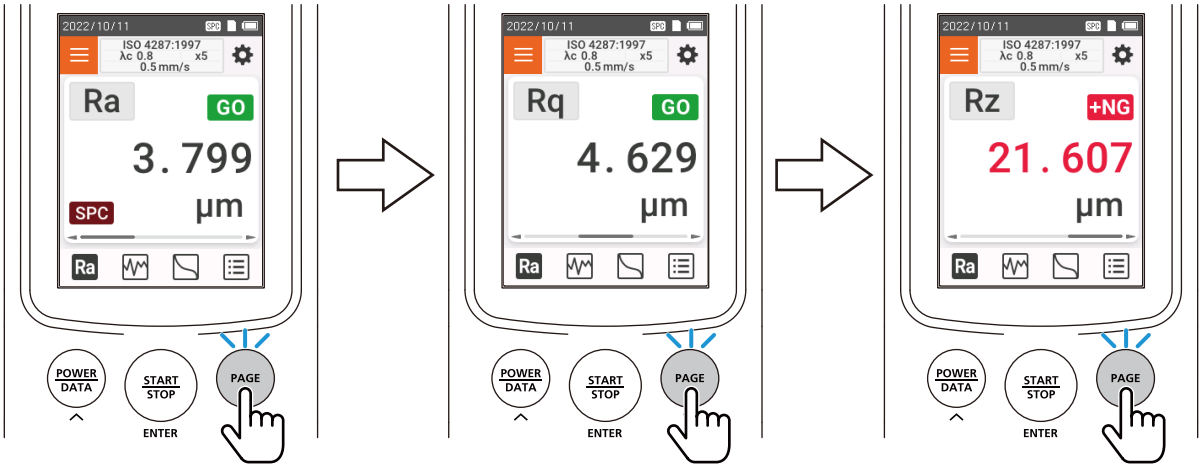
### Tips

- Only customized parameters are displayed.
  For details about the parameter customization function, see "2.2 Setting the Parameters to Display (Parameter Customization)" on page D-46 in "PART D Measurement Conditions and Parameters".
- For details about the parameter display orientation, the display of multiple parameters on one screen, and the trace display, see "2.4.3 Calculation Results Screen" on page A-29 in "PART A Overview".

**Switching by flicking**



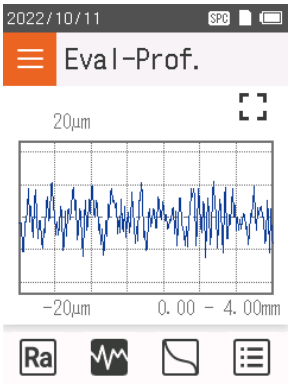

**Switching with the [PAGE] key**



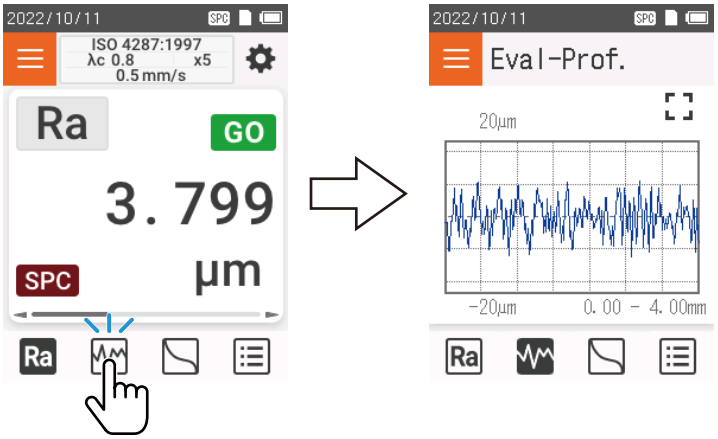
## 3.5.3 Evaluation Profile Display

The measurement results can be displayed in a measurement profile (evaluation profile).

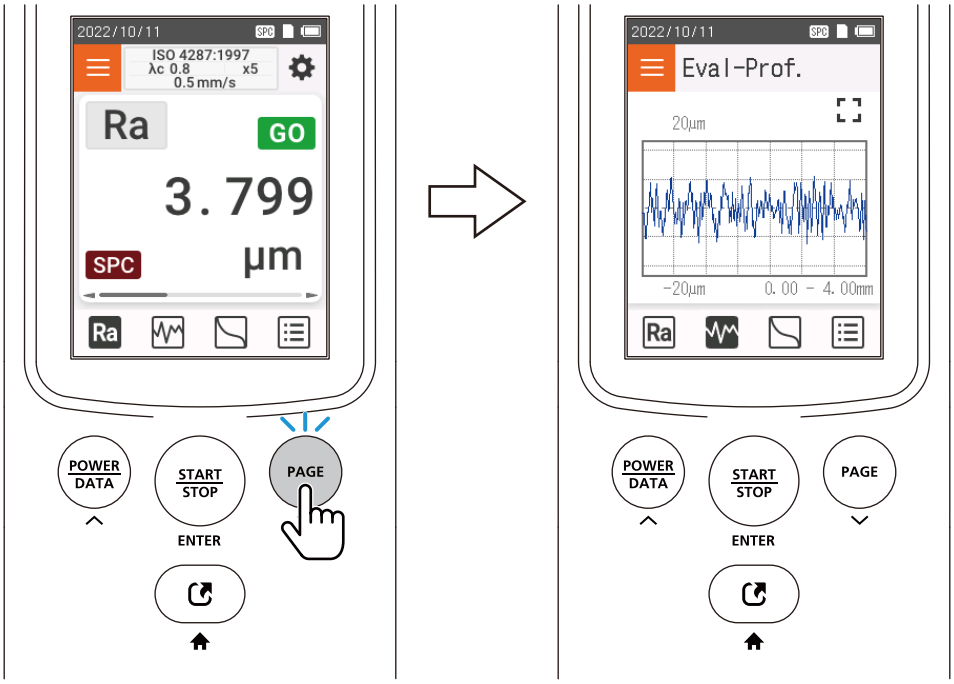
To display the [Eval-Prof.] screen, touch (evaluation profile) on the Home screen, or press the [PAGE] key while the parameter you selected last in the parameter customization function is displayed.




**Screen transition from the Home screen**




**Screen transition with the [PAGE] key**




**Tips**

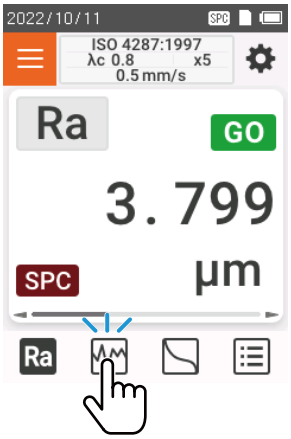
For details about how to display or hide the [Eval-Prof.] screen, see "2.4.4 Evaluation Profile Screen" on page A-31 in "PART A Overview".

## ■ Zooming in/out of the evaluation profile

You can zoom in on or out of the evaluation profile displayed on the screen.
Here as an example, this section explains the procedure in the portrait orientation display.

**1 On the Home screen, touch (evaluation profile).**

» The [Eval-Prof.] screen is displayed.

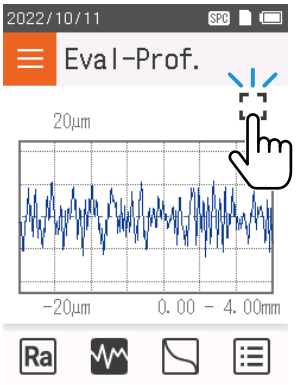



**Tips**

The [Eval-Prof.] screen can also be displayed by pressing the [PAGE] key while the parameter you selected last in the parameter customization function is displayed.

**2 Touch (zoomed-in waveform mode).**

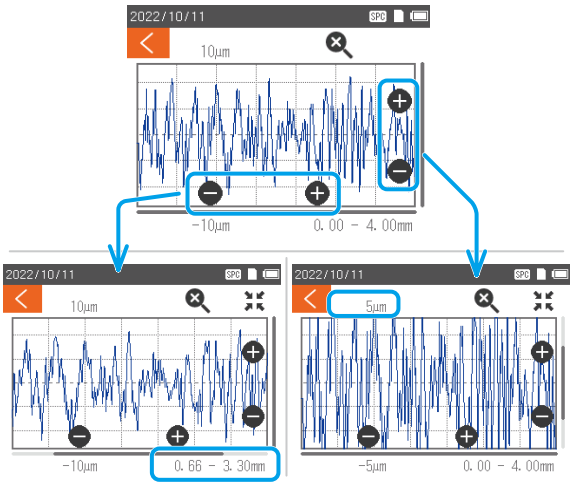
» The display mode changes to zoomed-in waveform mode.



## 3 Zoom in and out.

1 To zoom in or out horizontally, touch ⊕ (zoom in) or ⊖ (zoom out) along the horizontal axis.
To zoom in or out vertically, touch ⊕ (zoom in) or ⊖ (zoom out) along the vertical axis.

» The waveform is zoomed in or out.

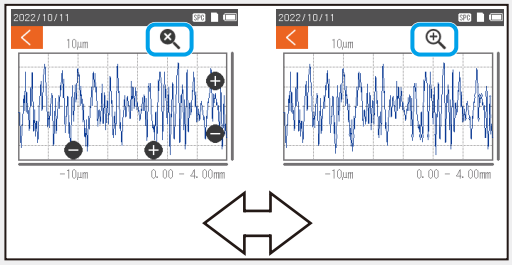



### Tips

You can display or hide the ⊕ (zoom in) button and the ⊖ (zoom out) button.

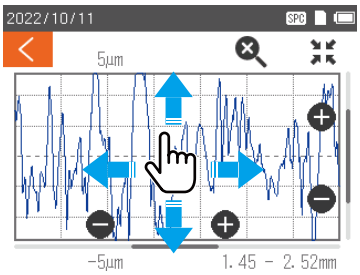
Touching 🔍 (hide the zoom in and out buttons) hides the ⊕ (zoom in) button and the ⊖ (zoom out) button.

Touching 🔍 (display the zoom in and out buttons) while the buttons are hidden displays the ⊕ (zoom in) button and the ⊖ (zoom out) button.




2 Swipe the evaluation profile vertically or horizontally.

» The evaluation profile scrolls vertically or horizontally.

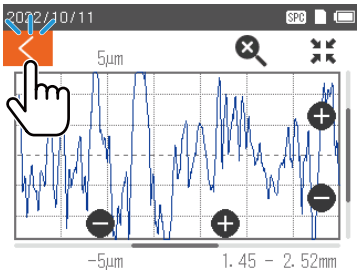



### Tips

To return the display to 100 % scaling while zooming in or out in zoomed-in waveform mode, touch ⤡ (100 % scaling).

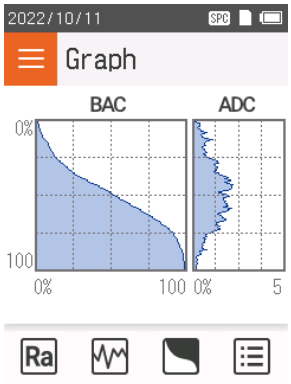
## 4 Touch < (return).

» The screen returns to the [Eval-Prof.] screen.

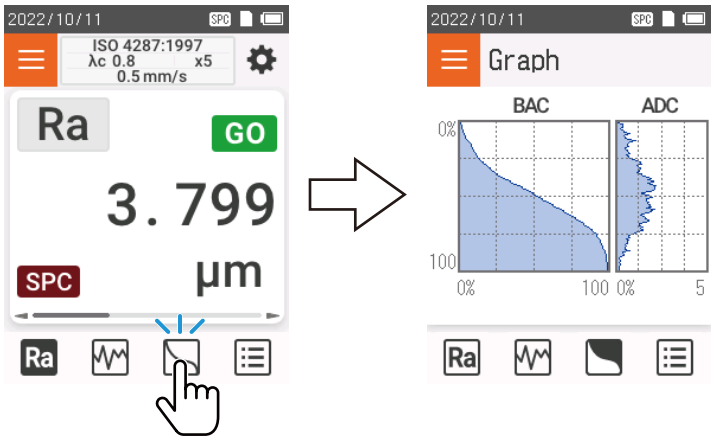


## 3.5.4 Graph Display

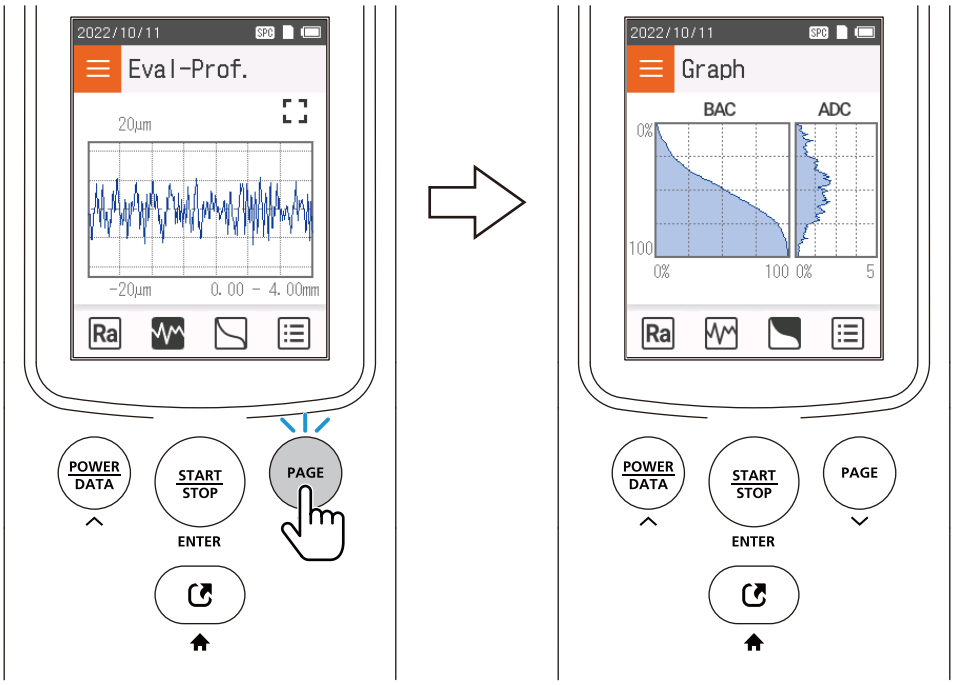
A BAC graph or an ADC graph for the measurement results can be displayed.
To display the [Graph] screen, touch (graph) on the Home screen, or press the [PAGE] key on the [Eval-Prof.] screen.




**Screen transition from the Home screen**




**Screen transition with the [PAGE] key**




**Tips**

For details about how to display or hide the graph screen, see "2.4.5 Graph Display Screen" on page A-32 in "PART A Overview".

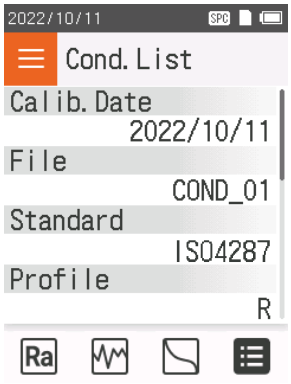
## 3.5.5 Conditions List Display

A list of the measurement conditions can be displayed. When saved measurement data or measurement conditions are recalled, the file name of the recalled data will be displayed in the [File] field.

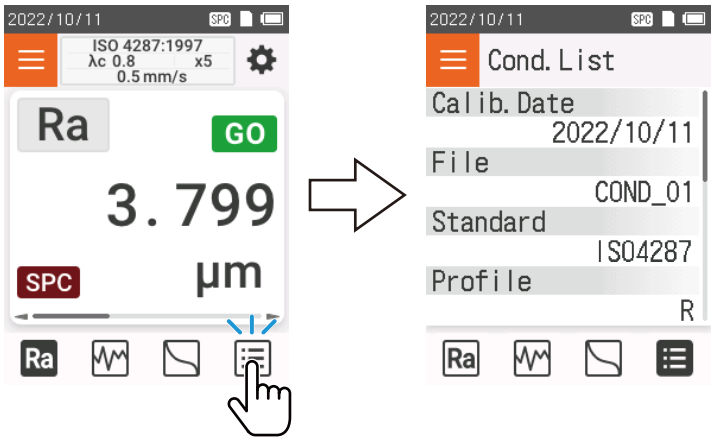
To display the [Cond.List] screen, touch (conditions list) on the Home screen, or press the [PAGE] key on the [Graph] screen.

To scroll the [Cond.List] screen vertically, swipe the screen vertically.

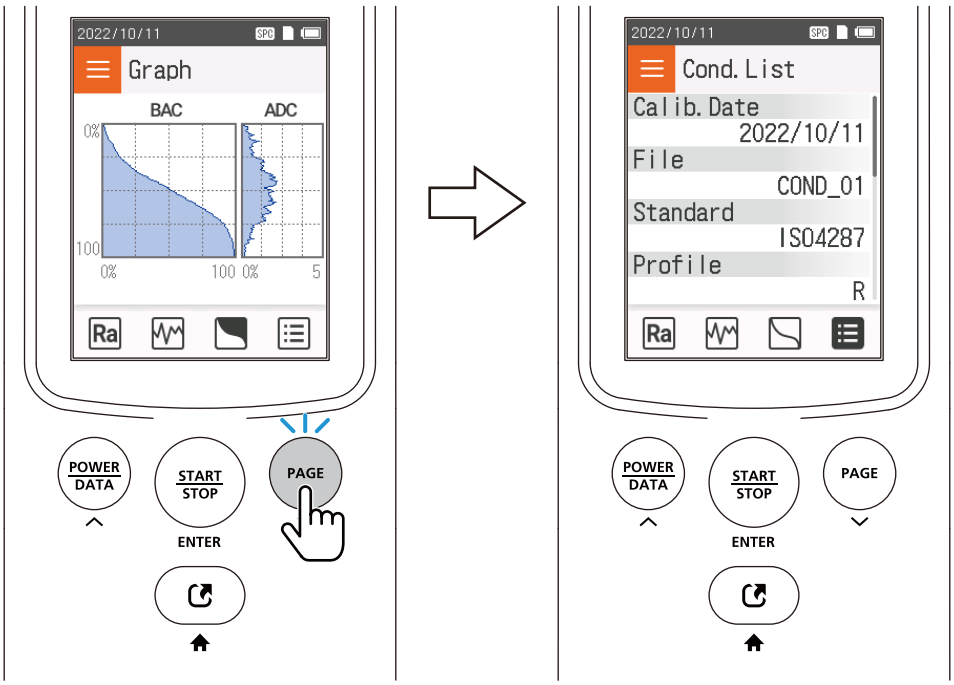
Pressing the [PAGE] key also scrolls the screen down the same as swiping the screen up.




**Screen transition from the Home screen**




**Screen transition with the [PAGE] key**



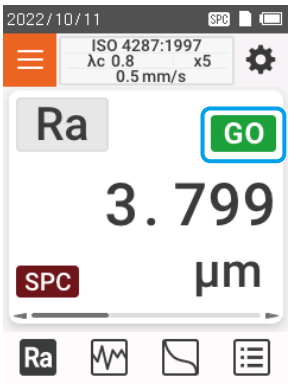

**Tips**

For details about how to display or hide the conditions list display screen, see "2.4.6 Conditions List Display Screen" on page A-33 in "PART A Overview".

## 3.5.6 GO/NG Judgment Result Display

When the GO/NG judgment function is used, calculation results are compared with the upper and lower tolerance limits. If the calculation results fall outside the limits, the color of the displayed calculation results changes.

If the calculation results are within the limits, [GO] is displayed to the right of the parameter name.




If the calculation results exceed the upper limit, [+NG] is displayed to the right of the parameter name, and the results are displayed in red.




If the calculation results fall below the lower limit, [-NG] is displayed to the right of the parameter name, and the results are displayed in blue.




**Tips**

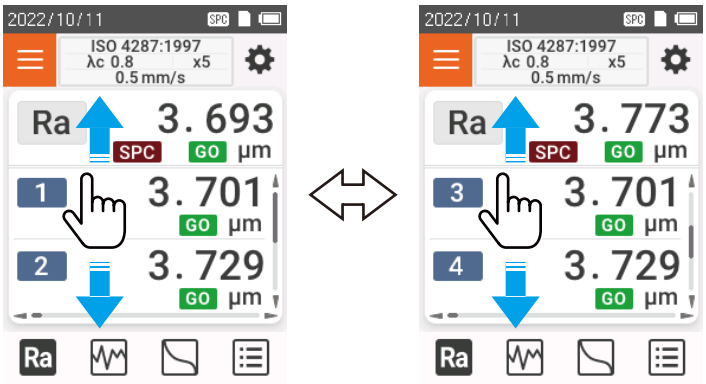
- If the upper or lower limit is set to 0, GO/NG judgment for the respective limit is disabled. Because the upper and lower limits can be set independently, GO/NG judgment for the upper and lower limits can be disabled separately.
- For details about how to set the GO/NG judgment function, see "2.3 GO/NG Judgment" on page D-54 in "PART D Measurement Conditions and Parameters".

## 3.5.7 Trace Display

This product can memorize the most recent 10 calculation results for each customized parameter. Calculation results are displayed in descending order from the most recent result.

To display the rows below the second row, flick the screen vertically.
To switch between the calculation results for each parameter, flick the screen right or left.

Only the most recent measurement results can be saved to a memory card, printed, or output via SPC.




### Tips

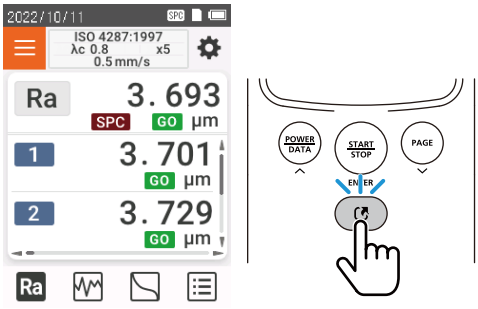
- The result data of the measurements performed before the last 10 measurements are deleted in order from the oldest data.
- The trace data may be cleared when the measurement conditions are modified.
- For details about how to set the trace screen, see "2.4.3 Calculation Results Screen" on page A-29 in "PART A Overview".

## ■ Clearing the trace data

All the trace data other than the most recent measurement results can be cleared.

**1** **While the Home screen is displayed, press the HOME key.**

» The [Daily menu] screen is displayed.

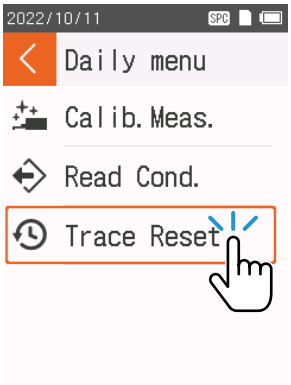



**Tips**

The [Trace Reset] menu item is displayed on the [Daily menu] screen only when the trace display is enabled.

**2** **Touch [Trace Reset].**

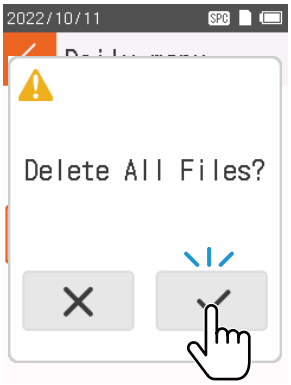
» A message screen is displayed.




**Tips**

A message screen will also be displayed if you press the [PAGE] key twice, select [Trace Reset], and press the [START/STOP] key.

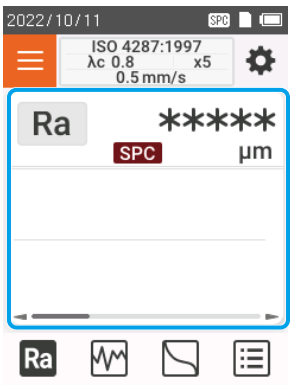
**3** **Touch ✓ (confirm).**




**Tips**

To cancel the deletion, touch ✕ (cancel).

» All the trace data is cleared.



## 3.5.8 Displaying the Calculation Results at Each Section Length

You can check the calculation results and the GO/NG judgment results at each specified section length for each parameter.

Use the following procedure to check the calculation results and the GO/NG judgment results at each section length.

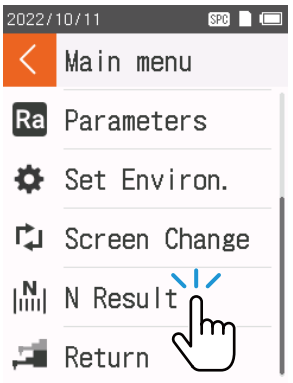
**1 On the Home screen, touch (main menu).**

» The [Main menu] screen is displayed.




**2 Touch [N Result].**

» The [N Result] screen is displayed.



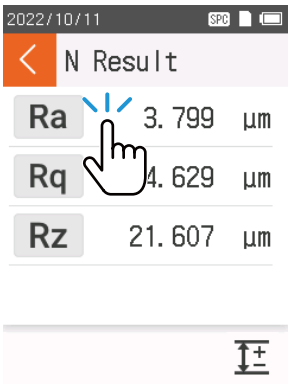

**Tips**

To scroll the [Main menu] screen, swipe the screen vertically.

For details about swiping, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

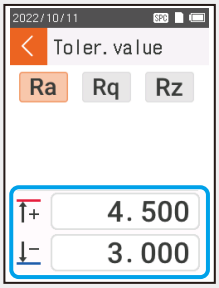
## 3 Touch the parameter you want to check.

» The calculation results for each parameter is displayed.




### Tips

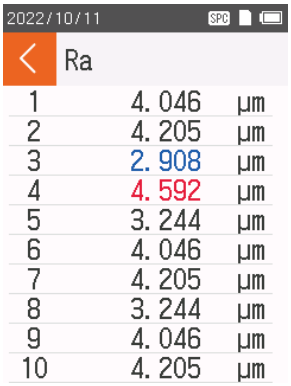
- Clicking (tolerance values) at the bottom of the [N Result] screen displays the [Toler.value] screen is displayed.
- Touch a parameter to view the upper and lower tolerance limits.
- For details about how to set the GO/NG judgment Settings , see "2.3.3 GO/NG Judgment Settings" on page D-56 in "PART D Measurement Conditions and Parameters".




## 4 Check the calculation results and the GO/NG judgment results at each section length.

If the measurement result at a section length exceeds the upper limit, the result at that section length is displayed in red.

If the measurement result falls below the lower limit, the result at that section length is displayed in blue.




### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 4 Daily Menu

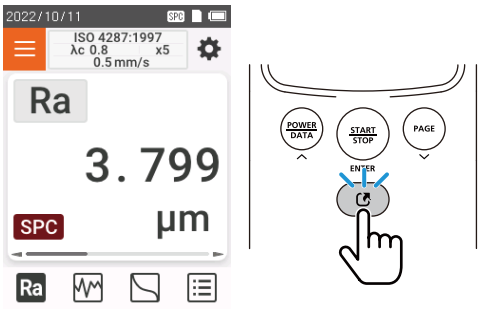
The [Daily menu] screen contains the following menus: [Calib. Meas.], [Read Cond.], and [Trace Reset]. You can select menu items and confirm the selection with the operation keys.

**Tips**

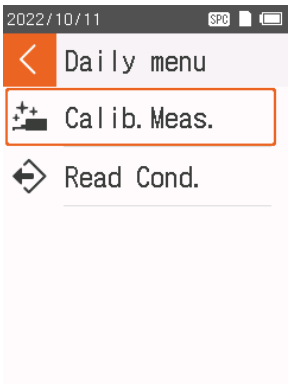
- The menu item for clearing the trace data is displayed only when the trace display is enabled. For details about clearing the trace data, see "■ Clearing the trace data" on page C-71.
- You can also select menu items and confirm the selection on the [Daily menu] screen with touch operations.
- For details about the functions of the operation keys, see "2.1 Functions of the Operation Keys" on page A-8 in "PART A Overview".

This chapter explains how to operate the [Daily menu] screen with the operation keys.

**1 While the Home screen is displayed, press the HOME key.**

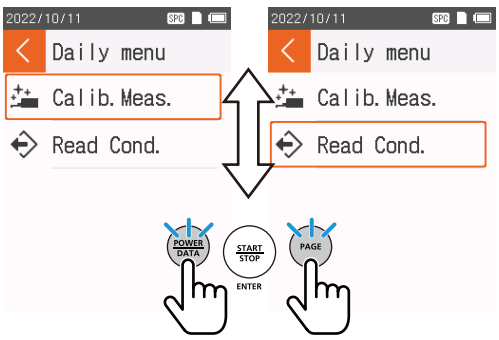



» The [Daily menu] screen is displayed.

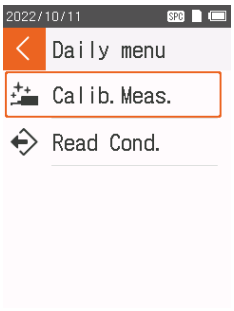


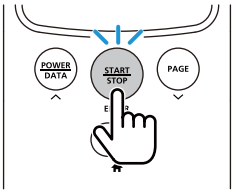

**2 Press the [POWER/DATA] key or [PAGE] key to select a menu.**

**(Example: Select the calibration measurement screen.)**

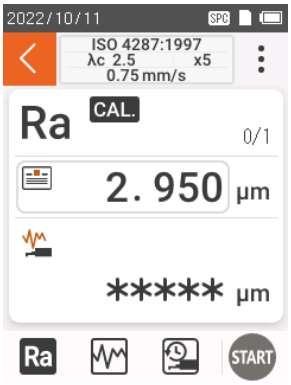


## 3 Press the [START/STOP] key to confirm the menu selection.




» The calibration measurement screen is displayed.




### Tips

- The calibration measurement screen is also displayed by touching [Calib. Meas.].
- Modify the calibration conditions on the [Cal.Condition] screen, which is displayed by touching ⋮ (calibration menu) on the calibration measurement screen -> [Cal. Condition].

## MEMO

# PART D
# Measurement Conditions and Parameters


1 Measurement Conditions ..... D-1
2 Setting the Parameters..... D-45


No. 99MBB794A

# 1 Measurement Conditions

## 1.1 Modifying the Measurement Conditions

Measurement conditions are set or modified according to surface roughness parameters, degree of roughness, conditions of the location measured, etc.

This product complies with the following roughness standards: JIS (JIS B 0601, JIS B 0671:2002, JIS B 0631:2000, JIS B 0601:1994, JIS B 0601:1982), ISO (ISO 12085:1996, ISO 13565:1996, ISO 4287, ISO 21920), ASME B46.1, and VDA.

Refer to 📖 the separate "Surface Roughness Parameters", and set the measurement conditions according to the roughness standard to comply with.

**IMPORTANT**

- When certain measurement conditions are set, other relevant conditions are automatically set according to the selected standard. Also, if no choices are displayed for a measurement condition you are trying to modify, it means that the condition is fixed either by the standard or other conditions.
- For information about the relationship between measurement conditions, see 📖 "1.1.2 Roughness Standard" on page D-3 to 📖 "1.1.11 Measurement Range" on page D-24.

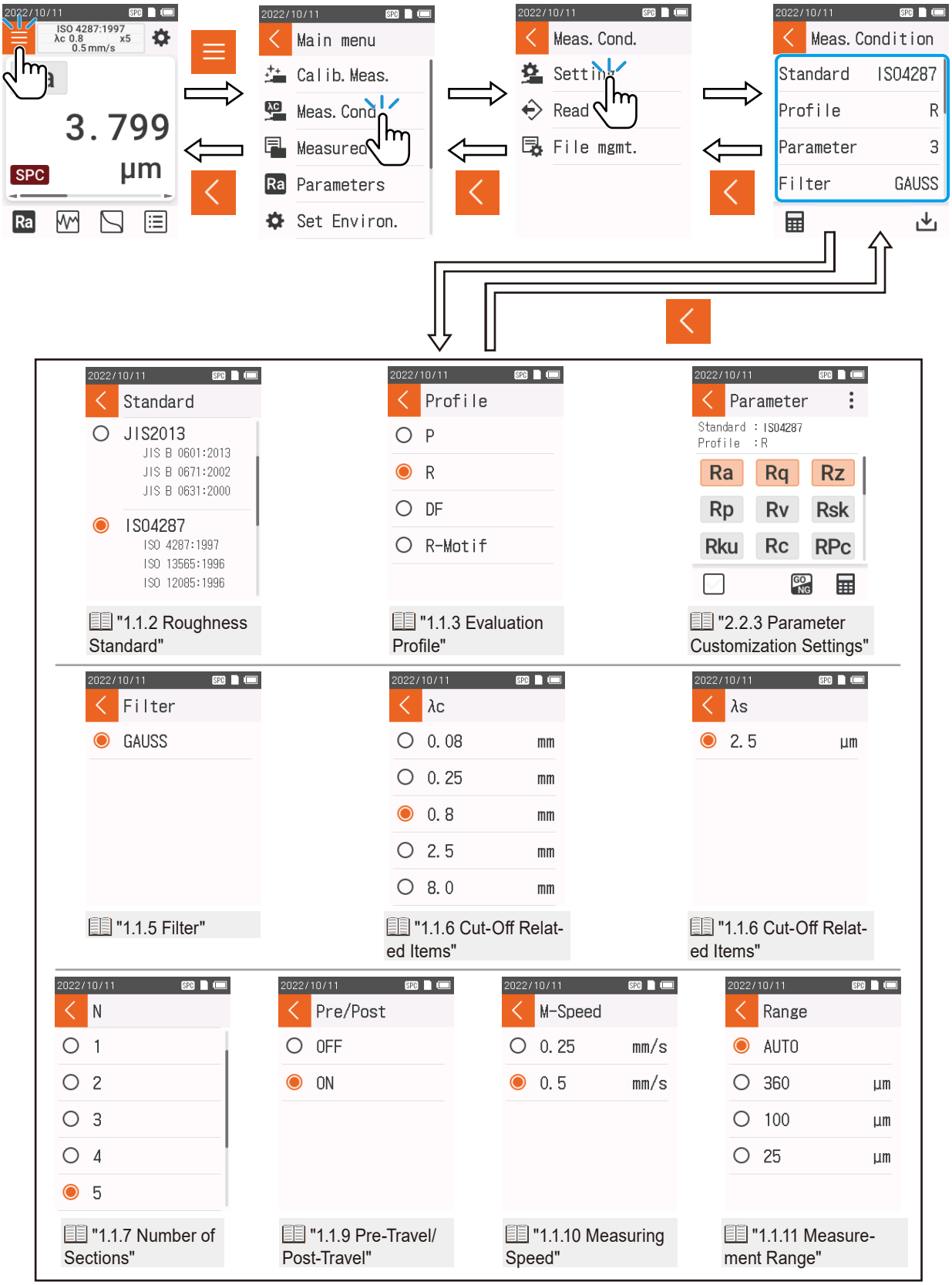
The measurement conditions you can set are shown below.

| Measurement conditions | Description | Reference |
|---|---|---|
| Standard | Set the roughness standard. | 📖 "1.1.2 Roughness Standard" |
| Profile | Set the primary profile type. | 📖 "1.1.3 Evaluation Profile" |
| Parameter | Set the roughness parameters. (Multiple parameters can be set.) | 📖 "1.1.4 Parameters to Display" |
| Filters | Set the filter type. | 📖 "1.1.5 Filter" |
| Cutoff value (λc) | Set 0.08 mm (0.003 in), 0.25 mm (0.01 in), 0.8 mm (0.03 in), 2.5 mm (0.1 in), or 8 mm (0.3 in). | 📖 "1.1.6 Cut-Off Related Items" |
| Cutoff value (λs) | The selectable value is determined by the value set for λc. | |
| Number of sections | Set a number from 1 to 10 or an arbitrary length.<br>**Tips**<br>The maximum number of sections that can be selected changes according to the measurement conditions. | 📖 "1.1.7 Number of Sections", 📖 "1.1.8 Evaluation Length" |
| Pre-travel/ Post-travel | Set pre-travel/post-travel to ON or OFF. | 📖 "1.1.9 Pre-Travel/ Post-Travel" |
| Measuring speed | Set 0.25 mm/s (0.01 in/s), 0.5 mm/s (0.02 in/s), 0.75 mm/s (0.03 in/s) or 1.0 mm/s (0.04 in/s).<br>**Tips**<br>The selectable speed changes according to the measurement conditions. | 📖 "1.1.10 Measuring Speed" |
| Range | Set 360 µm (14400 µin), 100 µm (4000 µin), 25 µm (1000 µin), or automatic. | 📖 "1.1.11 Measurement Range" |

## 1.1.1 Measurement Conditions Setting Screen Transition

**Tips**

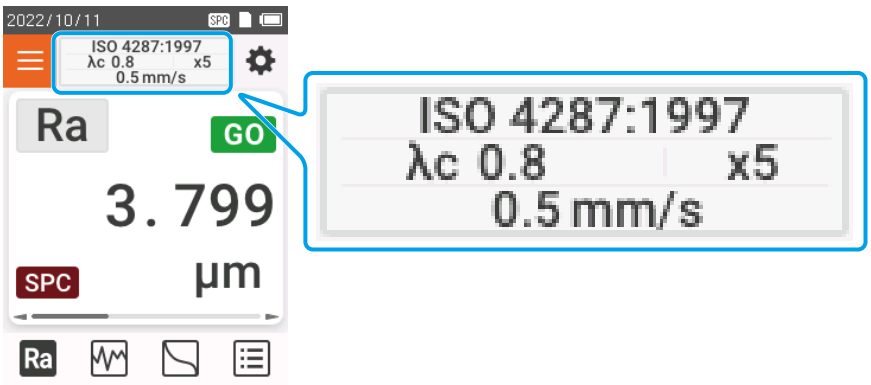
To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.



## 1.1.2 Roughness Standard

This product complies with the following roughness standards: JIS (JIS B 0601, JIS B 0671:2002, JIS B 0631:2000, JIS B 0601:1994, JIS B 0601:1982), ISO (ISO 12085:1996, ISO 13565:1996, ISO 4287, ISO 21920), ASME B46.1, and VDA.

The currently specified roughness standard is displayed at the top of the Home screen.




**IMPORTANT**

Note that when you change the roughness standard, other measurement conditions are automatically specified.

**Tips**

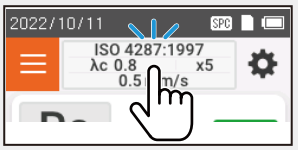
For details about the supported roughness standards, see "1.2.1 Supported Roughness Standards" on page H-3 in "PART H Specifications".

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

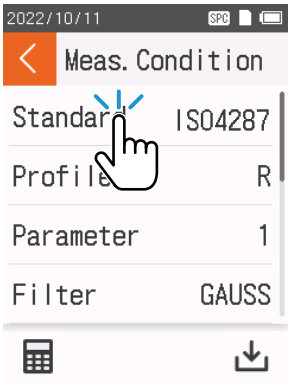
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




**2 Touch [Standard].**

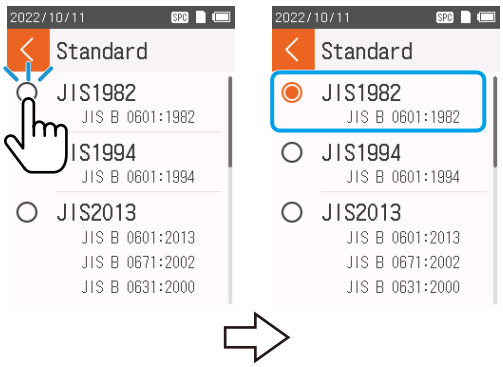
» The [Standard] screen is displayed.



**3** **Touch the option button for the desired standard.**

**(Example: Select [JIS1982].)**

» The option button for [JIS1982] is selected.




### Tips

- Vertical swiping is available when the vertical scroll bar is displayed on the screen.
  For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".
- The display of the roughness standards can be changed between simple display and detailed display by touching (main menu) on the Home screen, [Screen Change], and finally [Standard].

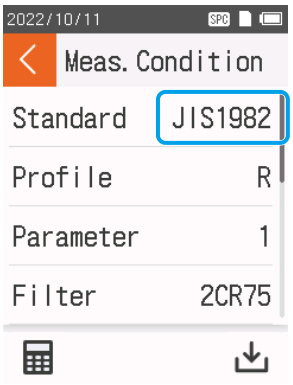
**4** **Touch (return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the standard you selected is reflected on the [Meas.Condition] screen.**

### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.1.3 Evaluation Profile

You can change the evaluation profile according to the purpose of your measurements.

**Tips**

For definitions of the evaluation profile and filter, see 📖 the separate "Surface Roughness Parameters".

### ■ Roughness standard and evaluation profile

The profiles selectable according to each standard are shown below.

| Roughness standard | Evaluation profile | | | |
|---|---|---|---|---|
| | P | R | DF | R-Motif |
| JIS B 0601:1982 | ✓ | ✓ | – | – |
| JIS B 0601:1994 | – | ✓ | – | – |
| JIS B 0601 | ✓ | ✓ | – | – |
| JIS B 0671:2002 | – | – | ✓ | – |
| JIS B 0631:2000 | – | – | – | ✓ |
| ISO 4287 | ✓ | ✓ | – | – |
| ISO 13565:1996 | – | – | ✓ | – |
| ISO 12085:1996 | – | – | – | ✓ |
| ISO 21920 | ✓ | ✓ | – | – |
| ASME B46.1 | – | ✓ | – | – |
| VDA | ✓ | ✓ | ✓ | – |
| Free | ✓ | ✓ | ✓ | ✓ |

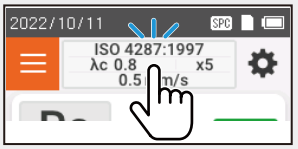
Use the following procedure to change the evaluation profile.

**1 Touch ☰ (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

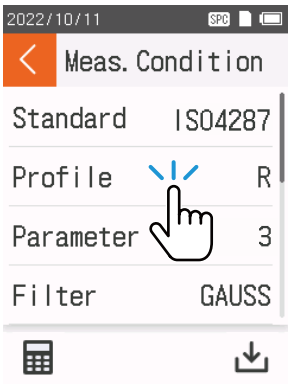
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



## 2 Touch [Profile].

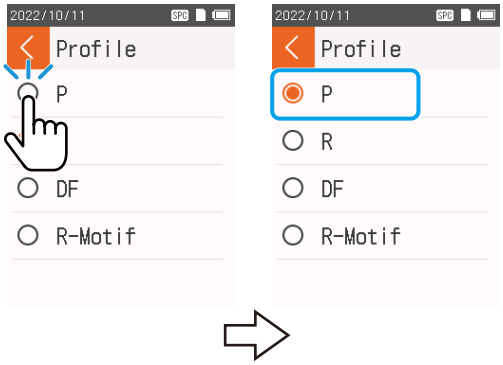
» The [Profile] screen is displayed.




## 3 Touch the option button for the desired profile.

**(Example: Select [P].)**

» The option button for [P] is selected.



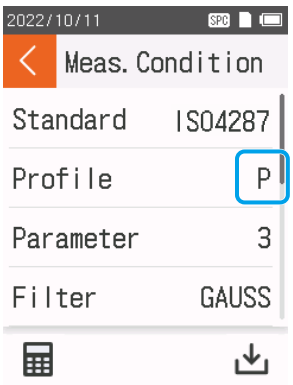

## 4 Touch (return).

» The screen returns to the [Meas.Condition] screen.

## 5 Check that the evaluation profile you selected is reflected on the [Meas.Condition] screen.

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.1.4 Parameters to Display

You can set which parameters to calculate and display.

**Tips**

For details about changing the parameters to display, see "2.2 Setting the Parameters to Display (Parameter Customization)" on page D-46.

## 1.1.5 Filter

Profile filters can be set to 2CR75, PC75, or GAUSS.

**IMPORTANT**

Note that when you change the roughness standard, an applicable filter is automatically specified.

### ■ Filter and roughness standard / evaluation profile

The following filters are automatically set according to the selected roughness standard and evaluation profile.

| Roughness standard | Evaluation profile | | | |
|---|---|---|---|---|
| | P | R | DF | R-Motif |
| JIS B 0601:1982 | NONE | 2CR75 | – | – |
| JIS B 0601:1994 | – | GAUSS | – | – |
| JIS B 0601 | GAUSS | GAUSS | – | – |
| JIS B 0671:2002 | – | – | GAUSS | – |
| JIS B 0631:2000 | – | – | – | GAUSS |
| ISO 4287 | GAUSS | GAUSS | – | – |
| ISO 13565:1996 | – | – | GAUSS | – |
| ISO 12085:1996 | – | – | – | GAUSS |
| ISO 21920 | GAUSS | GAUSS | – | – |
| ASME B46.1 | – | PC75<br>GAUSS | – | – |
| VDA | (NONE*1)<br>GAUSS | GAUSS | GAUSS | – |
| Free | (NONE*1)<br>2CR75<br>PC75<br>GAUSS | 2CR75<br>PC75<br>GAUSS | GAUSS | (NONE*1)<br>2CR75<br>PC75<br>GAUSS |

*1: When [NONE] is set for "λs"

**Tips**

For information on the filter characteristics, see the separate "Surface Roughness Parameters".

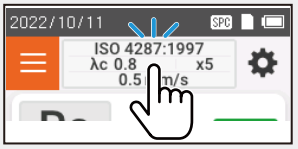
Use the following procedure to change the filter.

## 1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].

» The [Meas.Condition] screen is displayed.

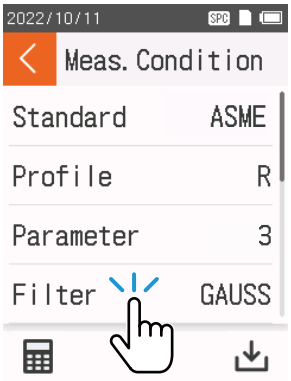
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




## 2 Touch [Filter].

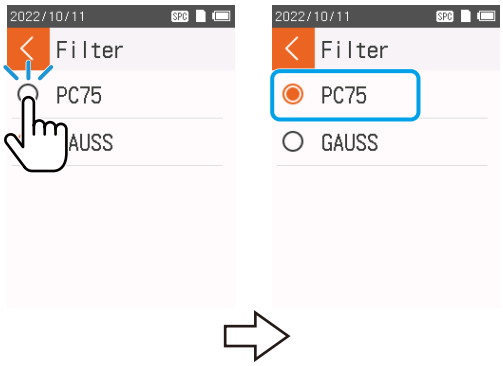
» The [Filter] screen is displayed.




## 3 Touch the option button for the desired filter.

**(Example: Select [PC75].)**

» The option button for [PC75] is selected.



**4** **Touch (return).**

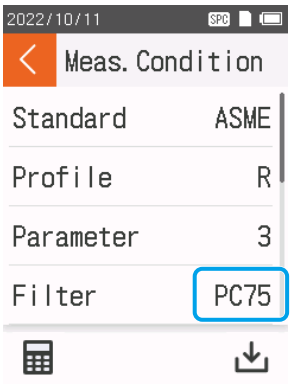
» The screen returns to the [Meas.Condition] screen.




**5** **Check that the filter you selected is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.1.6 Cut-Off Related Items

The following items related to cut-off can be changed: the cutoff values (λc and λs), section lengths (ℓp and ℓ), and upper limit length (A).

### ■ Relationship between cutoff value (λc) and cutoff value (λs)

When [R] or [DF] is selected for the evaluation profile and a cutoff value (λc) is set, that length determines the cutoff value (λs) as shown below.

| Evaluation profile | Cutoff value (λc, Nic*4) | Cutoff value (λs, Nis*4) |
|---|---|---|
| R | 0.08 | 2.5*1, *2 |
| | 0.25 | 2.5*1, *2 |
| | 0.8 | 2.5*1, *2 |
| | 2.5 | 8*1, *2 |
| | 8 | 8/25*1, *2 |
| DF | 0.08 | 2.5*3 |
| | 0.25 | 2.5*3 |
| | 0.8 | 2.5*3 |
| | 2.5 | 8*3 |
| | 8 | 8/25*3 |

*1: When the roughness standard is set to [JIS B 0601:1982], the cutoff value (λs) is set to [NONE].

*2: When the roughness standard is set to [JIS B 0601:1994], [VDA], or [Free], [NONE] can be selected for the cutoff value (λs).

*3: When the roughness standard is set to [VDA] or [Free], [NONE] can be selected for the cutoff value (λs).

*4: When the roughness standard is set to [ISO 21920], the symbols for cutoff values change from [λc] and [λs] to [Nic] and [Nis] respectively.

### ■ Relationship between section length and cutoff value (λs)

When [P] is selected as the evaluation profile, section length is displayed as a cut-off related item.
The symbol used to represent section length changes according to which roughness standard is set.

When [JIS B 0601], [ISO 4287], [VDA], or [Free] is selected for the roughness standard, [ℓp] is displayed.
When [JIS B 0601:1982] is selected for the roughness standard, [ℓ] is displayed.
When [ISO 21920] is selected for the roughness standard, [lsc] is displayed.

When the section length is set, that length is used to determine the cutoff value (λs) as shown below.

| Evaluation profile | Section length (ℓp, ℓ, lsc) | Cutoff value (λs, Nis*3) |
|---|---|---|
| P | 0.08 | 2.5*1, *2 |
| | 0.25 | 2.5*1, *2 |
| | 0.8 | 2.5*1, *2 |
| | 2.5 | 8*1, *2 |
| | 8 | 8/25*1, *2 |

*1: When the roughness standard is set to [VDA] or [Free], [NONE] can be selected for the cutoff value (λs).

*2: When the roughness standard is set to [JIS B 0601:1982], the cutoff value (λs) is set to [NONE].

*3: When the roughness standard is set to [ISO 21920], the symbol for cutoff value changes from [λs] to [Nis].

## ■ Relationship between upper limit length and cutoff value (λs)

When [R-Motif] is selected for the evaluation profile, upper limit length (A) is displayed as a cut-off related item.

When the upper limit length is set, that length determines the cutoff value (λs) as shown below.

| Evaluation profile | Upper limit length (A) | Cutoff value (λs) |
|---|---|---|
| R-Motif | 0.02 | 2.5*1 |
| | 0.1 | 2.5*1 |
| | 0.5 | 8*1 |

*1: When the roughness standard is set to [Free], [NONE] can be selected for the cutoff value (λs).

Use the following procedure to change the cut-off related items.

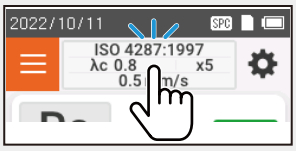
Here as an example, the procedure for changing the cutoff value (λs) is explained. Other items related to cut-off can be changed using similar procedures.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




**2 Touch [λc].**

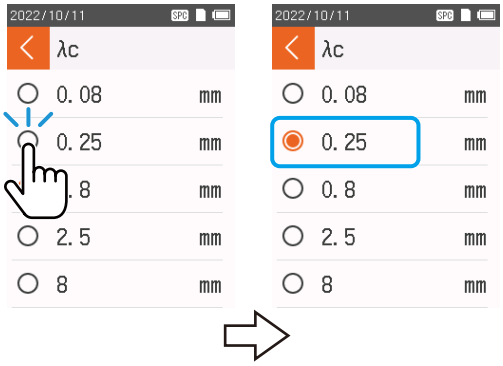
» The [λc] screen is displayed.




**3 Touch the option button for the desired cutoff value.**

**(Example: Select [0.25].)**

» The option button for [0.25] is selected.



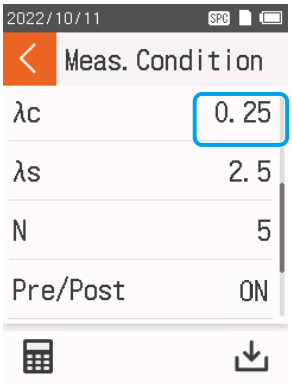
**4** **Touch (return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the cutoff value you selected is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.1.7 Number of Sections

With this product, the number of sections is set either to a number from 1 to 10 or to an arbitrary length, and then the evaluation length (cutoff value × number of sections) is set. When the number of sections is set to an arbitrary length, the evaluation length can be set to an arbitrary length.

**IMPORTANT**

- When [R-Motif] is selected for the evaluation profile, you cannot set the number of sections.
- The maximum number of sections that can be selected differs according to the measurement conditions.

### ■ Evaluation profile and number of sections

When the evaluation profile is changed, the number of sections is set to the following initial values. These values can be changed as necessary.

| Evaluation profile | Number of sections |
|---|---|
| P | 1 |
| R | 5 |
| DF | 5 |
| R-Motif | Designate arbitrary length |

**Tips**

- When [Opt Length] is selected, the evaluation length can be set to an arbitrary length. For details, see "1.1.8 Evaluation Length" on page D-15.
- When GO/NG judgment is based on the 16 % rule, seven or more section lengths are required.
- For GO/NG judgement rules set with an arbitrary length, only the maximum value and average are valid.

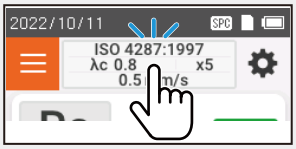
Use the following procedure to change the number of sections.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

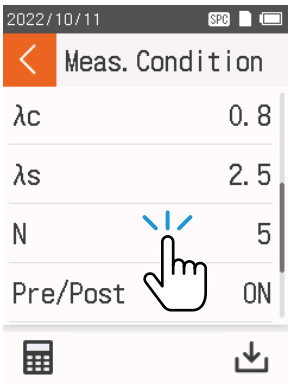
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



**2** **Touch [N].**

» The [N] screen is displayed.




**3** **Touch the option button for the desired number of sections.**

**(Example: Select [3].)**

» The option button for [3] is selected.



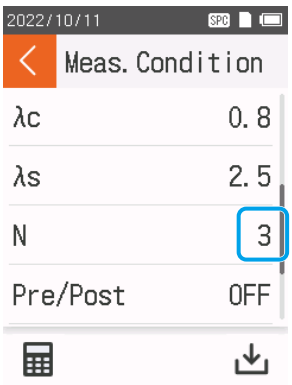

**4** **Touch (return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the number of sections you selected is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

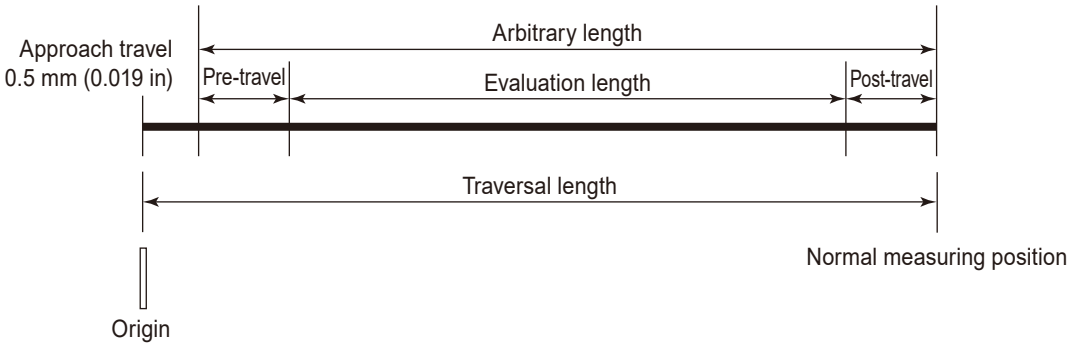


## 1.1.8 Evaluation Length

The evaluation length can be set to an arbitrary length (from 0.10 mm to 16.00 mm (0.0039 in to 0.6299 in)) with this product.

The evaluation length is the distance of the arbitrary length minus the pre-travel/post-travel lengths.

When pre-travel/post-travel is set to [OFF], the evaluation length is equal to the arbitrary length.




**IMPORTANT**

- The setting range of an arbitrary evaluation length depends on the cutoff value and filter settings. When performing measurement at an arbitrary evaluation length, set the length after setting a cut-off value and a filter.
- Note that when [R-Motif] is selected for the evaluation profile, the procedure for setting the evaluation length to an arbitrary length differs from the other profiles. For details about the setting method, see "■ Operation procedure when [R-Motif] is selected for the evaluation profile (when the motif evaluation profile (R-Motif) is specified)" on page D-18 below.

**Tips**

- For information about the relationship between the evaluation profile and pre-travel/post-travel, see "1.2.7 Traversal Length" on page H-6 in "PART H Specifications".
- When pre-travel/post-travel is set to [OFF], calculation is performed with the pre-travel and post-travel data created by copying both ends of the evaluation profile.

### ■ Evaluation length and cutoff value

When [R] or [DF] is selected for the evaluation profile, the range of settable evaluation lengths is determined based on the set cutoff value and filter. When [R-Motif] is selected for the evaluation profile, the relationship between the upper limit length and evaluation length is as follows.

| Upper limit length A | Evaluation length |
|---|---|
| 0.02 mm (0.001 in) | 0.3 ≤ L ≤ 0.64 mm (0.0118 ≤ L ≤ 0.0252 in) |
| 0.1 mm (0.004 in) | 0.65 ≤ L ≤ 3.2 mm (0.0256 ≤ L ≤ 0.1260 in) |
| 0.5 mm (0.02 in) | 3.3 ≤ L ≤ 16 mm (0.1299 ≤ L ≤ 0.6299 in) |

For evaluation profile P, L ≥ 0.3 mm (0.0118 in).

Use the following procedure to change the evaluation length.

**Tips**

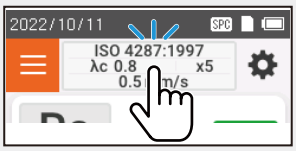
When [R-Motif] is selected for the evaluation profile, see "■ Operation procedure when [R-Motif] is selected for the evaluation profile (when the motif evaluation profile (R-Motif) is specified)" on page D-18.

## 1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].

» The [Meas.Condition] screen is displayed.

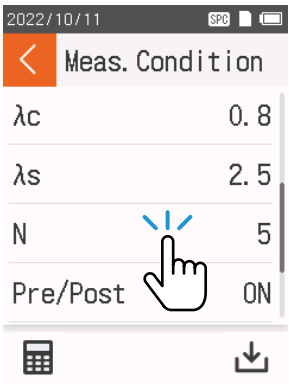
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



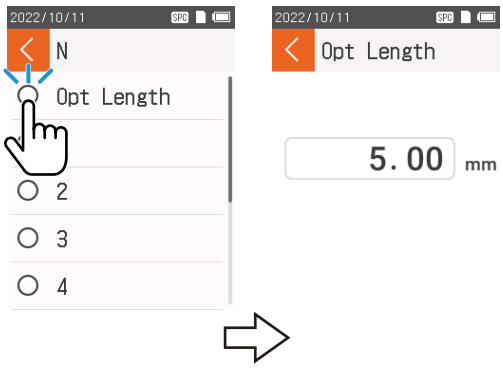

## 2 Touch [N].

» The [N] screen is displayed.




## 3 Touch the option button for [Opt Length].

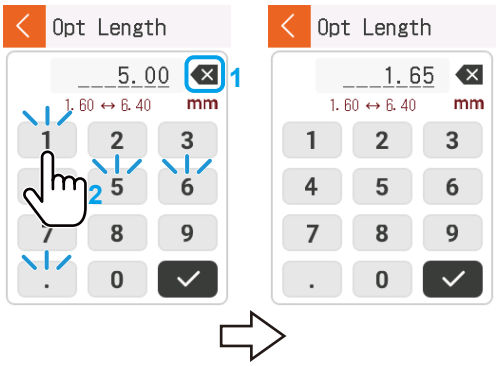
» The option button for [Opt Length] is selected, and the [Opt Length] screen is displayed.



## 4 Input the desired evaluation length.

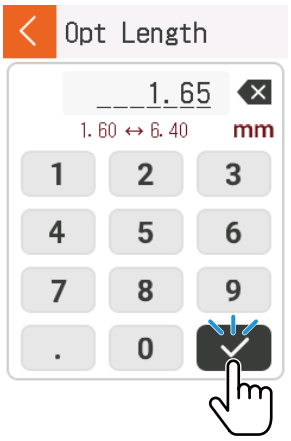
**Tips**

For details about inputting numerals, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 5 Touch ✓ (confirm).

» The arbitrary evaluation length is confirmed.



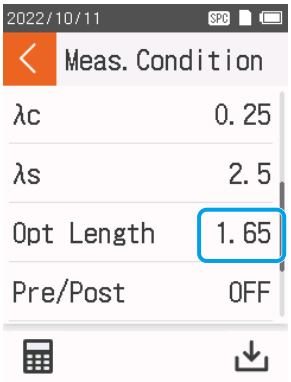

## 6 Touch < (return) two times.

» The screen returns to the [Meas.Condition] screen.

## 7 Check that the evaluation length you input is reflected on the [Meas.Condition] screen.

**Tips**

- To return to the previous screen, touch < (return).
- To return to the Home screen, press the HOME key.



Use the following procedure to set the evaluation length to an arbitrary length when [R-Motif] is selected for the evaluation profile.

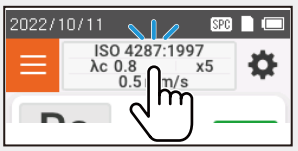
## ■ Operation procedure when [R-Motif] is selected for the evaluation profile (when the motif evaluation profile (R-Motif) is specified)

**1** **Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

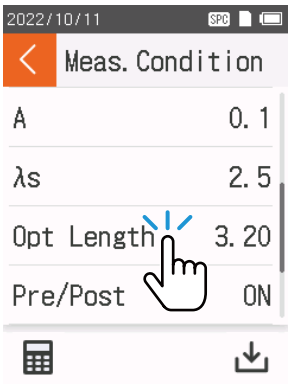
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



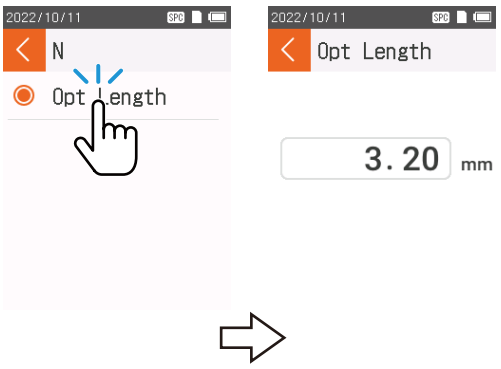

**2** **Touch [Opt Length].**

» The [N] screen is displayed.




**3** **Touch the words [Opt Length].**

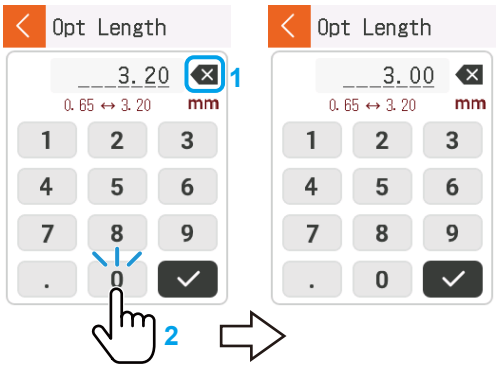
» The [Opt Length] screen is displayed.



## 4 Input the desired evaluation length.

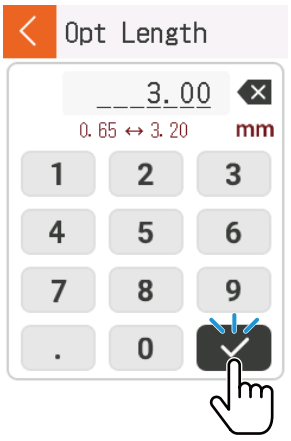
**Tips**

For details about inputting numerals, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 5 Touch ✓ (confirm).

» The arbitrary evaluation length is confirmed.



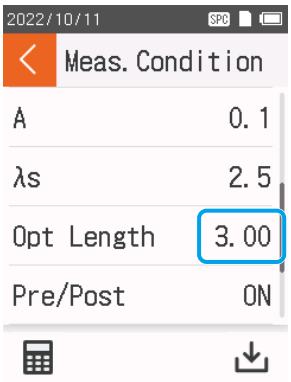

## 6 Touch ‹ (return) two times.

» The screen returns to the [Meas.Condition] screen.

## 7 Check that the evaluation length you input is reflected on the [Meas.Condition] screen.

**Tips**

- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.



## 1.1.9 Pre-Travel/Post-Travel

When performing measurement while [R] is selected for the evaluation profile, pre-travel/post-travel can be set to "OFF" if the length to measure is extremely short, etc. By setting pre-travel/post-travel to [OFF], the traversal length can be reduced by the pre-travel and post-travel lengths, making it possible to measure the narrow surface.

At the time of purchase, pre-travel/post-travel is set to [ON].

**IMPORTANT**

- Set pre-travel/post-travel to [ON] unless otherwise required. When pre-travel/post-travel is set to [OFF], measurement is not performed according to the standard. As a result, minute errors may occur in calculation results.
- When the evaluation profile is [P] or [R-Motif] and [λs] is set to [NONE], pre-travel/post-travel is fixed as [OFF] because filtering will not be performed.

**Tips**

For details about the traversal length, see "1.2.7 Traversal Length" on page H-6 in "PART H Specifications".

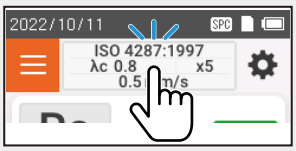
Use the following procedure to switch the pre-travel/post-travel between [ON] and [OFF].

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

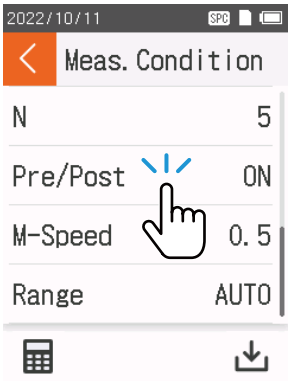
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




**2 Touch [Pre/Post].**

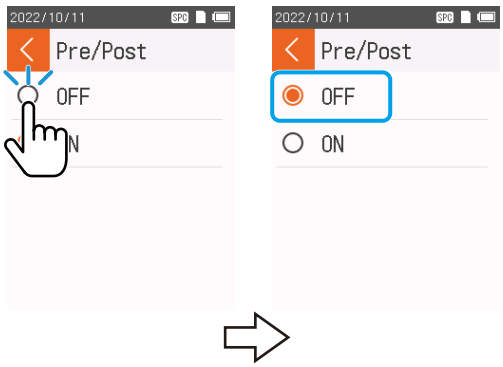
» The [Pre/Post] screen is displayed.



**3** **Touch the option button for [ON] or [OFF] for pre-travel/post travel.**

**(Example: Select [OFF].)**

» The option button for [OFF] is selected.



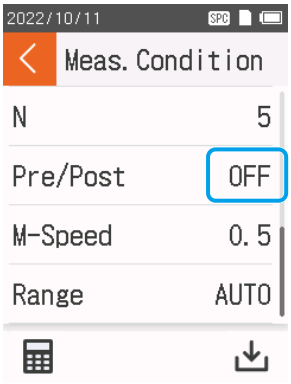

**4** **Touch** < **(return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the selection you made is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch < (return).
- To return to the Home screen, press the HOME key.



## 1.1.10 Measuring Speed

The measuring speed can be changed according to the set cutoff value (λc) or upper limit length.

### ■ Cutoff value (section length) and measuring speed

The measuring speed can be set according to the cutoff value (λc) or the upper limit length as shown in the table below.

| Cutoff value (section length) mm (in) | A mm (in) (for R-Motif) | Measuring speed mm/s (in/s) |
|---|---|---|
| 0.08 (0.003) | | 0.25, 0.5 (0.010, 0.020) |
| 0.25 (0.01) | 0.02 (0.001) | 0.25, 0.5 (0.010, 0.020) |
| 0.8 (0.03) | 0.10 (0.004) | 0.25, 0.5 (0.010, 0.020) |
| 2.5 (0.1) | 0.5 (0.020) | 0.25, 0.5, 0.75, 1.0 (0.010, 0.020, 0.030, 0.040) |
| 8 (0.3) | - | 0.25, 0.5, 0.75, 1.0 (0.010, 0.020, 0.030, 0.040) |

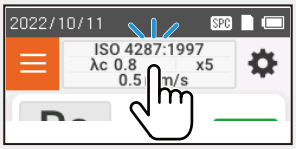
Use the following procedure to change the measuring speed.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

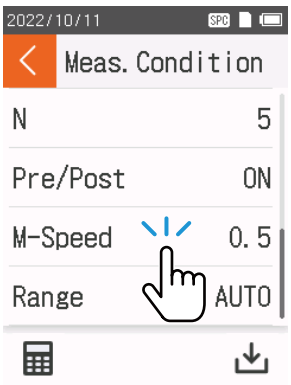
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




**2 Touch [M-Speed].**

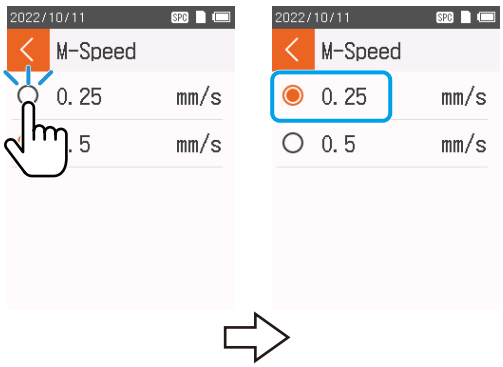
» The [M-Speed] screen is displayed.



**3** **Touch the option button for the desired measuring speed.**

**(Example: Select [0.25].)**

» The option button for [0.25] is selected.



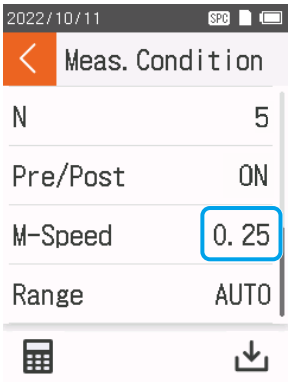

**4** **Touch (return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the measuring speed you selected is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.1.11 Measurement Range

You can select one of the following measurement ranges to perform measurement with this product: 25 µm (1000 µin), 100 µm (4000 µin), 360 µm (14400 µin), or AUTO. In general, set the measurement range to [AUTO], because a high-sensitivity (narrow) measurement range is likely to lead to an over-range.

**Tips**

When the measurement range is changed, the resolution also changes accordingly.

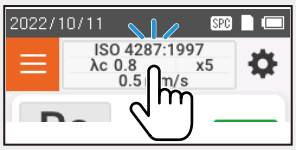
Use the following procedure to change the measurement range.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

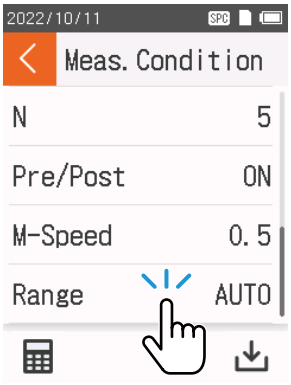
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.




**2 Touch [Range].**

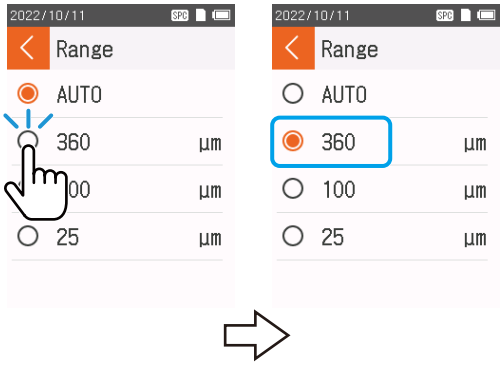
» The [Range] screen is displayed.




**3 Touch the option button for the desired range.**

**(Example: Select [360].)**

» The option button for [360] is selected.



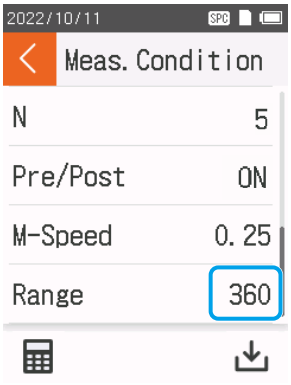
**4** **Touch (return).**

» The screen returns to the [Meas.Condition] screen.

**5** **Check that the range you selected is reflected on the [Meas.Condition] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 1.2 Recalculation of Calculation Results

This product has a function to recalculate calculation results when you have modified measurement conditions after roughness measurement. When the recalculation function is used, the calculation results are recalculated based on the modified measurement conditions, and the recalculated values are displayed.

## ■ Measurement conditions that can be modified for recalculation

Recalculation is available when any of the following measurement conditions are modified.

- Roughness standard
- Filter
- Parameter
- Evaluation profile
- Number of sections (reduction)
- GO/NG judgment

**IMPORTANT**

- When the cutoff value and the arbitrary length are changed, recalculation may not be available if the conditions for sampling pitch and number of data points do not match.
- When the number of sections is increased, for example from [1] to [3], recalculation is not available.
- When pre-travel/post-travel is set to [ON] from [OFF], recalculation may not be available.
- When the filter or the evaluation profile is changed, recalculation may not be available if the conditions for the pre-travel and post-travel do not match.

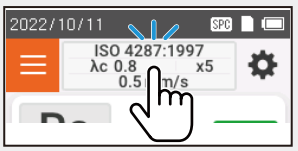
Use the following procedure to recalculate the calculation results. Modify the measurement conditions when the calculation results are displayed after roughness measurement.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

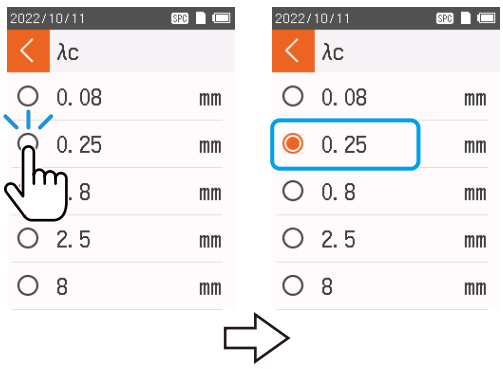
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



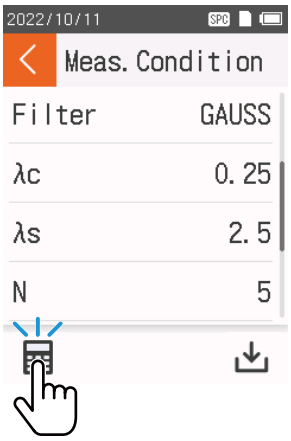

**2 Modify the measurement conditions.**

**(Example: Change the λc value from 0.8 mm to 0.25 mm.)**



## 3 Touch (recalculation).

» A message screen is displayed that indicates that the recalculation is in progress.




### Tips

If you have input an incorrect value, a message screen that indicates a calculation error is displayed.

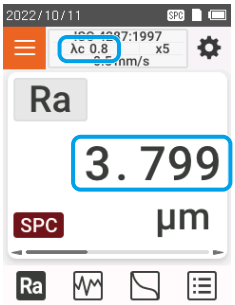
In that case, touch ✓ (confirm) on the message screen, and then set that measurement condition again.



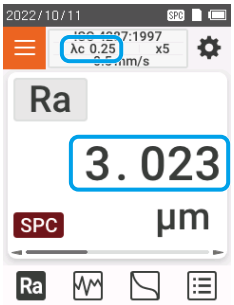

» After recalculation, the screen returns to the Home screen.

» The recalculated calculation result is displayed on the Home screen.

Before recalculation




After recalculation



# 1.3 Saving/Recalling/Deleting/Renaming Measurement Conditions

Up to 10 sets of measurement conditions can be saved in the internal memory of this product, and up to 500 sets of measurement conditions can be saved on a memory card (optional accessory).
Saved measurement condition files can also be deleted or renamed.

**NOTICE**

**The memory card may be damaged or data may be corrupted.**

While this product is accessing the memory card, do not remove or insert the card. The memory card may be damaged or data may be corrupted, causing data to no longer be readable.

**IMPORTANT**

- In this document, a "microSD card" is referred to as a "memory card".
- While this product was designed to comply with existing memory card standards, some memory cards may not be used with this product due to changes or additions in the standards, etc.
- This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210[*1]) or with the exFAT file system.
  Use only memory cards listed as an optional accessory (Part No. 12AAY917)[*2] or memory cards[*3] that were formatted with the FAT32 file system.

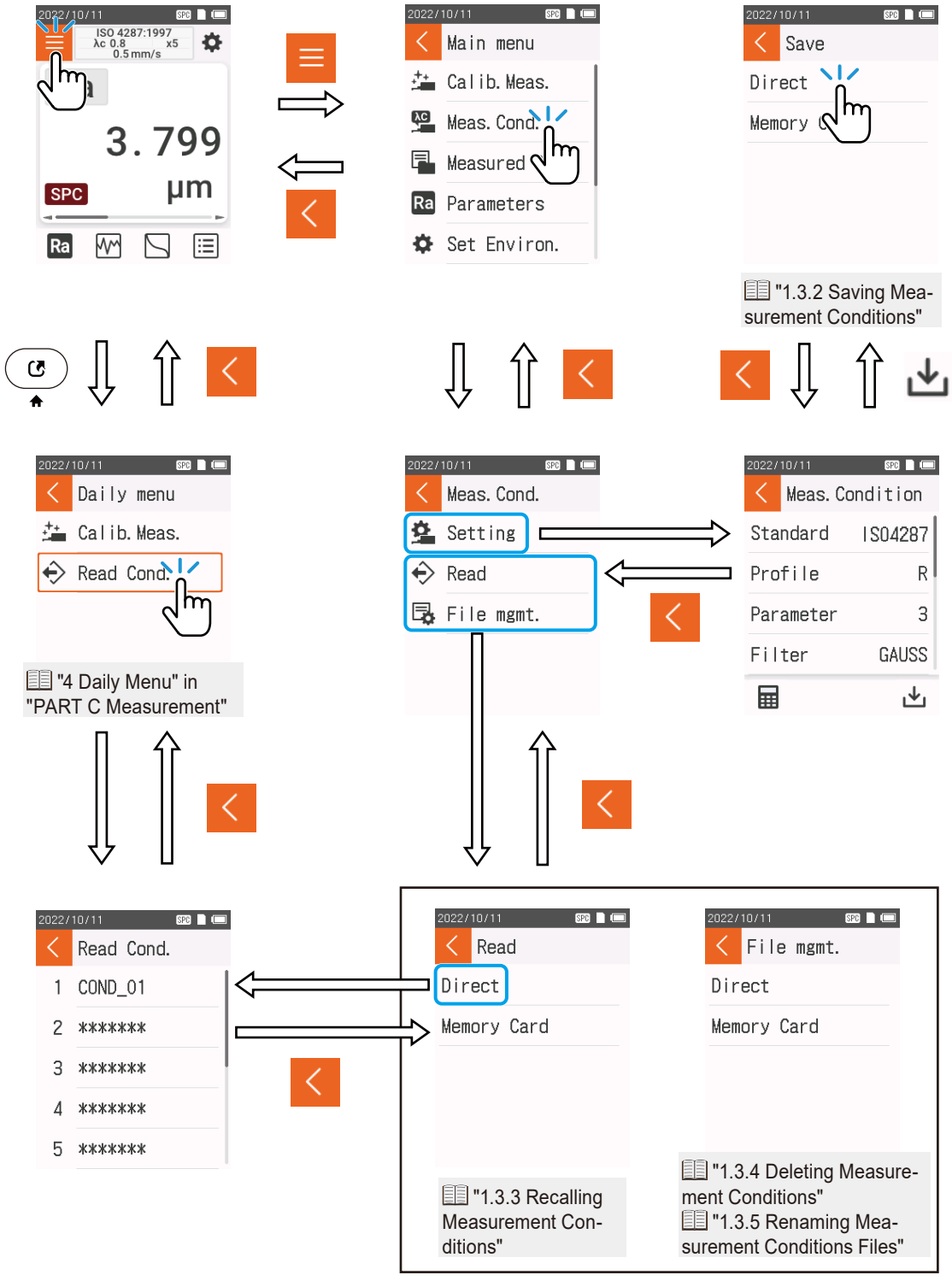
  *1 Memory cards that were formatted with the SJ-210 can be reformatted with this product.
  *2 Memory cards listed as an optional accessory comply with microSDHC standards.
  *3 Memory cards that were formatted with the FAT32 file system can be reformatted with this product, but access to the memory card may be slow.

  For details about formatting the memory card with this product, see "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".
- To prevent the power to this product from being interrupted during operation, connect this product to an external power source.
- When using the internal battery, make sure it is sufficiently charged. If this product is operated when the remaining capacity of the internal battery power is low, the power to this product may turn off during operation.

## 1.3.1 Measurement Conditions Data Management Screen Transition

**Tips**

To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.



## 1.3.2 Saving Measurement Conditions

You can save the currently set measurement conditions to the internal memory or on a memory card (optional accessory).

**IMPORTANT**

- When using a new memory card, you must insert the card into this product and format it. Memory cards that are formatted by a measuring instrument other than this product (SJ-210, etc.) may not operate correctly. For details about formatting the memory card, see "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".
- If the internal battery is completely depleted, or if the internal battery switch is set to OFF, any measurement conditions saved in the internal memory are lost. Making periodic backups to the memory card is recommended. For details about backups, see "■ Backups" on page F-44 in "PART F Environment Settings".
- When using the internal battery, make sure it is sufficiently charged. If measurement conditions are saved when the remaining capacity of the internal battery is low, this product may turn off while the data is being saved.

### ■ Saving to the internal memory

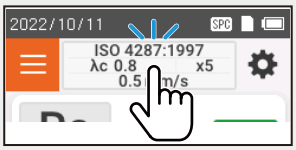
Use the following procedure to save the measurement conditions to the internal memory.

**1 Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

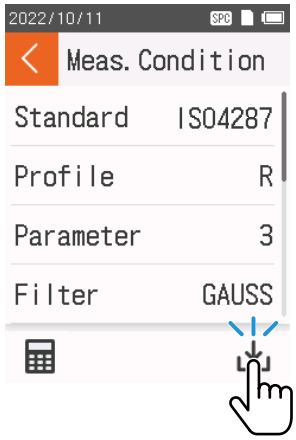
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



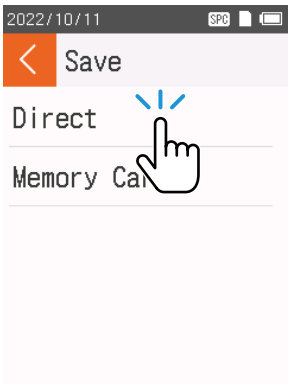

**2 At the bottom of the [Meas.Condition] screen, touch (save).**

» The [Save] screen is displayed.



## 3 Touch [Direct].

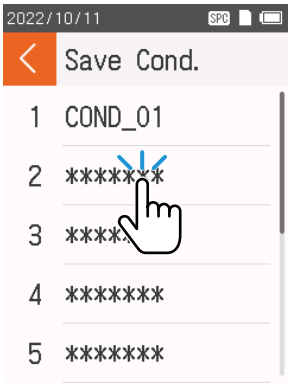
» The [Save Cond.] screen is displayed.




## 4 Touch the field for the desired save number.

**(Example: Select 2.)**

» The [Save New] screen is displayed.

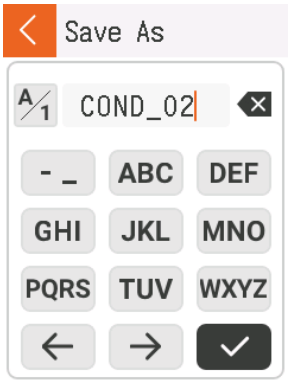



### Tips

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

## 5 Input a name for the measurement conditions file.



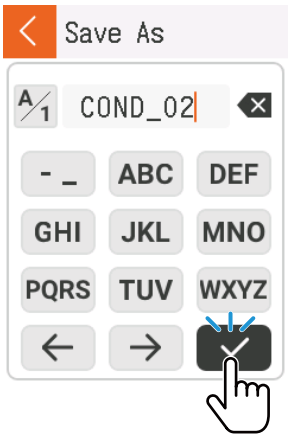

### Tips

- A default file name is automatically entered, but you can change it as necessary. The name can consist of alphanumeric characters, "-" (hyphen), and "_" (underscore). Up to eight characters can be used.
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see 📖 "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

## 6 Touch (confirm).

» The measurement conditions are saved to the internal memory.

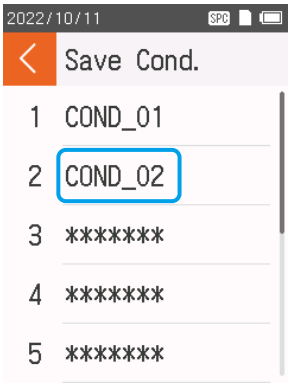
» The screen returns to the [Save Cond.] screen automatically.




## 7 Check that the set file name is reflected on the [Save Cond.] screen.

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## ■ Saving to a memory card

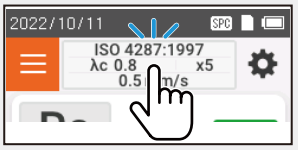
Use the following procedure to save the measurement conditions on a memory card.

**1** **Touch (main menu) on the Home screen, then [Meas.Cond.], and finally [Setting].**

» The [Meas.Condition] screen is displayed.

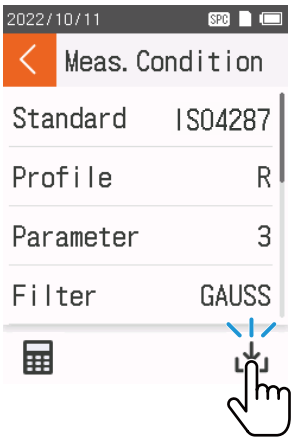
**Tips**

Touching the measurement conditions field at the top of the Home screen also displays the setting menu for measurement conditions.



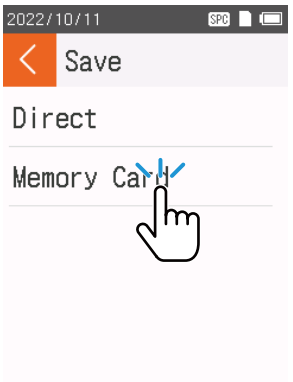

**2** **At the bottom of the [Meas.Condition] screen, touch (save).**

» The [Save] screen is displayed.



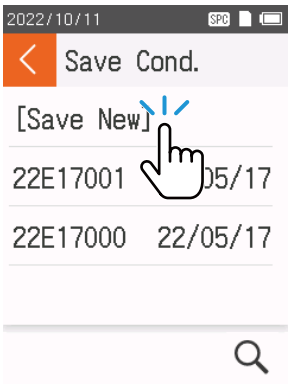

**3** **Touch [Memory Card].**

» The [Save Cond.] screen is displayed.



## 4 Touch [Save New].

» The [Save New] screen is displayed.




### Tips

- To overwrite measurement conditions saved on the memory card, touch the measurement conditions file you want to overwrite.
  When a message screen is displayed, touch ✓ (confirm).
- When multiple files of measurement conditions are registered, use 🔍 (search) to narrow the search range.
  For details, see 📖 "● Searching the measurement conditions" on page D-35.

## 5 Input a name for the measurement conditions file.




### Tips

- A default file name is automatically entered, but you can change it as necessary. The name can consist of alphanumeric characters, "-" (hyphen), and "_" (underscore). Up to eight characters can be used.
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see 📖 "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

## 6 Touch ✓ (confirm).

» The measurement conditions are saved to the memory card.

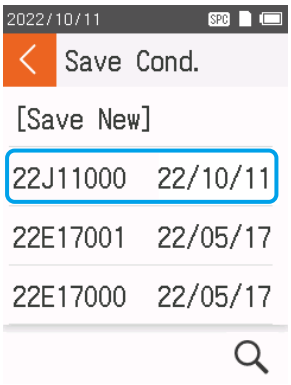
» The screen returns to the [Save Cond.] screen automatically.



**7** **Check that the set file name is reflected on the [Save Cond.] screen.**

**Tips**

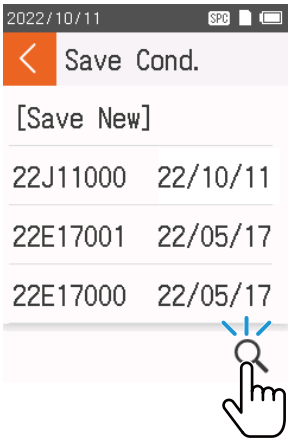
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.




## ● Searching the measurement conditions

**1** **At the bottom of the [Save Cond.] screen for the memory card, touch (search).**

» The [Search] screen is displayed.




**2** **Input a keyword in the input field, and then touch (confirm).**

» The measurement conditions files that include the keyword are displayed.

**Tips**

For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".



## 1.3.3 Recalling Measurement Conditions

You can recall measurement conditions that have been saved to either the internal memory or memory card (optional accessory).

To recall measurement conditions, first display the [Read] screen from the [Meas.Cond.] screen, and then select the source from which to recall the measurement conditions (Direct (internal memory) or Memory Card). Then, perform operations such as file selection.

**IMPORTANT**

When using the internal battery, make sure it is sufficiently charged. If measurement conditions are recalled when the remaining capacity in the internal battery is low, this product may turn off while the data is being loaded.

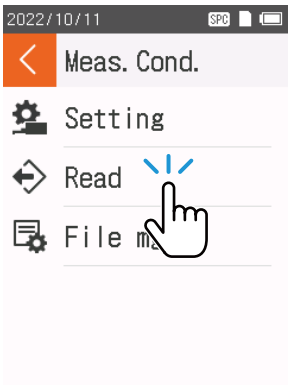
Use the following procedure to recall measurement conditions.

**1 Touch (main menu) on the Home screen and then [Meas.Cond.].**

» The [Meas.Cond.] screen is displayed.

**2 Touch [Read].**

» The [Read] screen is displayed.




**3 Touch [Direct] or [Memory Card].**

**(Example: Select [Direct].)**

[Direct]: Internal memory
[Memory Card]: Memory card

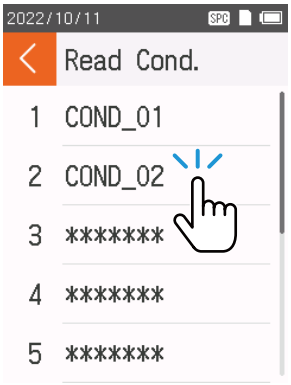
» The [Read Cond.] screen is displayed.



## 4 Touch the file of the measurement conditions to recall.

**(Example: Select 2 [COND_02].)**

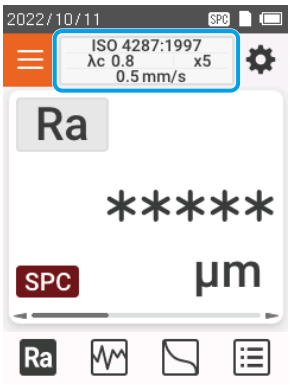
» The selected measurement conditions are recalled.
» The screen returns to the Home screen.




### Tips

- Vertical swiping is available when the vertical scroll bar is displayed on the screen.
  For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".
- When multiple files of measurement conditions are registered, use 🔍 (search) to narrow the search range.
  For details, see 📖 "● Searching the measurement conditions" on page D-35.

## 5 Check that the measurement conditions you recalled are reflected.



## 1.3.4 Deleting Measurement Conditions

You can delete saved measurement conditions from the internal memory or memory card.

**IMPORTANT**

When using the internal battery, make sure it is sufficiently charged. If measurement conditions are deleted when the remaining capacity of the internal battery is low, this product may turn off while the data is being deleted.

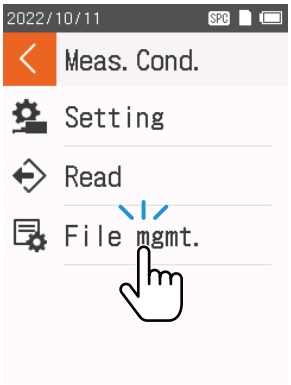
### ■ Deleting a single file

**1 Touch (main menu) on the Home screen and then [Meas.Cond.].**

» The [Meas.Cond.] screen is displayed.

**2 Touch [File mgmt.].**

» The [File mgmt.] screen is displayed.

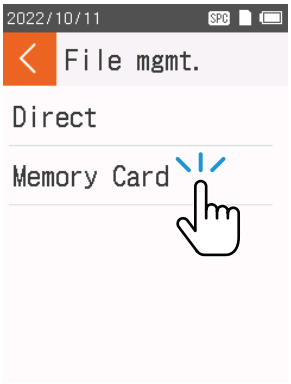



**3 Touch [Direct] or [Memory Card].**

**(Example: Select [Memory Card].)**

[Direct]: Internal memory
[Memory Card]: Memory card

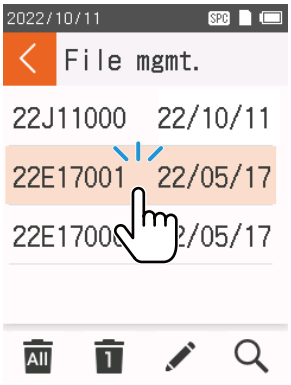
» A list of measurement conditions files is displayed.



**4** **Touch the measurement conditions file to delete.**

**(Example: Select [22E17001].)**

» The measurement conditions file you touched is selected.




**5** **At the bottom of the screen, touch 1 (single file deletion).**

» A message screen is displayed.

**Tips**

Measurement conditions saved in the memory card can be collectively deleted.

For details, see "■ Deleting all files (only for measurement conditions saved on the memory card)" on page D-40.



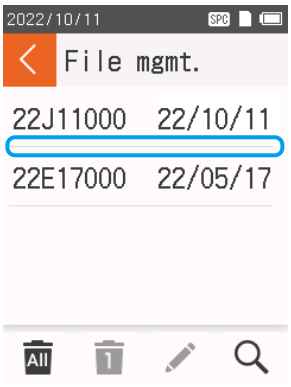

**6** **Touch ✓ (confirm).**

**Tips**

To cancel the file-deletion operation, touch ✕ (cancel) on the message screen.

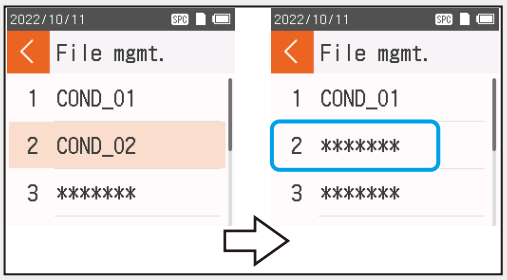


» The measurement conditions file you selected is deleted.




**Tips**

- When a file is deleted from the internal memory, [*******] is displayed instead of the name of the deleted file.
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



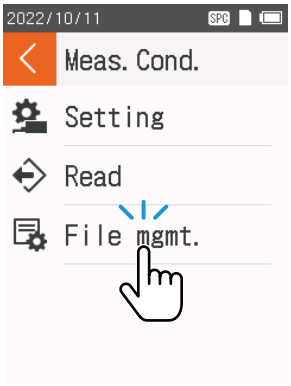

## ■ Deleting all files (only for measurement conditions saved on the memory card)

**1 Touch (main menu) on the Home screen and then [Meas.Cond.].**

» The [Meas.Cond.] screen is displayed.

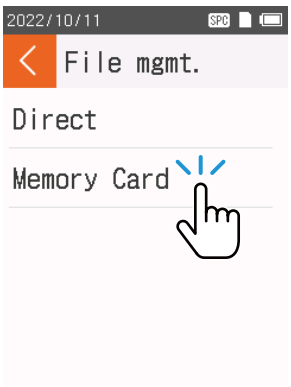
**2 Touch [File mgmt.].**

» The [File mgmt.] screen is displayed.



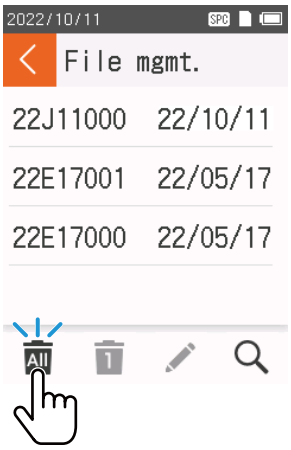

**3 Touch [Memory Card].**

» A list of measurement conditions files is displayed.



**4** **At the bottom of the screen, touch All (all files deletion).**

» A message screen is displayed.



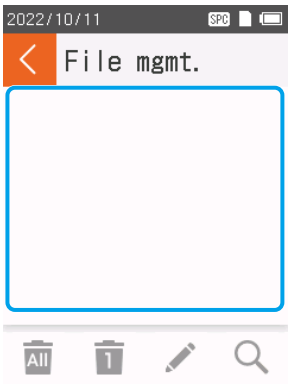

**5** **Touch ✓ (confirm).**

**Tips**

To cancel the file-deletion operation, touch ✕ (cancel) on the message screen.




» All measurement conditions files are deleted from the memory card.




**Tips**

- To return to the previous screen, touch < (return).
- To return to the Home screen, press the HOME key.

## 1.3.5 Renaming Measurement Conditions Files

You can rename measurement conditions files saved in the internal memory or on the memory card.

**IMPORTANT**
When using the internal battery, make sure it is sufficiently charged. If a measurement conditions file is renamed when the remaining capacity of the internal battery is low, this product may turn off while the name is being changed.

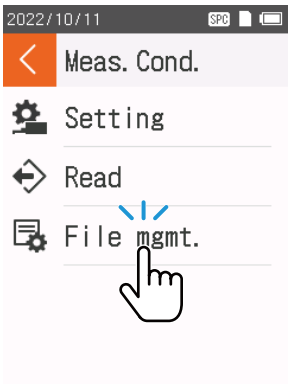
Use the following procedure to rename a measurement conditions file.

**1 Touch (main menu) on the Home screen and then [Meas.Cond.].**

» The [Meas.Cond.] screen is displayed.

**2 Touch [File mgmt.].**

» The [File mgmt.] screen is displayed.

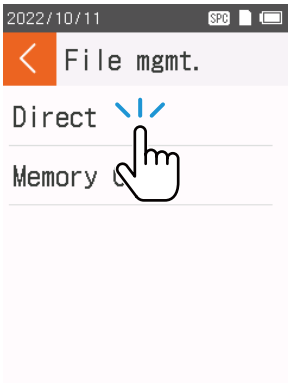



**3 Touch [Direct] or [Memory Card].**

**(Example: Select [Direct].)**

[Direct]: Internal memory
[Memory Card]: Memory card

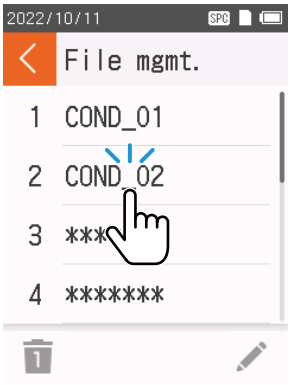
» A list of measurement conditions files is displayed.



**4** **Touch the measurement conditions file to rename.**

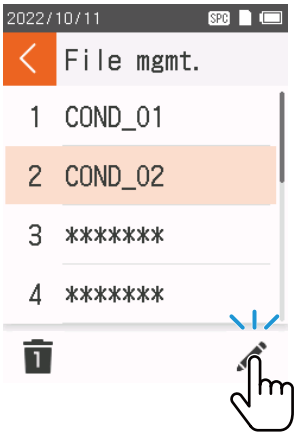
**(Example: Select 2 [COND_02].)**

» The measurement conditions file you touched is selected.




**5** **At the bottom of the screen, touch (rename).**

» The [File Rename] screen is displayed.

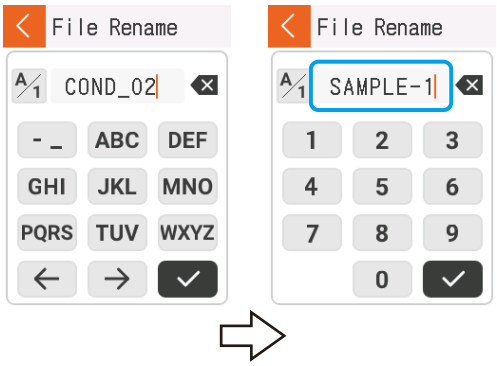



**6** **Change the file name.**

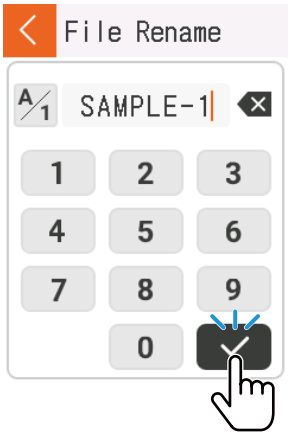
**(Example: Change to "SAMPLE-1".)**

**Tips**

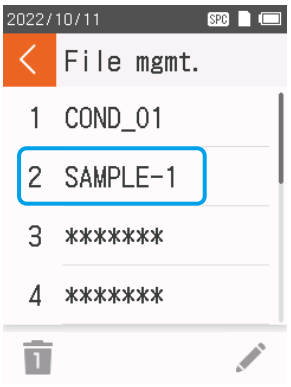
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- The name can consist of alphanumeric characters, "-" (hyphen), and "_" (underscore). Up to eight characters can be used.
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".



**7** Touch ✓ (confirm).




» The new file name is set.




**Tips**

- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.

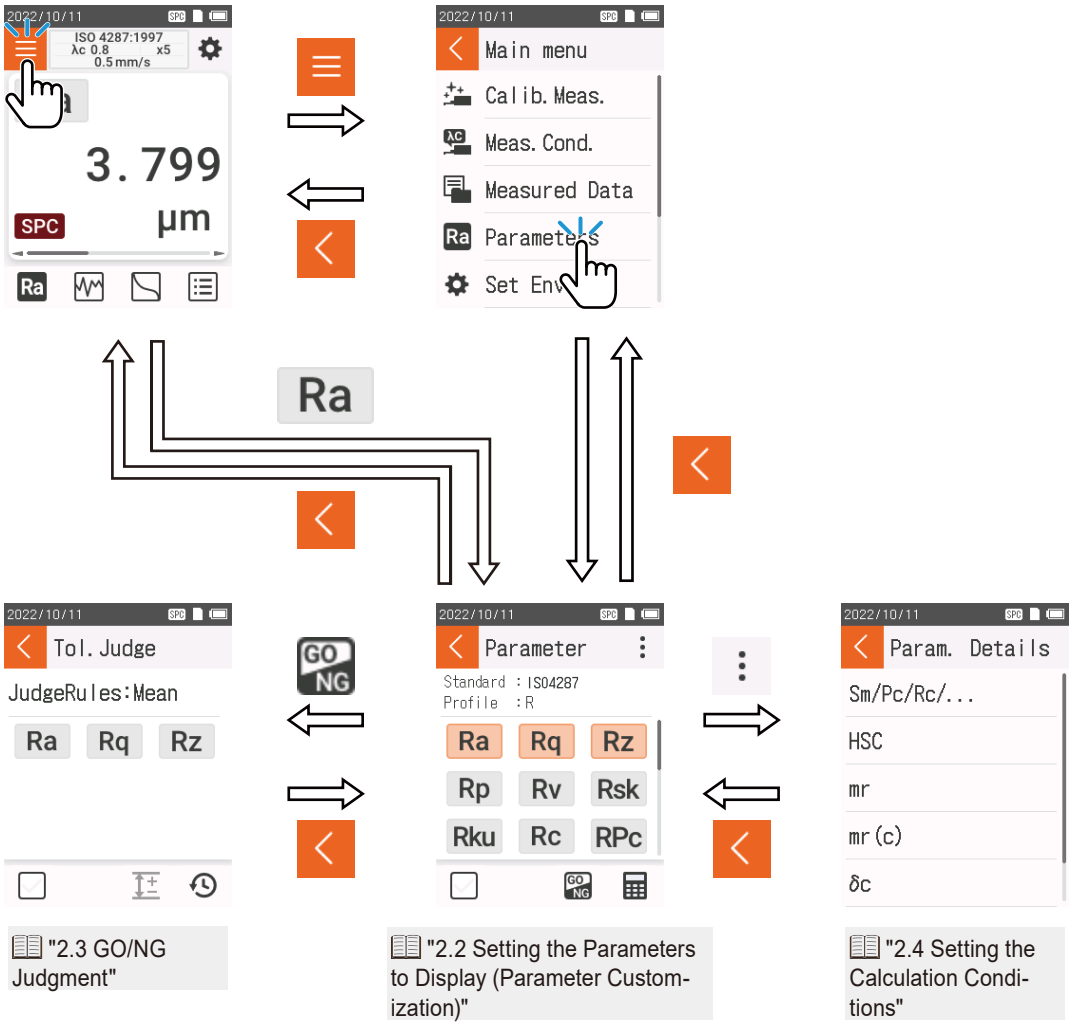
# 2 Setting the Parameters

Select which parameters to use, set the GO/NG judgment for each parameter, and set the calculation conditions as required for parameters such as [Sm], [Pc], and [Rc].

## 2.1 Parameter Setting Screen Transition

**Tips**

To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.




"2.3 GO/NG Judgment"

"2.2 Setting the Parameters to Display (Parameter Customization)"

"2.4 Setting the Calculation Conditions"

# 2.2 Setting the Parameters to Display (Parameter Customization)

With the parameter customization function, you can select which parameters you want to calculate and display.

## 2.2.1 Overview of Parameter Customization

At the time of purchase, this product is initially set to calculate and display the most commonly used parameters (Ra, Rq, Rz).
With the parameter customization function, you can select which parameters you want to calculate and display, according to your application.

By calculating and displaying only the necessary parameters, the time required for calculating the measurement results can be shortened, and parameter-related operations, such as changing the displayed parameter, can be simplified.
Also, this product has a function to collectively select all the parameters and a function to collectively cancel the selection.

**Tips**

- For definitions of each parameter, see 📖 the separate "Surface Roughness Parameters".
- When the Sm, Pc, or Ppi parameter is selected, the count level must be set.
  For details about the setting procedure, see 📖 "2.4.1 When Sm, Pc, Rc, etc., Is Selected" on page D-62.
- When the HSC parameter is selected, the count level must be set.
  For details about the setting procedure, see 📖 "2.4.2 When HSC Is Selected" on page D-68.
- When the mr parameter is selected, the number of slice points, reference line, and slice level must be set.
  For details about the setting procedure, see 📖 "2.4.3 When mr Is Selected" on page D-73.
- When the mr[c] parameter is selected, the slice level must be set.
  For details about the setting procedure, see 📖 "2.4.4 When mr(c) (tp for ASME) Is Selected" on page D-79.
- When the δc parameter is selected, the reference line and slice level must be set.
  For details about the setting procedure, see 📖 "2.4.5 When δc (Htp for ASME) Is Selected" on page D-85.

## 2.2.2 Relationship between Roughness Standards, Evaluation Profiles, and Parameters

Parameters can be selected and saved for each combination of roughness standard and evaluation profile. When a roughness standard and an evaluation profile are set, predetermined parameters are recalled.

| Roughness standard | Evaluation profile | Parameter |
|---|---|---|
| JIS B 0601:1982 | P | Rz, Rmax |
| | R | Ra |
| JIS B 0601:1994 | R | Ra, Rz, Ry, Pc, Sm, S, mr(c) |
| JIS B 0601 | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PPc, PSm, PzJIS, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, RzJIS, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| JIS B 0671:2002 | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, RzJIS, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| JIS B 0631:2000 | R-Motif | R, Rx, AR |
| ISO 4287 | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PPc, PSm, Pz1max, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, RPc, Rc, RSm, Rz1max, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| ISO 13565:1996 | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, Rz1max, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| ISO 12085:1996 | R-Motif | R, Rx, AR |
| ISO 21920 | P | Pa, Pq, Pz, Pp, Ppt, Pv, Pt, Pvt, Pzx(l), Psk, Pku, Pc, Pcx, Pcq, Ppc, Psm, Psmx, Psmq, Pda, Pdq, Pdt, Pdl, Pdr |
| | R | Ra, Rq, Rz, Rp, Rpt, Rv, Rt, Rvt, Rzx(l), Rsk, Rku, Rc, Rcx, Rcq, Rpc, Rsm, Rsmx, Rsmq, Rda, Rdq, Rdt, Rdl, Rdr |
| ASME B46.1 | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, RPc, RSm, Rmax, RΔa, RΔq, tp, Htp, Rpm |
| VDA | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PSm, Pmax, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RSm, Rmax, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RSm, Rmax, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| Free | P | Pa, Pq, Pz, Py, Pp, Pv, Pt, P3z, Psk, Pku, Pc, PPc, PSm, S, HSC, PzJIS, Pppi, PΔa, PΔq, Plr, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Ppm |
| | R | Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, RPc, RSm, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm |
| | DF | Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, RPc, RSm, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm |
| | R-Motif | R, Rx, AR |

## 2.2.3 Parameter Customization Settings

This section explains the parameter customization methods, such as the procedures to select parameters individually and collectively, and to cancel the parameter selection.

**IMPORTANT**

- To apply a calculated measurement result to a newly customized parameter, be sure to touch (recalculation).
- The calculation results of canceled parameters will be cleared. Even if the canceled parameter is selected again, the calculation results will not be displayed on the Home screen. ([*****] will be displayed.) To display the calculation result of that parameter, touch (recalculation).

### ■ Individual parameter selection

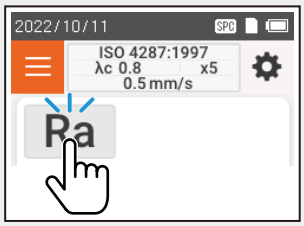
Use the following procedure to individually select parameters.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

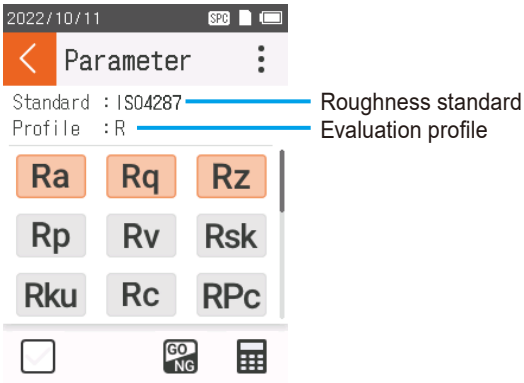
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2 Check that the displayed roughness standard and evaluation profile are correct.**

If the roughness standard or evaluation profile is not correct, see "1.1.2 Roughness Standard" on page D-3 or "1.1.3 Evaluation Profile" on page D-5 and correct it.



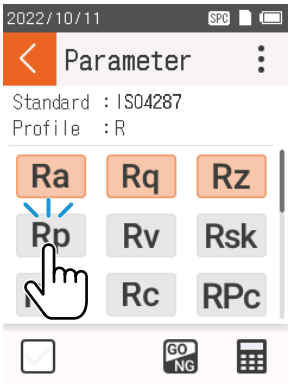
**3** **Touch the parameter you want to calculate and display.**

**(Example: Select [Rp].)**

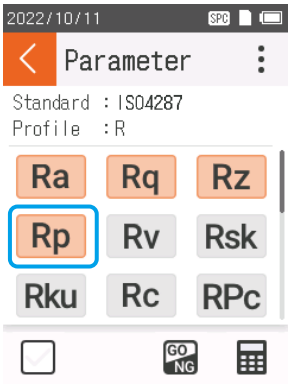
**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

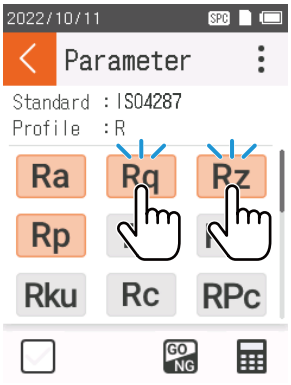



» The parameter you touched is selected, and the icon turns orange.

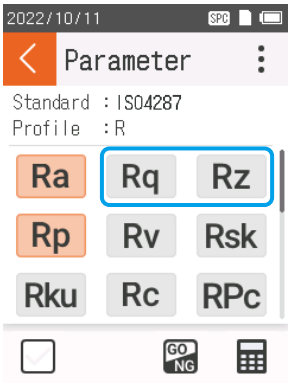



**4** **Among the selected parameters, touch the parameters you do not want to calculate and display.**

**(Example: Cancel the selection of [Rq] and [Rz].)**



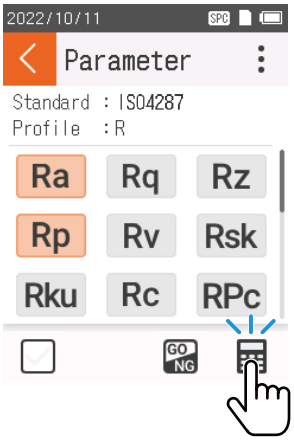

» The selected parameters are canceled, and the icons turn gray.



**5** **Repeat steps 3 and 4 to set all parameters you want to calculate and display.**

**6** **Touch (recalculation).**

» A message screen is displayed that indicates that the recalculation is in progress.
» After recalculation, the screen returns to the Home screen.
» The recalculated calculation result is displayed on the Home screen.




**Tips**

For details about recalculating calculation results, see "1.2 Recalculation of Calculation Results" on page D-26.

## ■ Selecting all parameters

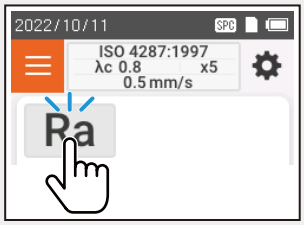
Use the following procedure to select all the parameters.

**1** **Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

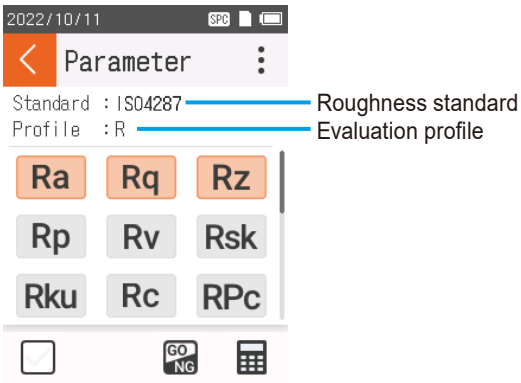
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2** **Check that the displayed roughness standard and evaluation profile are correct.**

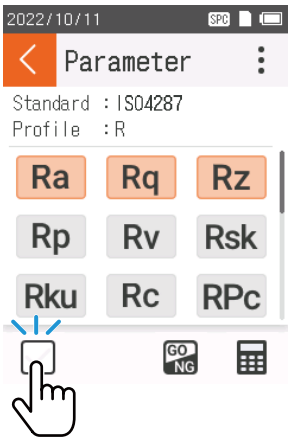
If the roughness standard or evaluation profile is not correct, see "1.1.2 Roughness Standard" on page D-3 or "1.1.3 Evaluation Profile" on page D-5 and correct it.



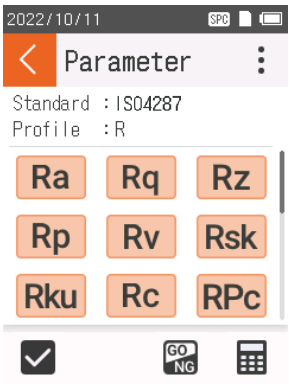
## 3 Touch the select all/cancel all button at the bottom of the [Parameter] screen.

**Tips**

Each time you touch the select all/cancel all button, the button toggles between ☑ (all selected) and ☐ (all canceled).




» The select all/cancel all button changes to ☑ (all selected).
» All the parameters are selected, and all the icons turn orange.

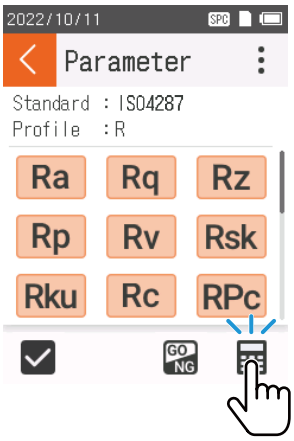



## 4 Touch (recalculation).

» A message screen is displayed that indicates that the recalculation is in progress.
» After recalculation, the screen returns to the Home screen.
» The recalculated calculation result is displayed on the Home screen.

**Tips**

For details about recalculating calculation results, see "1.2 Recalculation of Calculation Results" on page D-26.



## ■ Canceling all parameters

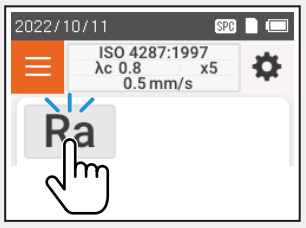
Use the following procedure to cancel all the selected parameters.
To cancel all selected parameters, you first need to select all parameters.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

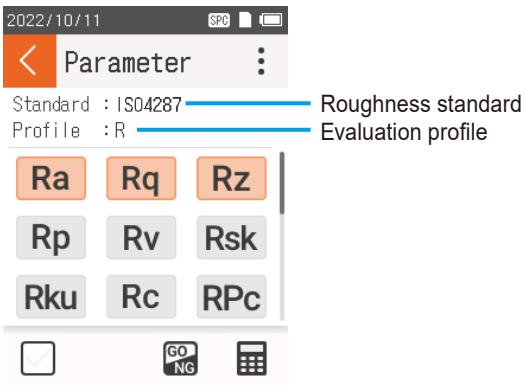
» The [Parameter] screen is displayed.

**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.



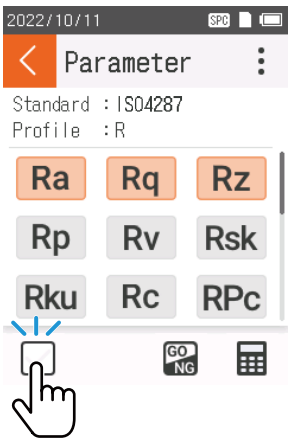

**2 Check that the displayed roughness standard and evaluation profile are correct.**



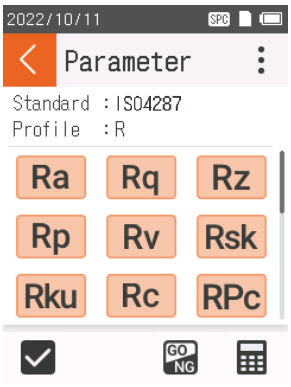

**3 Touch the select all/cancel all button at the bottom of the [Parameter] screen.**

**Tips**

Each time you touch the select all/cancel all button, the button toggles between ☑ (all selected) and ☐ (all canceled).



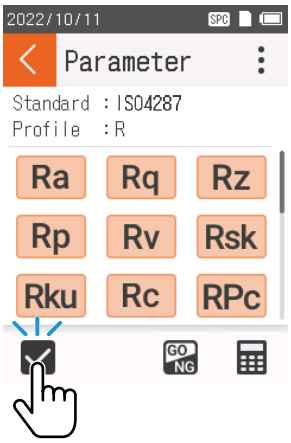
» The select all/cancel all button changes to ☑ (all selected).
» All the parameters are selected, and all the icons turn orange.



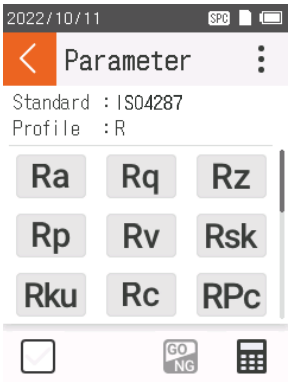

**Tips**

When canceling all the selected parameters, you first need to select all parameters.

## 4 Touch the select all/cancel all button at the bottom of the [Parameter] screen.




» The select all/cancel all button changes to ☐ (cancel all).
» All the selected parameters are canceled, and all the icons turn gray.




**Tips**

- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.

# 2.3 GO/NG Judgment

This product can perform GO/NG judgment of the surface roughness of workpieces.

The judgment rule for GO/NG judgment can be selected from the following three rules: the Mean rule, the 16 % rule, and the Max rule.

With this product, the GO/NG judgment function can be set for each selected parameter.

## 2.3.1 GO/NG Judgment Result Display

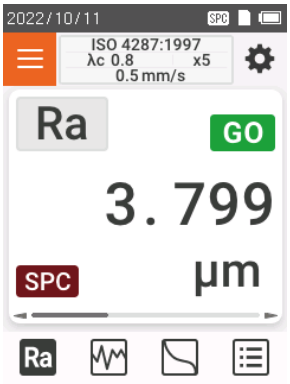
When the GO/NG judgment function is used, calculation results are compared with the upper and lower tolerance limits. If the calculation results fall outside the limits, the color of the displayed calculation results changes.

If the calculation results are within the limits, [GO] is displayed to the right of the parameter name.

If the calculation result exceeds the upper limit, [+NG] will appear to the right of the parameter name, and the result is displayed in red.

If the calculation result falls below the lower limit, [-NG] will appear to the right of the parameter name, and the result is displayed in blue.

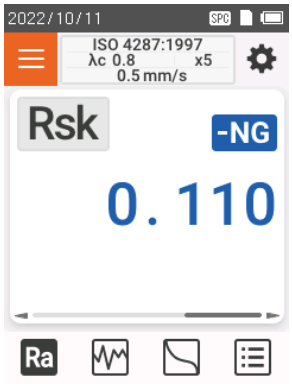
GO (Passed)




+NG
(Failed: Exceeded the upper limit)




-NG
(Failed: Fell below the lower limit)




**IMPORTANT**

If the upper or lower limit is set to 0 (zero), GO/NG judgment for the respective limit is disabled.

Because the upper and lower limits can be set independently, GO/NG judgment for the upper and lower limits can be disabled separately.

## 2.3.2 Judgment Rule

The judgment rule for GO/NG judgment can be selected from the following three rules: the Mean rule, the 16 % rule, and the Max rule.

**IMPORTANT**

- The judgment rules for GO/NG judgments are applied only to parameters for which a calculation result is obtained for each section length within the evaluation range and the arithmetic mean is determined.
- For parameters for which the number of sections is 1 or a measured value is obtained for the entire evaluation length, the following rule is applied irrespective of any judgment rule.
  Judgment results in failed if parameter value > upper limit value or parameter value < lower limit value.

The three judgment rules are defined as follows.

Mean rule: This rule makes a greater-than/less-than comparison between the upper/lower limit values and the parameter value that is determined as the arithmetic mean of the calculation results obtained for each section length within the evaluation range, and judges whether the results are "GO" or "NG".

16 % rule: This rule makes a greater-than/less-than comparison between the upper/lower limit values and the calculation results that are obtained for each section length within the evaluation range. The result (the number of NG judgments) is then divided by the number of calculation results obtained for each section length to determine the percentage of NG results. If the percentage is 16 % or less, the parameter value is "Go". If the percentage exceeds 16 %, the parameter value is "NG".
The 16 % rule produces the same results as the Max rule when six or fewer section lengths are evaluated.

Max rule: This rule makes a greater-than/less-than comparison between the upper/lower limit values and the calculation results obtained for each evaluation length, and then makes a judgment. If any of the calculation results is over the upper limit value or below the lower limit value, a NG judgment is made.

## 2.3.3 GO/NG Judgment Settings

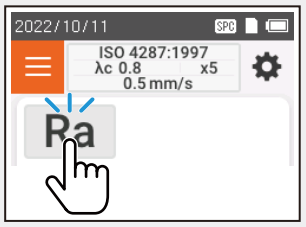
Use the following procedure to configure the GO/NG judgment settings.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.

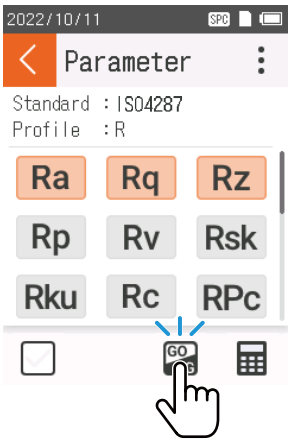



**2 At the bottom of the [Parameter] screen, touch (GO/NG judgment).**

» The [Tol.Judge] screen is displayed.

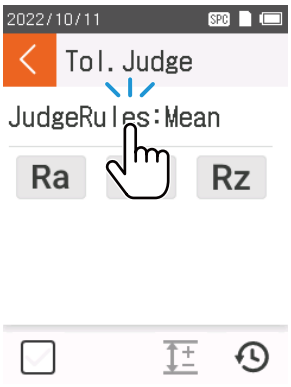
**Tips**

If no parameters are selected, the GO/NG judgment button is disabled ( ).




**3 Touch the [JudgeRules] field.**

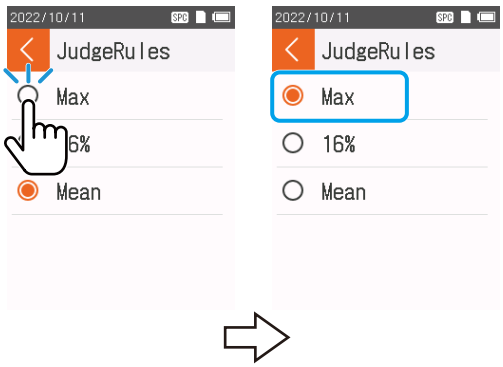
» The [JudgeRules] screen is displayed.



**4** **Touch the option button for the desired judgment rule.**

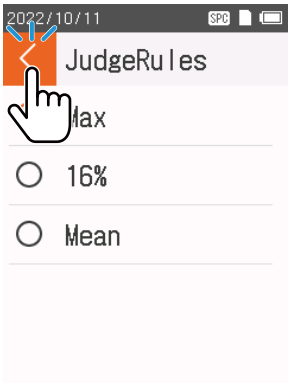
**(Example: Select [Max].)**

» The option button you touched is selected.

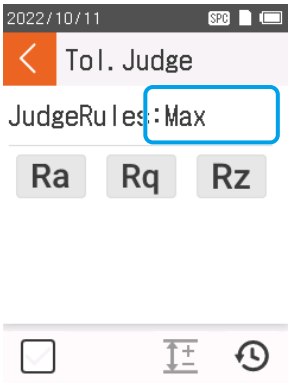



**5** **Touch**  **(return).**

» The screen returns to the [Tol.Judge] screen.



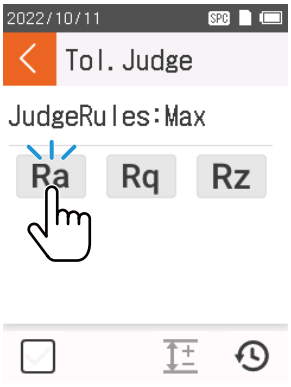

**6** **Check that the set judgment rule is reflected on the [Tol.Judge] screen.**



## 7 Set the upper and lower limit values for each parameter.

**Perform the following operations for all the parameters to which GO/NG judgment will be applied.**

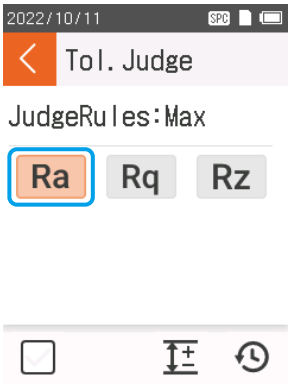
1 Touch a target parameter for GO/NG judgment.



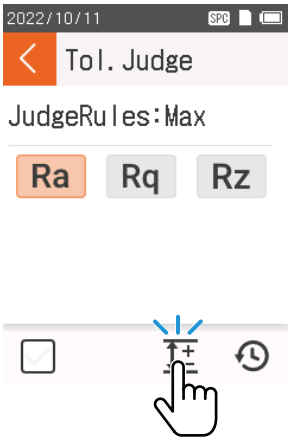

### Tips

- Use the select all/cancel all button at the bottom of the screen to switch between selecting all parameters ( ) and canceling all the selected parameters ( ).
- If no parameters are selected, the upper/lower limit button is disabled ( ).

» The parameter you touched is selected, and it turns orange.



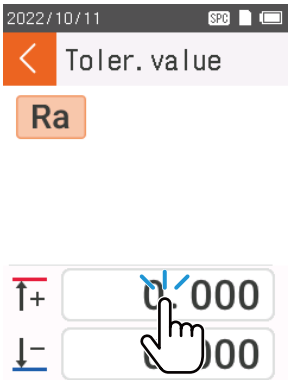

2 Touch (upper/lower limits).



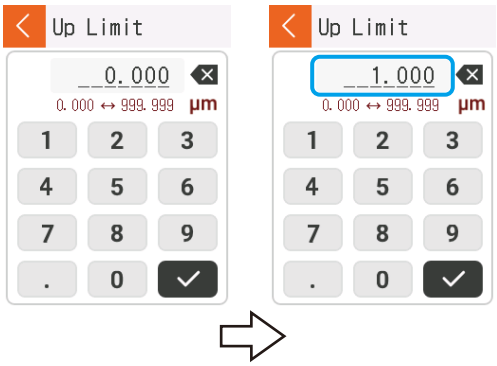

» The [Toler.value] screen is displayed.

3 Touch the upper limit field.

» The [Up Limit] screen is displayed.



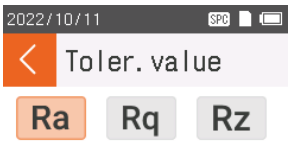
**4** Input the upper limit value.
(Example: Input "1.000".)
The allowable input range differs according to the parameter.

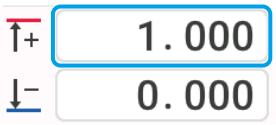



**IMPORTANT**
When the upper limit is set to 0, GO/NG judgment for the upper limit is disabled.

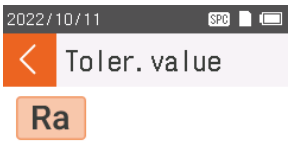
**Tips**
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

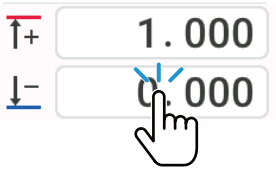
**5** Touch ✓ (confirm).
» The input value is confirmed as the upper limit value and reflected on the [Toler.value] screen.




**6** Touch the lower limit field.
» The [LowLimit] screen is displayed.



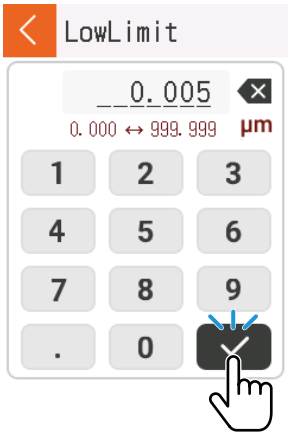
7 Input the lower limit value.
(Example: Input "0.005".)
The allowable input range differs according to the parameter.



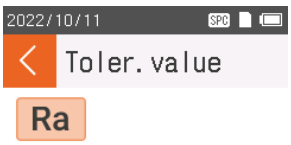

**IMPORTANT**
When the lower limit is set to 0, GO/NG judgment for the lower limit is disabled.

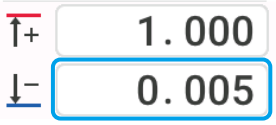
**Tips**
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

8 Touch ✓ (confirm).



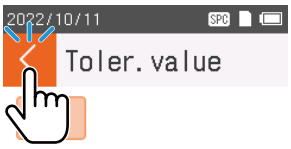

» The input value is confirmed as the lower limit value and reflected on the [Toler.value] screen.



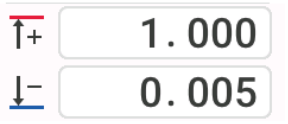
9 Touch (return).

» The screen returns to the [Tol.Judge] screen.




## Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.4 Setting the Calculation Conditions

Set the necessary calculation conditions for parameters such as Sm, Ppi, Rc, and HSC.

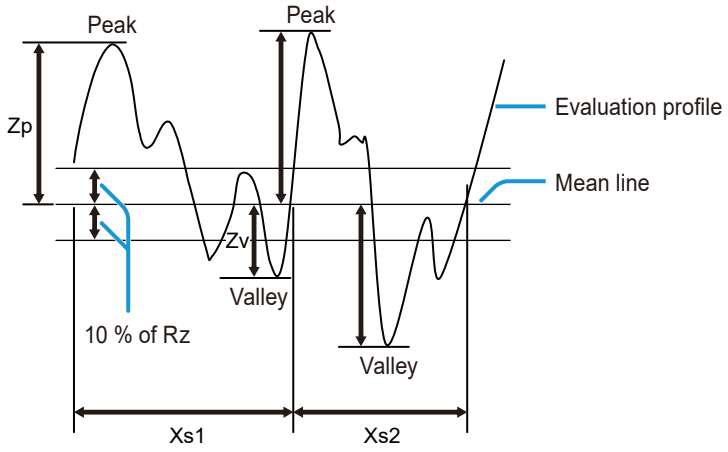
## 2.4.1 When Sm, Pc, Rc, etc., Is Selected

The count level calculation condition must be set when a parameter such as [Sm], [Pc], [Rc] is selected. Also, the Profile Element restriction definition can be made.

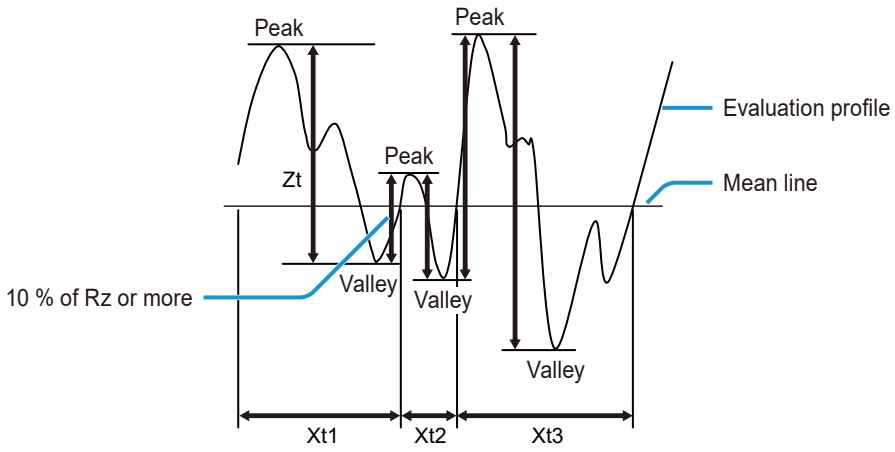
**Profile Element restriction definition**

The following shows definition examples where the unit for the count level is set to [%].
When [µm] or [µin] is set as the unit, the actual figures will be specified.

(1) Zp/Zv: Zp > Zmin, Zv > Zmin Zmin = 10 % of Rz (when the count level is set to 10 %)




(2) Zt: Zt > Zmin Zmin = 10 % of Rz

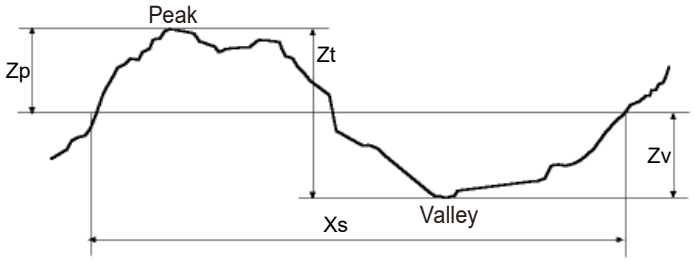





No. 99MBB794A

(3) Rp/Rv (when ISO21920 is selected)

- A contiguous peak-valley pair, as shown in the figure below, constitute a profile element.




- During the [Rp/Rv] settings, the peak height upper limit is specified based on Rp and the valley depth lower limit is specified based on Rv.
  While the unit for the count level is set to "%", the threshold values are specified as percentages to Rp and Rv.
- The number of profile elements is counted in both directions along the entire profile (i.e., from the start to the end of the evaluation length and again in reverse).
  At the same time, points above the mean line that are 0.01% or less of Rp and points below the mean line that are 0.01% or less of Rv are not considered profile elements and are excluded from the count.
- The ratio of the minimum values of Zp and Zv, shown in the figure above, is specified respectively to Rp and Rv. Peaks and valleys that do not satisfy this condition are not considered profile elements and are excluded from the count.

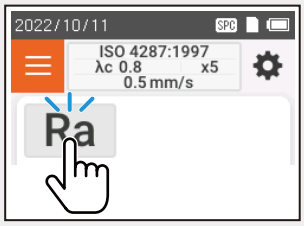
When a parameter such as [Sm], [Pc], and [Rc] is selected, use the following procedure to set the calculation conditions.

**1 Touch ☰ (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

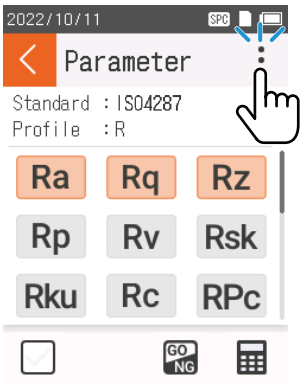
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.



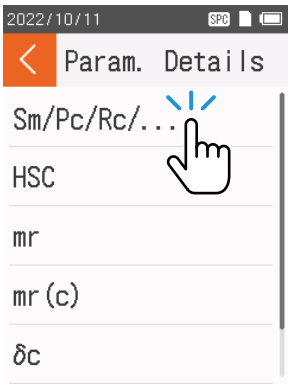

**2 At the top of the [Parameter] screen, touch ⋮ (detailed settings).**

» The [Param. Details] screen is displayed.



## 3 Touch [Sm/Pc/Rc...].

» The [Sm/Pc/Rc...] screen is displayed.




### Tips

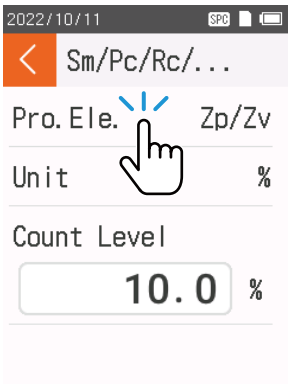
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details about inputting numerals, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

## 4 Make the Profile Element restriction definition.

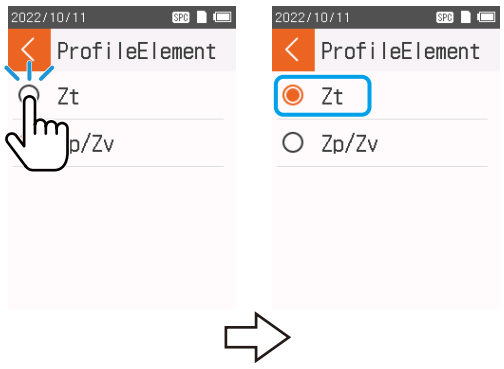
1 Touch the [Pro.Ele.] (Profile Element restriction definition) field.

» The [ProfileElement] screen is displayed.




2 Touch the option button for the desired definition. (Example: Select [Zt].)

» The option button you touched is selected.

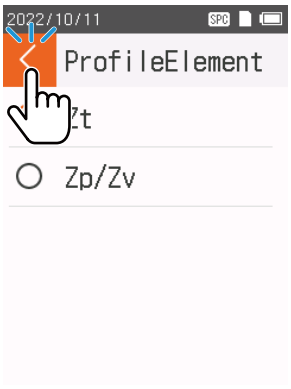



### Tips

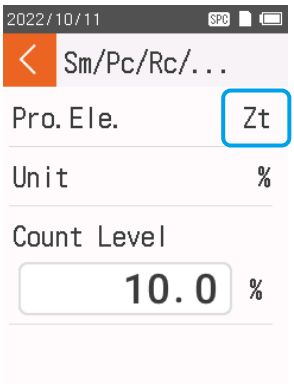
When the roughness standard is set to [ISO 21920], the Profile Element restriction definition is fixed to [Rp/Rv] ([Pp/Pv] when profile P is set).

3 Touch (return).

» The screen returns to the [Sm/PC/Rc...] screen.



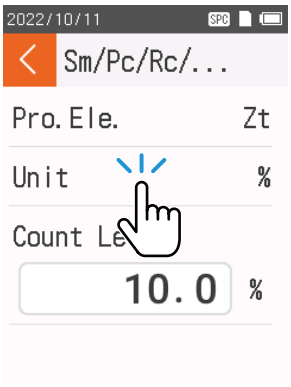
4 Check that the change to the definition is reflected on the [Sm/PC/Rc...] screen.




## 5 Set the units for the count level.

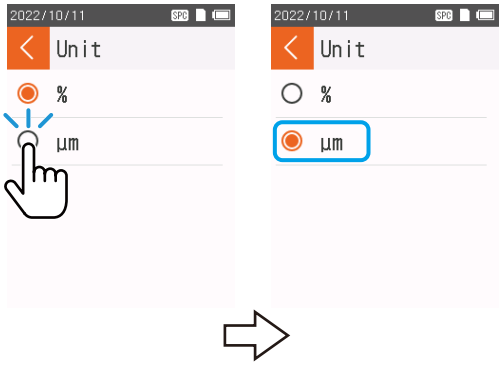
1 Touch [Unit] (units for the count level).

» The [Unit] screen is displayed.




2 Touch the option button for the desired definition. (Example: Select [µm].)

» The option button you touched is selected.

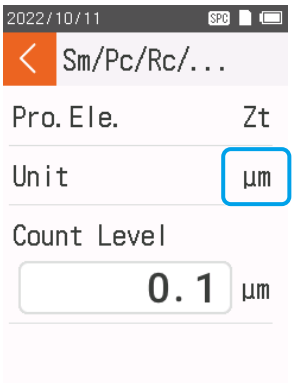



3 Touch (return).

» The screen returns to the [Sm/PC/Rc...] screen.

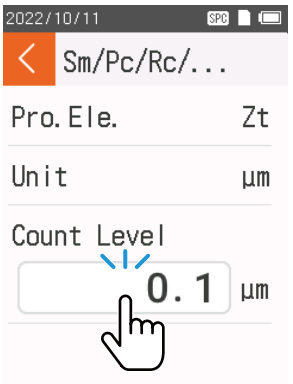


4 Check that the set unit is reflected on the [Sm/PC/Rc...] screen.



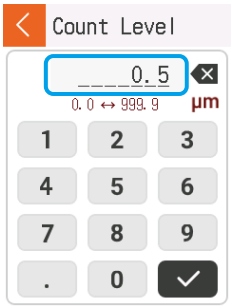

## 6 Set the count level.

1 Touch the [Count Level] input field.
» The [Count Level] screen is displayed.




2 Input the count level.
(Example: Input "0.5".)
The input ranges are as follows.
0.0 to 99.9 %
0.0 to 999.9 µm (0.0 to 39366 µin)

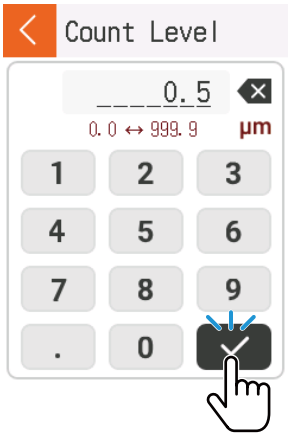


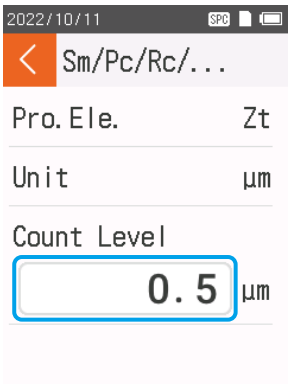

**Tips**

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

3 Touch ✓ (confirm).
» The screen returns to the [Sm/PC/Rc...] screen.



4 Check that the change to the count level is reflected on the [Sm/PC/Rc...] screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.4.2 When HSC Is Selected

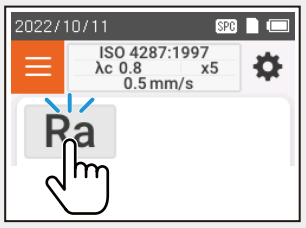
The count level calculation condition must be set when the [HSC] parameter is selected.
Use the following procedure to set the count level.

**1** **Touch ☰ (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

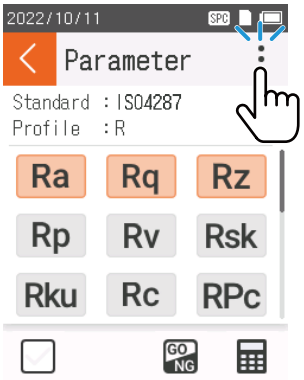
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2** **At the top of the [Parameter] screen, touch ⋮ (detailed settings).**

» The [Param. Details] screen is displayed.



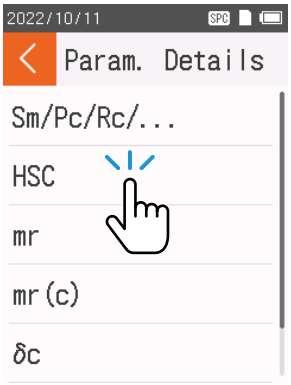

**3** **Touch [HSC].**

» The [HSC] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

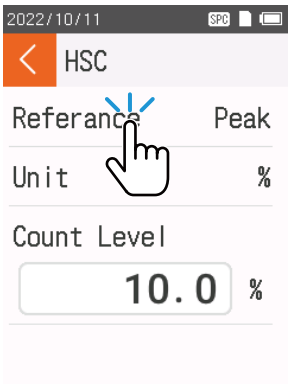
For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



## 4 Set the reference for the count level.

**1** Touch [Referance] (reference for the count level).

» The [Referance] screen is displayed.

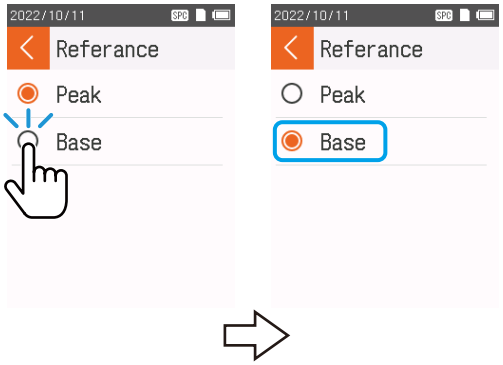



**2** Touch the option button for the desired definition.
(Example: Select [Base].)

[Peak]: Set based on the highest peak of the evaluation profile

[Base]: Set based on the mean line of the evaluation profile

» The option button you touched is selected.

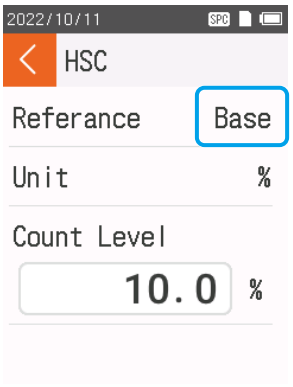



**3** Touch (return).

» The screen returns to the [HSC] screen.

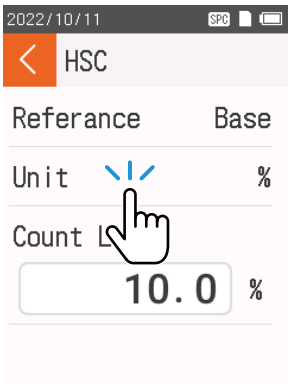



**4** Check that the change to the reference is reflected on the [HSC] screen.

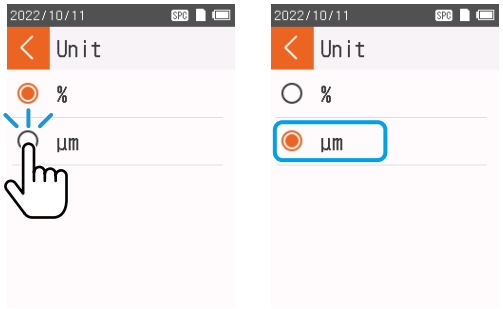


## 5 Set the units for the count level.

1 Touch [Unit] (units for the count level).
» The [Unit] screen is displayed.



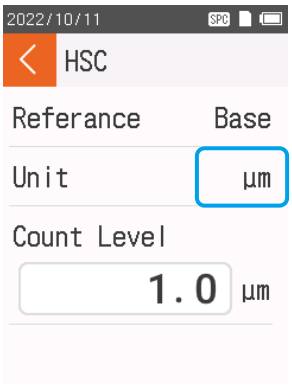

2 Touch the option button for the desired definition. (Example: Select [µm].)
» The option button you touched is selected.




3 Touch (return).
» The screen returns to the [HSC] screen.

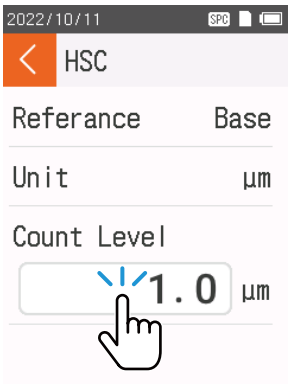



4 Check that the change to the units is reflected on the [HSC] screen.



## 6 Set the count level.

1 Touch the [Count Level] input field.
» The [Count Level] screen is displayed.



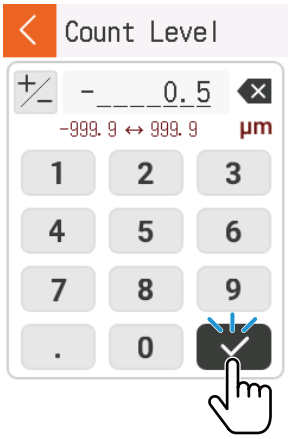

2 Input the count level.
(Example: Input "-0.5".)
The input ranges are as follows.
Peak reference: 0.0 to 99.9 % / 0.0 to 999.9 µm
(0.0 to 39366 µin)
Base reference: -50.0 to 50.0 % / -999.9 to 999.9 µm
(-39366 to 39366 µin)



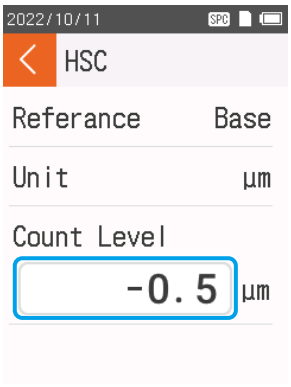

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- Each time you touch +/− (plus/minus), the plus/minus sign toggles between plus (+) and minus (–).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

3 Touch ✓ (confirm).
» The screen returns to the [HSC] screen.



4 Check that the change to the count level is reflected on the [HSC] screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.4.3 When mr Is Selected

If the [mr] parameter is selected, the following calculation conditions must be set: the number of slice points, the reference line, and the division depth.

**Tips**

- The results of the parameter [mr] calculation are displayed according to the set number of slice points (N).
- The [Rz] mode and [Rt] mode can be set when the roughness standard is set to [Free].

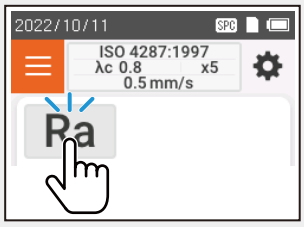
Use the following procedure to set the number of slice points, the reference line, and the division depth.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

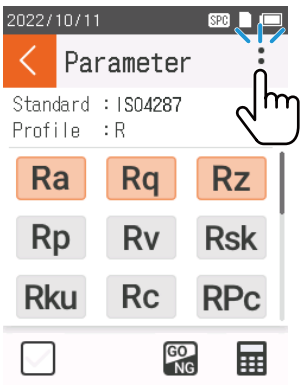
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2 At the top of the [Parameter] screen, touch (detailed settings).**

» The [Param. Details] screen is displayed.



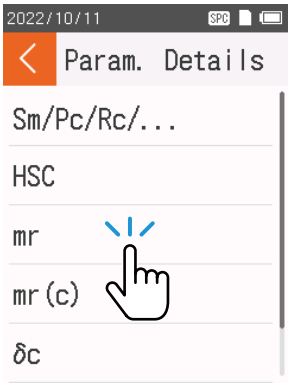

**3 Touch [mr].**

» The [mr] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

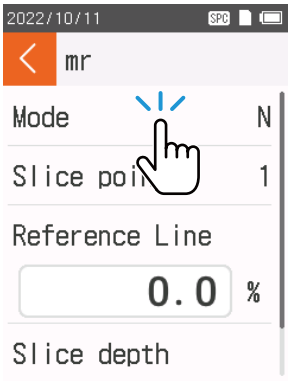


## 4 Set the mode (only when the roughness standard is set to [Free]).

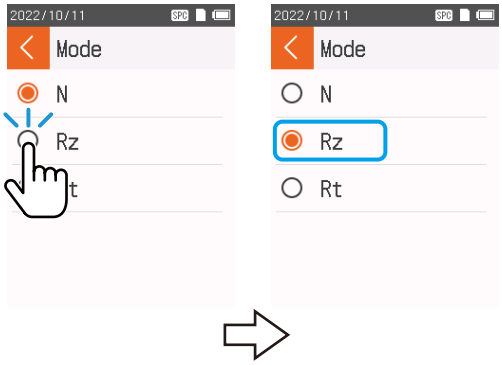
**Tips**

- When the roughness standard is not set to [Free], the mode is fixed to [N] (Normal).
- When you are not setting the roughness standard to [Free], proceed to step 5.

1 Touch [Mode].
» The [Mode] screen is displayed.



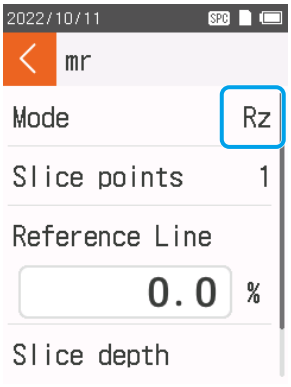

2 Touch the desired mode.
(Example: Select [Rz].)
» The mode you touched is selected.




3 Touch (return).
» The screen returns to the [mr] screen.




4 Check that the change to the mode is reflected on the [mr] screen.

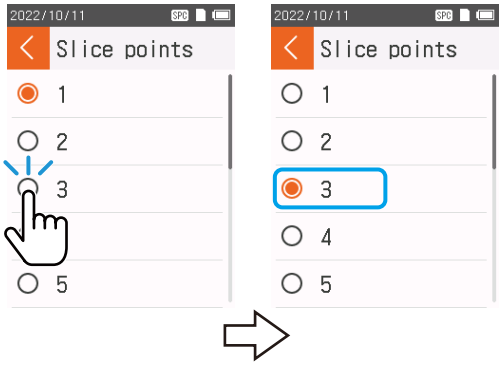


## 5 Set the number of slice points.

1 Touch [Slice points].
» The [Slice points] screen is displayed.




2 Touch the option button for the desired number of slice points.
(Example: Select [3].)
» The option button you touched is selected.




### Tips

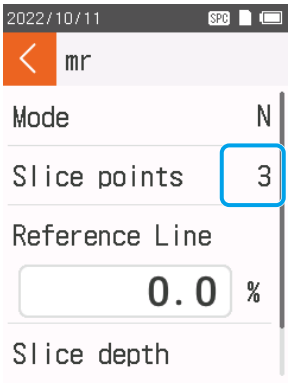
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

3 Touch (return).
» The screen returns to the [mr] screen.

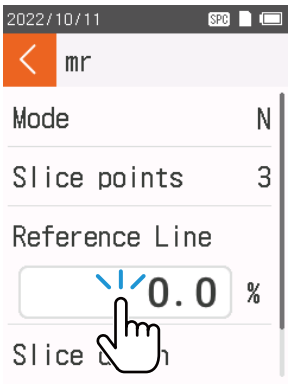



4 Check that the change to the number of slice points is reflected on the [mr] screen.

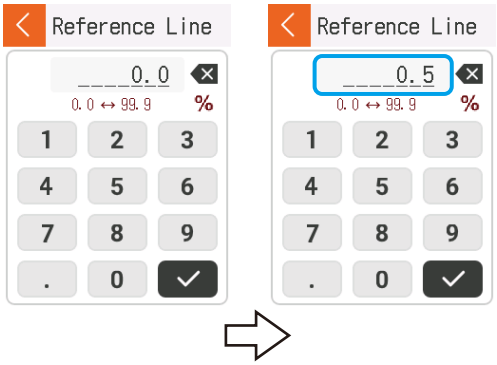


## 6 Set the reference line.

1 Touch the [Reference Line] input field.
» The [Reference Line] screen is displayed.



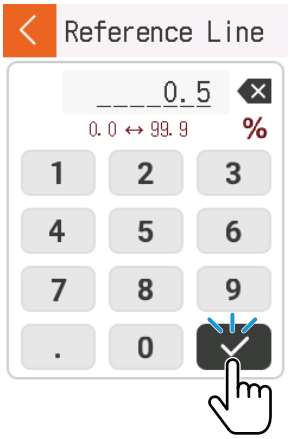

2 Input the reference line.
(Example: Input "0.5".)
The input range is as follows.
0.0 to 99.9 %



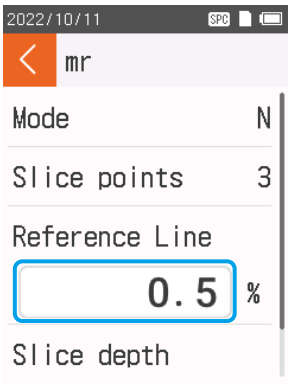

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

3 Touch ✓ (confirm).
» The screen returns to the [mr] screen.

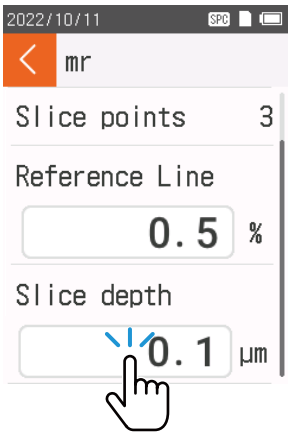



4 Check that the change to the reference line is reflected on the [mr] screen.



## 7 Set the division depth.

1 Touch the [Slice depth] input field.
» The [Slice depth] screen is displayed.



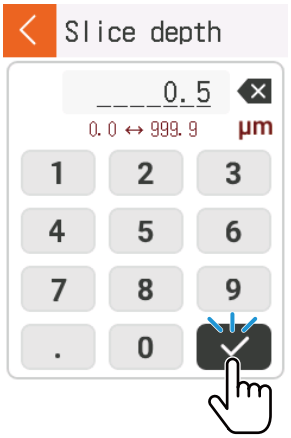

2 Input the division depth.
The input range is as follows.
0.0 to 999.9 µm (0.0 to 39366 µin)
0.0 to 99.9 %
(When the roughness standard is set to [Free] and the [Rz] mode or the [Rt] mode is set)



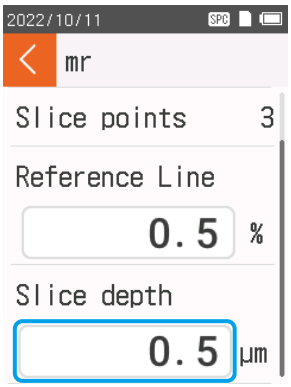

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

3 Touch ✓ (confirm).
» The screen returns to the [mr] screen.



4 Check that the change to the division depth is reflected on the [mr] screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.4.4 When mr(c) (tp for ASME) Is Selected

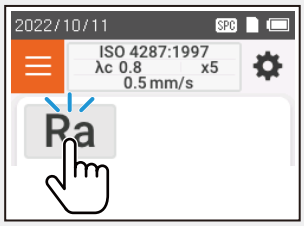
The slice level calculation condition must be set when the [mr(c)] ([tp] for ASME) parameter is selected. Use the following procedure to set the slice level.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

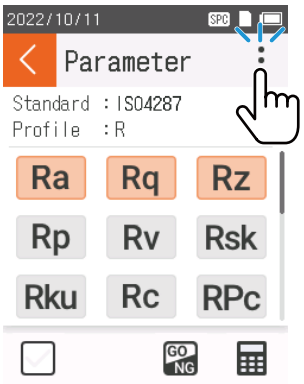
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2 At the top of the [Parameter] screen, touch (detailed settings).**

» The [Param. Details] screen is displayed.




**3 Touch [mr(c)] ([tp] for ASME).**

» The [mr(c)] ([tp] for ASME) screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

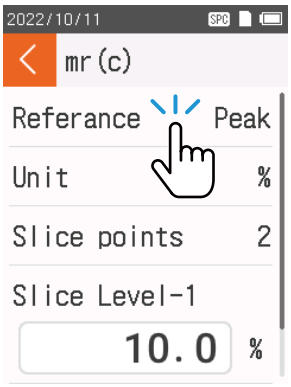
For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".




Other than ASME ASME

## 4 Set the reference for the slice level.

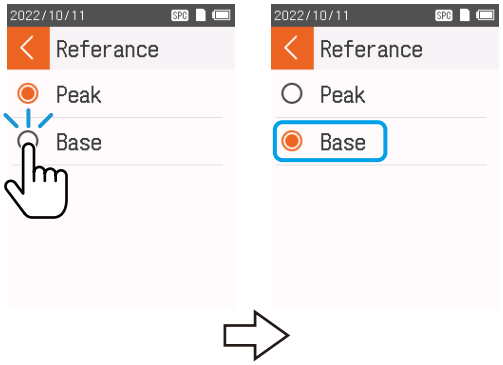
**1** Touch [Referance] (reference for the slice level).
» The [Referance] screen is displayed.




**2** Touch the option button for the desired definition.
(Example: Select [Base].)

[Peak]: Set based on the highest peak of the evaluation profile
[Base]: Set based on the mean line of the evaluation profile

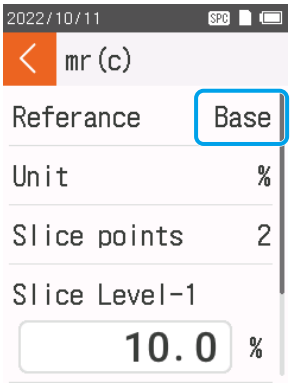
» The option button you touched is selected.




**3** Touch (return).
» The screen returns to the [mr(c)] ([tp] for ASME) screen.

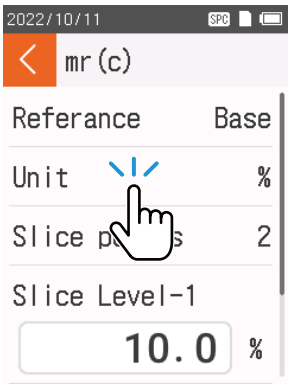



**4** Check that the change to the reference is reflected on the [mr (c)] ([tp] for ASME) screen.

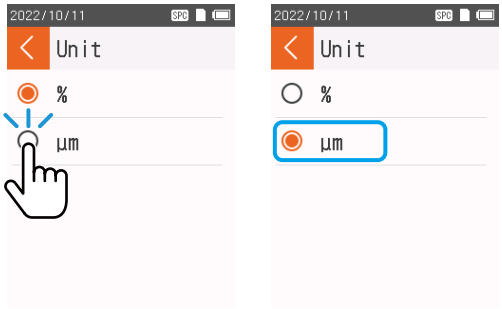


## 5 Set the units for the slice level.

1 Touch [Unit] (units for the slice level).
» The [Unit] screen is displayed.



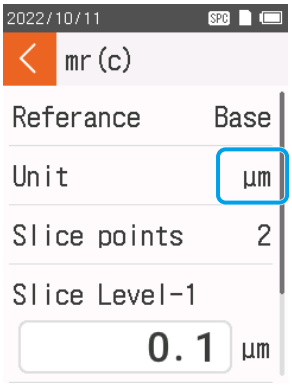

2 Touch the option button for the desired definition.
(Example: Select [µm].)
» The option button you touched is selected.




3 Touch (return).
» The screen returns to the [mr(c)] ([tp] for ASME) screen.

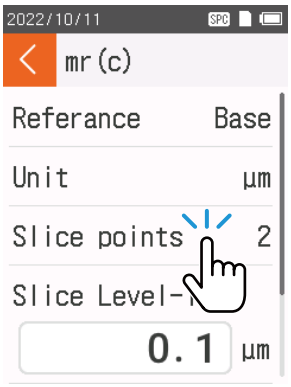



4 Check that the change to the units is reflected on the [mr(c)] ([tp] for ASME) screen.

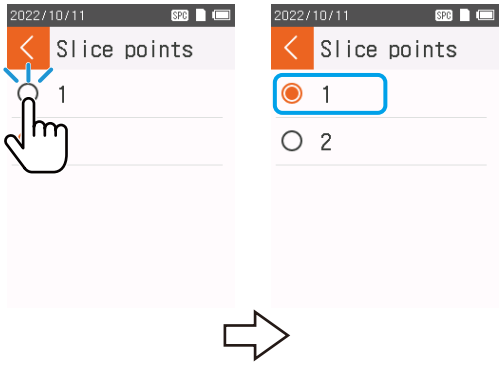


## 6 Set the number of slice points.

**1** Touch [Slice points].
» The [Slice points] screen is displayed.



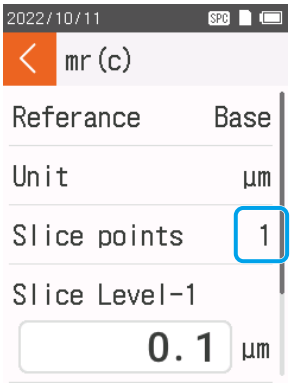

**2** Touch the option button for the desired number of slice points.
(Example: Select [1].)
» The option button you touched is selected.




**3** Touch (return).
» The screen returns to the [mr(c)] ([tp] for ASME) screen.



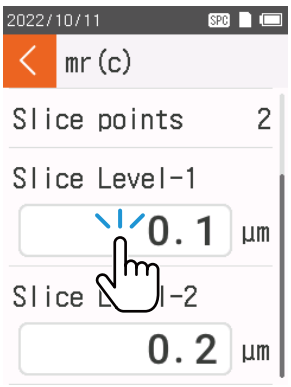

**4** Check that the change to the number of slice points is reflected on the [mr(c)] ([tp] for ASME) screen.



## 7 Set the slice level.

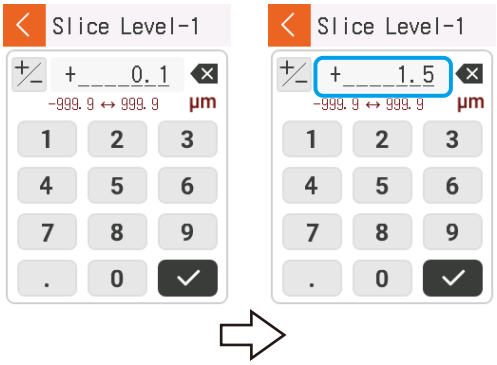
When [Slice points] is set to [2], set two types of slice level.

1 Touch the [Slice Level-1] input field.
» The [Slice Level-1] screen is displayed.




2 Input the slice level.
(Example: Input "1.5".)
The input ranges are as follows.

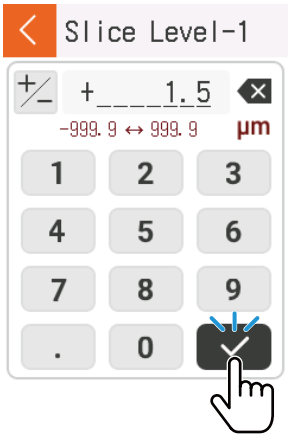
| Base | Peak |
|---|---|
| -50.0 to 50.0 % | 0.0 to 99.9 % |
| -999.9 to 999.9 µm (-39366 to 39366 µin) | 0.0 to 999.9 µm (0.0 to 39366 µin) |



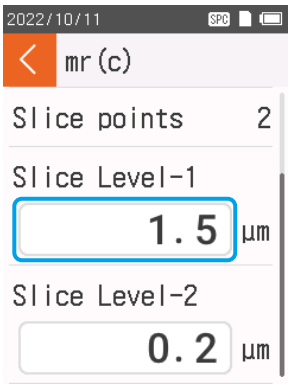

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- Each time you touch +/− (plus/minus), the plus/minus sign toggles between plus (+) and minus (–).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

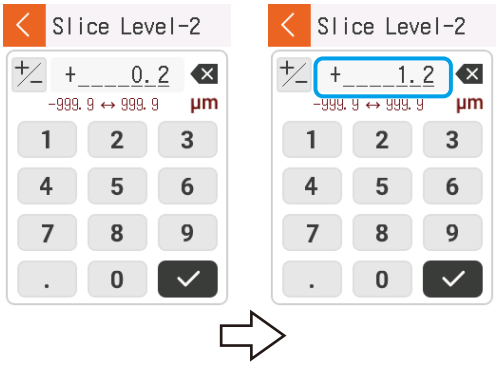
3 Touch ✓ (confirm).
» The screen returns to the [mr(c)] ([tp] for ASME) screen.



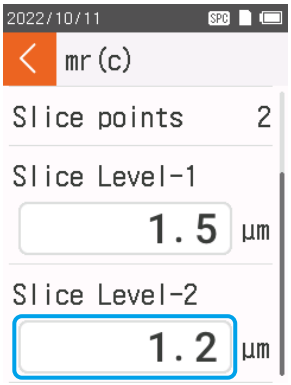
**4** Check that the change to slice level 1 is reflected on the [mr(c)] ([tp] for ASME) screen.




**5** Set [Slice Level-2] with the same procedure as above.




**6** Check that the change to slice level 2 is reflected on the [mr(c)] ([tp] for ASME) screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.4.5 When δc (Htp for ASME) Is Selected

When the [σc] ([Htp] for ASME) parameter is selected, the following calculation conditions must be set: reference line and slice level.

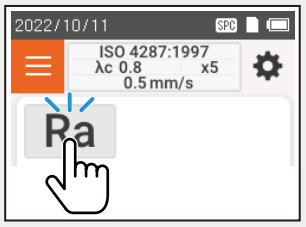
Use the following procedure to set the reference line and slice level.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

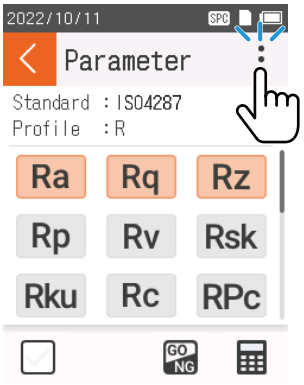
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2 At the top of the [Parameter] screen, touch (detailed settings).**

» The [Param. Details] screen is displayed.



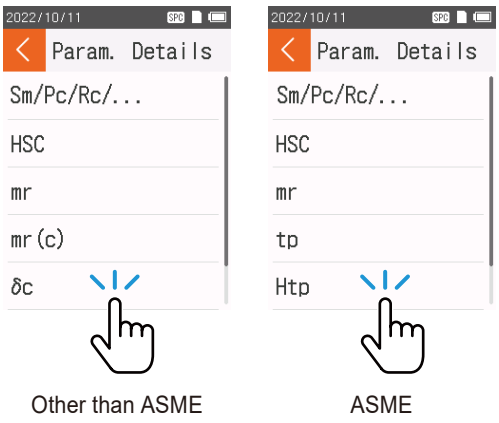

**3 Touch [σc] ([Htp] for ASME).**

» The [σc] ([Htp] for ASME) screen is displayed.

**Tips**

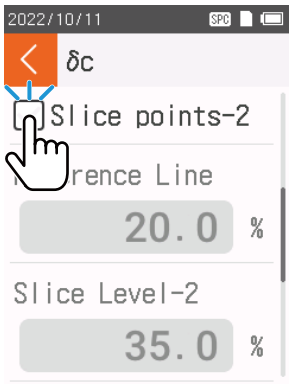
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

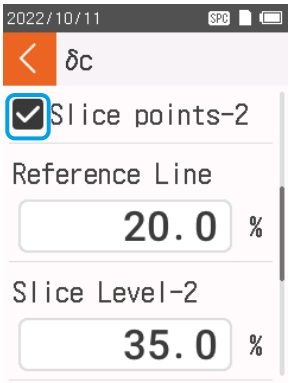


## 4 Set the number of slice points.

1 Select the following check boxes according to the number of slice points you want to set: [Slice points-1], [Slice points-2], and [Slice points-3].




» The number of slice points is selected.
» You can now input the reference line and slice level for the selected number of slice points.



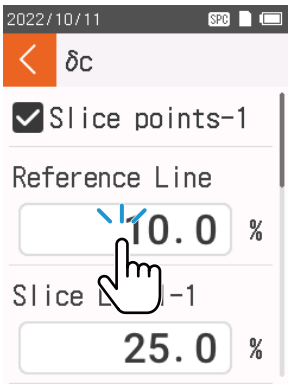

### Tips

- Vertical swiping is available when the vertical scroll bar is displayed on the screen.
- The [Slice points-2] check box can be selected when the [Slice points-1] check box is selected (☑). The [Slice points-3] check box can be selected when the [Slice points-2] check box is selected (☑).

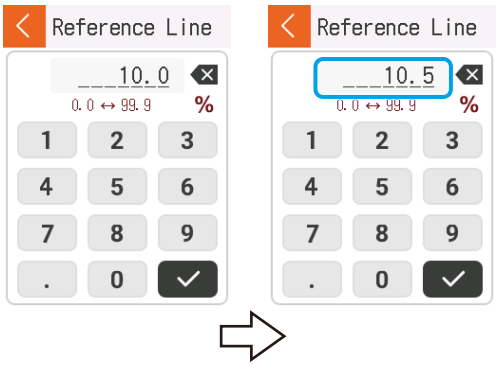
## 5 Set the same number of reference lines as the set number of slice points.

Before inputting the reference line, check that the check box for the number of slice points is selected (☑).

1 Touch the [Reference Line] input field.
» The [Reference Line] screen is displayed.



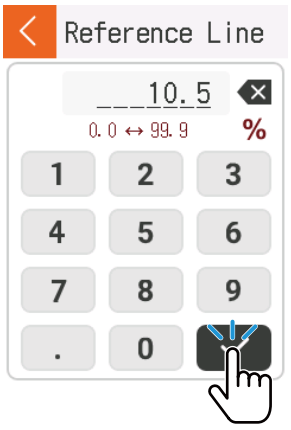
**2** Input the reference line.
(Example: Input "10.5".)
The input range is as follows.
0.0 to 99.9 %



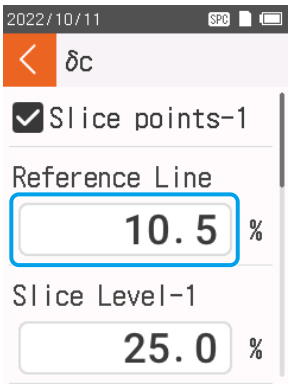

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

**3** Touch ✓ (confirm).
» The screen returns to the [σc] ([Htp] for ASME) screen.



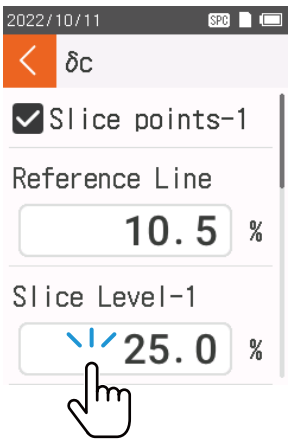

**4** Check that the change to the reference line is reflected on the [σc] ([Htp] for ASME) screen.



## 6 Set the same number of slice levels as the set number of slice points.

Before inputting the slice level, check that the check box for the number of slice points is selected (☑).

1 Touch the slice level input field.
» The [SliceLv.] screen is displayed.



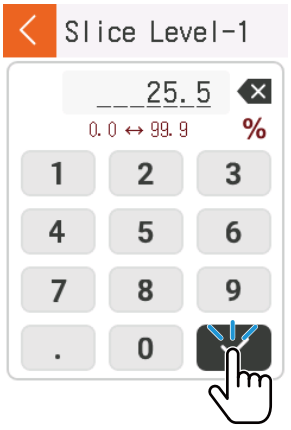

2 Input the slice level.
(Example: Input "25.5".)
The input ranges are as follows.
0.0 to 99.9 %



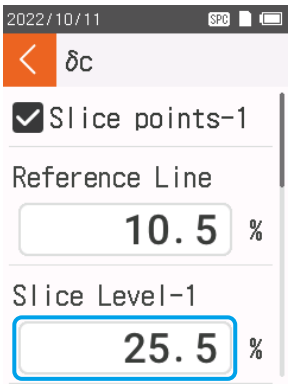

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see 📖 "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

3 Touch ✓ (confirm).
» The screen returns to the [σc] ([Htp] for ASME) screen.



4 Check that the set slice level is reflected on the [σc] ([Htp] for ASME) screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.4.6 When the Motif Measurement Profile (R-Motif) Is Selected

When the Motif measurement profile [R-Motif] is selected, you can set how motifs are combined from one of the following methods: a method that complies with the body text of ISO 12085:1996 or a method that complies with Annex A of ISO 12085:1996.

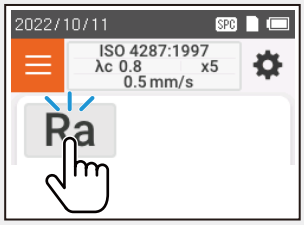
Use the following procedure to set the method of combining motifs.

**1 Touch (main menu) on the Home screen, and then [Parameters].**

» The [Parameter] screen is displayed.

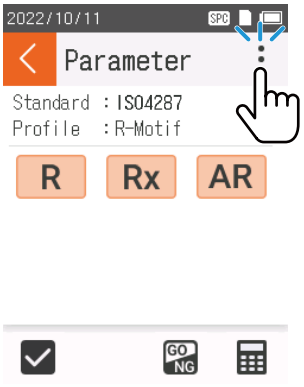
**Tips**

Touching the parameter field at the top of the Home screen also displays the [Parameter] screen.




**2 At the top of the [Parameter] screen, touch (detailed settings).**

» The [Param. Details] screen is displayed.



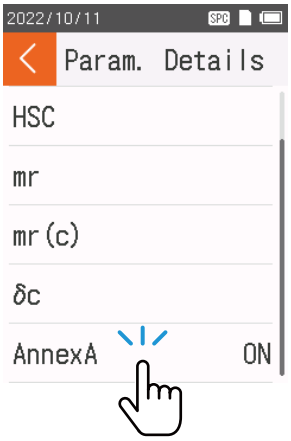

**3 Touch [AnnexA].**

» The [AnnexA] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

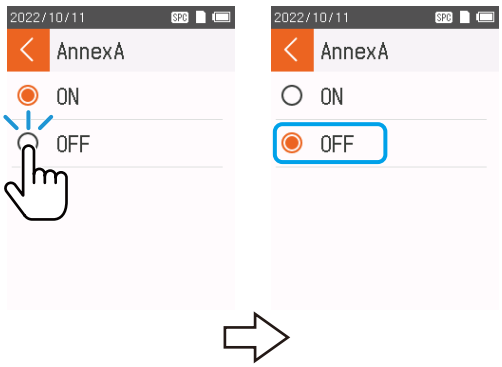
For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



**4** **Touch the option button for [ON] or [OFF].**

**(Example: Select [OFF].)**

» The option button for [OFF] is selected.




**5** **Touch (return).**

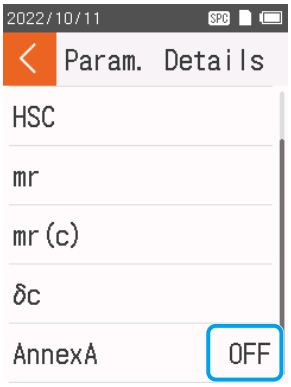
» The screen returns to the [Param. Details] screen.




**6** **Check that the change to the method for combining motifs is reflected on the [Param. Details] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## MEMO

# PART E
# Measurement Data Management


1 Saving/Recalling/Deleting/Renaming Measurement Data ..... E-1

2 Saving or Outputting Measurement Results Using the [POWER/DATA] Key ..... E-30

3 Communication with an External Device Using a Wireless Communication Unit for Measuring Instruments ..... E-49


No. 99MBB794A

# 1 Saving/Recalling/Deleting/ Renaming Measurement Data

Measurement conditions and measurement data can be saved in files and recalled.
Files can also be deleted and renamed.

To save measurement conditions and measurement data and to recall saved data, a memory card (optional accessory) is required.
Using a memory card, you can save up to 500 sets of measurement conditions and up to 10,000 sets of measurement data.

**IMPORTANT**

- In this document, a "microSD card" is referred to as a "memory card".
- While this product was designed to comply with existing memory card standards, some memory cards may not be used with this product due to changes or additions in the standards, etc.
- This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210[*1]) or with the exFAT file system.
  Use only memory cards listed as an optional accessory (Part No. 12AAY917)[*2] or memory cards[*3] that were formatted with the FAT32 file system.

  *1 Memory cards that were formatted with the SJ-210 can be reformatted with this product.
  *2 Memory cards listed as an optional accessory comply with microSDHC standards.
  *3 Memory cards that were formatted with the FAT32 file system can be reformatted with this product, but access to the memory card may be slow.

  For details about formatting the memory card with this product, see "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".
- To prevent the power to this product from being interrupted during setting operations, connect this product to an external power source.
- When using the internal battery, make sure it is sufficiently charged. If this product is operated when the remaining capacity of the internal battery power is low, the power to this product may turn off during operation.


No. 99MBB794A

# 1.1 Storage Media and Data that Can Be Saved and Recalled

The following table shows the storage media and data to be saved and recalled.

| Data group | Stored contents | Storage media |
|---|---|---|
| Measurement conditions | Measurement conditions | Internal memory (up to 10 files)<br>Memory card (up to 500 files) |
| Measurement data | Measured profile data, calculation results | Internal memory (data from the most recent measurement)<br>Memory card (up to 10,000 files) |

**IMPORTANT**

When saved data is recalled, the contents described above in "Saved contents" are also recalled, and the existing product settings will be overwritten.

## 1.1.1 Handling the Memory Card

### ■ Inserting the memory card

Use the following procedure to insert the memory card into the memory card slot on the rear of this product.

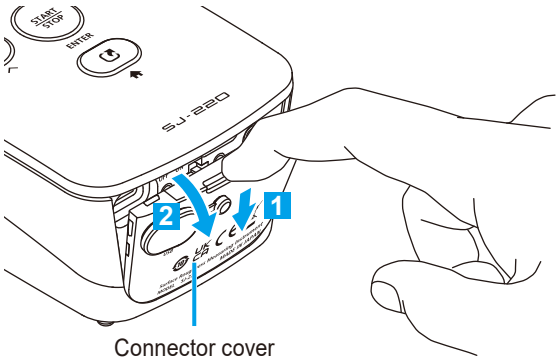
**NOTICE**

**There is a risk of damaging this product or the memory card.**

- Insert the memory card straightforward correctly fitting in the memory card slot guide. If the memory card is not aligned with the guide when it is inserted, the internal connector pins may be damaged.
- Insert the memory card with its pins facing down.
  If the memory card is inserted with its pins facing up, the memory card may be damaged.
- Insert and remove the memory card while the power to this product is off.

**1** **Insert a fingernail into the recess located at the top of the connector cover on the rear of the display unit, and push down the connector cover in the direction indicated by the arrow.**

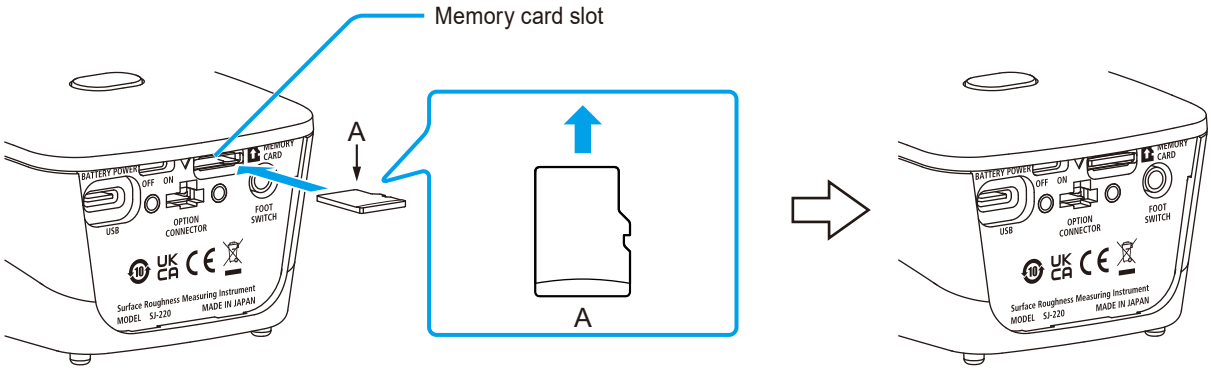
**2** **Open the connector cover in the direction indicated by the arrow to remove it.**




**3** **Insert the memory card with its pins facing down as far as it will go into the memory card slot.**

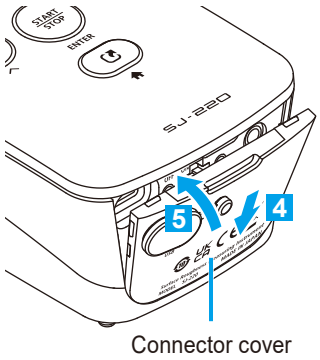
**NOTICE**

**If the memory card is inserted with its pins facing up, the memory card may be damaged.**
Insert the memory card with its pins facing down.




**4** **Align the connector cover with the recess on the rear of the display unit, and insert it in the direction indicated by the arrow.**

**5** **Close the connector cover in the direction indicated by the arrow to attach it.**



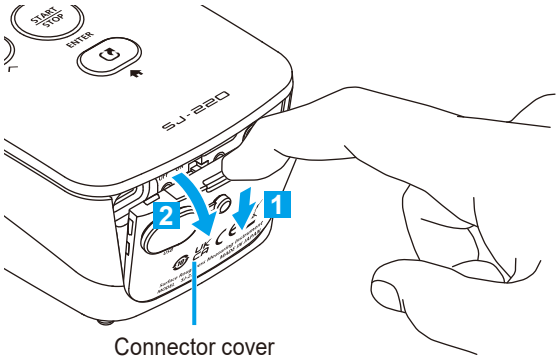
## ■ Removing the memory card

Use the following procedure to remove the memory card.

When removing the memory card, use the tool for operating the internal battery switch (hereinafter referred to as the operation tool) included with this product.

**1 Insert a fingernail into the recess located at the top of the connector cover on the rear of the display unit, and push down the connector cover in the direction indicated by the arrow.**

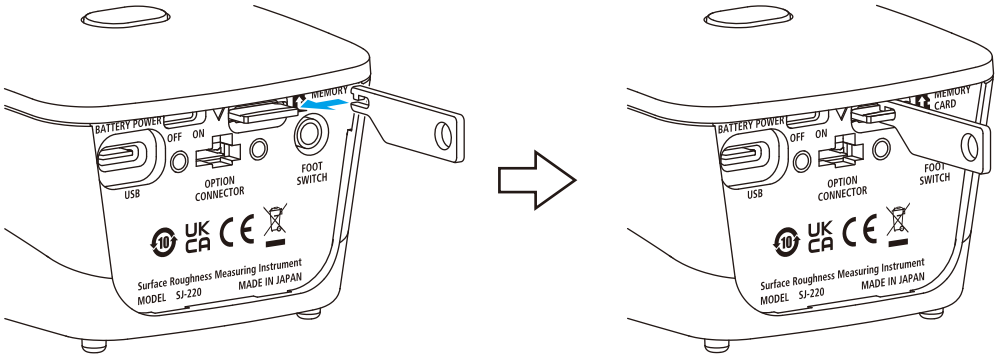
**2 Open the connector cover in the direction indicated by the arrow to remove it.**



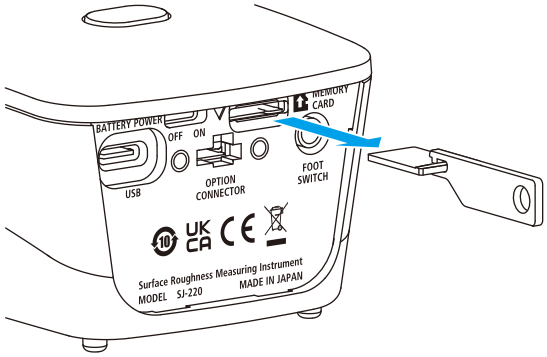

**3 Push in the memory card.**

» The memory card will pop out of the memory card slot slightly.

**4 Insert the operation tool from the left or right side of the protruding memory card.**



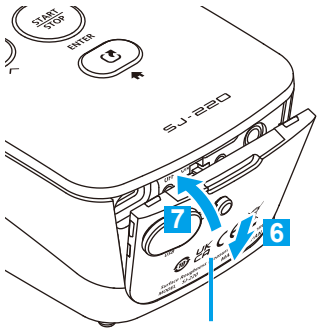
**5** **Pull the operation tool straight out together with the memory card.**




» The memory card is removed.

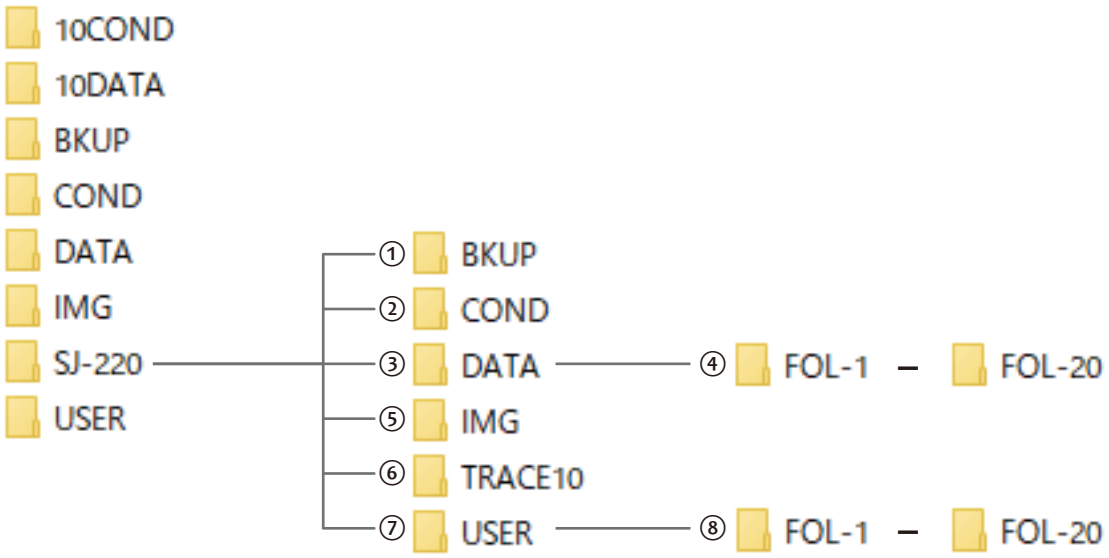
**6** **Align the connector cover with the recess on the rear of the display unit, and insert it in the direction indicated by the arrow.**

**7** **Close the connector cover in the direction indicated by the arrow to attach it.**



## 1.1.2 Folder Structure in a Memory Card

When data of this product is saved to a memory card, the data will be sorted into the following folders. The following table shows the folder structure in a memory card.




| No. | Folder | Description |
|---|---|---|
| ① | BKUP | Folder for saving backups of the basic information of the memory card. |
| ② | COND | Folder for saving and recalling measurement conditions files.<br>Maximum number of files: 500 files |
| ③ | DATA | Folder for saving the measurement results.<br>The DATA folder consists of 20 folders. |
| ④ | FOL-1–FOL-20 | Up to 500 measurement data files can be saved in each of the 20 folders.<br>Only this product can load saved measurement data.<br>Maximum number of files: 10,000 files |
| ⑤ | IMG | Folder for saving bitmap screenshots that were taken with the hardcopy function.<br>Maximum number of files: 500 files |
| ⑥ | TRACE10 | Folder for internal processing. Not accessible to users. |
| ⑦ | USER | Folder for saving the measurement results and calculation results in a text file.<br>The USER folder consists of 20 folders. |
| ⑧ | FOL-1–FOL-20 | Up to 500 text files can be saved in each of the 20 folders.<br>Users can freely access saved text files since the files can be opened with a text editor on the PC. |

## IMPORTANT

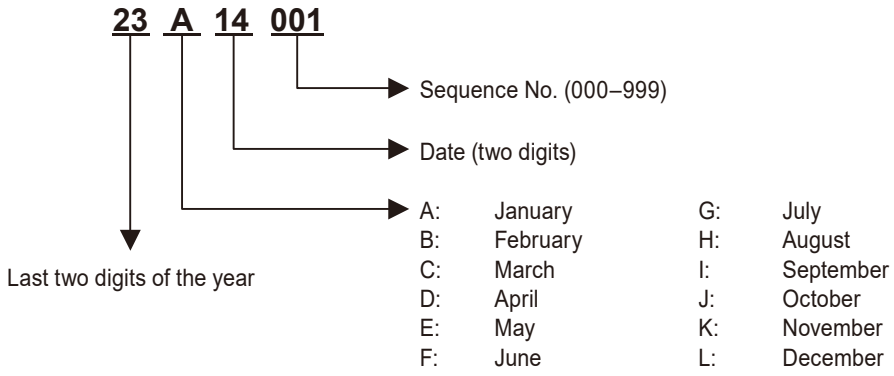
- Only graphic data in the [IMG] folder and text files in the [USER] folder can be read or deleted on a PC using a commercially available card reader.
  Do not modify or delete any files saved in folders other than the [IMG] folder or [USER] folder. Also, do not modify or delete the folders.
  A card access error will occur.
- Note that if a text file in the [USER] folder is edited on a PC, that data will no longer be able to be recalled properly with Mitutoyo communication software.
- The folder names (FOL-1 to FOL-20) can be changed on the [Folder mgmt.] screen, and the changes to the names are reflected only on the screen of this product. The changes are not reflected to the folder names on memory cards.

## Tips

For details about changing the main folder and the names of folders on a memory card, see "1.3 Management of Folders on a Memory Card" on page E-11.

## 1.1.3 Contents Saved on a Memory Card

### ■ Rules for automatically created file names




### ■ Contents of text files

The contents of a text file saved under the default conditions are shown below.

| Stored contents | Description |
|---|---|
| // Header<br>Version;SJ-220 V.1.0.0<br>Date;2009/10/01,02:05:31<br>Mode;ALL | Header<br>Model name, Software version<br>Date of measurement<br>ALL: All data, RES: Calculation result |
| // Condition<br>Standard;ISO1997<br>Profile;R<br>Filter;GAUSS<br>Lc;0.8;mm<br>Ls;2.5;um<br>N;5<br>Pre_Length;ON<br>Speed;0.5;mm/s<br>Range;AUTO<br>GO/NG;Average<br>Pitch;0.5;um | Measurement conditions<br>Measurement standard<br>Profile<br>Filter<br>λc<br>λs<br>Number of sections<br>Pre-travel/post-travel setting<br>Measuring speed<br>Measurement range<br>GO/NG judgment method<br>Sampling pitch |
| // CalcResult<br>Ra;2.936;um;;<br>Rq;3.263;um;;<br>Rz;9.314;um;; | Calculation results<br>Parameter name; Calculation result; Unit; Detailed parameter settings; GO/NG judgment result |

| Stored contents | Description |
|---|---|
| // CalcData | Measurement data |
| 8000 | Number of data points |
| Z | |
| 4.3095 | Data |
| 4.2304 | |
| 4.1510 | |
| 4.0703 | |
| . . . | |

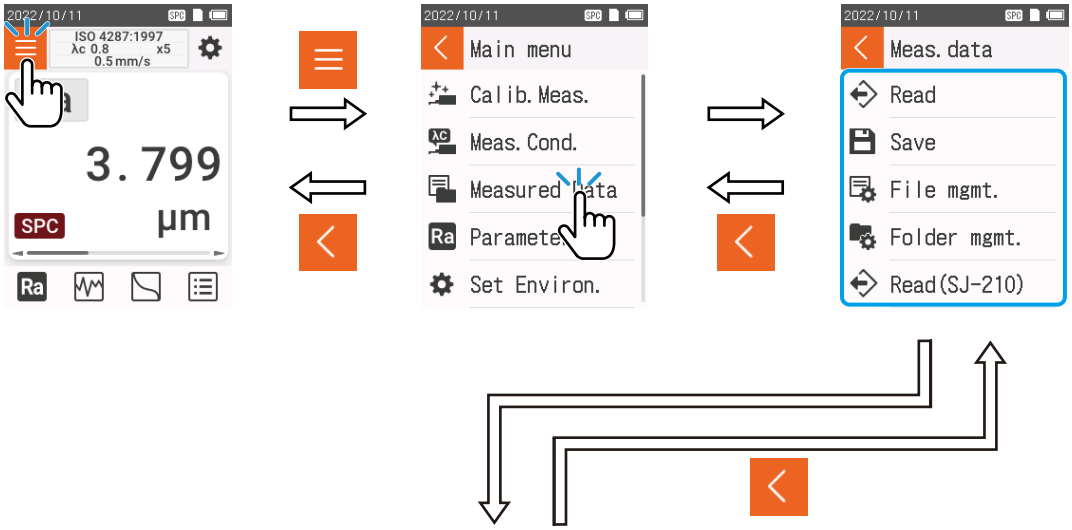
## ■ Image files

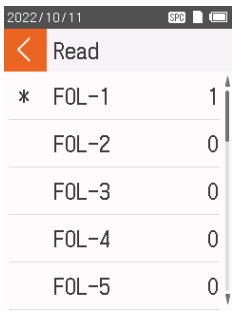
Image files are saved as bitmap files, so they can be read as normal image files by a PC.

# 1.2 Measurement Data Management Screen Transition

**Tips**

To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.

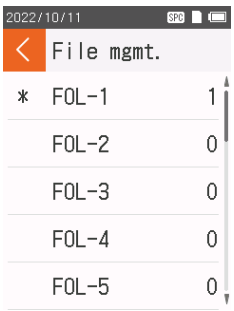



"1.4 Recalling Measurement Data Saved on a Memory Card"




"1.5 Saving Measurement Data to a Memory Card"




"1.6 Deleting Measurement Data Saved on the Memory Card"
"1.7 Renaming Measurement Data Files Saved on the Memory Card"




"1.3 Management of Folders on a Memory Card"




"1.4 Recalling Measurement Data Saved on a Memory Card"

# 1.3 Management of Folders on a Memory Card

The main folder and the names of folders on a memory card can be changed.

## 1.3.1 Renaming Folders

You can rename the folders where measurement data is saved.
Rename folders under [Folder mgmt.].

**IMPORTANT**
The folder names (FOL-1 to FOL-20) can be changed on the [Folder mgmt.] screen, and the changes to the names are reflected only on the screen of this product. The changes are not reflected to the folder names on memory cards.

**Tips**
Folder names cannot include "*", "\", or ".".

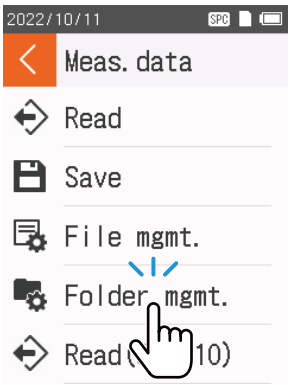
Use the following procedure to rename a folder.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Folder mgmt.].**

» The [Folder mgmt.] screen is displayed.

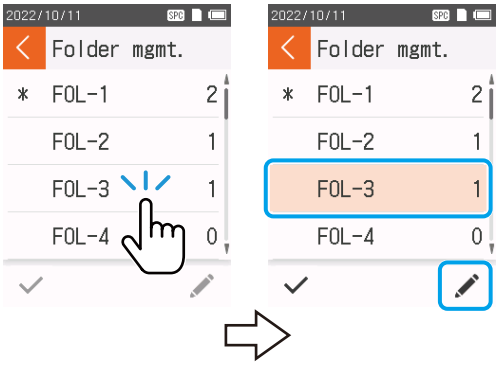



**3 Touch the desired folder name.**

**(Example: Select [FOL-3].)**

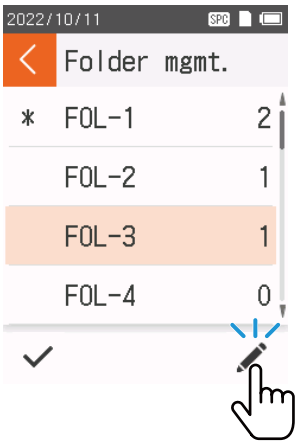
» The field of the folder you touched turns orange.
» (rename) at the bottom of the screen is enabled.

**Tips**
Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.
For details about inputting numerals, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



## 4 Touch (rename).

» The [Folder Rename] screen is displayed.

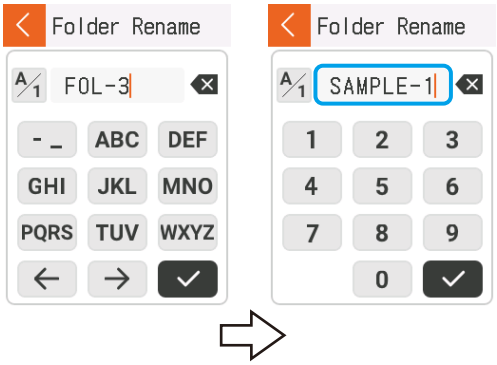



## 5 Enter a name for the folder.

**(Example: Enter "SAMPLE-1".)**

### Tips

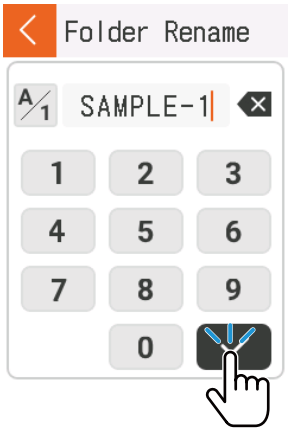
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 6 Touch (confirm).

» The folder is renamed.

» The screen returns to the [Folder mgmt.] screen.



**7** **Check that the change to the folder name is reflected on the [Folder mgmt.] screen.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 1.3.2 Setting the Main Folder on a Memory Card

After measurement, you can save the measurement data in a specified folder (main folder) by pressing the [POWER/DATA] key.

At the time of purchase, [FOL-1] is set as the main folder. This setting can be changed as desired.

**Tips**

For details about the data output settings, see 📖 "2.3 Data Output Setting" on page F-6 in "PART F Environment Settings".

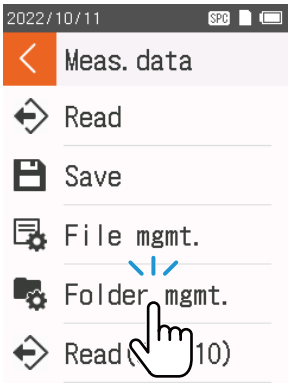
Use the following procedure to change the main folder.

**1 Touch ☰ (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Folder mgmt.].**

» The [Folder mgmt.] screen is displayed.




**3 Touch the desired folder name.**

**(Example: Select [FOL-3].)**

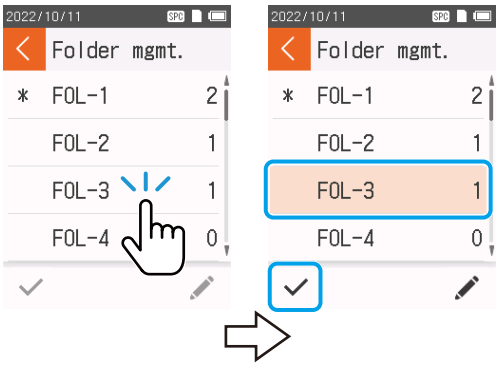
» The field of the folder you touched turns orange.

» ✓ (change the main folder) at the bottom of the screen is enabled.

**Tips**

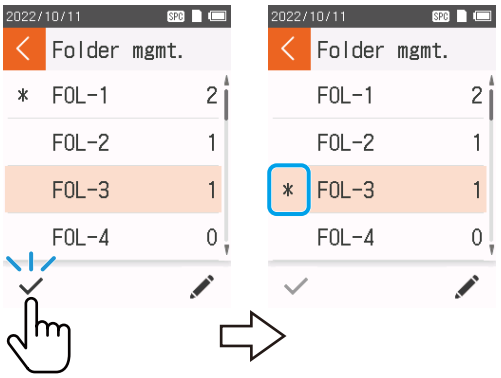
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



## 4 Touch ✓ (change the main folder).

» [*] is displayed before the folder name.
The folder with [*] displayed is now the main folder.




### Tips

- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.

# 1.4 Recalling Measurement Data Saved on a Memory Card

Measurement data saved on a memory card can be recalled.

SJ-210 measurement data saved on a memory card can also be recalled. (Recall data from [Read(SJ-210)] on the [Meas.data] screen.)

When saved measurement data is recalled, the existing data in the internal memory is overwritten with the recalled measurement data, and then the calculation results are displayed.

The following operations can be performed for the loaded results just as for the results obtained through the measurement: recalculating the measurement results by modifying the measurement conditions, printing data on the printer, resaving back to the memory card.

**IMPORTANT**

- When measurement data is recalled, the measurement conditions in the internal memory will be changed to the measurement conditions applied when the measurement data was saved.
- When using the internal battery, make sure it is sufficiently charged. If measurement data is recalled when the remaining capacity in the internal battery is low, this product may turn off while the data is being loaded.

## 1.4.1 Recalling Measurement Data

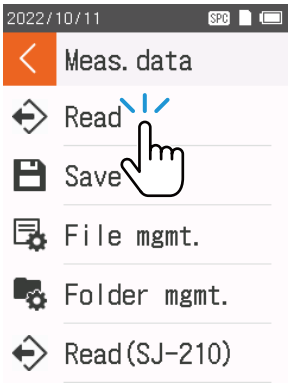
Use the following procedure to recall measurement data.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Read].**

» The [Read] screen is displayed.




**Tips**

To recall SJ-210 measurement data saved on a memory card, touch [Read(SJ-210)].

**3 Touch the desired folder name.**

**(Example: Select [FOL-1].)**

» The [Read Data] screen is displayed under the folder you touched.




**Tips**

- When the auto-save function is ON ( ), measurement data will be automatically saved in the main folder you set in "1.3.2 Setting the Main Folder on a Memory Card" on page E-14. You do not need to manually save the measurement data.
  For details about the auto-save function, see "■ Auto-Save" on page F-43 in "PART F Environment Settings".
- Vertical swiping is available when the vertical scroll bar is displayed on the screen.
  For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**4 Touch the desired measurement data.**

» The measurement data is recalled.
» The screen returns to the Home screen.




**Tips**

Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

## 1.4.2 Searching for Measurement Data to Recall

When several measurement data files are saved in one folder, use the search function to quickly find the measurement data file that you want.

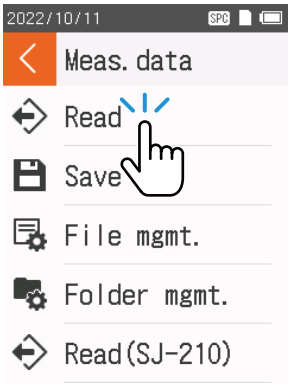
Use the following procedure to search for the measurement data.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Read].**

» The [Read] screen is displayed.




**Tips**

To recall SJ-210 measurement data saved on a memory card, touch [Read(SJ-210)].

**3 Touch the desired folder name.**

**(Example: Select [FOL-1].)**

» The [Read Data] screen is displayed under the folder you touched.




**Tips**

Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**4 Touch (search) at the bottom of the [Read Data] screen.**

» The [Search] screen is displayed.

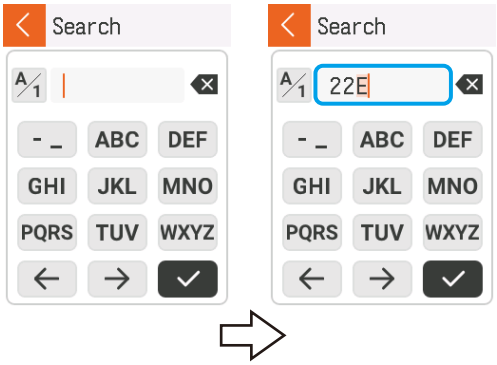


## 5 Enter the file name to search for.

**(Example: Enter "22E".)**

**Tips**

For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

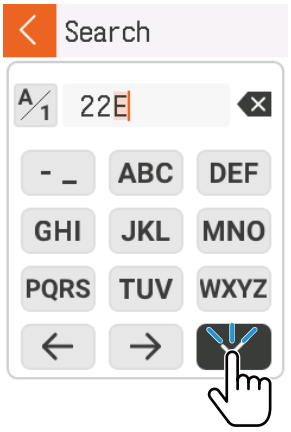



## 6 Touch ✓ (confirm).

» The measurement data files will be filtered based on the entered characters.

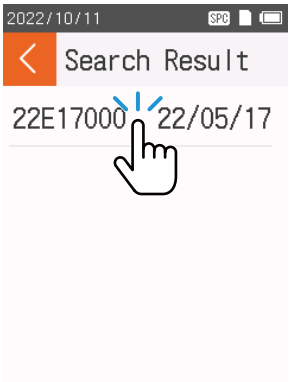
**Tips**

To cancel the filtering operation, touch ‹ (return).




## 7 From the filtered results, touch the measurement data file to recall.

» The measurement data is recalled.
» The screen returns to the Home screen.



# 1.5 Saving Measurement Data to a Memory Card

Measurement results can be saved on the memory card.

**IMPORTANT**

When using the internal battery, make sure it is sufficiently charged. If measurement data is saved when the remaining capacity of the internal battery is low, this product may turn off while the data is being saved.

**Tips**

To load the saved measurement results with Mitutoyo communication software, make sure to save the measurement results in a text file format beforehand. For details, see "■ Saving data in a text file" on page F-42 in "PART F Environment Settings".

## 1.5.1 Saving Measurement Data in a New File

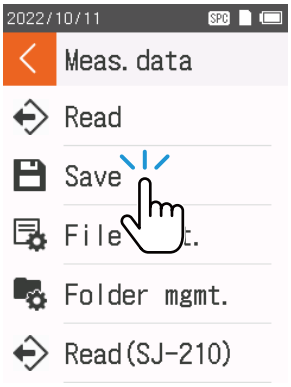
Use the following procedure to save measurement data in a new file.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Save].**

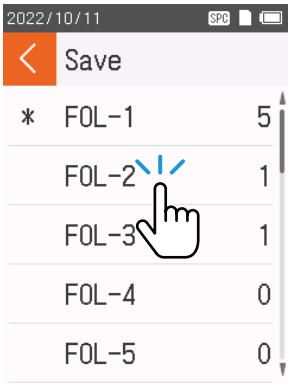
» The [Save] screen is displayed.




**3 Touch the folder where you want to save the measurement data.**

**(Example: Select [FOL-2].)**

» The [Save Data] screen is displayed under the folder you touched.

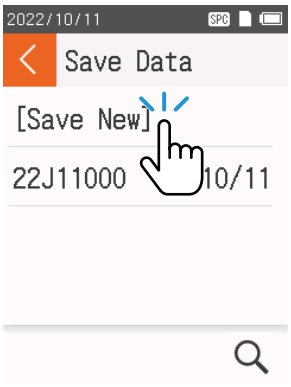


## 4 Touch [Save New].

### Tips

Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.

For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



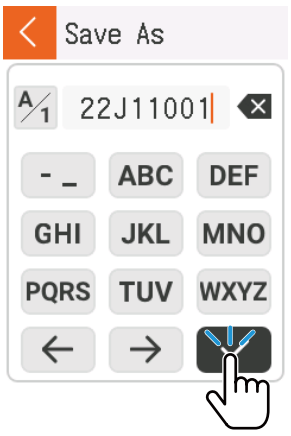

## 5 Enter a file name.

### Tips

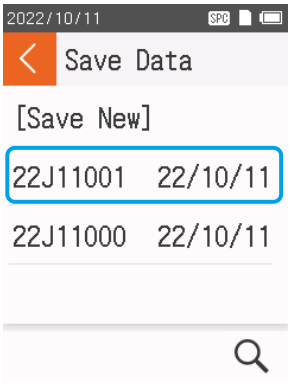
- A default file name is automatically entered, but you can change it as necessary.
- For details about inputting alphanumeric characters, see 📖 "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 6 Touch ✓ (confirm).




» The measurement data is saved in the file with the entered name.




### Tips

- To return to the previous screen, touch < (return).
- To return to the Home screen, press the HOME key.

## 1.5.2 Saving Measurement Data by Overwriting Previously Saved Data

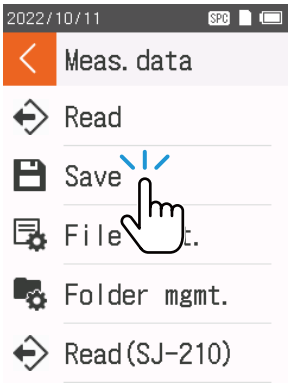
Use the following procedure to save measurement data by overwriting previously saved data.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [Save].**

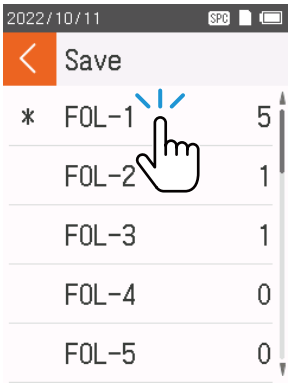
» The [Save] screen is displayed.




**3 Touch the folder where you want to save the measurement data.**

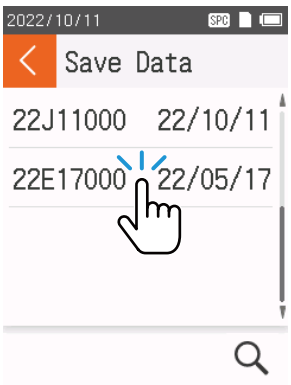
**(Example: Select [FOL-1].)**

» The [Save Data] screen is displayed under FOL-1.




**4 Touch the measurement data to overwrite.**

» A message screen is displayed.

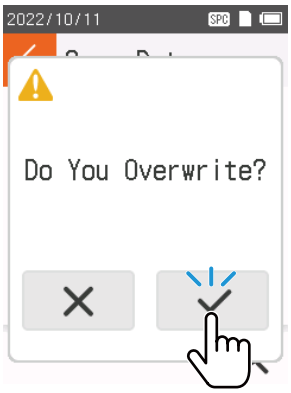



**Tips**

- Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends. For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".
- You can search for the measurement data to overwrite. For details about how to search, see "1.4.2 Searching for Measurement Data to Recall" on page E-18.

**5** **Touch ✓ (confirm).**

» The measurement data is saved, overwriting the previously saved data.




### Tips

- To cancel the overwriting and saving operation, touch ✕ (cancel).
- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.

# 1.6 Deleting Measurement Data Saved on the Memory Card

It is possible to delete the measurement results saved on the memory card.

**IMPORTANT**

When using the internal battery, make sure it is sufficiently charged. If measurement data is deleted when the remaining capacity of the internal battery is low, this product may turn off while the data is being deleted.

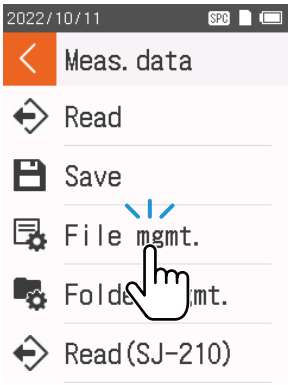
Use the following procedure to delete measurement data saved on the memory card.

**1** **Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2** **Touch [File mgmt.].**

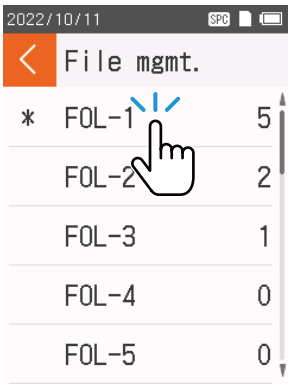
» The [File mgmt.] screen is displayed.




**3** **Touch the folder with the measurement data to delete.**

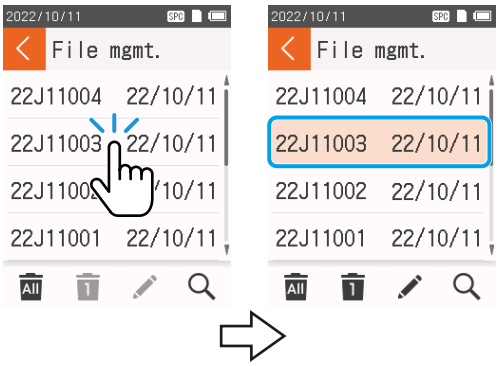
**(Example: Select [FOL-1].)**

» The [File mgmt.] screen is displayed under the folder you touched.



## 4 Touch the file name of the measurement data to delete.

» The field of the measurement data file name you selected turns orange.




## 5 At the bottom of the screen, touch 1 (single file deletion).

» A message screen is displayed.



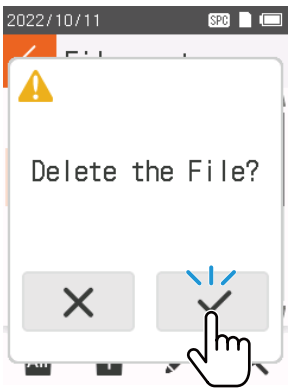

### Tips

- To delete all the saved measurement data, touch All (delete all).
  It may take several minutes to delete all the files found by searching.
- You can search for measurement data to delete. For details about how to search, see "1.4.2 Searching for Measurement Data to Recall" on page E-18.
- Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.
  For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

## 6 Touch ✓ (confirm).

### Tips

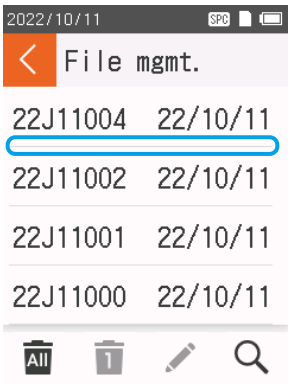
To cancel the deletion, touch ✕ (cancel).



» The measurement data you selected is deleted.

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 1.7 Renaming Measurement Data Files Saved on the Memory Card

It is possible to modify the file name of the measurement results saved on the memory card.

**IMPORTANT**

When using the internal battery, make sure it is sufficiently charged. If a measurement data file is renamed when the remaining capacity of the internal battery is low, this product may turn off while the name is being changed.

**Tips**

File names cannot include "*", "\", or ".".

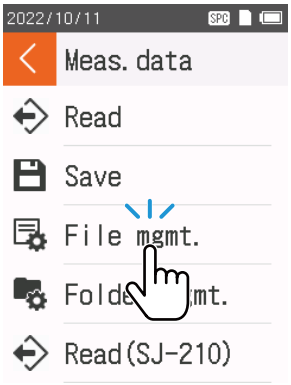
Use the following procedure to rename a measurement data file saved on the memory card.

**1 Touch (main menu) on the Home screen and then [Measured Data].**

» The [Meas.data] screen is displayed.

**2 Touch [File mgmt.].**

» The [File mgmt.] screen is displayed.




**3 Touch the folder with the measurement data file you want to rename.**

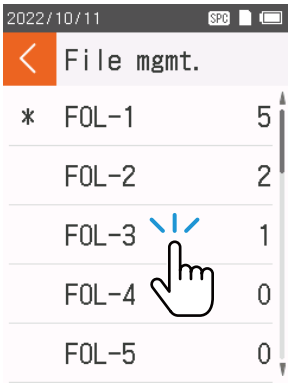
**(Example: Select [FOL-3].)**

» The [Read Data] screen is displayed under the folder you touched.

**Tips**

Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



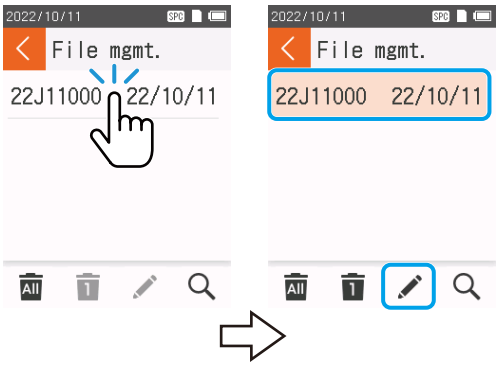



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## 4 Touch the measurement data file to rename.

» The field of the measurement data you touched turns orange.

» (rename) at the bottom of the screen is enabled.




### Tips

- You can search for the measurement data file to rename. For details about how to search, see "1.4.2 Searching for Measurement Data to Recall" on page E-18.
- Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends. For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

## 5 Touch (rename).

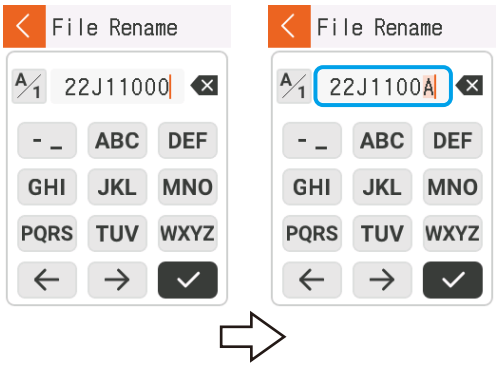
» The [File Rename] screen is displayed.




## 6 Enter a file name.

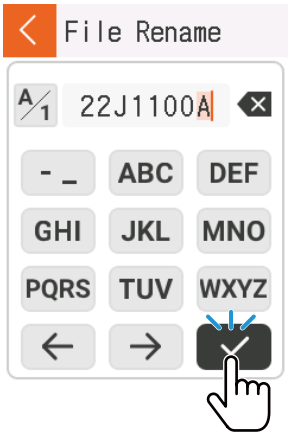
### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".



## 7 Touch (confirm).

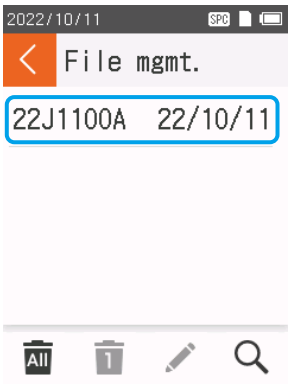
» The new file name is set.
» The screen returns to the [File mgmt.] screen.




## 8 Check that the change to the file name is reflected on the [File mgmt.] screen.

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



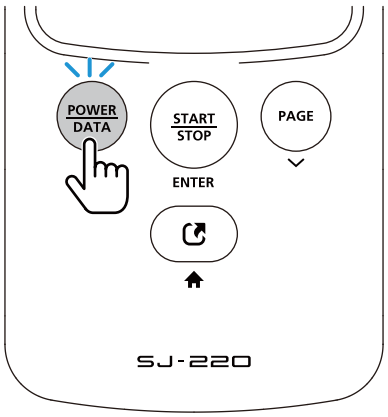
# 2 Saving or Outputting Measurement Results Using the [POWER/DATA] Key

By pressing the [POWER/DATA] key, you can save or output measurement data according to the data output type specified beforehand.

You can also choose to disable data output ([NONE]).

**Tips**

Specify the data output type from the [Set Environ.] screen. For details, see "2.3 Data Output Setting" on page F-6 in "PART F Environment Settings".




| Data output type | Description |
|---|---|
| SPC | Measurement results are output to a Digimatic Mini-Processor (optional accessory).<br>Connect a Digimatic Mini-Processor (optional accessory) beforehand.<br>**Tips**<br>For details, see "2.1 SPC Data Output" on page E-32. |
| Printer | Measurement results are output to a printer.<br>Set the communication conditions beforehand.<br>**Tips**<br>For details, see "2.2 Printing with an External Printer" on page E-38. |
| DataStora. | Measurement results can be saved on the memory card.<br>(The file name is automatically registered.)<br>**Tips**<br>• A memory card (optional accessory) is required as the save location.<br>• For details, see "2.3.1 Saving Measurement Data" on page E-45. |

| Data output type | Description |
|---|---|
| Hard copy | The displayed screen is saved to the memory card as image data<br>(The file name is automatically registered.)<br>**Tips**<br>• A memory card (optional accessory) is required as the save location.<br>• Screenshots cannot be made of the [Daily menu] screen or the [Read Cond.] screen displayed from the [Daily menu] screen.<br>• For details, see "2.3.2 Saving a Screenshot" on page E-47. |
| NONE | No data is output when the [POWER/DATA] key is pressed.<br>Set [NONE] when you will not use the [POWER/DATA] key, or when you want to select the data output destination or save location each time you output data. |

# 2.1 SPC Data Output

By connecting this product to a Digimatic Mini-Processor (optional accessory) with a Digimatic connection cable (1 m), measurement results can be output from this product via SPC to the Digimatic Mini-Processor (optional accessory) and printed.

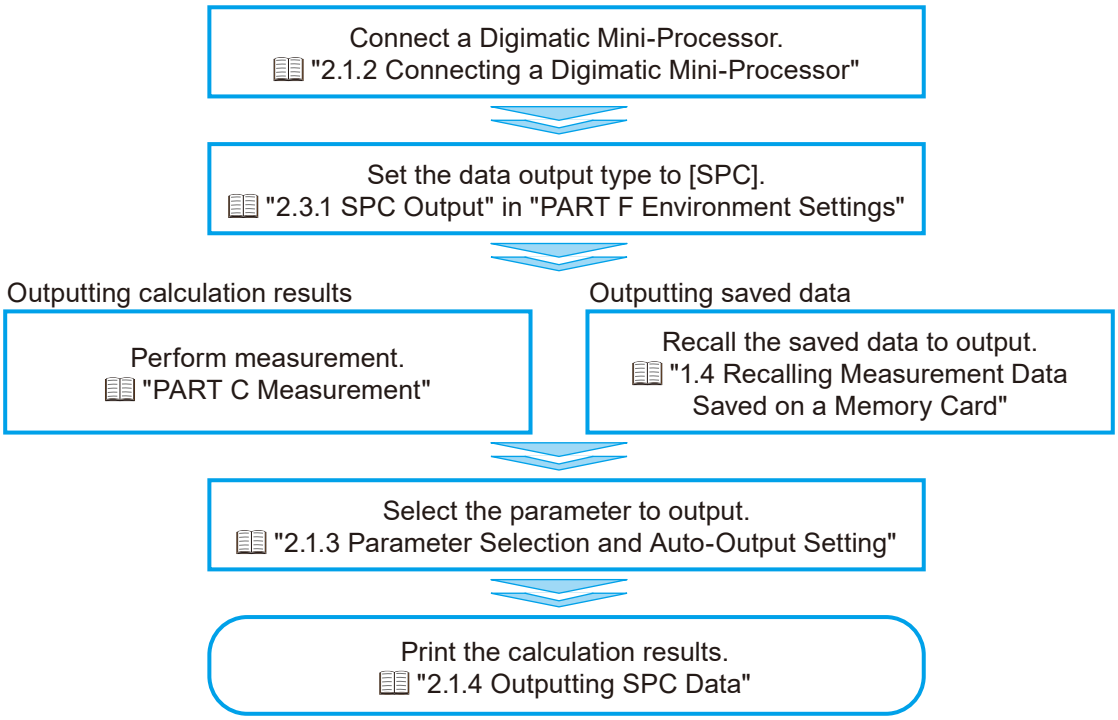
Measurement data saved on a memory card can also be printed with a Digimatic Mini-Processor (optional accessory) after the measurement data has been recalled with this product.

**IMPORTANT**

- Only parameter calculation results with the SPC mark (SPC) can be output via SPC. Other data such as parameter names is not output.
- When outputting parameter calculation results for printing, etc., be careful not to include data obtained with differing parameters.
  Note that an error may occur if multiple pieces of parameter data with differing units or differing decimal separator positions are output to a Digimatic Mini-Processor (optional accessory) via SPC.

## 2.1.1 SPC Data Output

The following shows the workflow related to SPC data output.



## 2.1.2 Connecting a Digimatic Mini-Processor

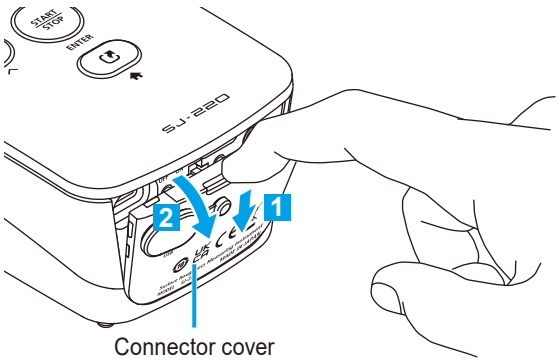
**IMPORTANT**

- Before connecting this product to a Digimatic Mini-Processor (optional accessory), disable the unit setting for the Digimatic Mini-Processor. For details, see the separate "User's Manual for Digimatic Mini-Processor".
- The tolerance settings and GO/NG judgment function of the Digimatic Mini-Processor (optional accessory) cannot be used.

This section explains the procedure for connecting this product to a Digimatic Mini-Processor with a Digimatic connection cable (1 m) (optional accessory).

**1 Insert a fingernail into the recess located at the top of the connector cover on the rear of the display unit, and push down the connector cover in the direction indicated by the arrow.**

**2 Open the connector cover in the direction indicated by the arrow to remove it.**

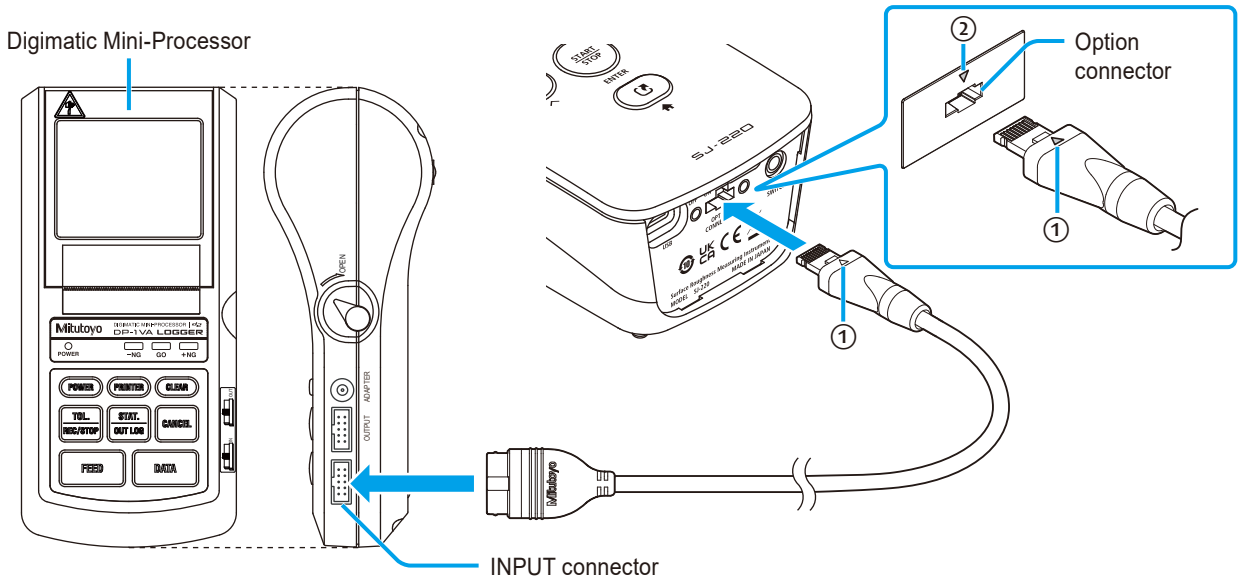



**3 Connect this product to the Digimatic Mini-Processor (optional accessory) with the dedicated Digimatic connection cable (optional accessory).**

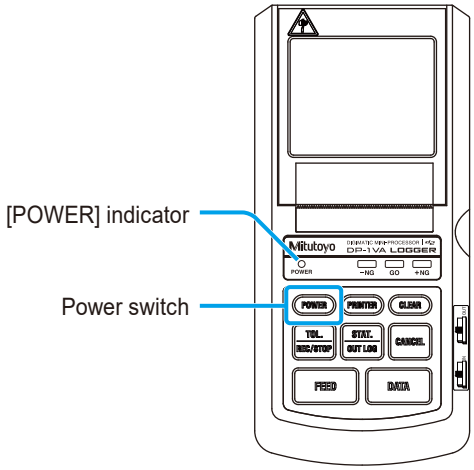
**NOTICE**

**There is a risk that this product or connected devices may malfunction.**

When inserting the cable connector that corresponds to the option connector, insert it with the △ mark (①) facing up.
If the cable connector is inserted with the △ mark (①) facing down, the connected devices or this product may malfunction. (The option connector of this product has a ▽ mark (②). Use this mark as a guide when aligning the positions.)




**4** **Turn on the power to the Digimatic Mini-Processor (optional accessory).**




**5** **Specify [SPC] for the data output setting of this product, and set Auto-Output to ON ( ).**

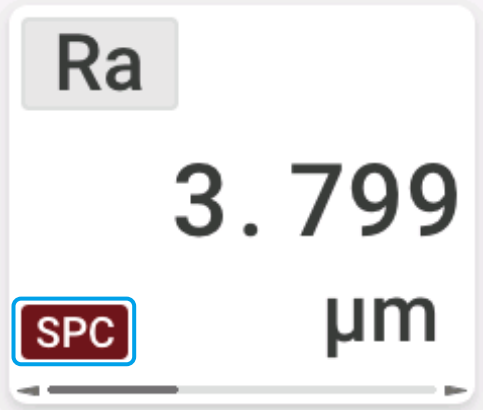
**Tips**

For details about setting the SPC data output, see "2.3.1 SPC Output" on page F-7 in "PART F Environment Settings".

## 2.1.3 Parameter Selection and Auto-Output Setting

Select the parameters for SPC output.
Parameters where the SPC mark ( SPC ) is displayed with the calculation result on the Home screen can be output via SPC.

At the time of purchase, [SPC] is set as the default value of the data output type. However, this section explains the procedure to change the data output type from [Printer] to [SPC], assuming that the set data output type is [Printer].

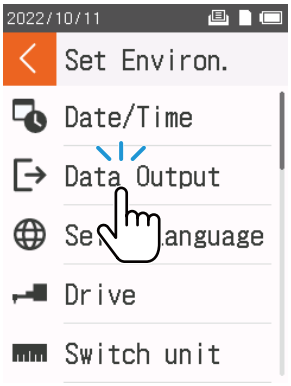



**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

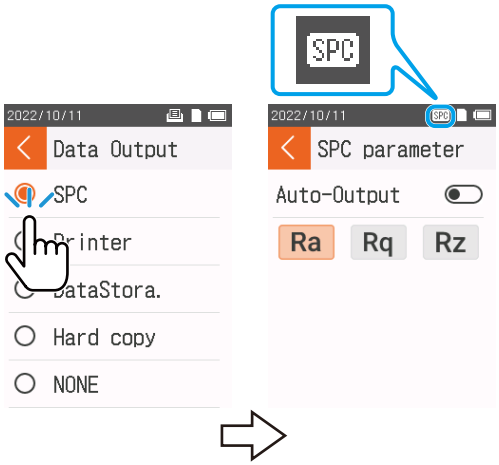
**2 Touch [Data Output].**

» The [Data Output] screen is displayed.



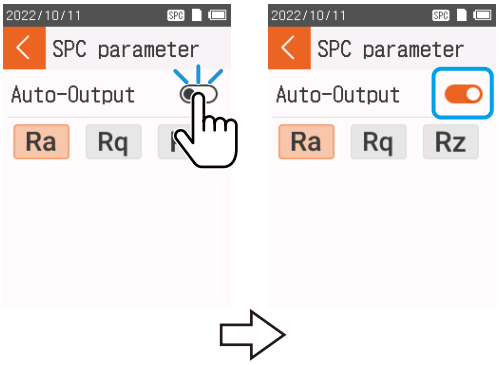

**3 Touch the option button for [SPC].**

» The [SPC parameter] screen is displayed.
» The SPC (SPC) icon is displayed on the status bar.



**4** **Touch the ON/OFF button for [Auto-Output] to switch between ON ( ) and OFF ( ).**
**(Example: Set the button to ON ( ).)**

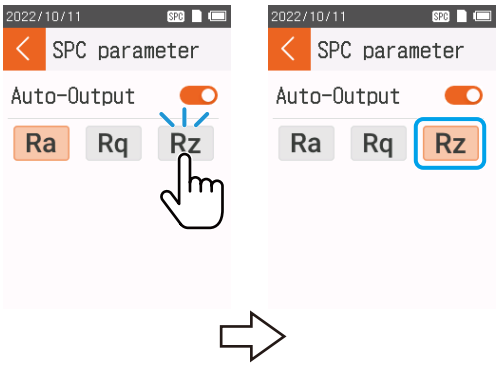
**Tips**
Touching the ON/OFF button toggles between ON ( ) and OFF ( ).




**5** **Touch the parameter for SPC output.**

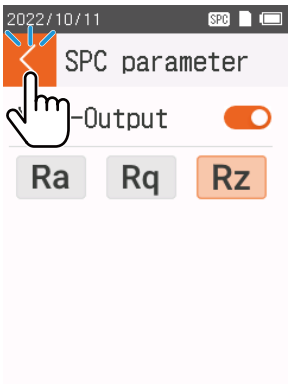
» The parameter you touched is selected.

**Tips**
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.




**6** **Touch (return).**

» The screen returns to the [Data Output] screen.




**7** **Check that the SPC mark ( SPC ) is displayed on the Home screen (calculation result of the parameter that you set).**

**Tips**
To display the Home screen, press the HOME key.



## 2.1.4 Outputting SPC Data

To output measurement results from this product to a Digimatic Mini-Processor (optional accessory), specify [SPC] as the data output setting of this product.

After measurement, the measurement results are output when you press the [POWER/DATA] key of this product or the [DATA] key of the Digimatic Mini-Processor (optional accessory).

**Tips**

- For details about connecting this product to a Digimatic Mini-Processor, see "2.1.2 Connecting a Digimatic Mini-Processor" on page E-33.
- For details about the data output settings, see "2.3.1 SPC Output" on page F-7 in "PART F Environment Settings".
- You can also recall saved measurement data and output the measurement results. For details about recalling measurement data, see "1.4 Recalling Measurement Data Saved on a Memory Card" on page E-16.

This section explains the procedure for outputting measurement results to a Digimatic Mini-Processor (optional accessory).

**1 Measure the workpiece.**

**Tips**

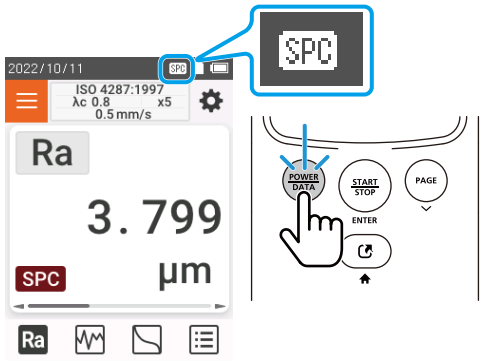
For details about the measurement, see "PART C Measurement".

**2 Press the [POWER/DATA] key of this product or the [DATA] key of the Digimatic Mini-Processor (optional accessory).**

» The measurement results are output and printed with the Digimatic Mini-Processor (optional accessory).

**Tips**

For details about the functions of the Digimatic Mini-Processor (optional accessory), see the separate "User's Manual for Digimatic Mini-Processor".



# 2.2 Printing with an External Printer

By connecting this product to a printer with an RS-232C communication cable (Part No. 12AAY688) (optional accessory), measurement conditions, calculation results, evaluation profiles, and BAC/ADC graphs can be printed.

**Tips**

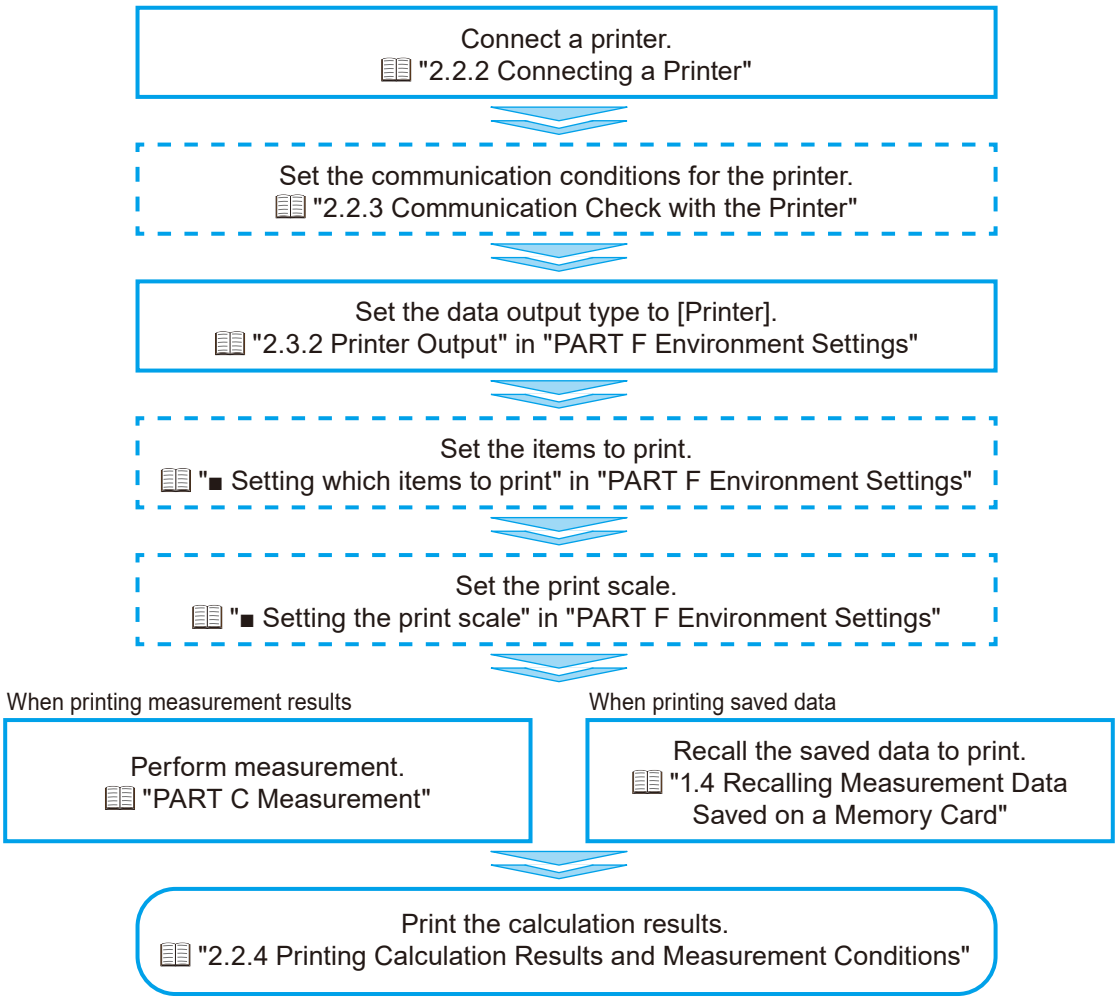
You can load saved measurement data and print the results.

For details about recalling measurement data, see "1.4 Recalling Measurement Data Saved on a Memory Card" on page E-16.

## 2.2.1 Print Setting Flow

The workflow for printing measurement results is shown below.

There are two types of operations: general operations and operations on demand. The former is performed regularly and the latter is performed as required. Perform the operations in the solid line frames regularly. Perform the operations in the dashed line frames as required.

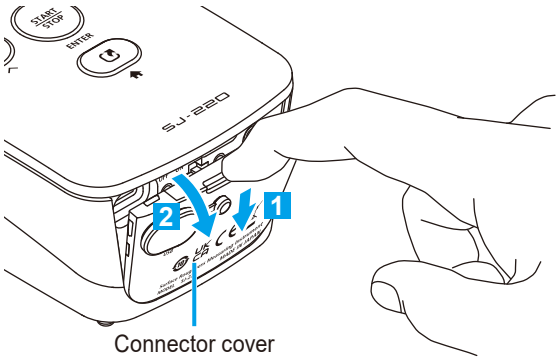


## 2.2.2 Connecting a Printer

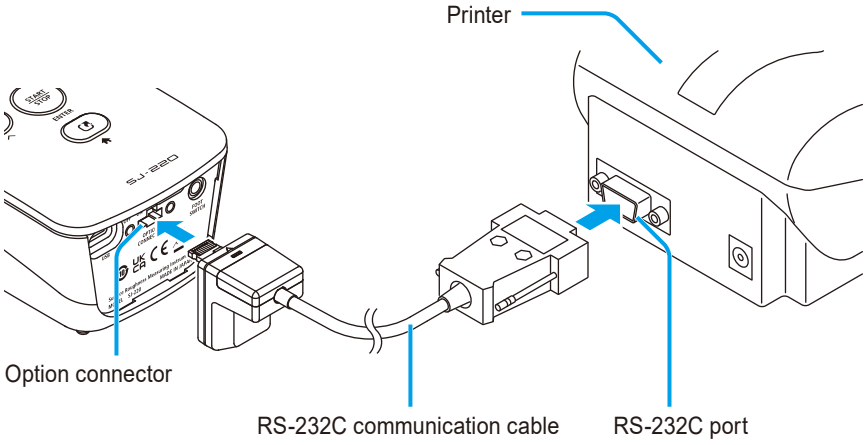
Connect this product to a printer with an RS-232C communication cable (Part No. 12AAY688) (optional accessory) to print with the printer.

**1 Insert a fingernail into the recess located at the top of the connector cover on the rear of the display unit, and push down the connector cover in the direction indicated by the arrow.**

**2 Open the connector cover in the direction indicated by the arrow to remove it.**




**3 Connect the option connector on the rear of the display unit of this product to the RS-232C port of the printer with the RS-232C communication cable (optional accessory).**




**4 Turn on the power to the printer.**

## 2.2.3 Communication Check with the Printer

When connecting this product to the printer for the first time, connect the printer to this product, and then perform a communication check.

By performing a communication check, the communication settings for the printer will be automatically configured, and the connected printer will be ready for printing.

**Tips**

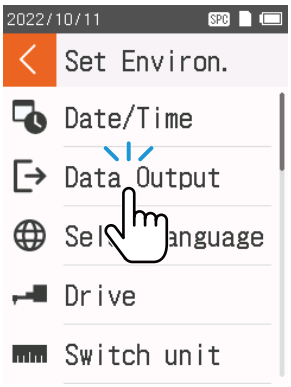
For details about connecting a printer to this product, see "2.2.2 Connecting a Printer" on page E-39.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.




**3 Touch the option button for [Printer].**

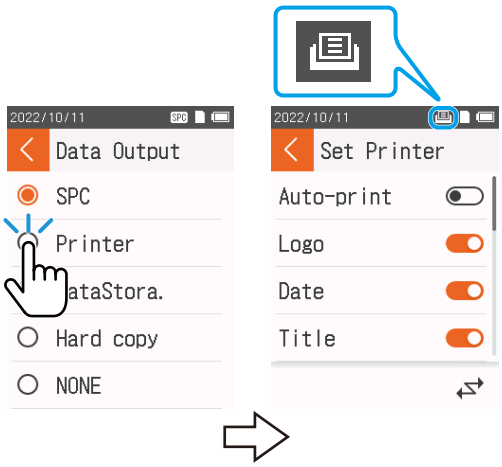
» The [Set Printer] screen is displayed.

» The (printer) icon is displayed on the status bar.

**Tips**

At the time of purchase, [SPC] is set as the data output type by default.

To print with the printer, be sure to change the data output type to [Printer].






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**4** **At the bottom of the screen, touch (communication check).**

» A message screen is displayed.

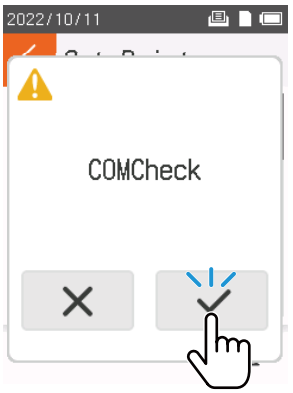



**5** **Touch (confirm).**

» A message screen is displayed.

» A communication check is performed, and then the communication settings for the printer are automatically configured.

» When the communication check is complete and the communication settings for the printer have been configured, the [Restart Printer] message screen is displayed.




**Tips**

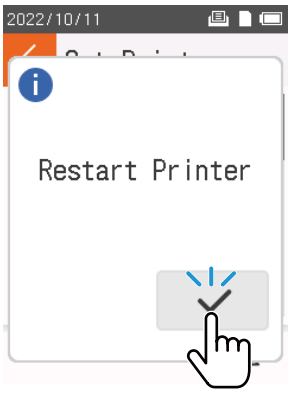
- To cancel the communication check, touch (cancel).
- If an error message is displayed after the communication check, set the communication conditions for the printer as shown in the following table. For details about how to configure the settings, see the User's Manual for the printer.

| Setup item | Setting value |
|---|---|
| COMMAND MODE | MODE A |
| BAUD RATE | 38400 bps |
| BIT LENGTH | 8 bit |
| PARITY | NON |
| BUSY CONTROL | RTS/CTS |

**6** **Touch ✓ (confirm).**

**Tips**

- To return to the previous screen, touch < (return).
- To return to the Home screen, press the HOME key.




**7** **Restart the printer.**

» The printer can now be used.

## 2.2.4 Printing Calculation Results and Measurement Conditions

When the data output type is set to [Printer], you can print calculation results and measurement conditions with the printer by pressing the [POWER/DATA] key.

**Tips**

- For details about connecting a printer to this product, see "2.2.2 Connecting a Printer" on page E-39.
- For details about the data output settings, see "2.3.2 Printer Output" on page F-9 in "PART F Environment Settings".
- You can load saved measurement data and print the calculation results. For details about recalling measurement data, see "1.4 Recalling Measurement Data Saved on a Memory Card" on page E-16.

**1** **Change the data output setting to [Printer].**

**2** **Measure the workpiece.**

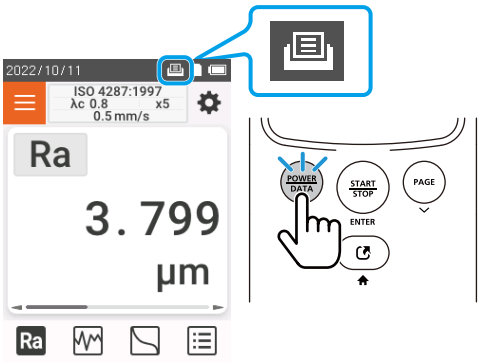
**Tips**

For details about the measurement, see "PART C Measurement".

**3** **Display the calculation results you want to output.**

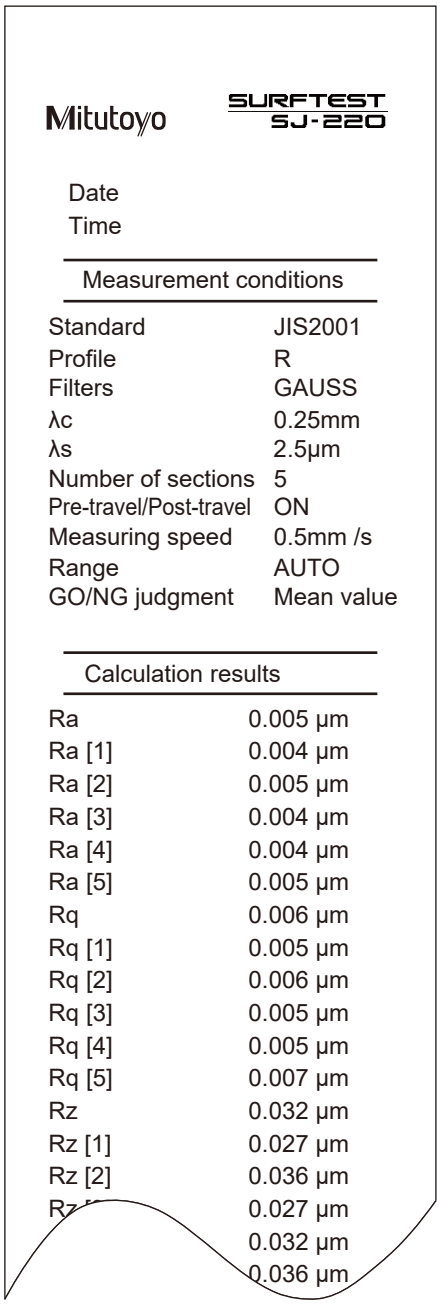
**4** **Press the [POWER/DATA] key.**

» The calculation results are printed with the printer.



## ■ Print example

The following shows an example of printed output from this product. (Example results from a receipt printer)



Mitutoyo SURFTEST SJ-220

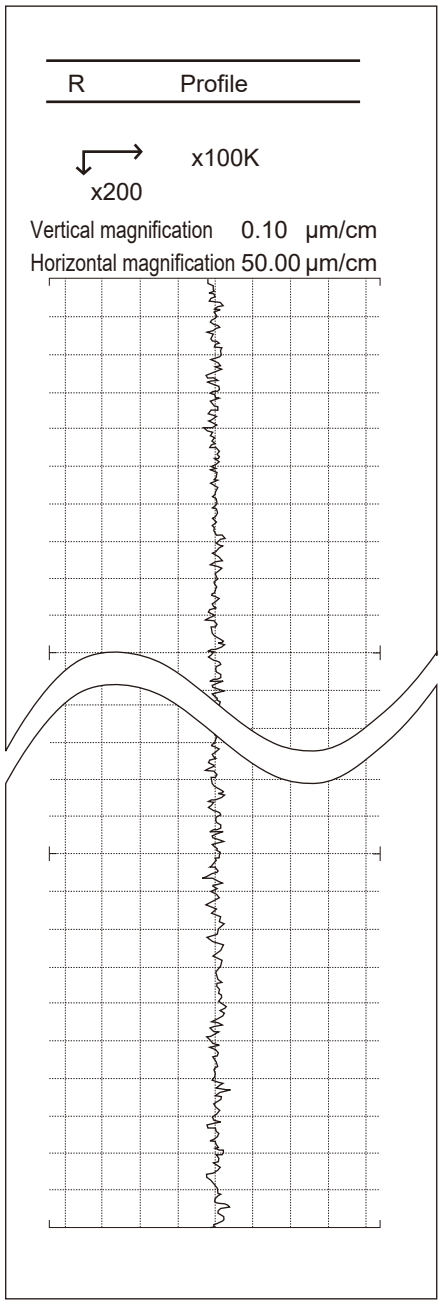
Date
Time

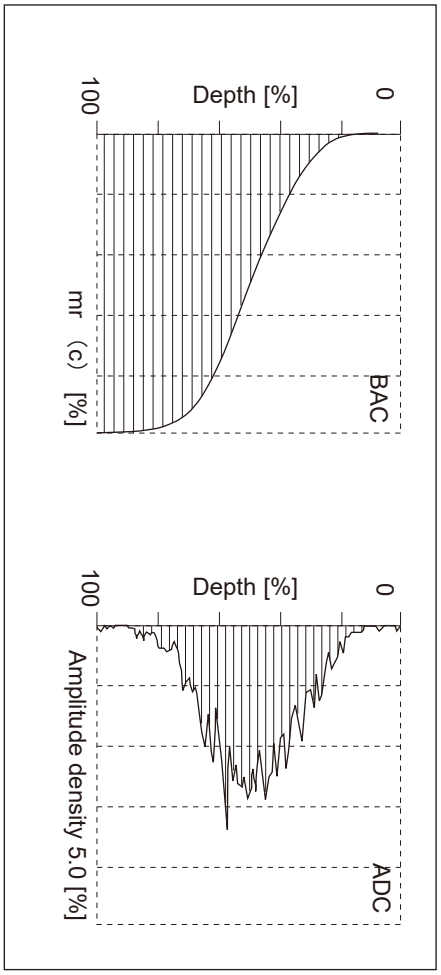
Measurement conditions

| | |
|---|---|
| Standard | JIS2001 |
| Profile | R |
| Filters | GAUSS |
| λc | 0.25mm |
| λs | 2.5μm |
| Number of sections | 5 |
| Pre-travel/Post-travel | ON |
| Measuring speed | 0.5mm /s |
| Range | AUTO |
| GO/NG judgment | Mean value |

Calculation results

| | |
|---|---|
| Ra | 0.005 μm |
| Ra [1] | 0.004 μm |
| Ra [2] | 0.005 μm |
| Ra [3] | 0.004 μm |
| Ra [4] | 0.004 μm |
| Ra [5] | 0.005 μm |
| Rq | 0.006 μm |
| Rq [1] | 0.005 μm |
| Rq [2] | 0.006 μm |
| Rq [3] | 0.005 μm |
| Rq [4] | 0.005 μm |
| Rq [5] | 0.007 μm |
| Rz | 0.032 μm |
| Rz [1] | 0.027 μm |
| Rz [2] | 0.036 μm |
| Rz [3] | 0.027 μm |
| | 0.032 μm |
| | 0.036 μm |



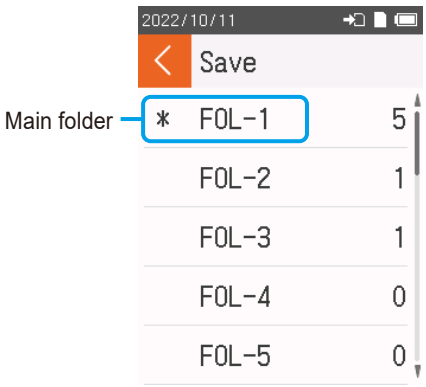
# 2.3 Saving Data to the Memory Card

When the data output type is set to [DataStora.] or [Hard copy], you can save measurement data or the displayed screen to a memory card by pressing the [POWER/DATA] key.

## 2.3.1 Saving Measurement Data

While the data output type is set to [DataStora.], you can save measurement data to a memory card by pressing the [POWER/DATA] key.

Measurement data is saved in a designated folder in the main folder.




**Tips**

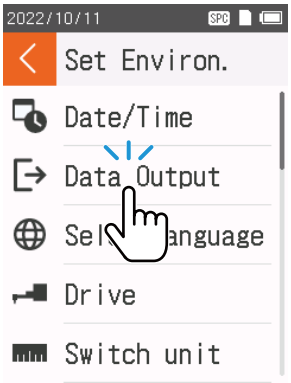
- When you save measurement data for the first time after the power is turned on, the saving process may take some time.
- The * displayed to the left of a folder means it is the main folder.
  For details about specifying the main folder, see "1.3.2 Setting the Main Folder on a Memory Card" on page E-14.
- For details about the data output settings, see "2.3.3 Saving Data" on page F-17 in "PART F Environment Settings".

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

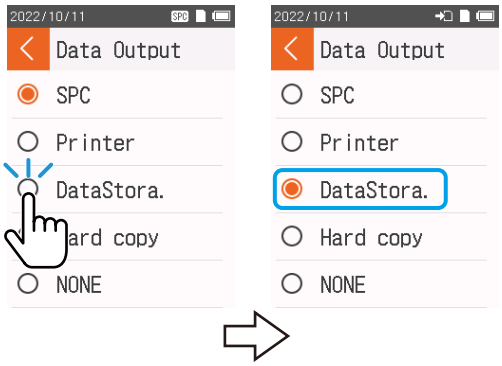
**2 Touch [Data Output].**

» The [Data Output] screen is displayed.



## 3 Touch the option button for [DataStora.].

» The option button for [DataStora.] is selected.



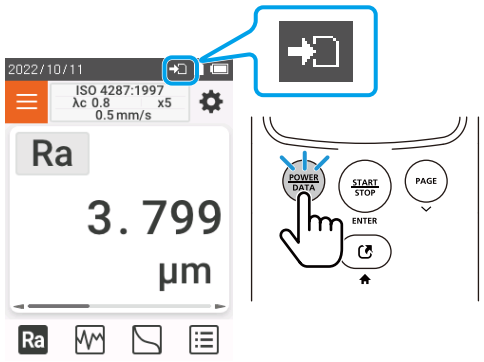

## 4 Measure the workpiece.

**Tips**

For details about the measurement, see 📖 "PART C Measurement".

## 5 Press the [POWER/DATA] key.

» The measurement data is saved in the folder that was specified as the main folder of the memory card.



## 2.3.2 Saving a Screenshot

When the data output type is set to [Hard copy], you can capture the currently displayed screen and save it to a memory card by pressing the [POWER/DATA] key.

When the data output type is not set to [Hard copy], press the [POWER/DATA] key and the [PAGE] key at the same time to capture the displayed screen and save it to a memory card.

Image data is saved in the [IMG] folder on the memory card as BMP data.

Image data can be imported to a PC using Mitutoyo communication software or a commercially available SD card reader (memory card reader).

**Tips**

For details about the data output settings, see "2.3.4 Hard Copy (Screenshot)" on page F-19 in "PART F Environment Settings".

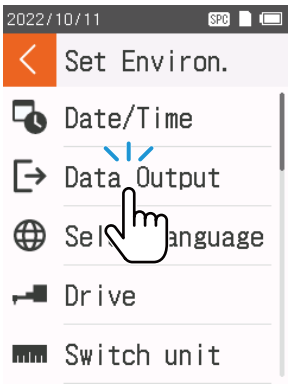
### ■ When the data output type is set to [Hard copy]

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

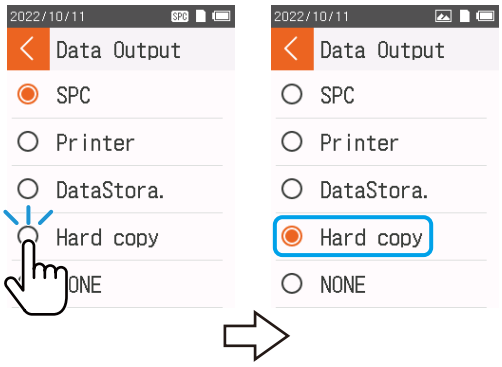
**2 Touch [Data Output].**

» The [Data Output] screen is displayed.




**3 Touch the option button for [Hard copy].**

» The option button for [Hard copy] is selected.



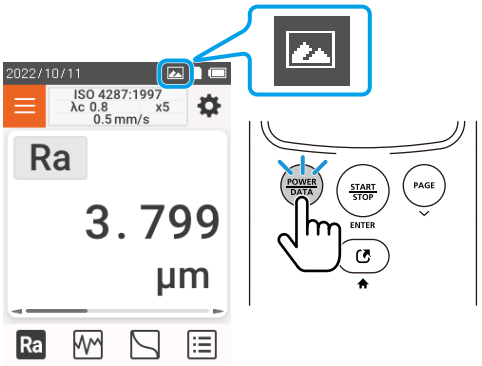

**4 Display the screen you want to capture.**

**5** **Press the [POWER/DATA] key.**

» A screenshot is saved to the memory card as image data (BMP data).

**Tips**

For details, see "1.1.2 Folder Structure in a Memory Card" on page E-6 and "1.1.3 Contents Saved on a Memory Card" on page E-8.




## ■ When the data output type is not set to [Hard copy]

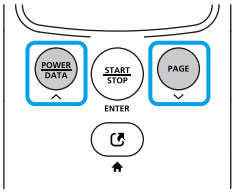
**1** **Display the screen you want to capture.**

**2** **Press the [POWER/DATA] key and the [PAGE] key at the same time.**

» A screenshot is saved to the memory card as image data (BMP data).

**Tips**

For details, see "1.1.2 Folder Structure in a Memory Card" on page E-6 and "1.1.3 Contents Saved on a Memory Card" on page E-8.



# 3 Communication with an External Device Using a Wireless Communication Unit for Measuring Instruments

When a wireless communication unit for measuring instruments (optional accessory) is connected to this product, you can use wireless communication (Bluetooth) to export measurement results, etc., from this product to a terminal device (PC, smartphone, tablet computer) where a dedicated application is installed.

Using the dedicated application, you can manage measurement data and create inspection reports based on the exported measurement results.

Also, you can transmit various settings, such as measurement conditions, from the terminal device to this product via wireless communication (Bluetooth) to modify the settings within this product.

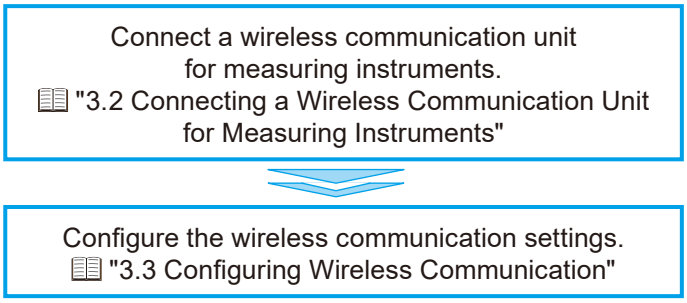
**Tips**

The wireless communication unit for measuring instruments is an optional accessory (Code No. 264-628).

For details about the wireless communication unit for measuring instruments, see 📖 the "User's Manual for Wireless Communication Unit for Measuring instrument".

## 3.1 Flow of Communication with an External Device Using a Wireless Communication Unit for Measuring Instruments

The workflow for setting up the wireless communication unit for measuring instruments (optional accessory) with this product is shown below.




**Tips**

You can reset the settings of a wireless communication unit for measuring instruments (optional accessory).

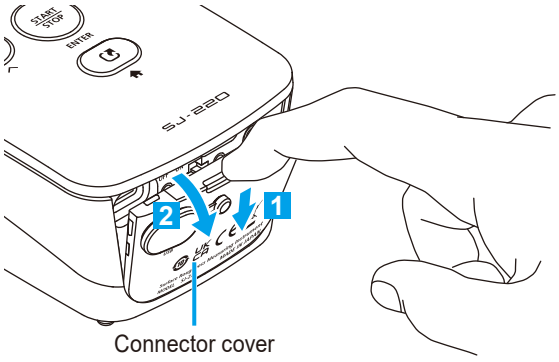
For details, see 📖 "3.4 Resetting the Settings of a Wireless Communication Unit for Measuring Instruments" on page E-54.

# 3.2 Connecting a Wireless Communication Unit for Measuring Instruments

Connect a wireless communication unit for measuring instruments to this product.
The power to the wireless communication unit for measuring instruments is supplied from this product.

**1 Insert a fingernail into the recess located at the top of the connector cover on the rear of the display unit, and push down the connector cover in the direction indicated by the arrow.**

**2 Open the connector cover in the direction indicated by the arrow to remove it.**

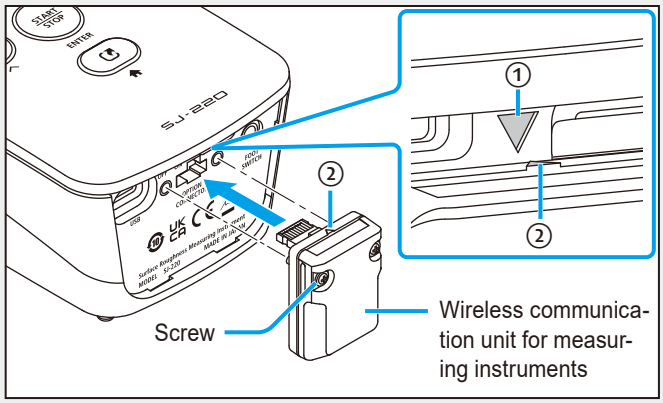



**3 Connect the wireless communication unit for measuring instruments to the option connector of this product.**

**NOTICE**

**There is a risk that this product or connected devices may malfunction.**

- Before connecting or disconnecting the wireless communication unit for measuring instruments, turn off the power to this product.
- When inserting the cable connector that corresponds to the option connector, insert it with the △ mark (①) facing up. If the cable connector is inserted with the △ mark (①) facing down, the connected devices or this product may malfunction. If the cable connector is inserted with the ▽ mark (②) facing down, the connected devices or this product may malfunction.




**4 Fasten the two screws with the screwdriver to secure the wireless communication unit for measuring instrument to this product.**

**Tips**

- The screwdriver and screws are included with the wireless communication unit for measuring instruments.
- Prescribed tightening torque: 8 cN·m to 12 cN·m

# 3.3 Configuring Wireless Communication

To use the wireless communication unit for measuring instruments, configure the wireless communication settings on this product and the terminal device.

**IMPORTANT**

If you press the [START/STOP] key of this product while a wireless communication unit for measuring instruments (optional accessory) is connected and the option button for [Power] on the [Wireless] screen is set to ON, a message screen is displayed asking you whether to start the reset operation.

If you do not wish to start the reset operation, touch ✕ (cancel).

For details about resetting the settings of a wireless communication unit for measuring instruments (optional accessory), see "3.4 Resetting the Settings of a Wireless Communication Unit for Measuring Instruments" on page E-54.

**Tips**

- At the time of purchase, the power to the wireless communication unit for measuring instrument is set to ON ( ).
  You can set the device name only when the power is set to OFF ( ).
- For details about connecting this product to a wireless communication unit for measuring instruments, see "3.2 Connecting a Wireless Communication Unit for Measuring Instruments" on page E-50.

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

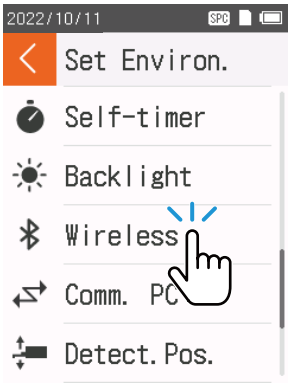
**2 Touch [Wireless].**

» The [Wireless] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



## 3 Set [Power] to OFF ( ).

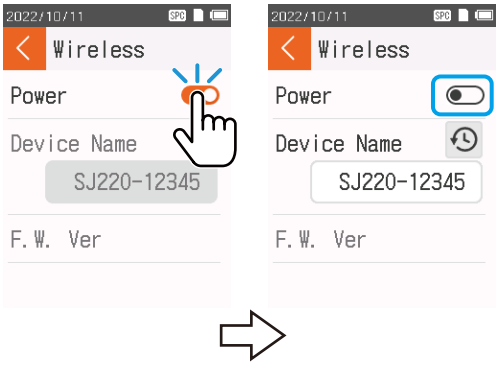
**IMPORTANT**

The power to the wireless communication unit for measuring instrument is supplied from this product.

To prevent draining the internal battery of this product, set the power to OFF ( ) when you are not using the wireless communication unit for measuring instruments.

**Tips**

- Each time you touch the ON/OFF button, the button toggles between ON ( ) and OFF ( ).
- The device name can be set only when the power to the wireless communication unit for measuring instrument is set to OFF ( ).
  When you do not set the device name, proceed to step 6 leaving the power ON ( ).

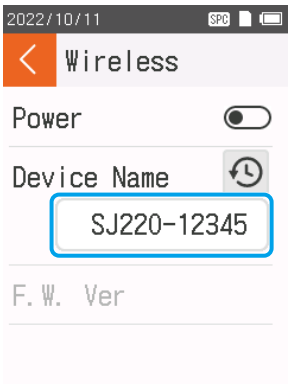



## 4 Set the device name of the wireless communication unit for measuring instruments.

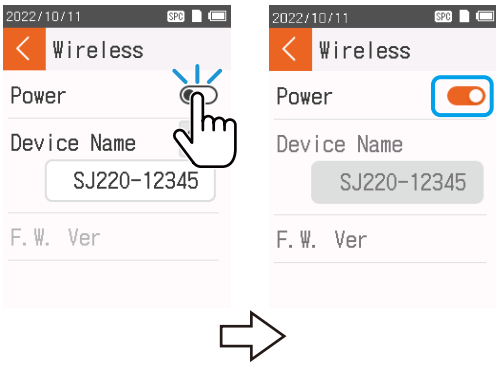
**Tips**

When you set the device name, set the power to the wireless communication unit for measuring instrument to OFF ( ). You cannot set the device name when the power is set to ON ( ).

For details, see "2.14 Wireless Communication Settings" on page F-55 in "PART F Environment Settings".

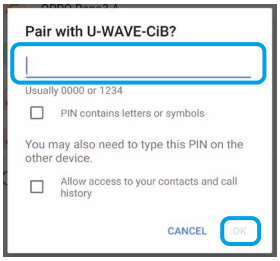



## 5 Set [Power] to ON ( ).



**6** **To pair the terminal device with the product to which the wireless communication unit for measuring instrument is connected, input "193410" into the PIN code field of the terminal device, and then touch [OK].**

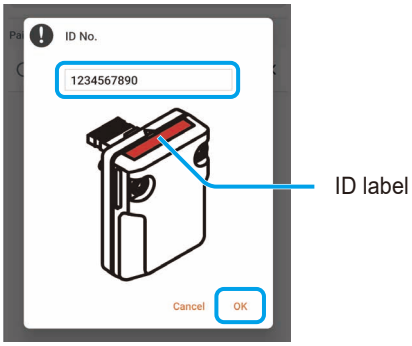
» The terminal device displays an input screen for the ID of the wireless communication unit for measuring instrument.




**Tips**

For details about pairing and how to check the pairing status, see the manuals terminal devices being paired.

**7** **Into the screen displayed on the terminal device, input the ID of the wireless communication unit for measuring instrument, and then touch [OK].**



# 3.4 Resetting the Settings of a Wireless Communication Unit for Measuring Instruments

You can reset the settings of a wireless communication unit for measuring instruments (optional accessory).

A reset operation will return the settings of the wireless communication unit for measuring instruments (optional accessory) to their default values at the time of purchase.

**IMPORTANT**

Once resetting the settings of the wireless communication unit for measuring instruments (optional accessory) is complete, the configured pairing settings are cleared.
Configure the pairing settings again after the reset operation.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

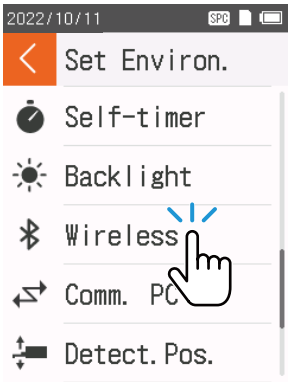
**2 Touch [Wireless].**

» The [Wireless] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18.




**3 Check that the wireless communication unit for measuring instruments is connected to this product.**

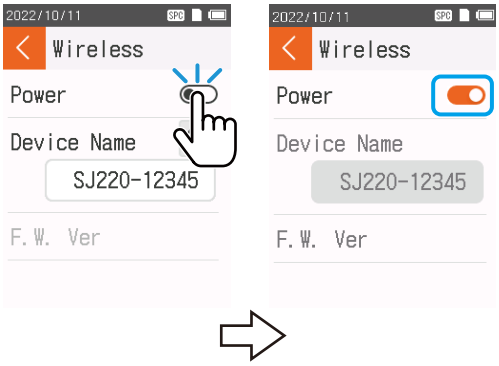
**Tips**

If the wireless communication unit for measuring instruments is not connected, connect it by referring to "3.2 Connecting a Wireless Communication Unit for Measuring Instruments" on page E-50.

**4** **Set [Power] to ON ( ).**

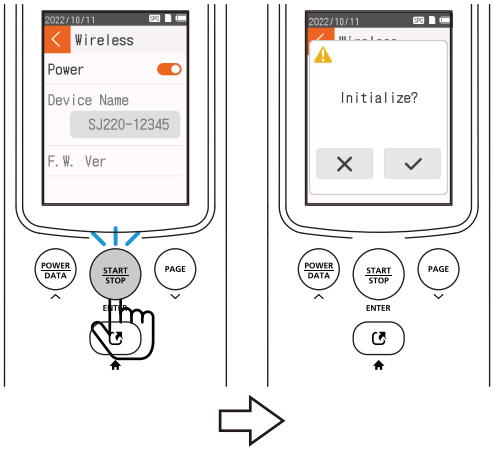
**Tips**

If [Power] is already set to ON ( ), proceed to step **5**.




**5** **Press the [START/STOP] key in the operation key section.**

» A message screen is displayed.

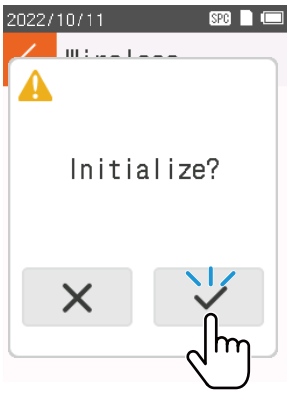



**6** **Touch ✓ (confirm).**

» The settings of the wireless communication unit for measuring instruments are reset to their default values.

**Tips**

To cancel the reset operation, touch ✕ (cancel).




» The [Wireless] screen is displayed.



## MEMO

# PART F
# Environment Settings


1 Settable Items on the Set Environ. Screen (Quick Reference Table) ……F-1
2 Environment Settings …… F-2
3 Set System Menus …… F-68


No. 99MBB794A

# 1 Settable Items on the Set Environ. Screen (Quick Reference Table)

Set the basic operating environment that allows you to use the functions of this product effectively.
On the Set Environ. screen, you can configure the settings for the following functions.

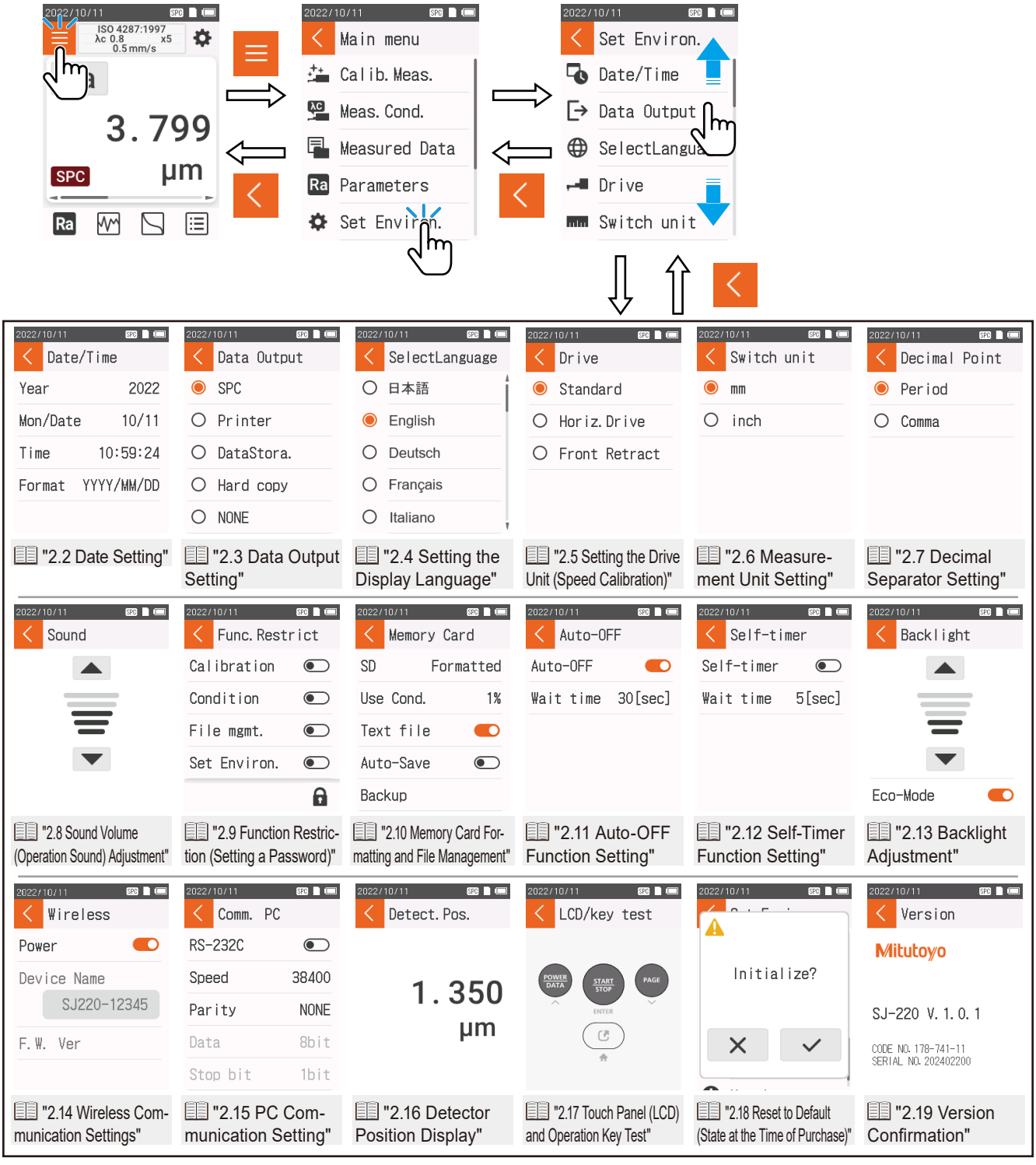
| Item | Description | Set system (quick setting) | Reference |
|---|---|---|---|
| Date/Time | Set the date, time, and display format. | − | 📖 "2.2 Date Setting" |
| Data Output | Set the output destination, etc., for the [POWER/DATA] key. | Select the output type. (For [SPC], select ON or OFF for Auto-Output and the parameters to output.) | 📖 "2.3 Data Output Setting" |
| Select Language | Change the display language. | − | 📖 "2.4 Setting the Display Language" |
| Drive | Set the drive/detector unit type and perform speed calibration. | − | 📖 "2.5 Setting the Drive Unit (Speed Calibration)" |
| Switch unit | Select the unit used for calculation results, etc., from [mm] or [inch]. (inch/millimeter specification only) | Change the units. (inch/millimeter specification only) | 📖 "2.6 Measurement Unit Setting" |
| Decimal Point | Switch between Period and Comma. | − | 📖 "2.7 Decimal Separator Setting" |
| Sound | Adjust the sound volume. | Adjust the level. | 📖 "2.8 Sound Volume (Operation Sound) Adjustment" |
| Function Restriction | Limit functions with a password. | − | 📖 "2.9 Function Restriction (Setting a Password)" |
| Memory Card | Configure the format, backups, and save settings for the memory card. | − | 📖 "2.10 Memory Card Formatting and File Management" |
| Auto-OFF | Set the Auto-OFF function ON/OFF and the wait time. | ON/OFF | 📖 "2.11 Auto-OFF Function Setting" |
| Self-timer | Set the self-timer function ON/OFF and the wait time. | ON/OFF | 📖 "2.12 Self-Timer Function Setting" |
| Backlight | Adjust the brightness of the backlight, and set the ECO mode ON/OFF. | Adjust the level. | 📖 "2.13 Backlight Adjustment" |
| Wireless | Set the device name and toggle the power to the wireless communication unit for measuring instruments (optional accessory) ON and OFF. You can also reset the settings. | ON/OFF | 📖 "2.14 Wireless Communication Settings" |
| PC Communication | Set the RS-232C communication conditions. | − | 📖 "2.15 PC Communication Setting" |
| Detect. Pos. | Confirm the position of the detector. (Maintenance function) | − | 📖 "2.16 Detector Position Display" |
| LCD/key test | Check the display of the touch panel (LCD) and the operation of the operation keys. (Maintenance function) | − | 📖 "2.17 Touch Panel (LCD) and Operation Key Test" |
| Reset-ToDefault | Return all the settings to their default values. | − | 📖 "2.18 Reset to Default (State at the Time of Purchase)" |
| Version | Display the version information of the display unit of this product. | Display | 📖 "2.19 Version Confirmation" |

# 2 Environment Settings

## 2.1 Environment Settings Screen Transition

**Tips**

To return to the Home screen from a screen other than the Home screen, press the HOME key in the operation key section.



# 2.2 Date Setting

Set the date, time, and date format for this product.

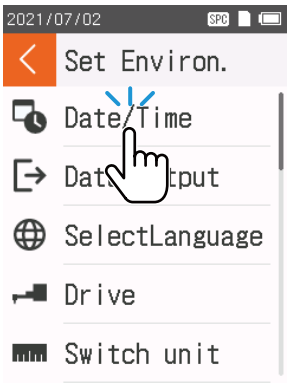
This function is useful for managing your records because the date and time is recorded as part of measurement data and measurement conditions.

**1** **Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

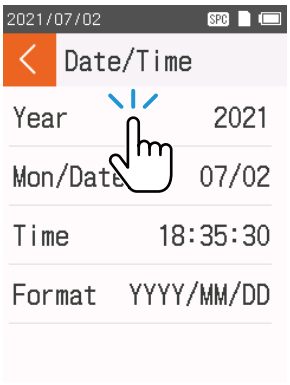
**2** **Touch [Date/Time].**

» The [Date/Time] screen is displayed.




**3** **Touch [Year].**

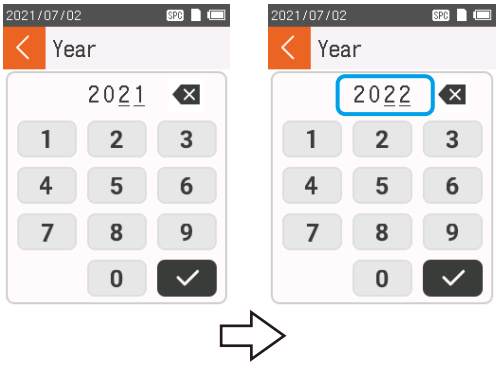
» The [Year] screen is displayed.




**4** **Set [Year].**

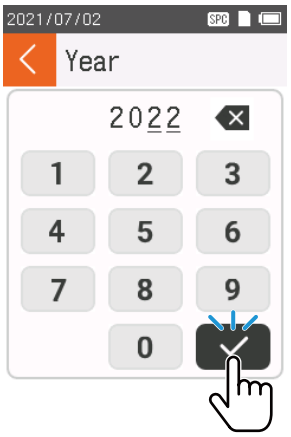
**Tips**

- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".
- For [Year], set the last two digits of the year.



## 5 Touch (confirm).

» The [Date/Time] screen is displayed.
» [Year] is set.

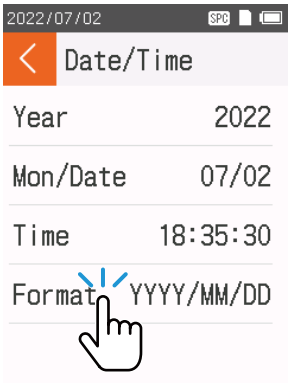



### Tips

- To cancel the input operation, touch (return).
- Use the same procedure as for [Year] to set [Mon/Date] and [Time].

## 6 Touch [Format].

» The [Format] screen is displayed.

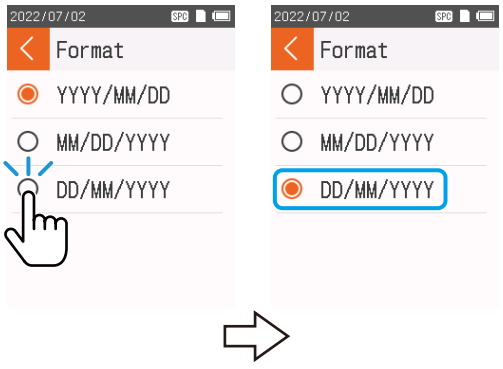



## 7 Touch the option button for the desired format.

**(Example: Select [DD/MM/YYYY].)**

### Tips

YYYY is the year, MM is the month, and DD is the day.



**8** **Touch (return).**

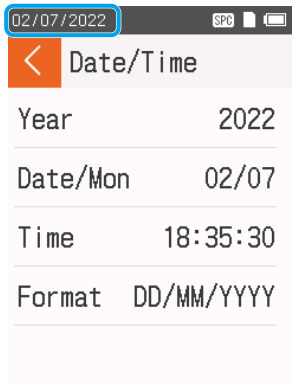
» The [Date/Time] screen is displayed.




**9** **Check that the date on the status bar is displayed in the format you set.**

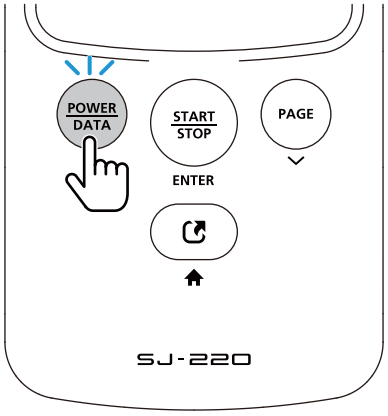
**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.3 Data Output Setting

Set how measurement results are output when the [POWER/DATA] key is pressed. You can also set the product so that no measurement results are output. At the time of purchase, [SPC] is set as the data output type by default.




## ■ Data output type

| Data output item | Description | Reference |
|---|---|---|
| SPC | Measurement results are output to a Digimatic Mini-Processor (optional accessory). | 📖 "2.3.1 SPC Output" |
| Printer | Measurement results are output to a printer.<br>You can set the [Auto-print] function to ON ( ).<br>When ON ( ) is selected, measurement results, measurement conditions, etc., are automatically printed at the same time as measurement finishes. | 📖 "2.3.2 Printer Output" |
| DataStora. | Measurement results can be saved on the memory card.<br>(The file name is automatically set.) | 📖 "2.3.3 Saving Data" |
| Hard copy | The displayed screen content is saved in a memory card as graphic data.<br>(The file name is automatically set.) | 📖 "2.3.4 Hard Copy (Screenshot)" |
| NONE | No measurement results are output. | 📖 "2.3.5 Outputting No Measurement Results with the [POWER/DATA] Key" |

**IMPORTANT**

- Screenshots cannot be made for some screens, such as the [Daily menu] screen, where the [POWER/DATA] key is used for purposes other than data output.
- If connections, such as those between devices, are not correctly established, data cannot be output even when the data output type is set.

## 2.3.1 SPC Output

When the data output type is set to [SPC], measurement results can be output from this product to a Digimatic Mini-Processor (optional accessory).

After measurement, the measurement results are output to the Digimatic Mini-Processor (optional accessory) when you press the [POWER/DATA] key on this product or the [DATA] key on the Digimatic Mini-Processor (optional accessory).

At the time of purchase, [SPC] is set as the default value of the data output type. However, this section explains the procedure to change the data output type from [Printer] to [SPC], assuming that the set data output type is [Printer].

**Tips**

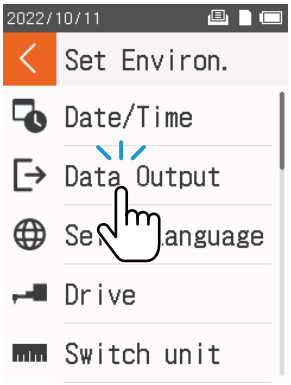
For details about connecting this product to a Digimatic Mini-Processor and outputting data via SPC, see "2.1 SPC Data Output" on page E-32 in "PART E Measurement Data Management".

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

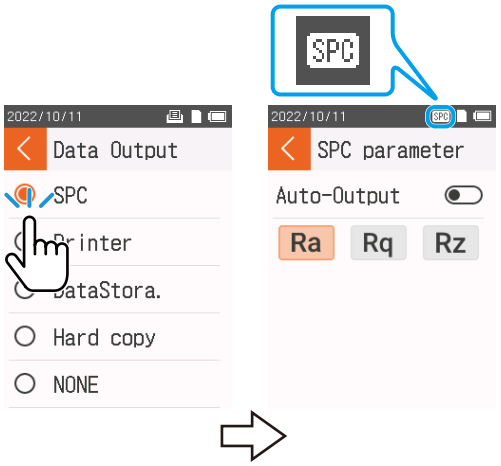
**2 Touch [Data Output].**

» The [Data Output] screen is displayed.




**3 Touch the option button for [SPC].**

» The [SPC parameter] screen is displayed.
» The SPC (SPC) icon is displayed on the status bar.

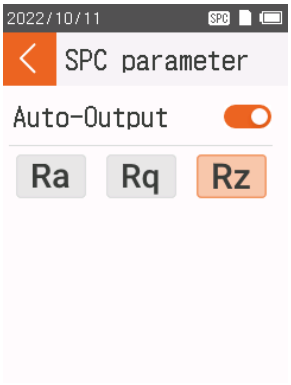


**4** **Select the parameters to output via SPC, and set Auto-Output.**

**(Example: Select [Rz], and set Auto-Output to ON ( ).)**

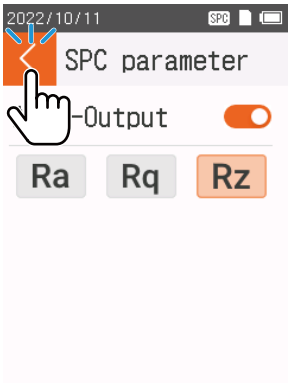
**Tips**

For details about the target parameters and Auto-Output setting, see "2.1.3 Parameter Selection and Auto-Output Setting" on page E-35 in "PART E Measurement Data Management".




**5** **Touch (return).**

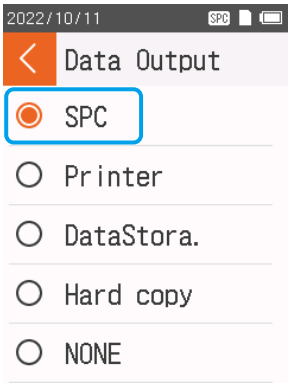
» The screen returns to the [Data Output] screen.




**6** **Check that the option button for [SPC] is selected.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## 2.3.2 Printer Output

When the data output type is set to [Printer], measurement results, measurement conditions, etc., can be output from this product to a printer.

After measurement, the measurement results are output to a printer when you press the [POWER/DATA] key.

When the [Auto-print] function is set to ON ( ), measurement results and measurement conditions are automatically printed at the same time as measurement is finished.

**Tips**

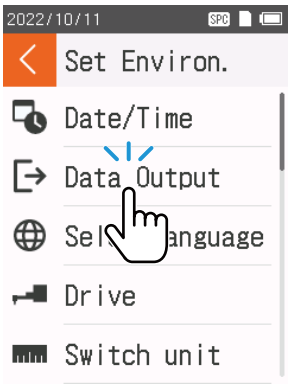
For details about the printer connection with this product and the printing operation, see "2.2 Printing with an External Printer" on page E-38 in "PART E Measurement Data Management".

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.



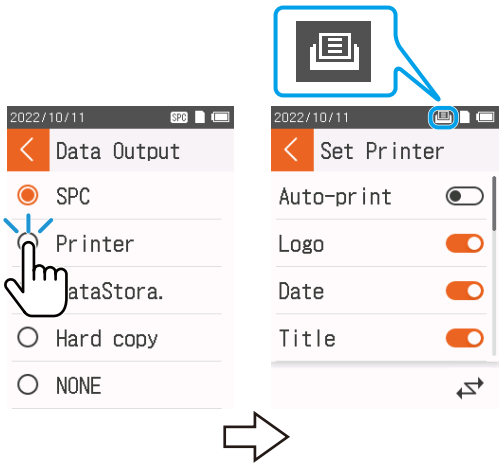

**3 Touch the option button for [Printer].**

» The [Set Printer] screen is displayed.

» The (printer) icon is displayed on the status bar.

**IMPORTANT**

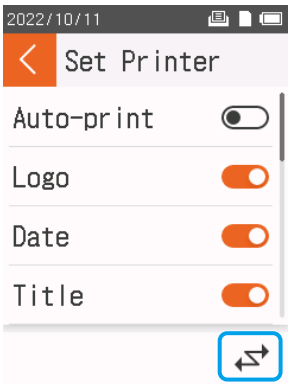
- At the time of purchase, [SPC] is set as the data output type by default.
- To print with the printer, be sure to change the data output type to [Printer].



## 4 Touch (communication check) to check the communication status with the printer.

### Tips

For details about checking the communication status, see "2.2.3 Communication Check with the Printer" on page E-40 in "PART E Measurement Data Management".

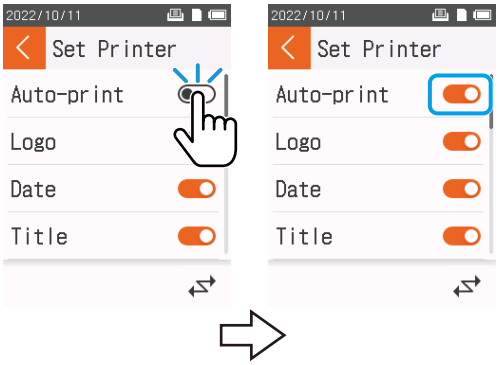



## 5 Touch the ON/OFF button for [Auto-print] to switch between ON ( ) and OFF ( ).

**(Example: Set the button to ON ( ).)**

### Tips

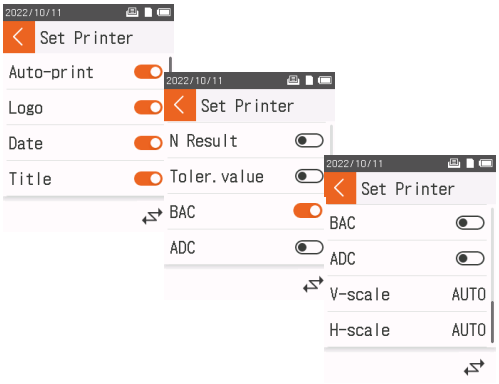
- When [Auto-print] is set to ON ( ), measurement results, measurement conditions, etc., are automatically printed with the connected printer at the same time as measurement finishes.
- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).




## 6 Set which items to print, and set the print scale as required.

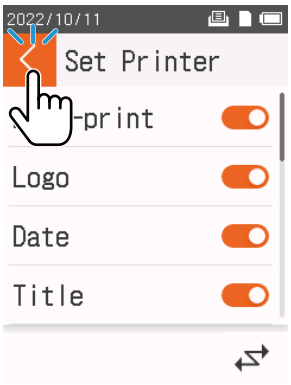
### Tips

- For details about setting the target items, see "■ Setting which items to print" on page F-11.
- For details about setting the print scale, see "■ Setting the print scale" on page F-13. The default value of the vertical and horizontal scale settings is [AUTO] (the optimal scale factors are automatically set).



**7** **Touch (return).**

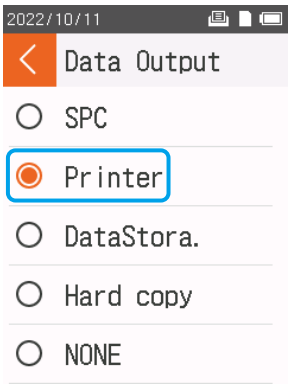
» The screen returns to the [Data Output] screen.




**8** **Check that the option button for [Printer] is selected.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.




## ■ Setting which items to print

The following items can be printed with a printer. Select which items to print on the [Set Printer] screen.

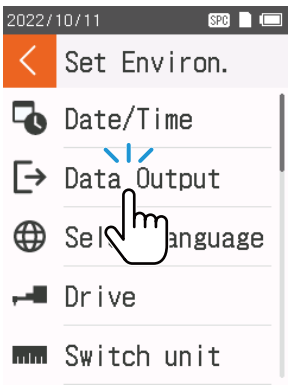
| | | | | |
|---|---|---|---|---|
| Logo | Date | Title | Measurement conditions | Evaluation profile |
| Calculation results | N (section lengths) result | Tolerance limit value | BAC | ADC |

**1** **Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [Data Output].**

» The [Data Output] screen is displayed.

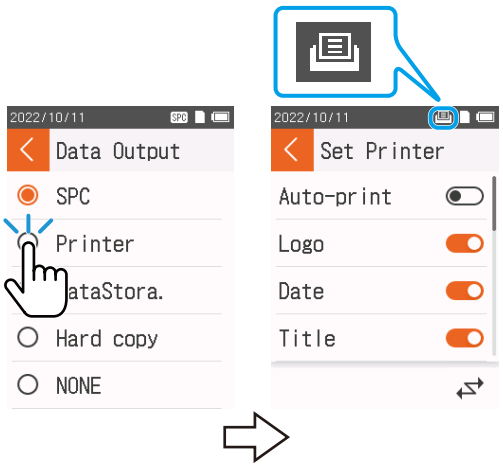





No. 99MBB794A

## 3 Touch the option button for [Printer].

» The [Set Printer] screen is displayed.
» The (printer) icon is displayed on the status bar.




**IMPORTANT**

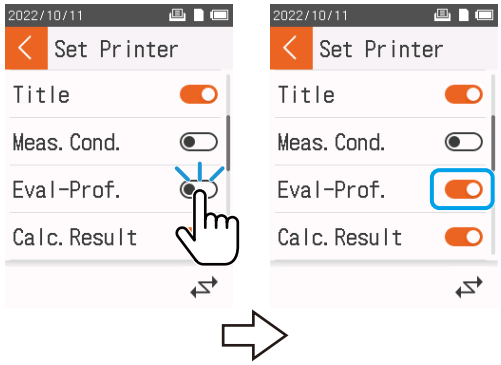
At the time of purchase, [SPC] is set as the data output type by default.

To print with the printer, be sure to change the data output type to [Printer].

## 4 Touch the items you want to print.

**(Example: Set [Eval-Prof.] to ON ( ).)**

» The items you selected are set to ON ( ) and will now be printed.




**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- Vertical swiping is available when the vertical scroll bar is displayed on the screen.
  For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## ■ Setting the print scale

You can set the vertical and horizontal scale factors for printing evaluation profiles.

The default value of the vertical and horizontal scale settings is [AUTO] (the optimal scale factors are automatically set).

Set [AUTO] unless otherwise required. Optimal scale factors will be automatically set.

The following scale factors can be set.

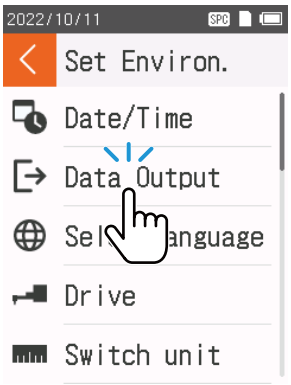
| Print magnification | |
|---|---|
| **Vertical magnification (factor)** | **Horizontal magnification (factor)** |
| 10 | 1 |
| 20 | 2 |
| 50 | 5 |
| 100 | 10 |
| 200 | 20 |
| 500 | 50 |
| 1K (1,000) | 100 |
| 2K (2,000) | 200 |
| 5K (5,000) | 500 |
| 10K (10,000) | 1K (1,000) |
| 20K (20,000) | AUTO |
| 50K (50,000) | – |
| 100K (100,000) | – |
| AUTO | – |

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.

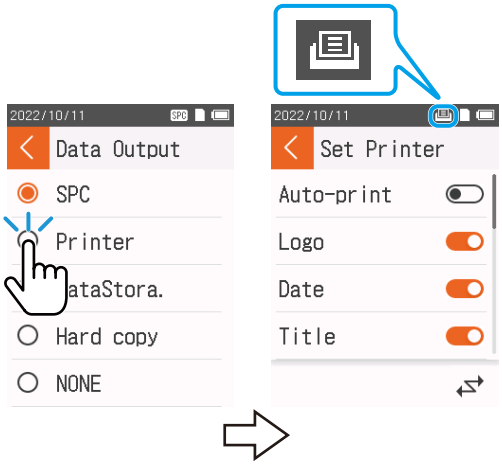


## 3 Touch [Printer].

» The [Set Printer] screen is displayed.
» The (printer) icon is displayed on the status bar.

**IMPORTANT**

- At the time of purchase, [SPC] is set as the data output type by default.
- To print with the printer, be sure to change the data output type to [Printer].



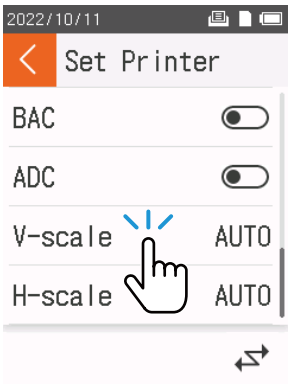

## 4 Touch [V-scale].

» The [V-scale] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.4 Touch Panel Operation and Input Operations" on page A-26 in "PART A Overview".




## 5 Touch the option button for the desired scale factor.

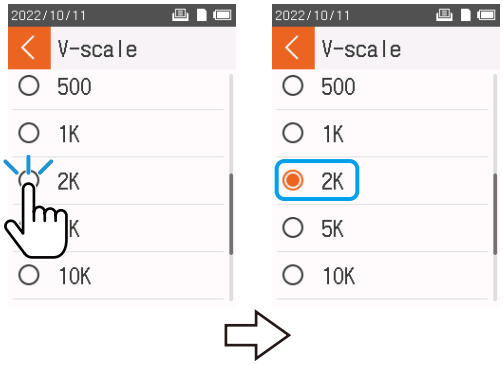
**(Example: Select [2K] (2,000×).)**

» The option button for [2K] is selected.

**Tips**

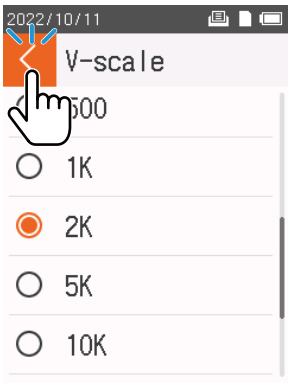
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.4 Touch Panel Operation and Input Operations" on page A-26 in "PART A Overview".

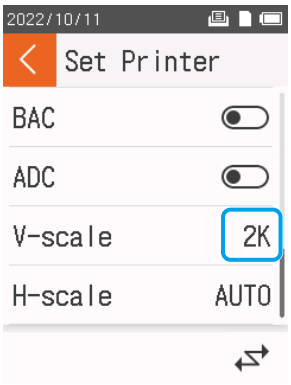


**6** **Touch (return).**

» The screen returns to the [Set Printer] screen.




**7** **Check that the set scale factor is reflected on the right side of the [V-scale] field.**



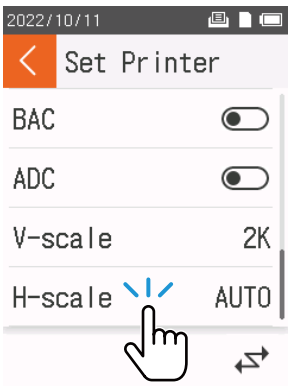

**8** **Touch [H-scale].**

» The [H-scale] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

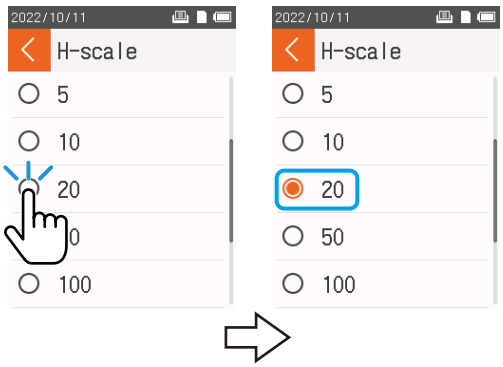
For details, see "2.4 Touch Panel Operation and Input Operations" on page A-26 in "PART A Overview".



**9** **Touch the option button for the desired scale factor.**

**(Example: Select [20].)**

» The option button for [20] is selected.



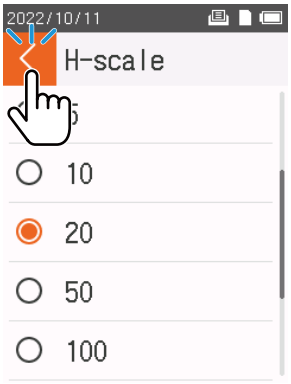

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.4 Touch Panel Operation and Input Operations" on page A-26 in "PART A Overview".

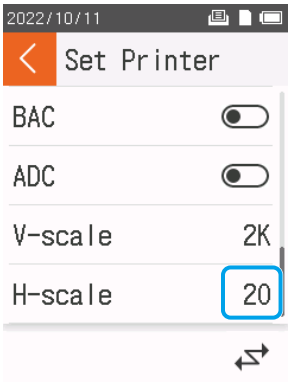
**10** **Touch (return).**

» The screen returns to the [Set Printer] screen.




**11** **Check that the set scale factor is reflected in the right side of the [H-scale] field.**

» The set horizontal magnification is displayed on the Print Setup screen.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.3.3 Saving Data

When the data output type is set to [DataStora.], measurement results can be saved in a memory card.
After measurement, the measurement results are saved to the memory card when you press the [POWER/DATA] key.

**Tips**

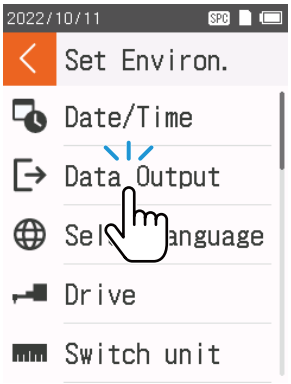
When measurement data is saved for the first time after the power is turned on, the save process may take some time.

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.

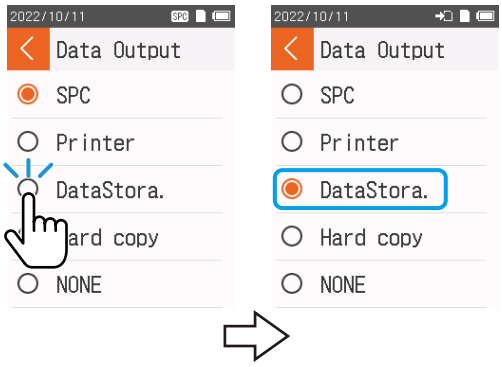



**3 Touch the option button for [DataStora.].**

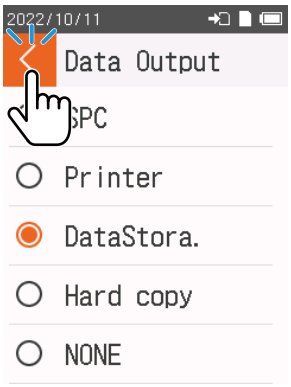
» The option button for [DataStora.] is selected.

**IMPORTANT**

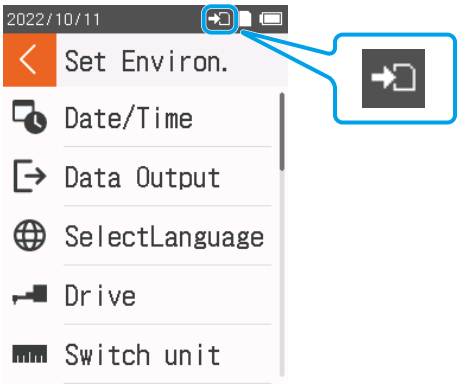
- At the time of purchase, [SPC] is set as the data output type by default.
- To print with the printer, be sure to change the data output type to [Printer].



**4** Touch (return).




» The [Set Environ.] screen is displayed.
» The (data saving) icon is displayed on the status bar.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.3.4 Hard Copy (Screenshot)

When the data output type is set to [Hard copy], the screen displayed on the display unit can be saved to a memory card.

After you have displayed the screen you want to make a screenshot, press the [POWER/DATA] key to save the displayed screen to the memory card as image data.

**IMPORTANT**

Screenshots cannot be made for some screens, such as the [Daily menu] screen, where the [POWER/DATA] key is used for purposes other than data output.

**Tips**

To make a screenshot of the displayed screen when the data output type is not set to [Hard copy], display the screen you want to make a screenshot of, and press the [POWER/DATA] key and the [PAGE] key at the same time.

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

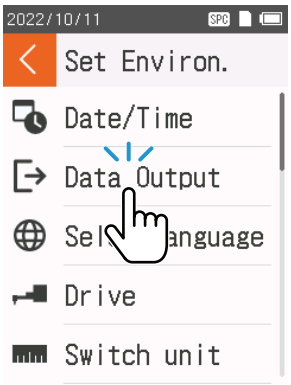
» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.

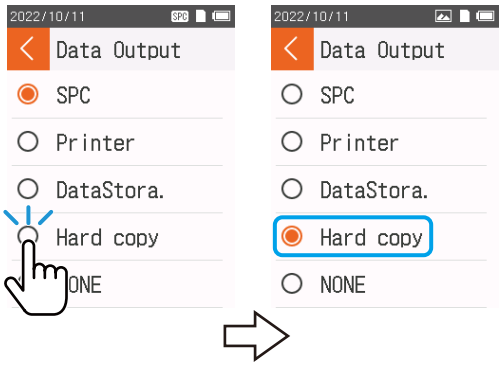
**IMPORTANT**

- At the time of purchase, [SPC] is set as the data output type by default.
- To print with the printer, be sure to change the data output type to [Printer].

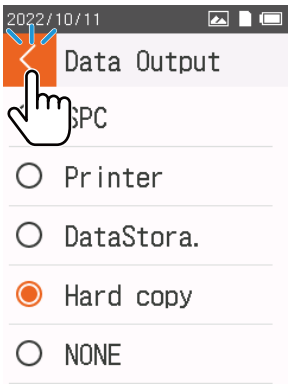



**3 Touch the option button for [Hard copy].**

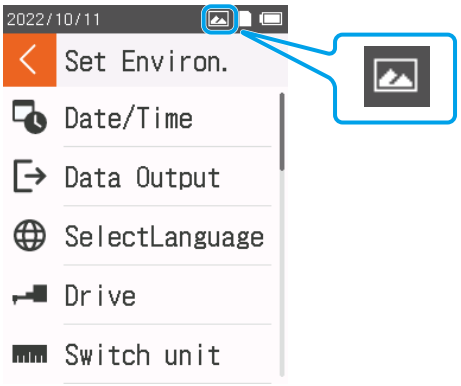
» The option button for [Hard copy] is selected.



**4** Touch (return).




» The [Set Environ.] screen is displayed.
» The (hard copy) icon is displayed on the status bar.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## 2.3.5 Outputting No Measurement Results with the [POWER/DATA] Key

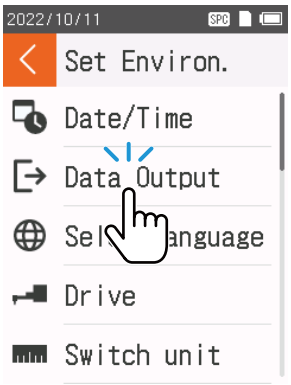
If you do not want to output measurement results with the [POWER/DATA] key, set the data output type to [NONE] (disabled).

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Data Output].**

» The [Data Output] screen is displayed.

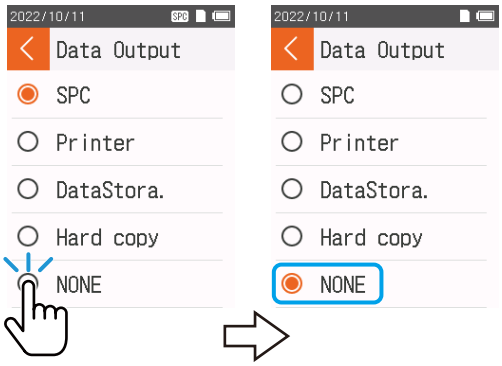



**3 Touch the option button for the [NONE].**

» The option button for [NONE] is selected.

**IMPORTANT**

- At the time of purchase, [SPC] is set as the data output type by default.
- To print with the printer, be sure to change the data output type to [Printer].

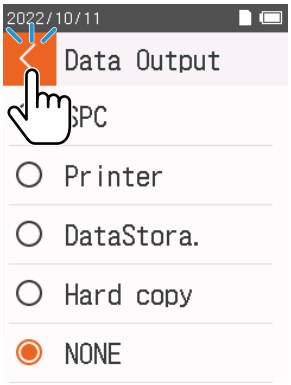



**4 Touch (return).**

» The [Set Environ.] screen is displayed.

**Tips**

- No icons that indicate the data output type are displayed on the status bar.
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.4 Setting the Display Language

The following languages can be selected for this product.

**IMPORTANT**
The default value is [English].

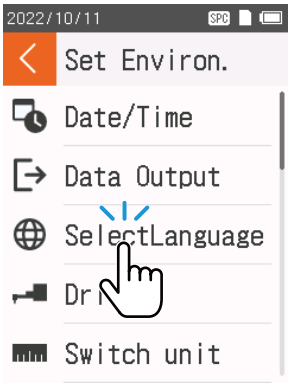
- Japanese
- Italian
- Chinese (traditional)
- Hungarian
- Slovenian
- Finnish
- Malaysian
- English
- Spanish
- Chinese (simplified)
- Turkish
- Russian
- Thai
- German
- Portuguese
- Czech
- Swedish
- Romanian
- Vietnamese
- French
- Korean
- Polish
- Dutch
- Bulgarian
- Indonesian

**1** **Touch ☰ (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [SelectLanguage].**

» The [SelectLanguage] screen is displayed.

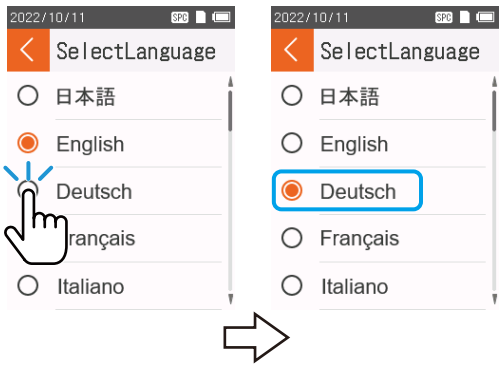



**3** **Touch the option button for the desired language.**

**(Example: Select [Deutsch] (German).)**

» The option button for the language you touched is selected.

**Tips**
Vertical flicking is available when the vertical scroll bar is displayed with the triangle-shaped marks on its ends.
For details, see 📖 "2.4 Touch Panel Operation and Input Operations" on page A-26 in "PART A Overview".



**4** **Touch (return).**

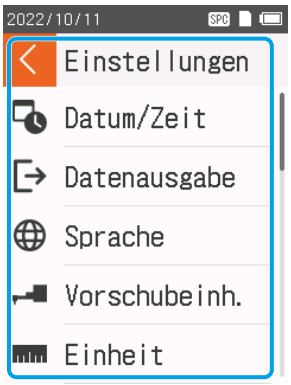
» The screen returns to the [Set Environ.] screen.




**5** **Check that the displayed language is the language you set.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.5 Setting the Drive Unit (Speed Calibration)

The following three types of drive units are available for this product: standard type, retractable type, transverse-tracing type.

Because the three types of drive units have different approach travel distances and maximum traversal lengths, speed calibration is required in some cases, for example when the drive unit is replaced.

**IMPORTANT**

Speed calibration is a means of making adjustments so that this product can measure at the correct speed according to the operating environment and the drive unit type.

If speed calibration has not been performed correctly, the measurement results may be adversely affected.

Be sure to perform the speed calibration in the following cases.

- When using this product for the first time
- When replacing the drive unit
- When the operating environment, such as ambient temperature, has changed significantly

This is an explanation of the drive unit settings on the calculation display.

**Tips**

- For details about how to replace the drive unit, see "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38 in "PART B Setting Up".
- Use the roughness specimen included with the drive unit when performing speed calibration. For details about arranging the roughness specimen and this product, see "2.1 Calibration Preparation" on page C-5 in "PART C Measurement".

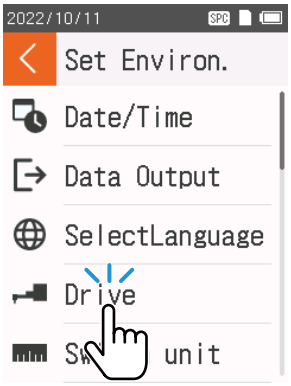
Use the following procedure to perform the speed calibration measurement.

**1 Touch (main menu) on the Home screen, and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Drive].**

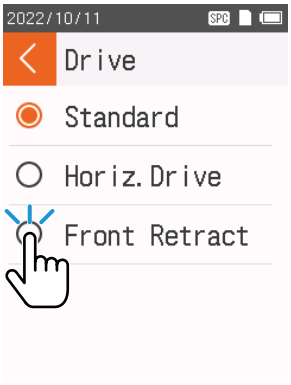
» The [Drive] screen is displayed.



## 3 Touch the option button for the drive unit type being used.

**(Example: Select the option button for [Front Retract].)**

» The option button for the drive unit type you touched is selected, and the speed calibration screen is displayed.




## 4 Set the nominal value for speed calibration.

1 Touch the nominal value field.

**IMPORTANT**

Use the supplied roughness specimen for the speed calibration.

Arrange the drive unit and the roughness specimen.

**Tips**

To not perform speed calibration, touch (return). The screen returns to the Set Environ. screen.




2 Input the nominal value.
(Example: Input "102.00".)
The input range is as follows.
98.0 to 106.0 µm (3858.3 to 4173.2 µin)

**IMPORTANT**

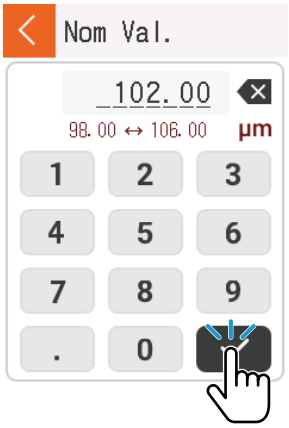
When using the supplied roughness specimen, set 101.6 µm (4000 µin) as the nominal value.

**Tips**

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- To input the decimal separator at an arbitrary position, touch . (decimal separator).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".



3 Touch ✓ (confirm).



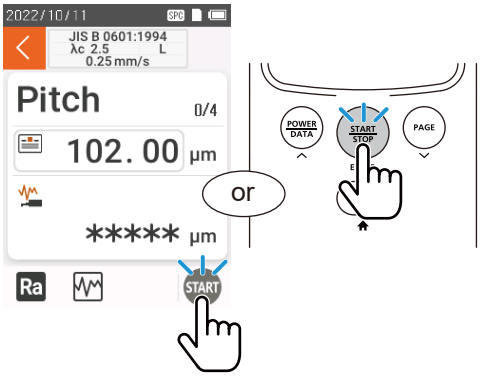

» The nominal value you input is displayed on the speed calibration screen.




## 5 On the speed calibration screen, touch [START].

**Tips**

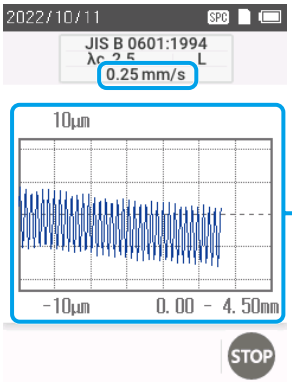
Pressing the [START/STOP] key in the operation key section also starts the measurement.




» Calibration measurement for a measuring speed of 0.25 mm/s (0.01 in/s) starts.

**Tips**

- During the speed calibration measurement, the waveform display screen is displayed.
- To stop the speed calibration measurement, touch [STOP]. Pressing the [START/STOP] key in the operation key section also stops the measurement.

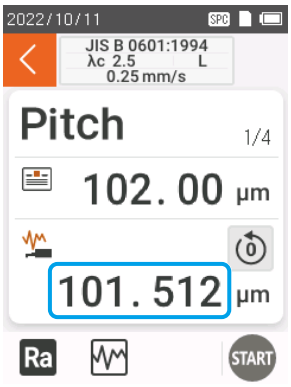



Waveform display screen



No. 99MBB794A

» When the speed calibration measurement is finished, the Pitch result is displayed in the lower row of the screen.

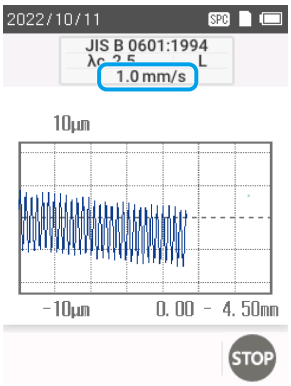



### Tips

- To discard (clear) the Pitch result, touch (clear), and then touch (confirm) on the message screen that is displayed.
- To cancel the speed calibration, touch (return), and then touch (confirm) on the message screen that is displayed.

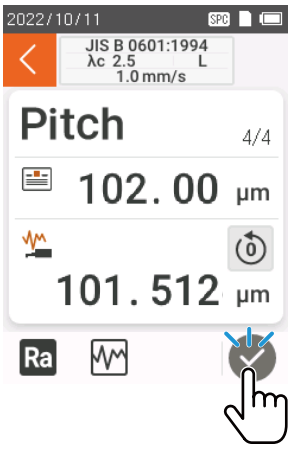
## 6 Touch [START] to continue calibration measurement for measuring speeds of 0.5 mm/s (0.02 in/s), 0.75 mm/s (0.03 in/s), and 1.0 mm/s (0.04 in/s).

» On the speed calibration screen, [START] changes to (update).




## 7 Touch (update).

» The results of the measuring speed calibration are updated.




### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.6 Measurement Unit Setting

Select the unit used for calculation results, etc., from [mm] or [inch]. (Inch/Millimeter specification only)

**IMPORTANT**

When the set unit is changed to [mm] or [inch], be sure to reconfigure the settings.

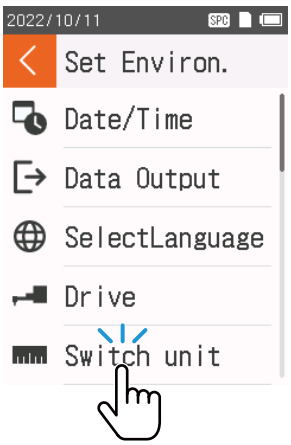
If you fail to reconfigure the settings, GO/NG judgment may not be correctly made or other problems may happen.

**1** **Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [Switch unit].**

» The [Switch unit] screen is displayed.



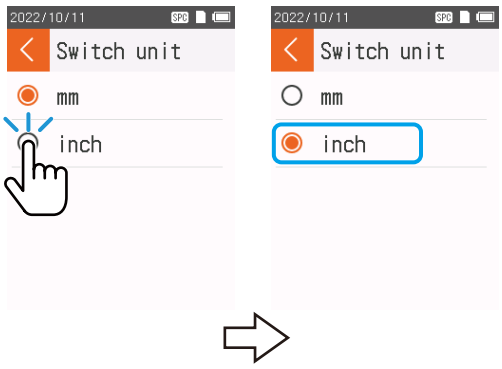

**3** **Touch the option button for the desired unit.**

**(Example: Select the option button for [inch].)**

» The option button for the unit you touched is selected.

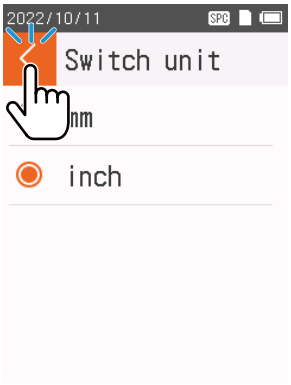
**Tips**

The unit used for millimeter specification is only "mm", so touching the option button for [mm] does not display anything.

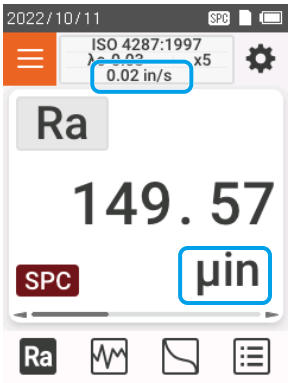


**4** **Touch (return).**

» The screen returns to the [Set Environ.] screen.
» The unit you set is applied.




**5** **Check that the unit displayed on the Home screen has been changed to the unit you set.**



# 2.7 Decimal Separator Setting

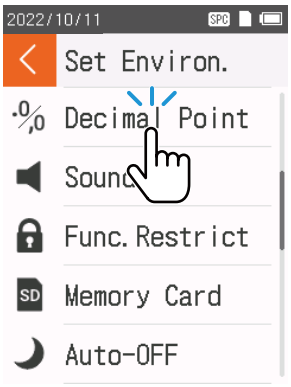
Specify [.] (period) or [,] (comma) as the decimal separator for values displayed on the screen.

**1** **Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [Decimal Point].**

» The [Decimal Point] screen is displayed.




**Tips**

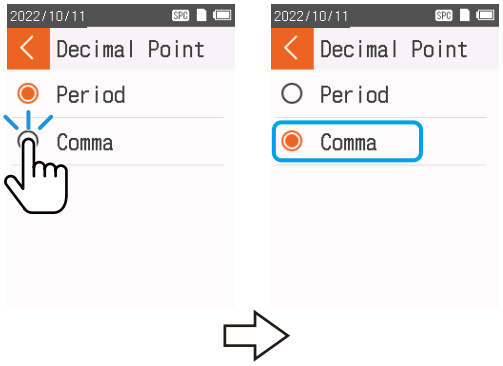
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3** **Touch the option button for the desired decimal separator.**

**(Example: Select the option button for [Comma].)**

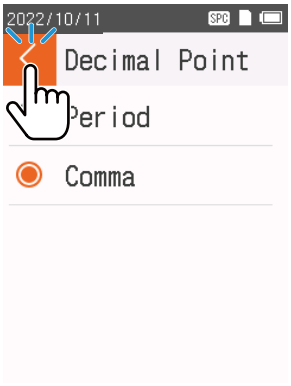
» The option button for the decimal separator you touched is selected.



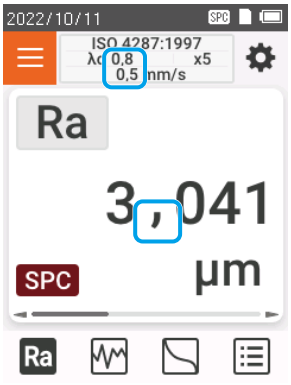

**4** **Touch (return).**

» The screen returns to the [Set Environ.] screen.

» The decimal separator you set is applied.



**5** **Check that the decimal separator displayed on the Home screen has been changed to the separator you set.**



# 2.8 Sound Volume (Operation Sound) Adjustment

You can adjust the volume of the sound that plays when you touch the touch panel or press the operation keys.

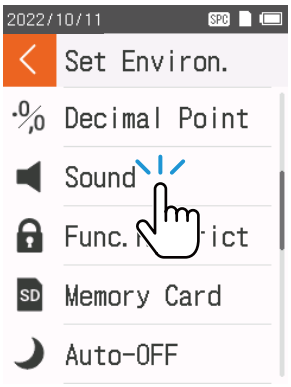
You can also mute the operation sound.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

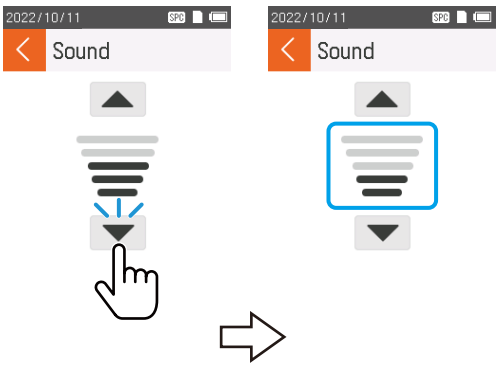
**2 Touch [Sound].**

» The [Sound] screen is displayed.

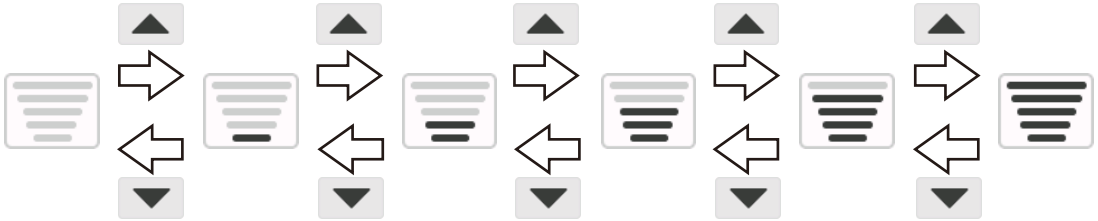



**3 Touch (increase the volume) and (reduce the volume) to adjust the volume.**

Sound can be muted by lowering the volume level until no level indicators are displayed.




Each time you touch or , the level indicators go up or down as shown below.



**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.9 Function Restriction (Setting a Password)

When function restriction is set, a password is required to display the following screens.
(The password is a four-digit number.)

| Function restriction item | Restricted screens |
|---|---|
| Calibration | Calibration measurement screen, speed calibration screen |
| Condition | Measurement conditions setting screen, calibration conditions setting screen |
| File mgmt. | File management screen for measurement conditions and measurement data |
| Set Environ. | Operating Environment Setup screen |

**IMPORTANT**

If you forget the password, you will not be able to navigate beyond the main menu or display the screens where access restrictions are imposed. In that case, display the [Set Environ.] screen by inputting the fixed password "0220", which is valid only for the Set Environ. menu screen. Then, set a new password on the [Func.Restrict] screen.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

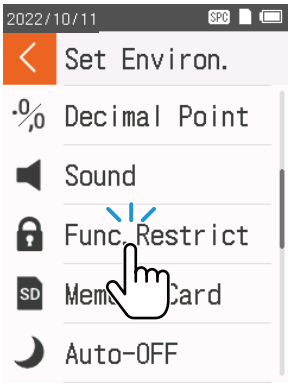
**2 Touch [Func.Restrict].**

» The [Func.Restrict] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".




**3 Touch (password).**

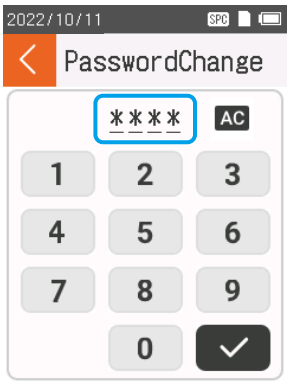
» The [PasswordChange] screen is displayed.



## 4 Input a four-digit number.

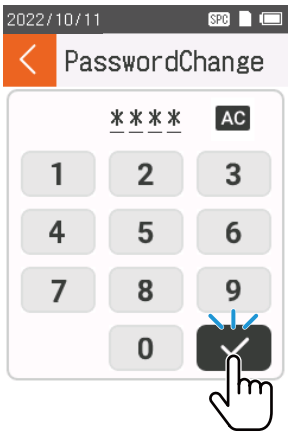
### Tips

- The default password is "0000".
- To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".
- To cancel inputting a password, touch < (return).




## 5 Touch ✓ (confirm).

» The password is set.
» The [Func.Restrict] screen is displayed.

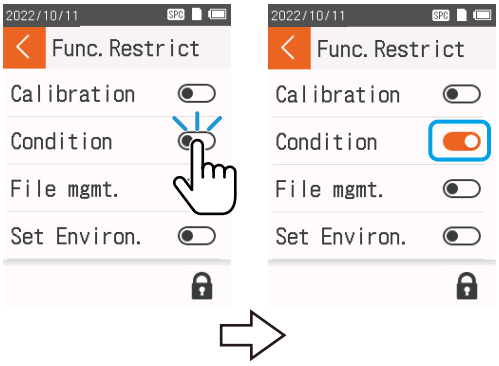



## 6 Set the ON/OFF button for the items where you want to set a password to ON ( ).

**(Example: Set the button for [Condition] to ON ( ).)**

### Tips

Touching the ON/OFF button toggles between ON ( ) and OFF ( ).

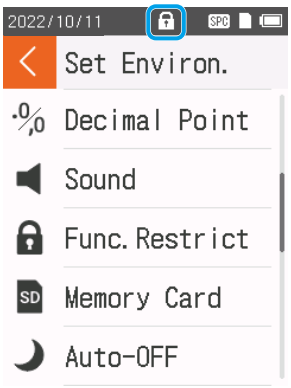


## 7 Touch (return).

» The screen returns to the [Set Environ.] screen.




» The function restriction is applied to the items where you set to ON ( ).
» The function-restriction icon is displayed on the status bar.




### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.10 Memory Card Formatting and File Management

Format the memory card inserted into this product.

You can also configure the settings for automatically saving measurement results to a memory card, delete files from the memory card, and back up data.

**IMPORTANT**

- Memory cards used with this product must be formatted with this product.
- This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210[*1]) or with the exFAT file system.
  Use only memory cards listed as an optional accessory (Part No. 12AAY917)[*2] or memory cards[*3] that were formatted with the FAT32 file system.

  *1 Memory cards that were formatted with the SJ-210 can be reformatted with this product.
  *2 Memory cards listed as an optional accessory comply with microSDHC standards.
  *3 Memory cards that were formatted with the FAT32 file system can be reformatted with this product, but access to the memory card may be slow.

## 2.10.1 Formatting

**IMPORTANT**
When the memory card is formatted, all of its contents are erased.

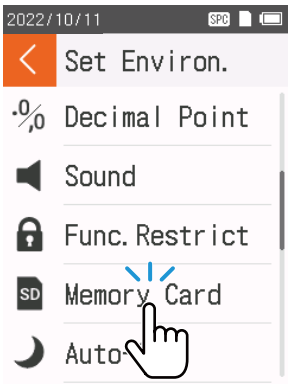
Use the following procedure to format a memory card that has been inserted into this product.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Memory Card].**

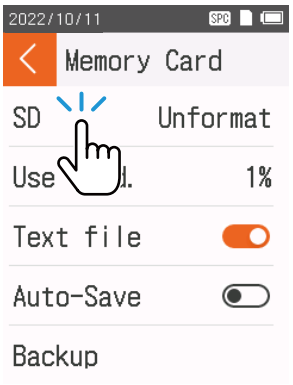
» The [Memory Card] screen is displayed.




**Tips**
Vertical swiping is available when the vertical scroll bar is displayed on the screen.
For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

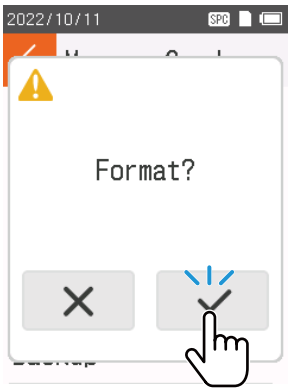
**3 Touch [SD].**

» A message screen is displayed.



**4** **Touch ✓ (confirm).**

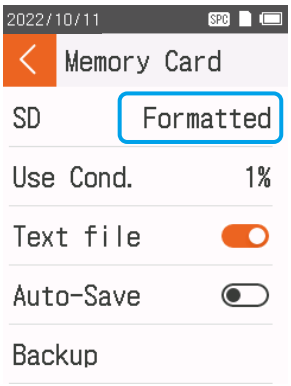
» The memory card is formatted.




**Tips**

- To cancel the formatting operation, touch ✕ (cancel) on the message screen.
- The format may take several minutes.

**5** **Check that [Formatted] is displayed in the [SD] field on the [Memory Card] screen.**




**Tips**

- To return to the previous screen, touch ‹ (return).
- To return to the Home screen, press the HOME key.

## 2.10.2 File Management

### ■ Confirming the number of saved files

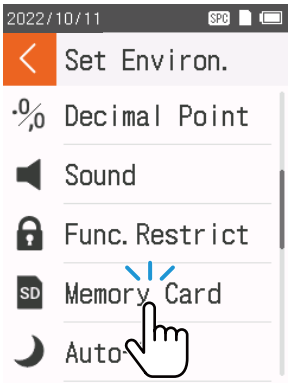
Use the following procedure to confirm the number of data files saved on the memory card.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Memory Card].**

» The [Memory Card] screen is displayed.



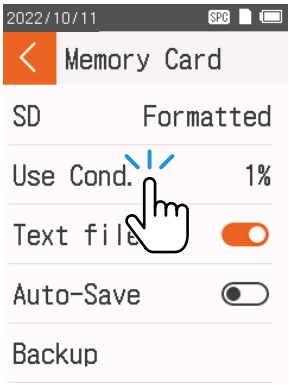

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3 Touch [Use Cond.].**

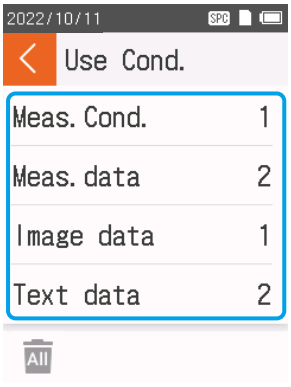
» The [Use Cond.] screen is displayed.




**Tips**

When a large number of data files are saved in the memory card, the loading process may take some time.

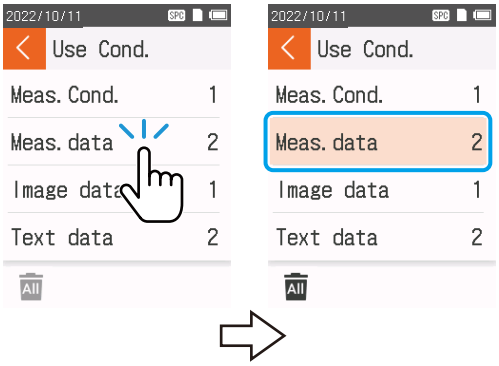
**4 Confirm the number of data files saved in the memory card.**



## 5 Delete the data files saved in the memory card.

You can delete all data files saved in the memory card by type.

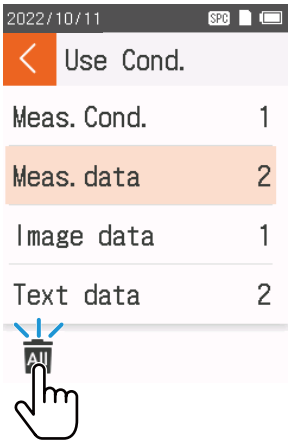
1 Touch the field for the data type you want to delete.
(Example: Select [Meas.data].)




**IMPORTANT**
At the same time as measurement data files are deleted, text data files are deleted. However, when text data files are deleted, measurement data files are not deleted.

» The field you touched turns orange.

2 At the bottom of the screen, touch All (delete all files).
» A message screen is displayed.




**Tips**
When a large number of files are being deleted, the deleting process may take several minutes.

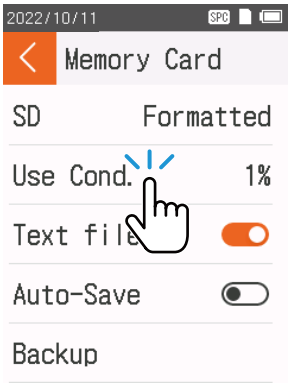
3 Touch ✓ (confirm).



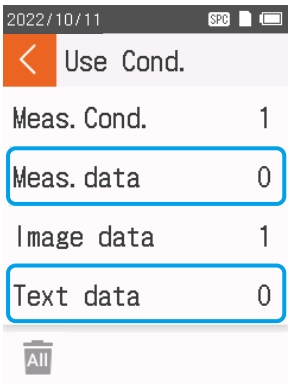

**Tips**
To cancel the deletion operation, touch ✕ (cancel) on the message screen.

» The [Memory Card] screen is displayed.

4 Touch [Use Cond.].
» The [Use Cond.] screen is displayed.



**5** Check that the number of saved measurement data files and saved text data files is 0.




### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## ■ Saving data in a text file

When saving measurement data, you can also save that measurement data as a text file at the same time.

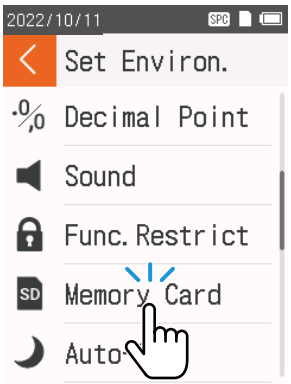
Use the following procedure to configure the settings.

### 1 Touch (main menu) on the Home screen and then [Set Environ.].

» The [Set Environ.] screen is displayed.

### 2 Touch [Memory Card].

» The [Memory Card] screen is displayed.



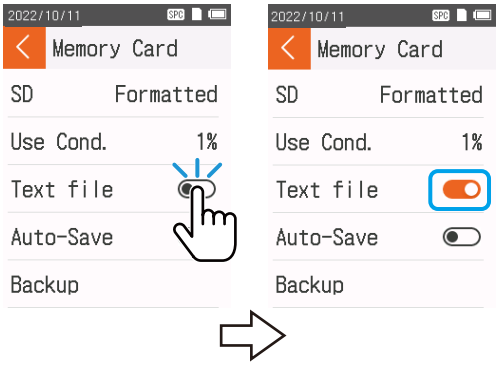

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

### 3 Set the ON/OFF button for [Text file] to ON ( ).

» When measurement data is saved, it will also automatically saved as a text file.




**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The default value is ON ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

## ■ Auto-Save

When [Auto-Save] is set, measurement data is automatically saved in the main folder of the memory card after measurement has been completed.

Use the following procedure to configure the settings.

**Tips**

When saving measurement data for the first time after the power is turned on, the save process may take some time.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

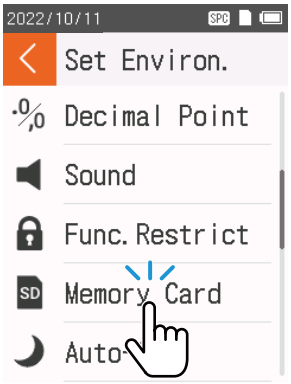
**2 Touch [Memory Card].**

» The [Memory Card] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



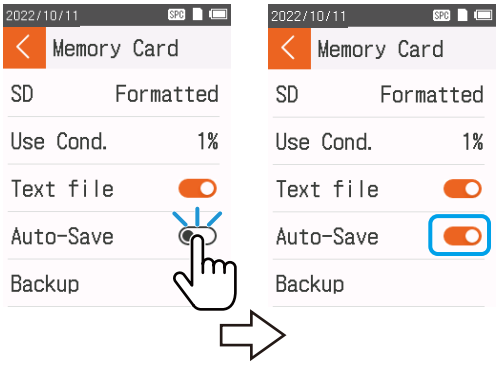

**3 Touch the ON/OFF button for [Auto-Save] to switch between ON ( ) and OFF ( ).**

**(Example: Set the button to ON ( ).)**

» Auto-save for measurement data is enabled.

**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The default value is OFF ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



## ■ Backups

You can back up 10 measurement conditions and information stored in internal memory to a memory card. Also, you can recall the backed-up data from the memory card.

The following table shows data files that are to be backed up.

| | Menu name | Data files that are to be backed up |
|---|---|---|
| Measurement conditions | Measurement conditions | Standard |
| | | Profile |
| | | Parameter |
| | | Parameter detail settings |
| | | GO/NG judgment |
| | | Filters |
| | | λc/L/A |
| | | λs |
| | | Number of sections |
| | | Pre-travel/post-travel |
| | | Measuring speed |
| | | Range |
| | Measurement conditions file | File name, the above contents under the measurement conditions menu<br>**Tips**<br>Backing up is possible only when a measurement conditions file has been saved. |
| | Print setting | Auto-print |
| | | Logo |
| | | Date |
| | | Title |
| | | Measurement conditions |
| | | Evaluation profile |
| | | Calculation results |
| | | N (section lengths) result |
| | | Tolerance limit value |
| | | BAC |
| | | ADC |
| | | Vertical magnification |
| | | Horizontal magnification |
| Product configuration information | Screen change | Display format |
| | | Calculation results |
| | | Evaluation profile |
| | | Graphs |
| | | Condition lists |
| | | Standard |
| | Sound | – |
| | Backlight | – |
| | | Eco-mode |

(Continued on the following page.)

| | Menu name | Data files that are to be backed up |
|---|---|---|
| Product configuration information (Continued from the previous page.) | PC Communication | RS-232C |
| | | Speed |
| | | Parity |
| | Calibration conditions | Number of measurements for calibration |
| | | Standard |
| | | Filters |
| | | λc |
| | | λs |
| | | Number of sections |
| | | Measuring speed |
| | | Range |
| | | Nominal value |
| | Calibration history | Calibration date, calibration factor, number of calibrations executed |
| | Memory Card | Text file |
| | | Auto-save |
| | Wireless communication | Device name |
| | Data output | Auto-output |
| | | SPC parameter |
| | Stylus alarm | Cumulative distance (of measured length) |
| | | Threshold |
| | Auto-OFF | Auto-OFF |
| | | Wait time (sec) |
| | Self-timer | Self-timer |
| | | Wait time (sec) |
| | Data output | – |

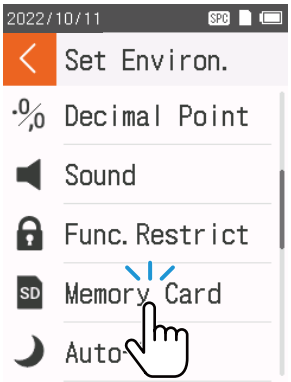
## ● Backing up saved data to a memory card

**1 Touch ☰ (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Memory Card].**

» The [Memory Card] screen is displayed.



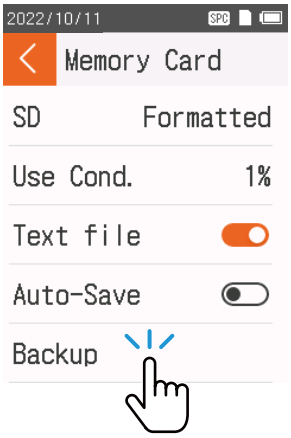

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

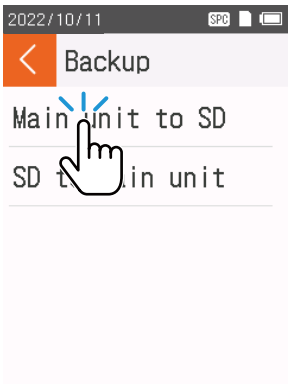
## 3 Touch [Backup].

» The [Backup] screen is displayed.



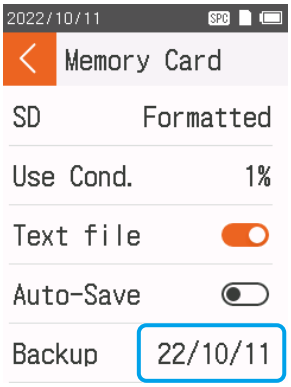

## 4 Touch [Main unit to SD].

» The [Memory Card] screen is displayed.




» Up to 10 measurement conditions files saved in the internal memory are backed up to the memory card.

» The date on which you backed up the data is displayed in the [Backup] field.




### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

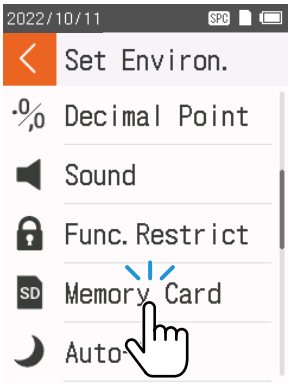
## ● Recalling backed-up data from the memory card

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Memory Card].**

» The [Memory Card] screen is displayed.



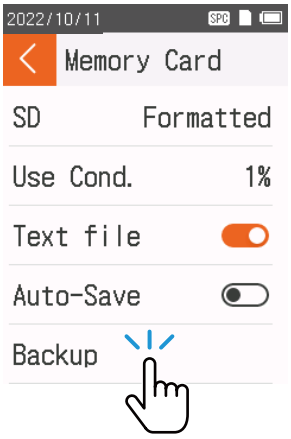

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

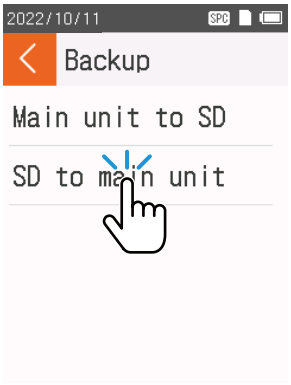
**3 Touch [Backup].**

» The [Backup] screen is displayed.




**4 Touch [SD to main unit].**

» The backed-up data is recalled to the main unit.




**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.11 Auto-OFF Function Setting

When the internal battery is used and this product has not been operated for a certain length of time, the power turns off automatically (Auto-OFF function). You can set the length of time that this product waits before entering the auto-off state.

**IMPORTANT**

The Auto-OFF function is disabled when power is supplied from an external power source.

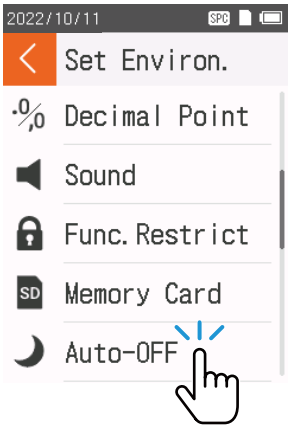
To turn the power off, press and hold the [POWER/DATA] key.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Auto-OFF].**

» The [Auto-OFF] screen is displayed.




**Tips**

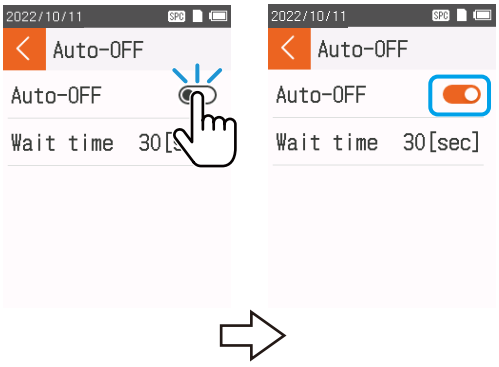
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3 Touch the ON/OFF button for [Auto-OFF] to switch between ON ( ) and OFF ( ).**

**(Example: Set the button to ON ( ).)**

» The Auto-OFF function is enabled.




**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The default value is ON ( ).

## 4 Touch [Wait time].

» The [Wait time] screen is displayed.

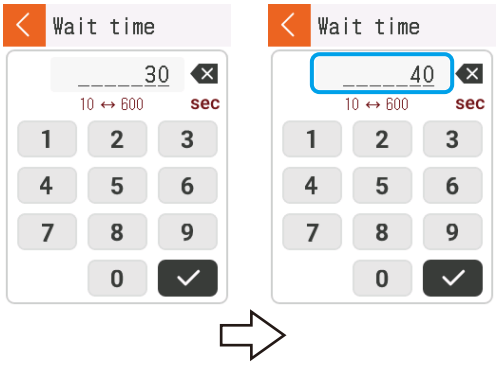



## 5 Set the length of time that this product waits before entering the auto-off state. (Example: Input "40".)

The input range is as follows.
10 to 600 sec

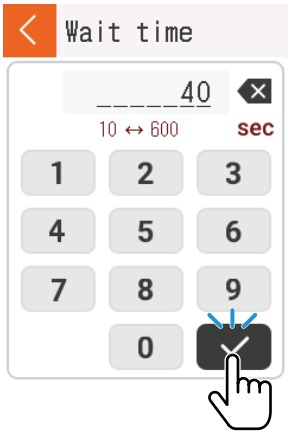
### Tips

- To discard the setting, touch (return).
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 6 Touch (confirm).

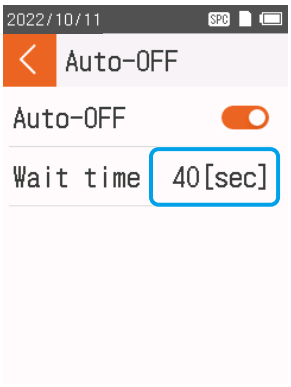
» The wait time is set.
» The [Auto-OFF] screen is displayed.



**7** **Check that the wait time you set is reflected in the [Wait time] field.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.12 Self-Timer Function Setting

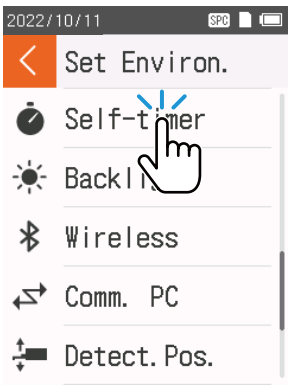
When the self-timer function is set, measuring starts after a set period of time has elapsed since the [START/STOP] key was pressed.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Self-timer].**

» The [Self-timer] screen is displayed.




**Tips**

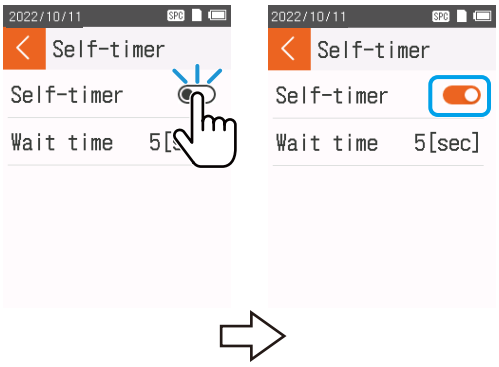
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3 Touch the ON/OFF button for [Self-timer] to switch between ON ( ) and OFF ( ).**

**(Example: Set the button to ON ( ).)**

» The self-timer function is enabled.




**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The default value is OFF ( ).

**4 Touch [Wait time].**

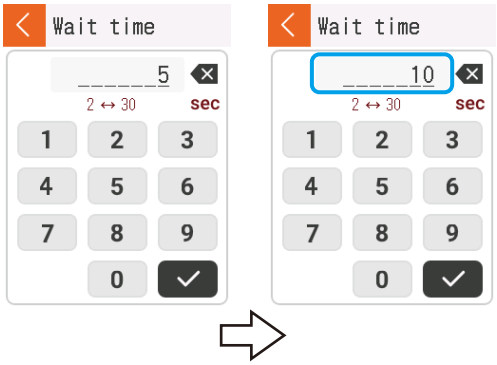
» The [Wait time] screen is displayed.



## 5 Set the length of time that this product waits before starting measurement.

**(Example: Input "10".)**

The input range is as follows.
2 to 30 sec

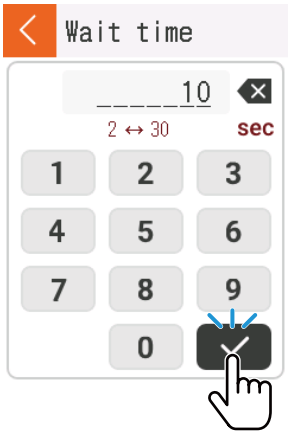



### Tips

- To discard the setting, touch (return).
- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".

## 6 Touch (confirm).

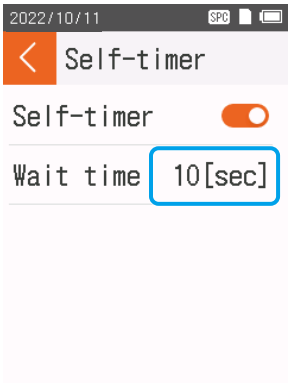
» The wait time is set.
» The [Self-timer] screen is displayed.




## 7 Check that the wait time you set is reflected in the [Wait time] field.

### Tips

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.13 Backlight Adjustment

You can adjust the brightness of the touch panel backlight.

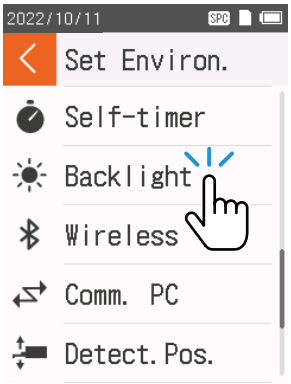
Also, you can set the eco-mode function. When no operations are made for approximately 10 seconds, the eco-mode function dims the screen.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Backlight].**

» The [Backlight] screen is displayed.

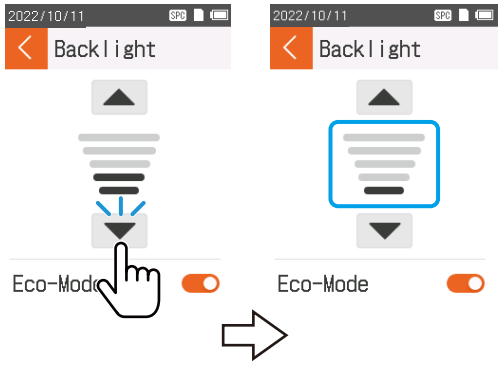



**Tips**

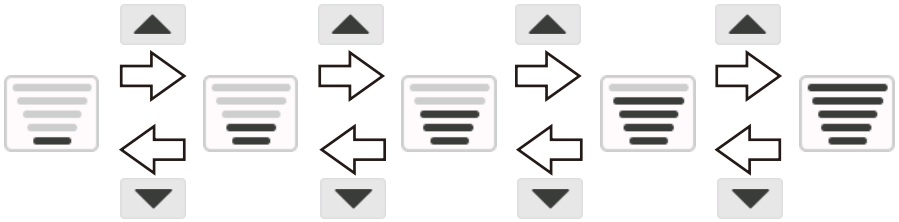
Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3 Touch (brighter) and (dimmer) to adjust the brightness.**

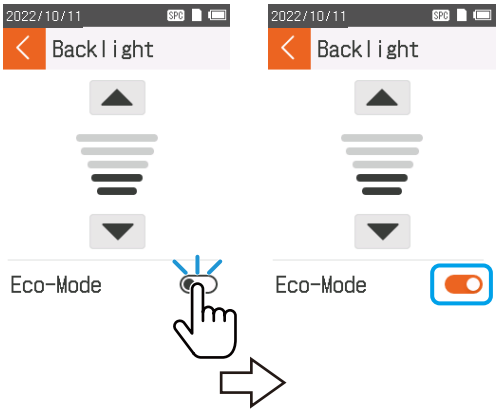



Each time you touch or , the level indicators go up or down as shown below.



**4** **Touch the ON/OFF button for [Eco-Mode] to switch between ON ( ) and OFF ( ).**
**(Example: Set the button to ON ( ).)**

» The eco-mode function is enabled.




### Tips

- While [Eco-Mode] is set to ON, the screen dims when no operations are made for approximately 10 seconds.
- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The default value is ON ( ).
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.14 Wireless Communication Settings

Configure the settings for using a wireless communication unit for measuring instruments (optional accessory).

You can set the device name and toggle the power to the wireless communication unit for measuring instruments (optional accessory) ON and OFF.

**IMPORTANT**

If you press the [START/STOP] key of this product while a wireless communication unit for measuring instruments (optional accessory) is connected and the option button for [Power] on the [Wireless] screen is set to ON, a message screen is displayed asking you whether to start the reset operation.

When you do not wish to start the reset operation, touch ✕ (cancel).

For details about resetting the settings of a wireless communication unit for measuring instruments (optional accessory), see "3.4 Resetting the Settings of a Wireless Communication Unit for Measuring Instruments" on page E-54.

**Tips**

At the time of purchase, the power to the wireless communication unit for measuring instruments (optional accessory) is set to ON ( ).

You can set the device name only when the power is set to OFF ( ).

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

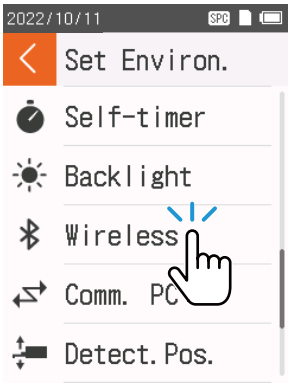
**2 Touch [Wireless].**

» The [Wireless] screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

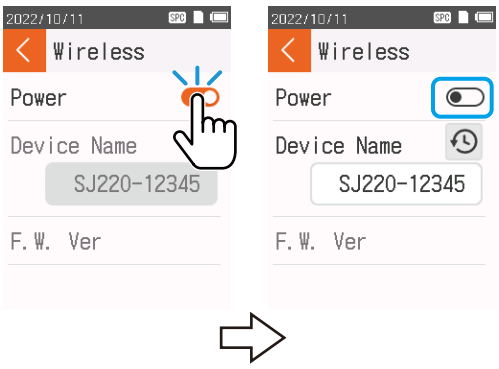
For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".




**3 Set [Power] to OFF ( ).**

**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).
- The device name can be set only when the power to the wireless communication unit for measuring instrument is set to OFF ( ).



## 4 Touch the [Device Name] input field.

» The [Device Name] input screen is displayed.




### Tips

The default device name is "SJ-220-*****".

("*****" indicates the first five digits of the serial number of this product.)

If you do not wish to change the device name, proceed to step 8.

## 5 Enter a name for [Device Name].

**(Example: Enter [123-A].)**

### IMPORTANT

You can change the five alphanumeric characters (including a hyphen and an underscore) following "SJ220-".

### Tips

- Touch the input field to display AC (all clear). To clear the entire input value, touch AC (all clear).
- For details about inputting alphanumeric characters, see "■ Input operations for alphanumeric characters" on page A-20 in "PART A Overview".




## 6 Touch ✓ (confirm).

» The device name is set.

» The [Wireless] screen is displayed.

### Tips

To cancel the input operation, touch < (return).



## 7 Check that the device name you set is reflected in the [Device Name] field.

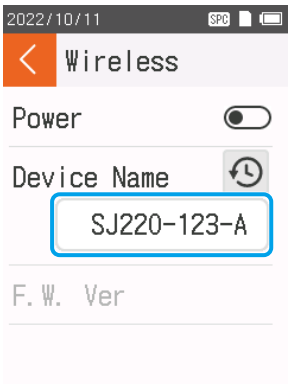
### Tips

To reset the device name to its default value, touch (initialize). The device name returns to its default value (SJ220-*****).

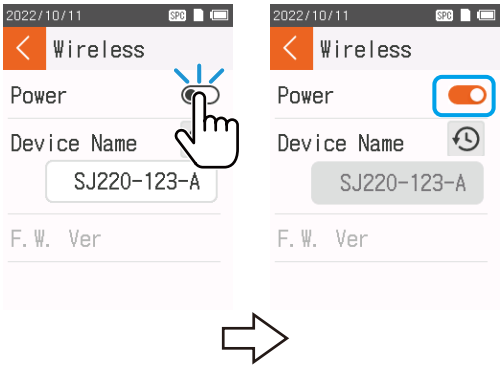
"******" indicates the first five digits of the serial number of this product.

Confirm the serial number with the [Version] screen or the label at the bottom of the display unit.

For details, see "2.19 Version Confirmation" on page F-68 or "3.9 Version" on page F-77 in "PART F Environment Settings" or "1.3.1 Display Unit" on page A-6 in "PART A Overview".




## 8 Set [Power] to ON ( ).



# 2.15 PC Communication Setting

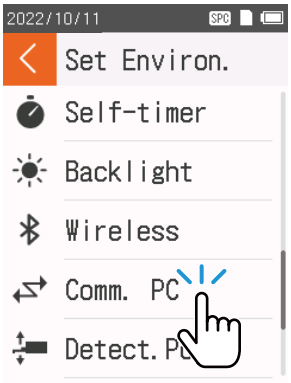
This section explains the settings for communication with a PC over RS-232C.
The RS-232C connector of this product is used for connecting a printer or PC.
The RS-232C communication conditions you set here are only for communication with a PC. The printer communication conditions are internally fixed, so there are no screens for setting them.

**1 Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2 Touch [Comm. PC].**

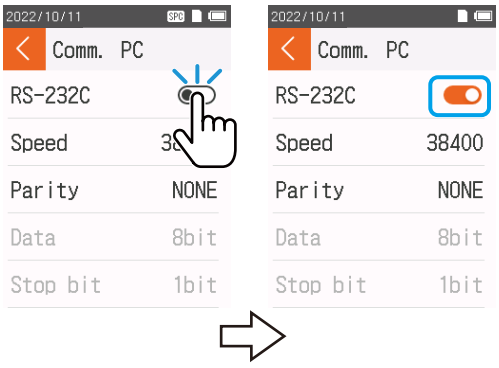
» The [Comm. PC] screen is displayed.




**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.
For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3 Touch the ON/OFF button for [RS-232C] to switch between ON ( ) and OFF ( ).**
**(Example: Set the button to ON ( ).)**




**IMPORTANT**

- When [RS-232C] is set to ON ( ), communication with the PC is prioritized even when the data output type is set to [Printer].
- If connections, such as those between devices, are not correctly established, data cannot be output even when [RS-232C] is set to ON ( ).

**Tips**

- Touching the ON/OFF button toggles between ON ( ) and OFF ( ).

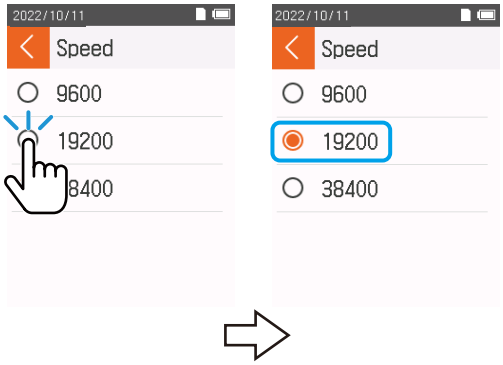
**4** **Touch [Speed].**

» The [Speed] screen is displayed.



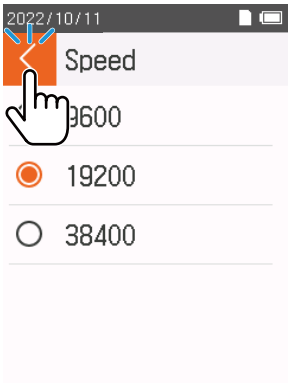

**5** **Touch the option button for the desired speed.**

**(Example: Select the option button for [19200].)**

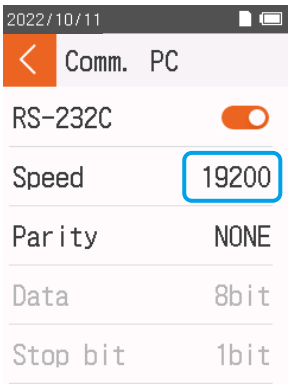



**6** **Touch** **(return).**

» The screen returns to the [Comm. PC] screen.



**7** **Check that the speed you set is reflected in the [Speed] field.**



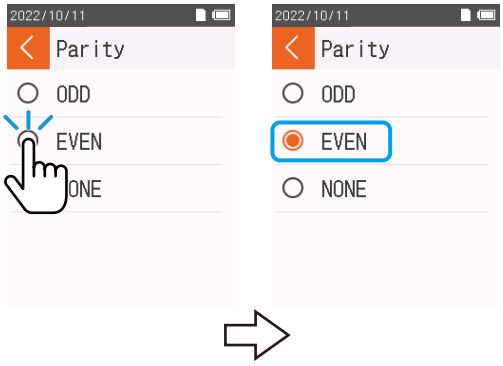

**8** **Touch [Parity].**

» The [Parity] screen is displayed.




**9** **Touch the option button for the desired parity.**

**(Example: Select the option button for [EVEN].)**



**10** **Touch (return).**

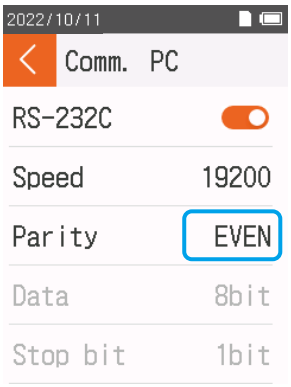
» The screen returns to the [Comm. PC] screen.




**11** **Check that the parity you set is reflected in the [Parity] field.**

**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.



# 2.16 Detector Position Display

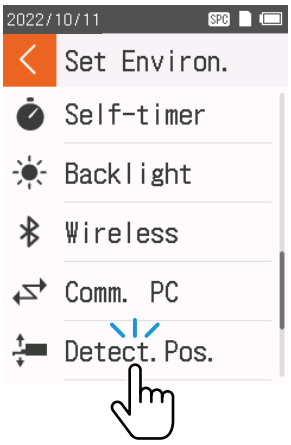
You can confirm the current position of the detector.

**1** **Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [Detect. Pos.].**

» The [Detect. Pos.] screen is displayed.




**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3** **Check the position of the detector.**







**Tips**

- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 2.17 Touch Panel (LCD) and Operation Key Test

You can check whether the colors displayed on the touch panel are correct and whether the screen buttons and operation keys respond properly.

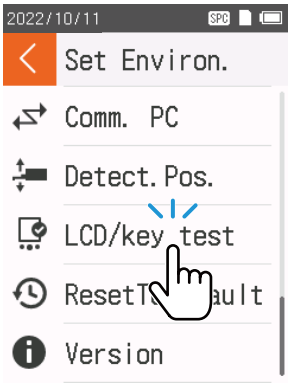
If colors are displayed incorrectly on the touch panel or if there is a problem with any of the touch panel buttons or in the response of the operation keys, please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1).

**1** **Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [LCD/key test].**

» A red screen is displayed.



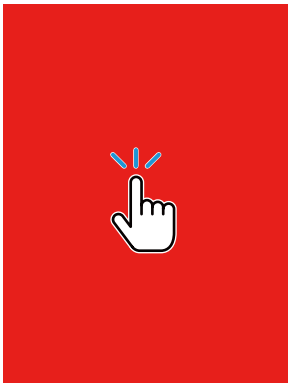

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

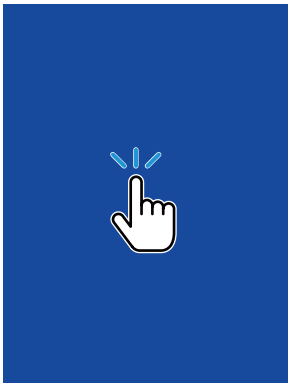
**3** **Check that the red color is correctly displayed, and then touch the screen.**

» A blue screen is displayed.



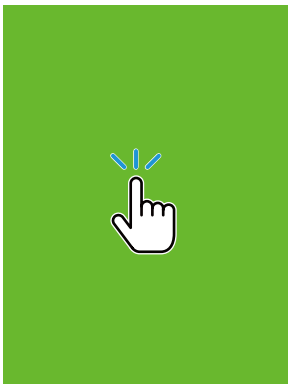
**4** **Check that the blue color is correctly displayed, and then touch the screen.**

» A green screen is displayed.



## 5 Check that the green color is correctly displayed, and then touch the screen.

» The screen displays five numbers.



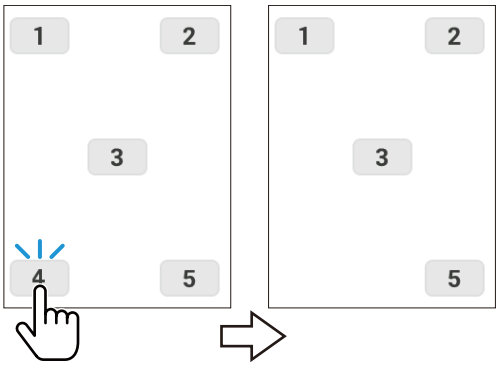
## 6 Touch each numeric button to check whether it responds properly.

» After you have touched all the numeric buttons, the screen displays the operation keys.

### Tips

Each number on the screen disappears when it is touched.

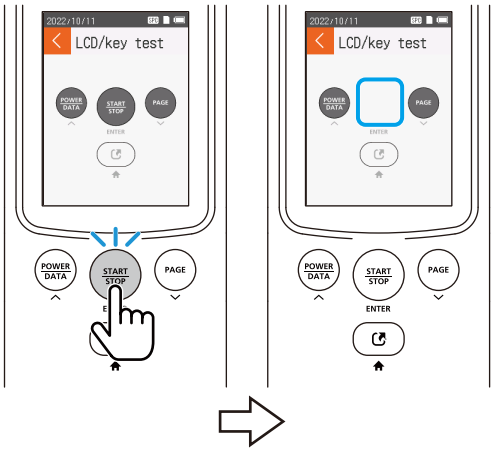
When all the numbers have disappeared, the screen changes to the operation key screen.




## 7 Press each operation key to check whether it responds properly.

### Tips

- Each operation key on the screen disappears when the corresponding physical operation key is pressed.
- To return to the previous screen, touch (return).



# 2.18 Reset to Default (State at the Time of Purchase)

Reset the settings of this product to their default states (the settings at the time of purchase).

**IMPORTANT**

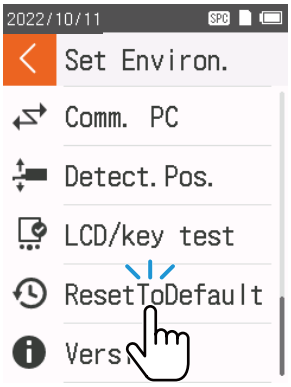
- Caution should be exercised during the reset operation. If all the settings are reset to their default state, any settings you have configured, such as measurement conditions, are lost. Perform a reset only when necessary.
- The following items are not reset: drive unit type, calibration information, decimal separator type, and language. For details about the settings at the time of purchase, see "■ Items that are reset to their default values at the time of purchase" on page F-66.

**1** **Touch ☰ (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [ResetToDefault].**

» A message screen is displayed.



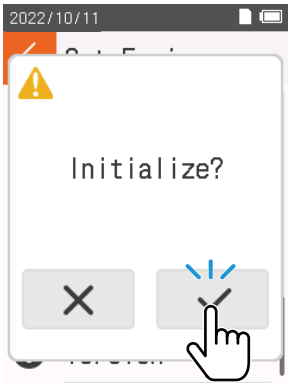

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3** **Touch ✓ (confirm).**

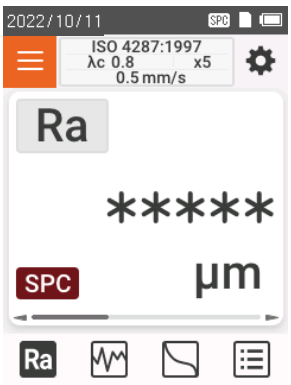
» The settings are reset to their default values.




**Tips**

To cancel the reset operation, touch ✕ (cancel).

» The Home screen is displayed






No. 99MBB794A

## ■ Items that are reset to their default values at the time of purchase

- Measurement data

  All data is cleared.

- Measurement conditions, parameter detail settings, GO/NG judgment result tolerance values

**Measurement conditions**

| Standard | Profile | Parameter | Filters | λc | λs | Number of sections | Pre-travel Post-travel | Measuring speed | Range |
|---|---|---|---|---|---|---|---|---|---|
| ISO 4287 | R | 3 (Ra, Rq, Rz) | GAUSS | 0.8 | 2.5 | 5 | ON | 0.5 | AUTO |

**Parameter detail settings**

| Parameter | Definition | Unit | Slice points | Count level | Slice level | Reference line | Slice depth |
|---|---|---|---|---|---|---|---|
| Sm/Pc/Rc/... | Zp/Zv | % | – | 10.0 | – | – | – |
| HSC | Peak | % | – | 10.0 | – | – | – |
| mr | N | – | 1 | – | – | 0 % | 0.1 m |
| mr (c) | Peak | % | 2 | – | 10 %, 15 % | – | – |
| σc | – | – | 1 | – | 25 % | 10 % | – |
| AnnexA | ON | – | – | – | – | – | – |

**GO/NG judgment**: All mean and tolerance values are 0.

- Nominal value for calibration measurement, calibration conditions, and calibration history

The contents of the previous calibration is not lost.

**Nominal value**: 2.95 (standard type, retractable type), 1.00 (transverse-tracing type)

**Calibration history**: Cleared

**Calibration conditions (standard type, retractable type)**

| Standard | Filters | λc | λs | Number of sections | Measuring speed | Range |
|---|---|---|---|---|---|---|
| ISO 4287 | GAUSS | 2.5 | 8 | 5 | 0.75 | AUTO |

**Calibration conditions (transverse tracing type)**

| Standard | Filters | λc | λs | Number of sections | Measuring speed | Range |
|---|---|---|---|---|---|---|
| JIS 1994 | GAUSS | 0.8 | NONE | 5 | 0.5 | AUTO |

- Stylus alarm cumulative distance and threshold

  Cleared

- Volume setting: Level 3

- Auto-OFF setting

  **Auto-OFF**: ON

  **Wait time**: 30 s

- Self-timer setting

  **Self-timer**: OFF

  **Wait time**: 5 s

- Backlight

  **Brightness**: Level 2

  **Eco-Mode**: ON

- Wireless communication

  **Wireless communication unit for measuring instrument**: ON

  **Device Name**: SJ220-*****

  **Tips**

  "*****" indicates the first five digits of the serial number of this product.

  Confirm the serial number with the [Version] screen or the label at the bottom of the display unit.

  For details, see "2.19 Version Confirmation" on page F-68 or "3.9 Version" on page F-77 in "PART F Environment Settings" or "1.3.1 Display Unit" on page A-6 in "PART A Overview".

- PC communication settings

| RS-232C | Speed | Parity | Data | Stop |
|---|---|---|---|---|
| – | 38400 | NONE | 8 bit | 1 bit |

**IMPORTANT**

The RS-232C setting (ON or OFF) will not be reset. The settings that were configured before the reset operation will remain.

- Screen setup

| Display format | Calculation result | Evaluation profile | Graphs | Conditions list | Standard |
|---|---|---|---|---|---|
| V | 1 Ver. | ON | ON | ON | Detail |

- Measurement conditions files (10 files)

  Cleared

# 2.19 Version Confirmation

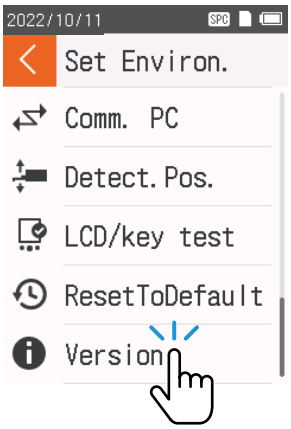
You can confirm the version information of the software installed on this product, and the code number and serial number of this product.

**1** **Touch (main menu) on the Home screen and then [Set Environ.].**

» The [Set Environ.] screen is displayed.

**2** **Touch [Version].**

» The [Version] screen is displayed.




**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

**3** **Confirm the version information.**




**Tips**

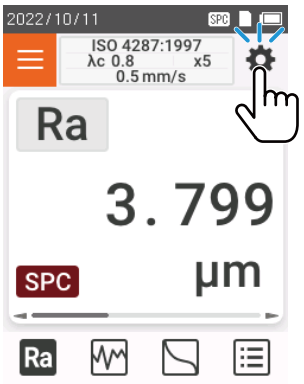
- To return to the previous screen, touch (return).
- To return to the Home screen, press the HOME key.

# 3 Set System Menus

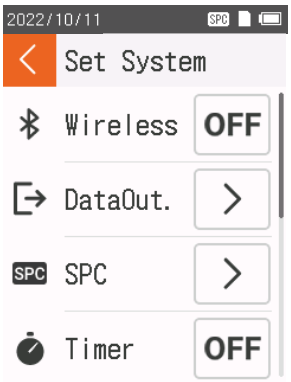
On the [Set System] screen, you can quickly set the following nine items from the Set Environ. menu.
For details about the Set Environ. menu, see 📖 "PART F Environment Settings".

| Item | Description | Reference |
|---|---|---|
| Wireless | Set the power to the wireless communication unit for measuring instruments (optional accessory) to ON or OFF. | 📖 "3.1 Wireless" |
| Data Output | Select how data is output when the [POWER/DATA] key is pressed.<br>Select SPC, printer, data saving, hard copy, or NONE (disabled). | 📖 "3.2 DataOut." |
| SPC | Select the parameters for SPC data output.<br>You can also set Auto-Output to ON or OFF. | 📖 "3.3 SPC" |
| Self-timer | Switch between ON or OFF. | 📖 "3.4 Timer" |
| Light | Adjust the backlight brightness from level 1 to 5. | 📖 "3.5 Light" |
| Sound | Adjust the volume from level 1 to 5. The sound can also be muted. | 📖 "3.6 Sound" |
| Auto-OFF | Switch between ON or OFF. | 📖 "3.7 Auto-OFF" |
| Unit | You can select from [mm] or [inch]. (Inch/Millimeter specification only) | 📖 "3.8 Unit" |
| Version | Confirm the product version information. | 📖 "3.9 Version" |

**1 On the Home screen, touch ⚙ (set system button).**




» The [Set System] screen is displayed.




**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see 📖 "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

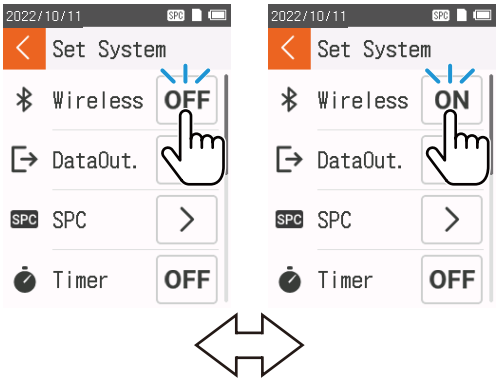
For details about how to configure the settings in the set system menus, see 📖 "3.1 Wireless" to "3.9 Version".

# 3.1 Wireless

**1** **Touch the ON/OFF button in the [Wireless] field.**

- [ON]: Wireless communication is enabled.
- [OFF]: Wireless communication is disabled.

» The button toggles between [ON] and [OFF].




**IMPORTANT**

With [Wireless] in the set system menu, you can only set the button to [ON] or [OFF].

To change the device name of a wireless communication unit for measuring instruments (optional accessory), use [Wireless] in the Set Environ. menu.

For details about the setting method, see "2.14 Wireless Communication Settings" on page F-55.

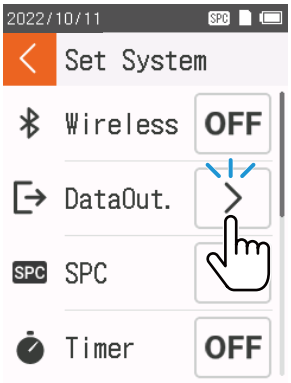
**Tips**

Touching the ON/OFF button toggles between [ON] and [OFF].

# 3.2 DataOut.

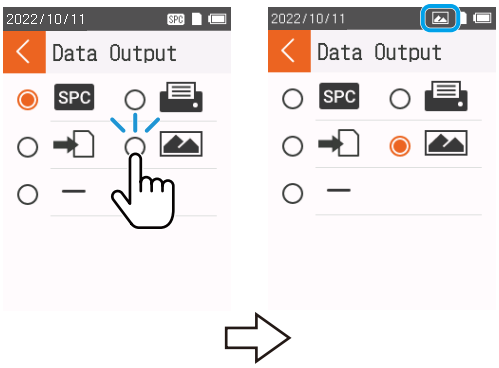
**1** **Touch [ > ] in the [DataOut.] field.**

» The [Data Output] screen is displayed.




**2** **Touch the option button for the desired data output method.**

» The option button you touched is selected.
(On the status bar, the data output icon also changes.)




**IMPORTANT**

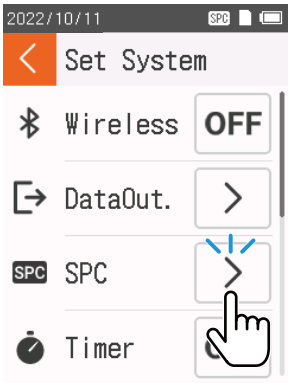
- With [DataOut.] in the set system menus, you can only change the data output type.
  Set the SPC parameters with [SPC] in the set system menu or with [Data Output] in the Set Environ. menu.
  For details about the setting method with the Set Environ. menu, see "2.3 Data Output Setting" on page F-6.
- If connections, such as those between devices, are not correctly established, data cannot be output even when the data output type is set.

| Icon | Data output type | Description |
|---|---|---|
| SPC | SPC | Measurement results are output to a Digimatic Mini-Processor. |
| | Printer | Measurement results are output to a printer. |
| | DataStora. | Measurement results are saved to a memory card. |
| | Hard copy | The displayed screen is captured and saved to a memory card. |
| — | NONE (no output) | No data is output when the [POWER/DATA] key is pressed. |

# 3.3 SPC

**1** **Touch [ > ] in the [SPC] field.**

» The [SPC parameter] screen is displayed.

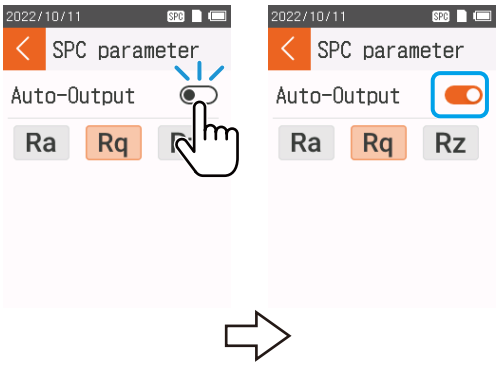



**2** **Touch the ON/OFF button for [Auto- Output] to switch between ON ( ) and OFF ( )**

**(Example: Set the button to ON ( ).)**

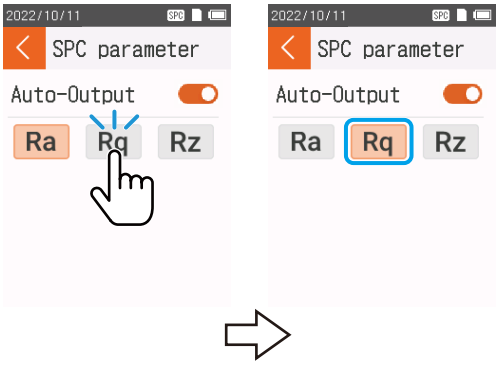
**Tips**

Touching the ON/OFF button toggles between ON ( ) and OFF ( ).




**3** **Touch the parameter for SPC output.**

» The parameter you touched is selected.

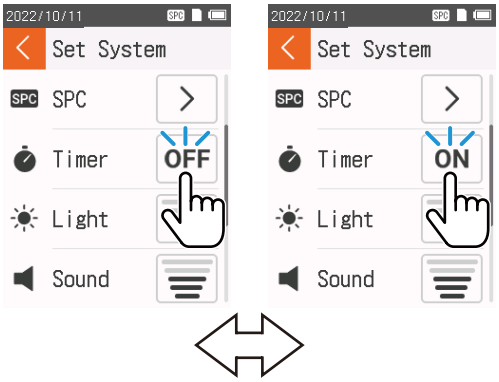


# 3.4 Timer

## 1 Touch the ON/OFF button in the [Timer] field.

- [ON]: The self-timer is set.
- [OFF]: The self-timer is not set.

» The button toggles between [ON] and [OFF].




### IMPORTANT

With [Timer] in the set system menu, you can only set the button to [ON] or [OFF].

Set the wait time with [Self-timer] in the Set Environ. menu.

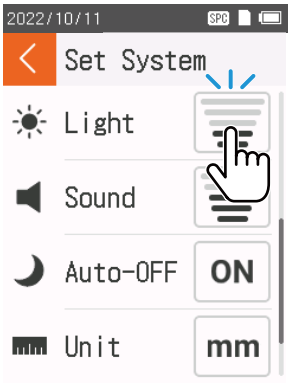
For details about the setting method, see "2.12 Self-Timer Function Setting" on page F-51.

### Tips

Touching the ON/OFF button toggles between [ON] and [OFF].

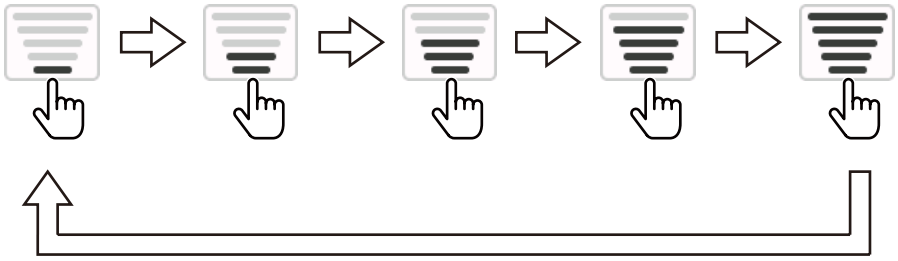
# 3.5 Light

**1** **Touch**  **(level indicator) in the [Light] field.**




» The backlight brightness increases or decreases along with the level indicator.

Each time you touch the level indicator, the backlight gets brighter. After the maximum brightness level (level 5) is reached, the brightness level returns to the minimum level (level 1).



**IMPORTANT**

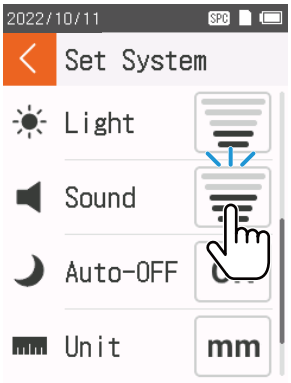
With [Light] in the set system menu, you can only adjust the brightness.

Set the eco-mode with [Backlight] in the Set Environ. menu.

For details about the setting method, see "2.13 Backlight Adjustment" on page F-53.

# 3.6 Sound

**1** **Touch**  **(level indicator) in the [Sound] field.**

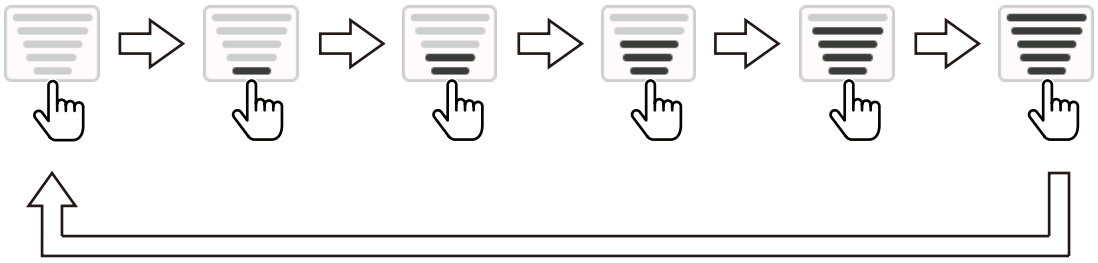



» The volume of the operation sound (the sound that plays when you press the touch panel buttons or the operation keys) increases or decreases along with the level indicator.

**Tips**

The operation sound that plays when the touch panel buttons or operation keys are pressed cannot be set individually.

Each time you touch the level indicator, the volume of the operation sound increases. After the maximum volume level (level 5) is reached, the volume level returns to the mute state (level 0).

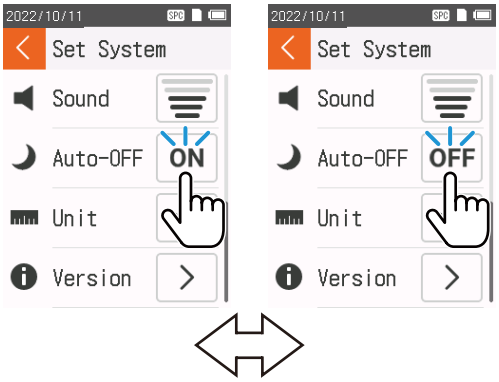


# 3.7 Auto-OFF

**1** **Touch the ON/OFF button in the [Auto-OFF] field.**

- [ON]: Auto-OFF is set.
- [OFF]: Auto-OFF is not set.

» The button toggles between [ON] and [OFF].




**IMPORTANT**

With [Auto-OFF] in the set system menu, you can only set the button to [ON] or [OFF].

Set the wait time with [Auto-OFF] in the Set Environ. menu.

For details about the setting method, see "2.11 Auto-OFF Function Setting" on page F-48.

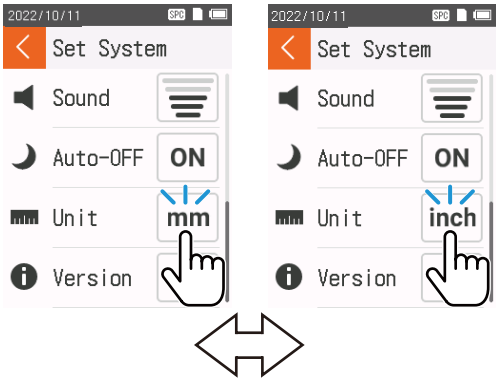
**Tips**

Touching the ON/OFF button toggles between [ON] and [OFF].

# 3.8 Unit

You can select from [mm] or [inch]. (Inch/Millimeter specification only)

**1** **Touch [mm] in the [Unit] field.**



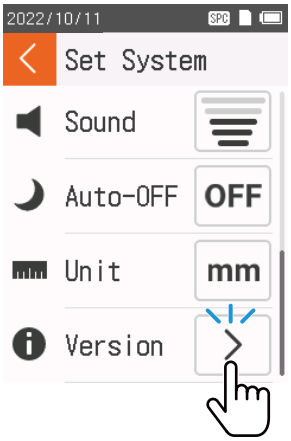

» Each time you touch it, it switches from [mm] to [inch], and then returns to [mm].

**Tips**

The unit used for millimeter specifications is only "mm", so touching the option button for [mm] does not display anything.

# 3.9 Version

**1** **Touch** [ > ] **in the [Version] field.**




» The [Version] screen is displayed.



## MEMO

# PART G
# Maintenance and Troubleshooting


1 Maintenance and Inspection ..... G-1
2 Troubleshooting ..... G-17


No. 99MBB794A

# 1 Maintenance and Inspection

## 1.1 Daily Care

### 1.1.1 Confirming for Normal Operation

To judge whether this product is operating normally, calibrate it with the supplied roughness specimen (Code No. 178-601-1, 178-605) , and then repeatedly measure the same measurement point on the roughness specimen to check that the variation in the obtained Ra values is within ±0.05 µm.

Note that if you change the measurement point of the supplied roughness specimen (Code No. 178-601-1, 178-605), the obtained Ra values are also affected by a variation of ±0.09 µm included in the roughness specimen.

**IMPORTANT**

Ra values fall within the above variation when obtained with a detector stylus with no dents or abrasions on its tip and a roughness specimen with no scratches or abrasions on its surface.

## 1.1.2 Cleaning

When this product gets dirty, refer to the following procedure to wipe off the dirt.

**NOTICE**

**The paint on this product may peel off, or the surfaces may be discolored.**

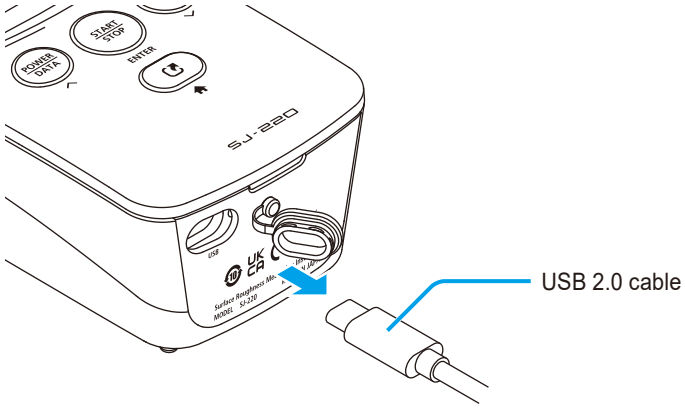
Do not use benzene, thinner, or a chemically-treated dust cloth to wipe off dirt.

**1** **Turn off the power.**

**Tips**

For details about turning off the power, see "5.5.2 Turning the Power Off" on page B-27 in "PART B Setting Up".

**2** **When the AC adapter is connected, remove the USB 2.0 cable from this product.**




**3** **Wipe off the dirt with a dry, soft cloth (silicon cloth).**

# 1.2 Storage

When storing this product, keep the product and its accessories in the handy case, etc. to avoid dust and moisture.
Remove the drive unit and detector as required.

**NOTICE**

**If this product is stored under inappropriate conditions, the service life of the internal battery may be shortened.**

Store this product in a place where the temperature can be maintained in a range from –10 °C to +50 °C. The service life of the internal battery varies substantially depending on the ambient conditions, such as temperature.

**IMPORTANT**

Keep the internal battery switch on except when the product is not used for a long period of time (more than 2 to 3 weeks). By keeping the internal battery switch on, data such as measurement results that was obtained immediately before the power is turned off will be retained even when the Auto-OFF function turns off the power to this product. The measurement data will then be displayed the next time the power is turned on.

However, if the internal battery switch is set to off, data such as measurement results obtained immediately before the power is turned off will be lost.

**Tips**

For details about how to remove the drive unit and detector, see "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38 in "PART B Setting Up".

Use the following procedure to store this product.

**1 Retract the detector.**

**Tips**

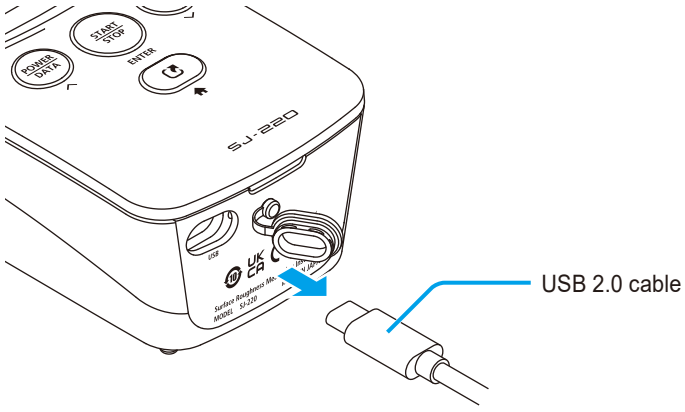
For details, see "1.2.1 Retracting the Detector" on page G-4.

**2 Turn off the power.**

**Tips**

For details about turning off the power, see "5.5.2 Turning the Power Off" on page B-27 in "PART B Setting Up".

**3 If the AC adapter is connected, remove the USB 2.0 cable from this product.**



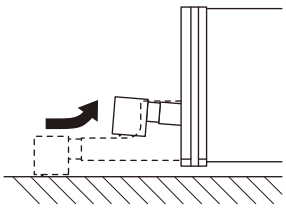

**4 Store this product.**

## 1.2.1 Retracting the Detector

The detector-retracted state is where the connector in the drive unit has moved back and the detector has entered the drive unit leaving the stylus outside.

When the drive/detector unit is housed in the display unit, the detector will enter the display unit.

When storing this product for a long period of time or transporting this product, retract the detector to prevent accidents, such as damage to the detector or workpiece caused by the detector tip interfering with the workpiece.



**NOTICE**

**If external force is applied to the detector tip, the drive unit may be damaged.**

Do not retract the detector when an extension rod (optional accessory) is being used.

**IMPORTANT**

The transverse-tracing type detector does not retract into the drive unit.

**Tips**

Remove the USB 2.0 cable and supply the power from the internal battery.

Use the following procedure to retract the detector.

Both the standard type and the retractable type can be retracted with the same procedure.

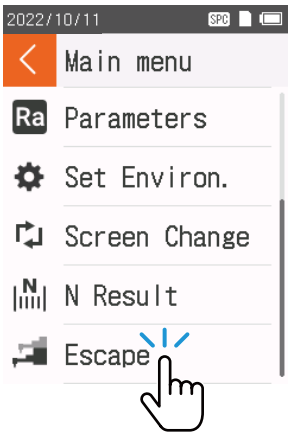
**1 On the Home screen, touch ☰ (main menu).**

» The [Main menu] screen is displayed.



## 2 Touch [Escape].

» A message screen is displayed.




### Tips

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".

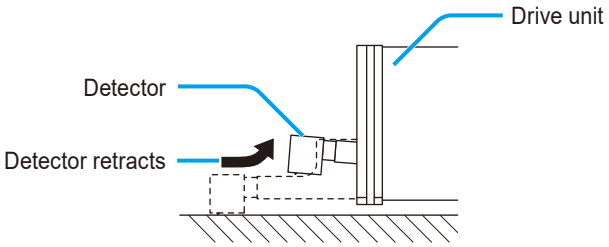
## 3 Touch ✓ (confirm).

» The detector retracts.



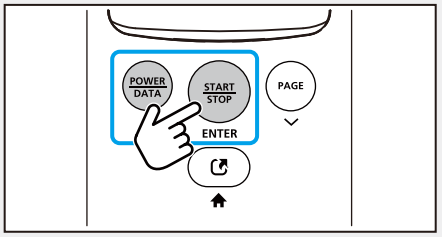

### Tips

To cancel the retracting operation, touch ✕ (cancel) on the message screen.




### Tips

- While the detector is retracting, a message screen is displayed indicating that the detector is being retracted.
- To retract the detector while the power is off, press and hold the [START/STOP] key and [POWER/DATA] key at the same time. When retraction starts, release your fingers from the keys. When the detector retraction is complete, the power turns off again.



## ■ Releasing the detector-retracted state

Use the following procedure to release the detector from the retracted state.

### 1 On the Home screen, touch ☰ (main menu).

» The [Main menu] screen is displayed.



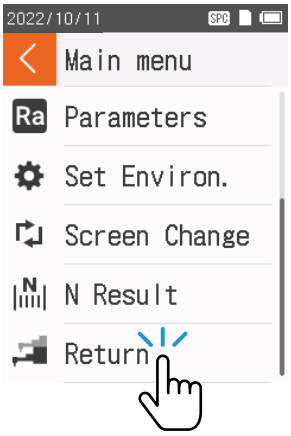

### 2 Touch [Return].

» A message screen is displayed.

**Tips**

Vertical swiping is available when the vertical scroll bar is displayed on the screen.

For details, see "2.3 Touch Panel Operations and Input Operations" on page A-18 in "PART A Overview".



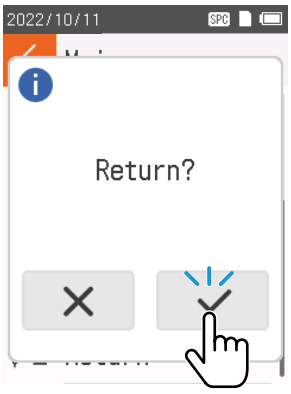

### 3 Touch ✓ (confirm).

» The detector returns to the origin position.

» When the detector-retracted state has been released, the message screen closes.

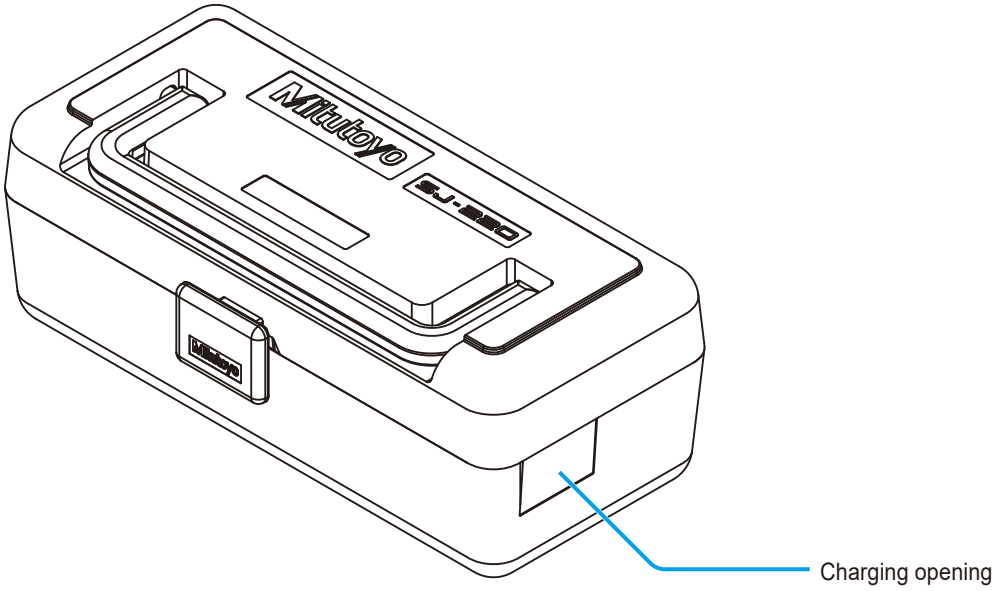
**Tips**

- While the detector is in the retracted state, [Return] is displayed instead of [Escape].
- To cancel the returning operation, touch ✕ (cancel) on the message screen.
- While the detector is returning, a message screen is displayed indicating that the detector is being returned.

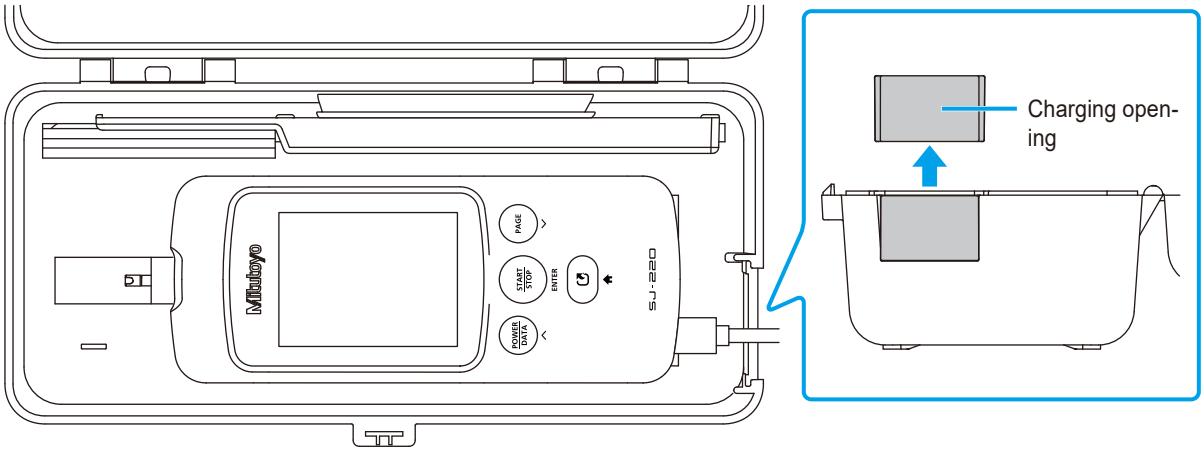


## 1.2.2 Handy Case

When storing or transporting this product, use the supplied handy case to protect it.

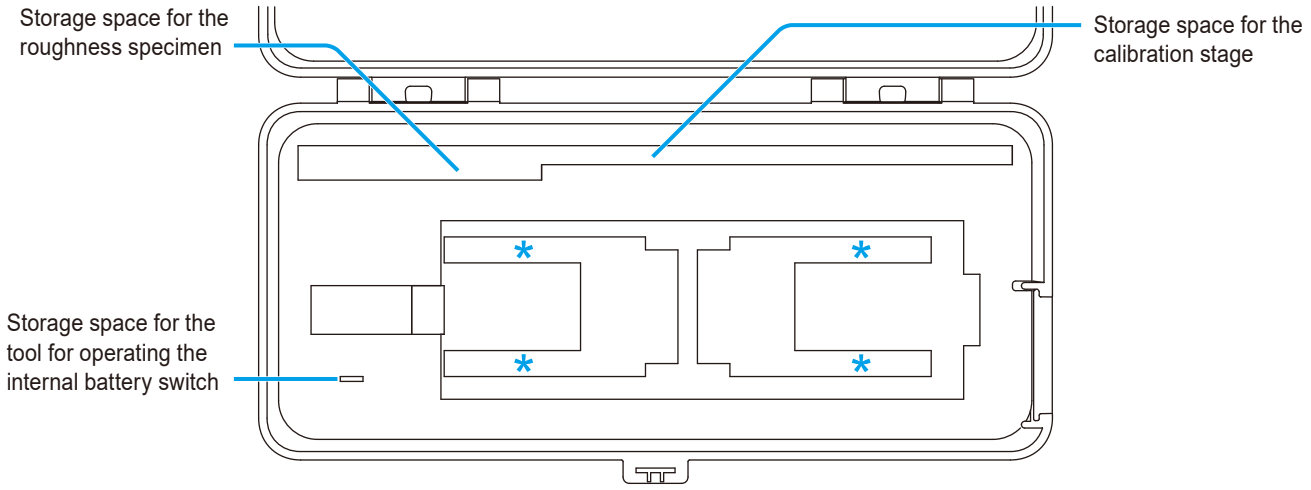



The handy case has an opening for charging the battery.
After removing the charging cover, you can charge this product while it is housed in the handy case.
When using the opening for charging the battery, hold the charging cover with your fingers and then pull it out upwards.



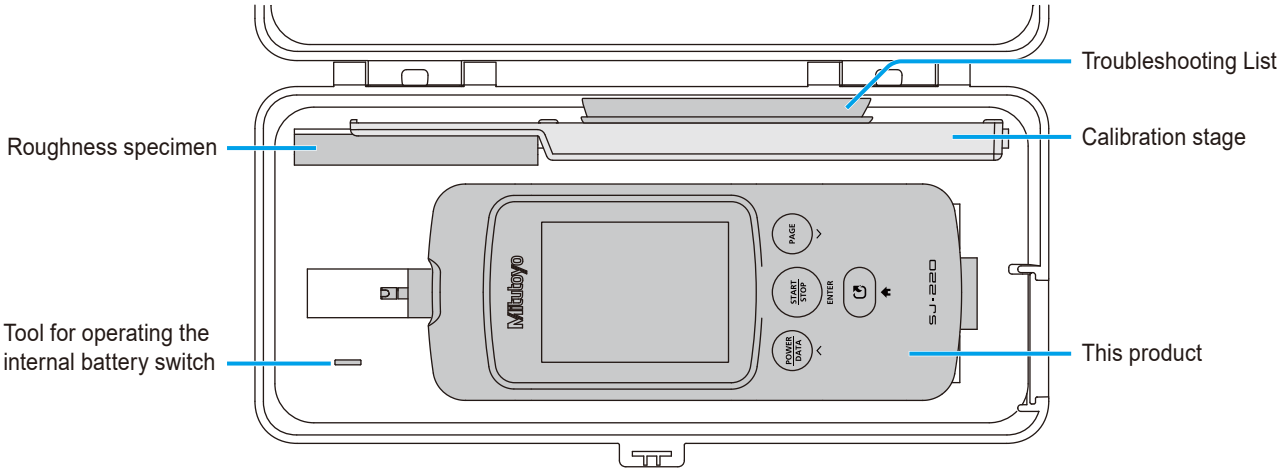
## ■ Storing the accessories

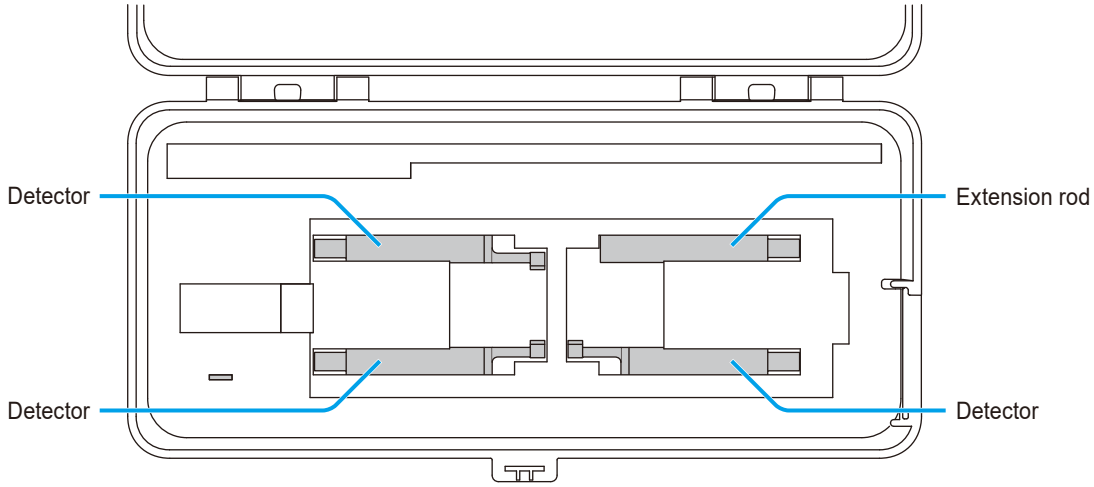
The following figure shows where to store the accessories of this product in the handy case.




* Storage space for detectors and extension rods (four spaces)

**Storage example**



# 1.3 Replacing the Internal Battery

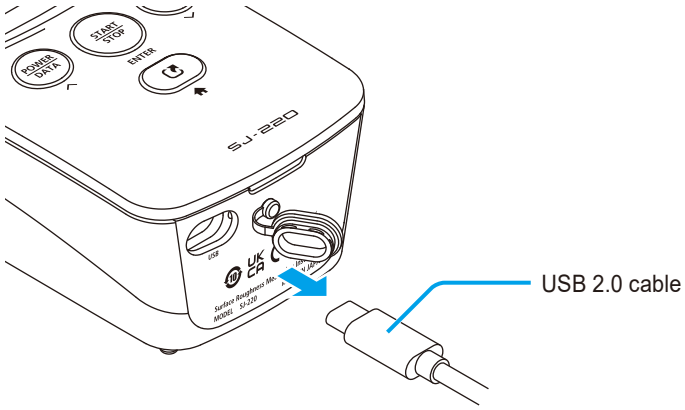
This section explains the procedure for replacing the internal battery.
Prepare a new replacement battery (Part No. 12AAZ222).

**NOTICE**

**There is a risk that this product may malfunction or may be damaged.**

- When replacing the internal battery, thoroughly read the replacement procedure, and exercise extreme caution during work to prevent the circuit board and cables from being damaged or cut.
- Replace the internal battery in an environment where no flying particles, such as dust, cut chips, or oil mist, can enter the product during work. The circuit board in this product will be temporarily exposed during work. If flying particles, such as dust, cut chips, or oil mist, get on the circuit board, this product may malfunction.

**1 If the AC adapter is connected, remove the USB 2.0 cable from this product.**




**2 Set the internal battery switch to OFF.**

**Tips**

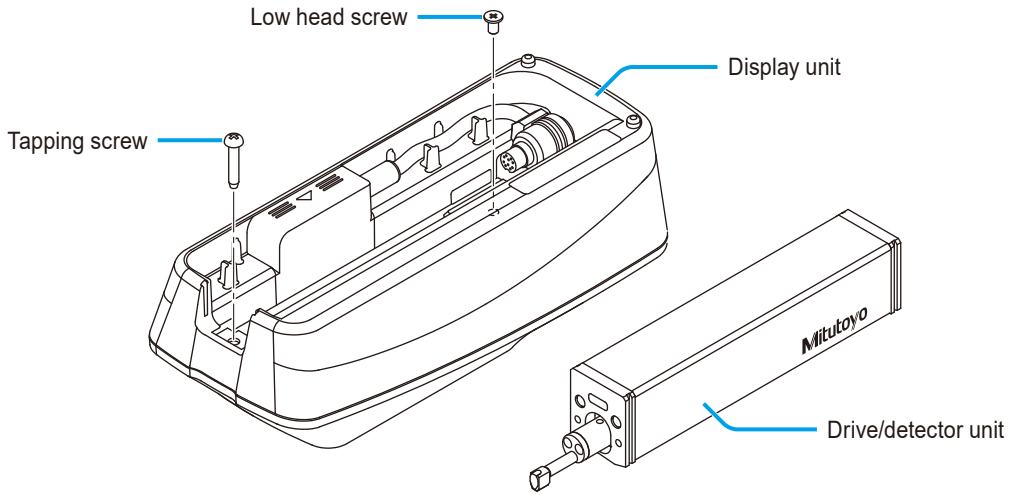
For details about setting the internal battery switch to ON or OFF, see "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14 in "PART B Setting Up".

**3 Detach the drive/detector unit from the display unit.**

**Tips**

For details about detaching and attaching the drive/detector unit, see "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38 in "PART B Setting Up".

**4** **Remove the tapping screw and the low head screw from the display unit by using a Phillips screwdriver.**



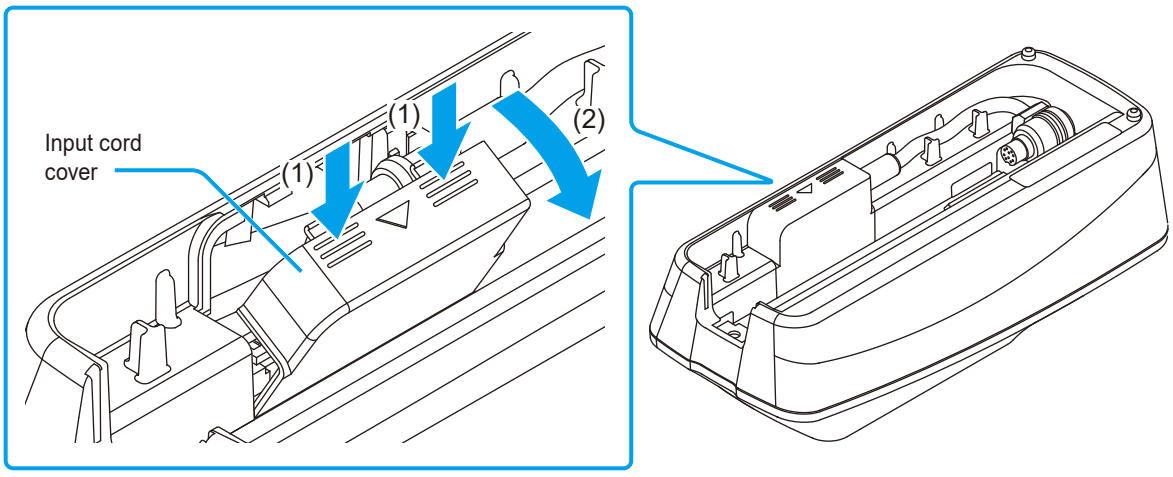

**5** **Remove the lower cover from the display unit.**

**NOTICE**

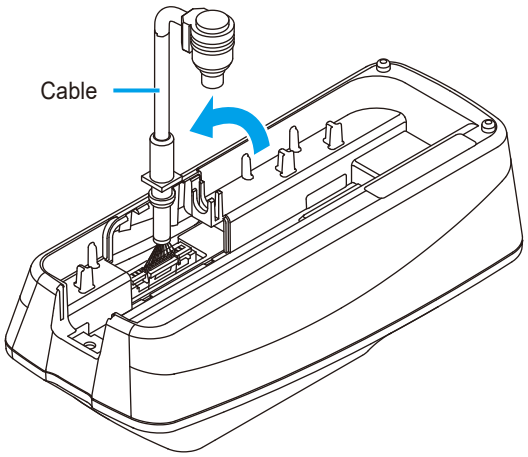
**There is a risk of damage to the cable.**

The cable is connected to the circuit board. Carefully remove the lower cover so that the cable does not get damaged.

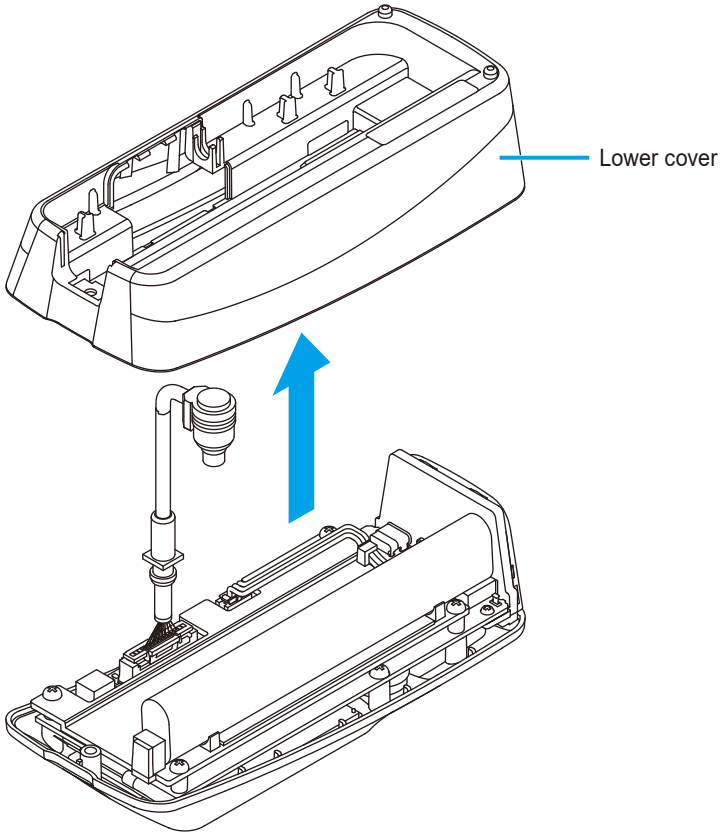
1 While pushing down on the input-cord cover with your fingers in the direction indicated by (1), tilt it in the direction indicated by (2) to remove it.



2 Release the cable from the catches at the bottom of the display unit.




3 Remove the lower cover.



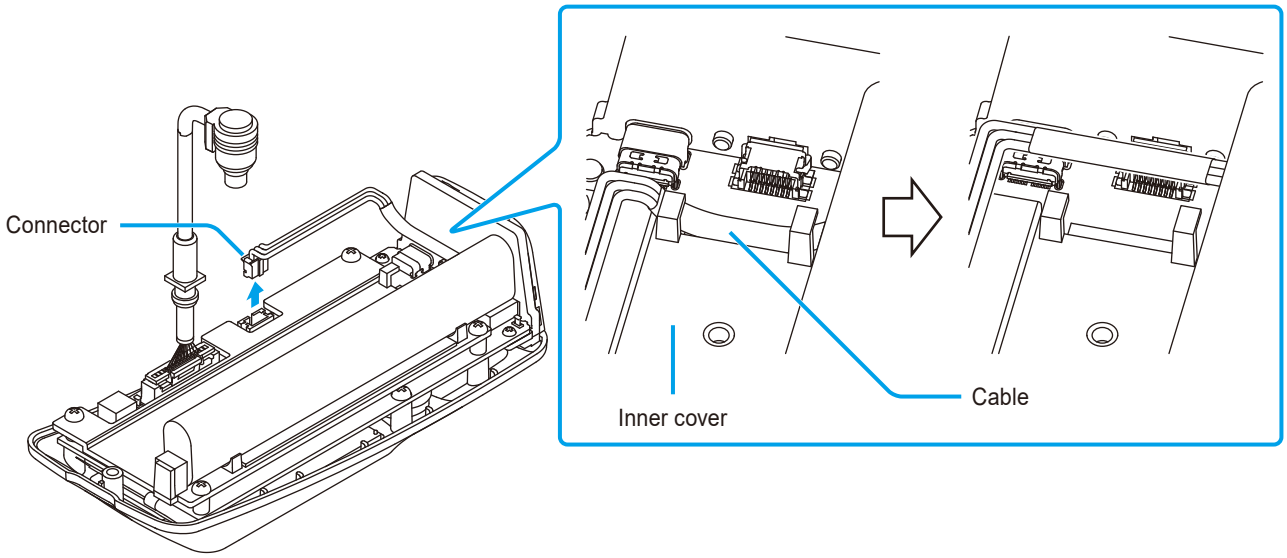
## 6 Disconnect the connector of the internal battery from the circuit board.

1 Slowly pull out the connector of the internal battery from the circuit board.

2 Release the cables of the internal battery from the two protrusions on the inner cover.

**Tips**

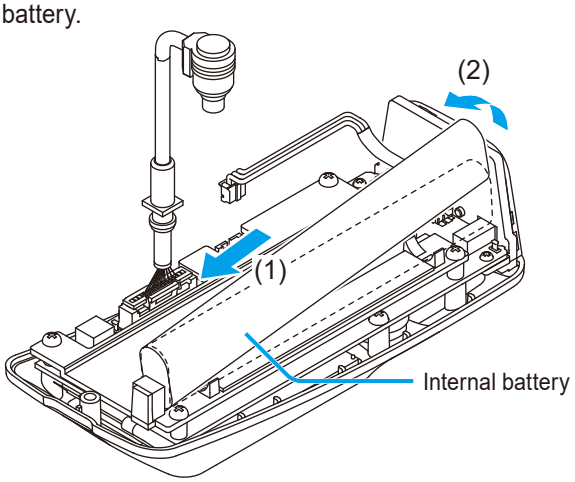
The cables are bundled in a shrinkable tube.




## 7 Remove the internal battery from the display unit.

1 While pushing the internal battery in the direction indicated by (1), lift it up in the direction indicated by (2) to remove it.

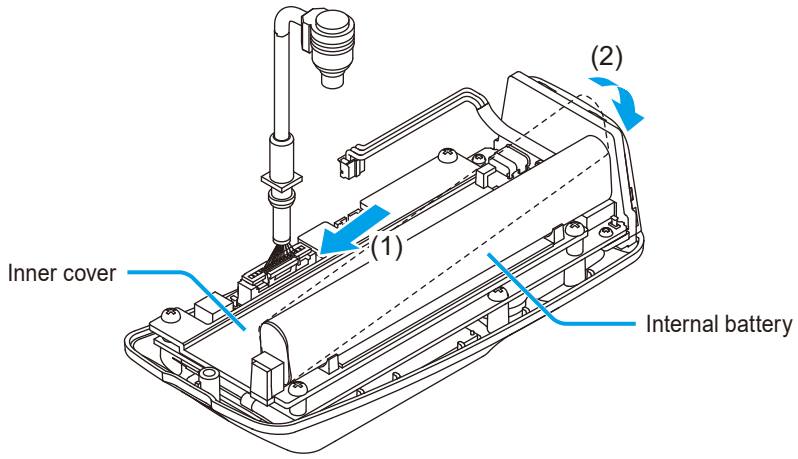
2 Slowly remove the internal battery.



## 8 Install the new internal battery in the inner cover.

1 While pushing the internal battery in the direction indicated by (1), tilt it in the direction indicated by (2).

2 Install the internal battery at right angles to the inner cover.




## 9 Connect the connector of the internal battery to the circuit board.

**NOTICE**

**There is a risk that this product may not operate properly.**

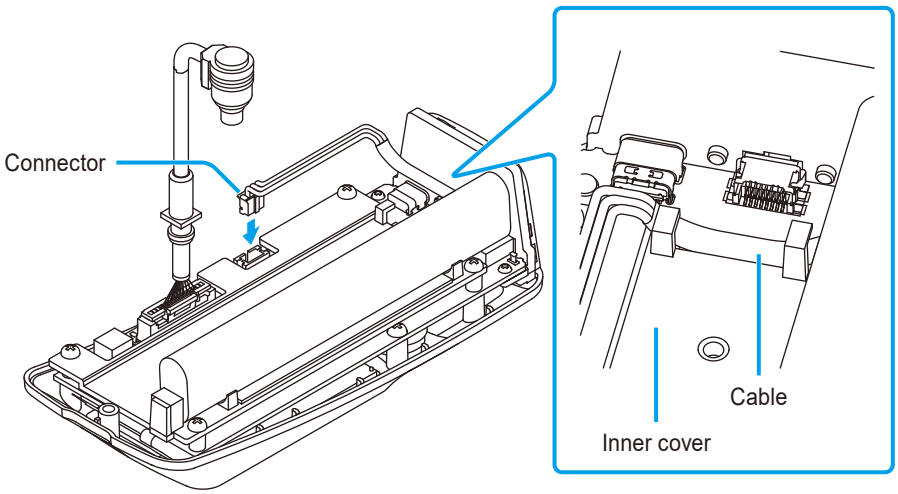
When connecting the connectors, pay attention to the connection orientation. Connect them firmly. If the connectors are not firmly connected, this product may not operate properly.

1 Slowly connect the connector of the internal battery to the circuit board.

2 Fasten the cables of the internal battery with the two protrusions on the inner cover.

**Tips**

The cables are bundled in a shrinkable tube.



## 10 Attach the lower cover to the display unit.

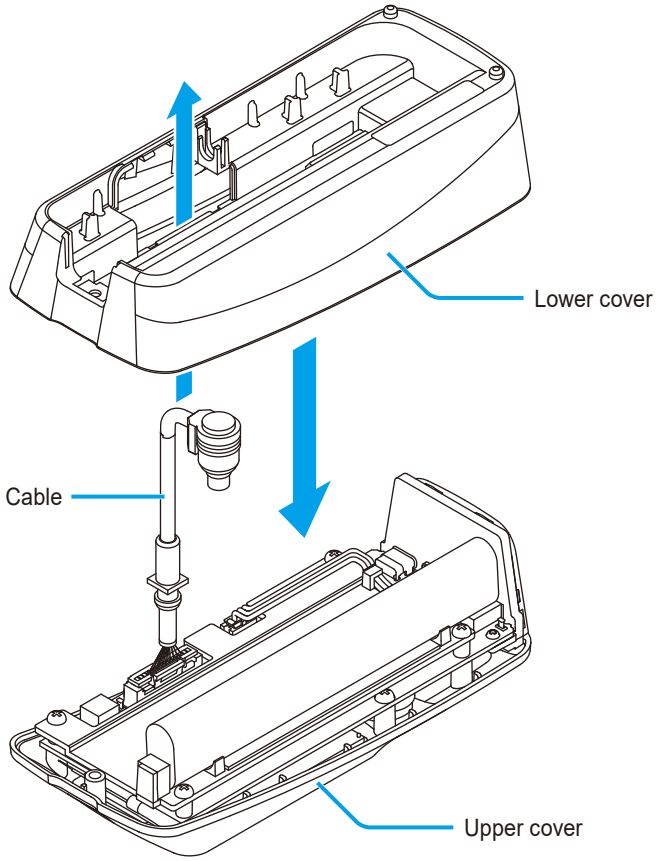
**NOTICE**

**There is a risk that the cable or display unit may be damaged.**

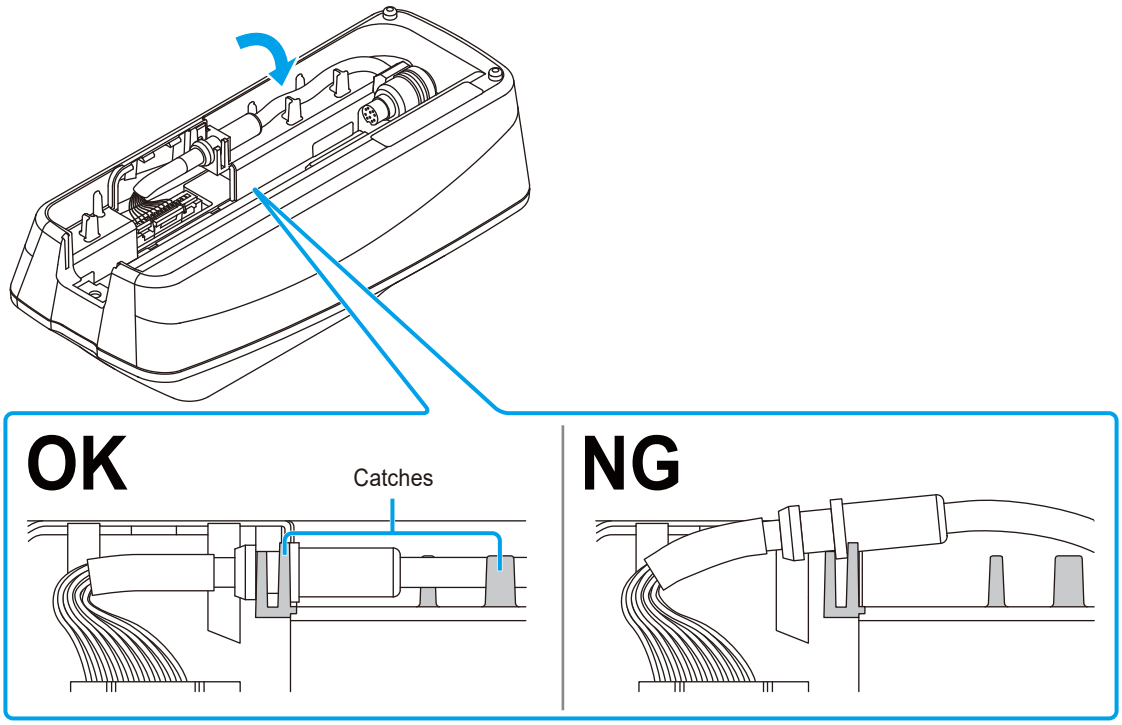
When attaching the lower cover to the upper cover, be careful not to pinch the cable with the lower cover or the circuit board. If the cable is pinched, it may be cut, or the display unit may be damaged.

1 Run the cable slowly through the opening of the lower cover.

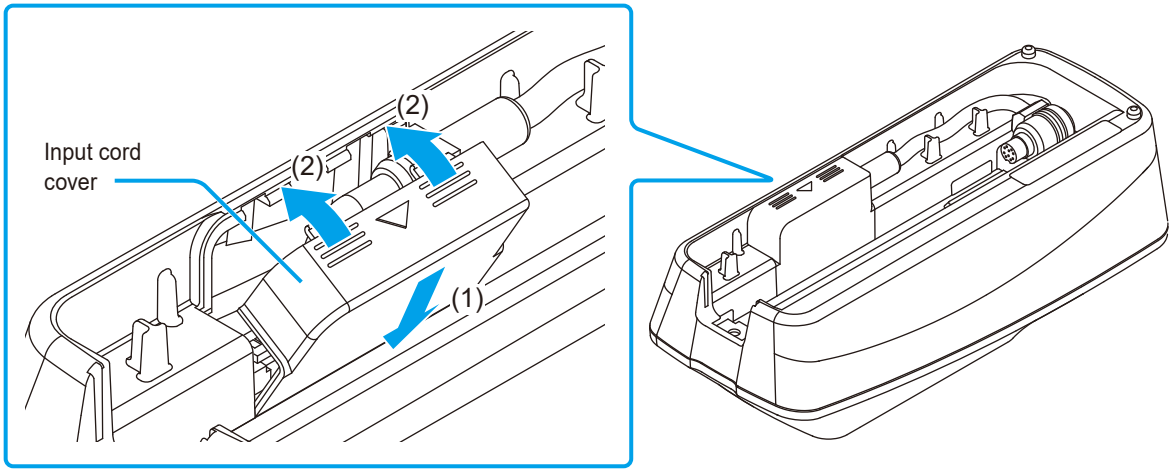
2 Attach the lower cover slowly to the upper cover of the display unit.



3 Hook the cable onto the catches at the bottom of the display unit to fasten the cable.




4 While pushing down on the input code cover in the direction indicated by (1), push it with your fingers in the direction indicated by (2) to attach it.

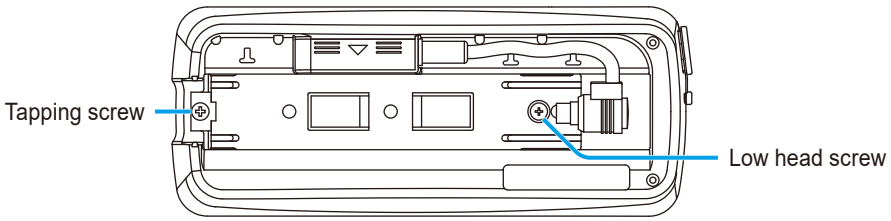


**11** **Tighten the tapping screw and the low head screw on the display unit by using the Phillips screwdriver.**

**NOTICE**

**There is a risk the display unit may be damaged.**

Do not tighten the screws with a tightening torque of 29.4 N·cm (3 kgf·cm) or more. There is a risk the display unit may be damaged.




**12** **Attach the drive/detector unit to the display unit.**

**Tips**

For details about detaching and attaching the drive/detector unit, see "7.2 Attaching and Detaching the Drive/Detector Unit" on page B-38 in "PART B Setting Up".

**13** **Set the internal battery switch to on.**

**Tips**

For details about setting the internal battery switch to ON or OFF, see "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14 in "PART B Setting Up".

**14** **Connect the USB 2.0 cable to this product to supply the power.**

**Tips**

For details about power supply, see "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".

# 2 Troubleshooting

If any trouble occurs, such as an error display or an operational failure, refer to this chapter to identify the cause of the trouble and find a solution.

If the trouble persists, please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1).

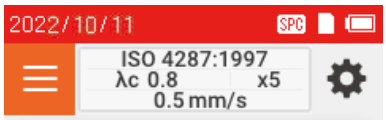
## ■ System operation

| Problem / Error display | Cause | Solution |
|---|---|---|
| This product suddenly restores the state where the power is turned ON. | A short-term power interruption occurred when the USB cable was inserted into this product. Consequently, this product recognized that the power was supplied via the USB cable. | If this problem persists, this product may be damaged. Take preventive measures such as installing an uninterruptible power system. |
| The power does not turn on when this product is not being powered by an external power source. | The remaining capacity of the internal battery is low (), or the battery is at 20 % to 0 % capacity (). | Charge the battery.<br>**Tips**<br>For details, see "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up". |
| | The internal battery switch is set to off. | Set the internal battery switch to on.<br>**Tips**<br>For details, see "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14 in "PART B Setting Up". |
| The power does not turn on when this product is being powered by an external power source. | The USB 2.0 cable is connected poorly.<br>This product failed to correctly recognize the USB power source. | Correctly connect the USB 2.0 cable.<br>**Tips**<br>For details, see "5.4 Operation Using an External Power Source" on page B-22 in "PART B Setting Up". |
| | Other than the above. | Please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1). |
| Charging is interrupted before completion. | A short-term power interruption occurred during the charging process. Consequently, the charging process was interrupted before completion. | If this problem persists, this product may be damaged. Take preventive measures such as installing an uninterruptible power system. |
| The internal battery status icon is changing every few seconds;  (charging) ->  (internal battery status icon) ->  (charging). | Power is not being supplied correctly through the USB cable. | Reconnect to the external power supply.<br>**Tips**<br>For details, see "5.4 Operation Using an External Power Source" on page B-22 in "PART B Setting Up". |

| Problem / Error display | Cause | Solution |
|---|---|---|
| The internal battery does not charge.<br>The charging icon ( ) is not displayed on the status bar. | The internal battery switch is set to off.<br>The battery has deteriorated.<br>The icon displayed: | Set the internal battery switch to on.<br>**Tips**<br>For details, see "5.1 Setting the Internal Battery Switch ON or OFF" on page B-14 in "PART B Setting Up".<br><br>Replace the internal battery with a new one.<br>**Tips**<br>For details, see "1.3 Replacing the Internal Battery" on page G-9 in "PART G Maintenance and Troubleshooting". |
| | The internal battery is fully charged ( ). | Charge the internal battery when the remaining capacity icon indicates that the battery level has fallen by one level ( ). |
| | An AC adapter other than the one supplied with this product is being used. | Use only the supplied AC adapter. |
| | The internal battery was charged in a high-temperature environment. | Adjust the ambient temperature and workpiece temperature to 5 °C to 40 °C, and then resume charging.<br>If the internal battery temperature rises to a certain level, the charging process may be interrupted to prevent injuries and damage. |
| | The USB 2.0 cable is connected poorly.<br>This product failed to correctly recognize the USB power source. | Correctly connect the USB 2.0 cable.<br>**Tips**<br>For details, see "5.4 Operation Using an External Power Source" on page B-22 in "PART B Setting Up". |
| The display turns off unexpectedly. | The power was turned off by the Auto-OFF function. | Press the [POWER/DATA] key to turn on the power.<br>Set the Auto-OFF function to off. |
| The power does not turn off. | This product is connected to an external power source.<br>The Auto-OFF function has been set to off. | Press and hold the [POWER/DATA] key for at least 3 seconds. |
| Cumula.Dist.<br>The icon displayed: | The cumulative measuring distance has exceeded the threshold. | The icon will disappear if you clear the cumulative distance or increase the threshold.<br>**Tips**<br>For details, see "2.7 Stylus Alarm Function" on page C-38 in "PART C Measurement". |
| The operation sound or the alert does not sound. | The volume has been muted ( ), or the volume level has been set to the minimum level ( ). | Adjust the volume.<br>**Tips**<br>For details, "2.8 Sound Volume (Operation Sound) Adjustment" on page F-32 in "PART F Environment Settings". |

| Problem / Error display | Cause | Solution |
|---|---|---|
| Error | Some other system error (fatal error) occurred. | Please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1). |
| Abn.Battery Temp<br>The icon on the screen displaying the charging status:  | The battery temperature is abnormal. (Charging in progress) | Please contact the agent where you purchased the product or a Mitutoyo sales office ("SERVICE NETWORK" on page App-1). |
| Undercharge | The remaining capacity of the internal battery is insufficient. | Charge the internal battery.<br>**Tips**<br>For details, see "5.3 Charging the Internal Battery" on page B-19 in "PART B Setting Up".<br><br>The internal battery is nearing the end of its service life.<br>Please purchase a new internal battery (Part No. 12AAZ222), and replace the old internal battery.<br>**Tips**<br>For details, see "1.3 Replacing the Internal Battery" on page G-9. |
| The touch panel does not respond when touched. | Touch interactions have been disabled.<br> (screen lock) is displayed on the status bar. | Press and hold the [PAGE] key to enable touch interactions (release the screen lock). |

## ■ Measuring operation

| Problem / Error display | Cause | Solution |
|---|---|---|
| Detector connection error | The detector is not correctly connected to the drive unit. | Correctly connect the detector to the drive unit.<br>**Tips**<br>For details, see 📖 "4 Attaching and Removing the Detector" on page B-8 in "PART B Setting Up". |
| Over range | The detector has exceeded the measurement range.<br>The status bar turned red.<br> | • Correctly attach the detector to the drive unit.<br>**Tips**<br>For details, see 📖 "4 Attaching and Removing the Detector" on page B-8 in "PART B Setting Up".<br>• If the measurement range is set to a fixed range, set the range to [AUTO].<br>**Tips**<br>For details, see 📖 "2.5.9 Measurement Range" on page C-33 in "PART C Measurement". |
| Abort Meas | The [START/STOP] key was pressed during measurement. | Start measuring again. |
| Measuring does not start immediately. | The self-timer function is set to ON. | Set the self-timer function to OFF.<br>**Tips**<br>For details, 📖 "2.12 Self-Timer Function Setting" on page F-51 in "PART F Environment Settings". |
| Limit error | The origin limit cannot be detected within a given period of time.<br>The retraction limit cannot be detected within a given period of time.<br><Approx. 26 seconds><br>Even after a given period of time has passed, nothing has occurred since the origin limit was detected.<br>Even after a given period of time has passed, nothing has occurred since the retraction limit was detected.<br><Approx. 2 seconds; 4 seconds at 0.25 mm/s (0.01 in/s)><br>The retraction limit was detected during measurement. | Check that the connection with and the settings for the drive unit are correct.<br>**Tips**<br>For details, 📖 "2.5 Setting the Drive Unit (Speed Calibration)" on page F-24 in "PART F Environment Settings".<br>Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |
| Timeout error | Control system timeout (internal processing) | Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |

| Problem / Error display | Cause | Solution |
|---|---|---|
| TraverseLeng.Error | A measurement distance that exceeds the movable distance of the drive unit has been specified. (This error occurs when the transverse-tracing type drive unit is set, measurement conditions that exceed the measurement distance of the transverse-tracing type drive unit are loaded, and the [START] key is pressed.) | Specify measurement conditions appropriate to the drive unit. |

## ■ Calculation result

| Problem / Error display | Cause | Solution |
|---|---|---|
| Abnor.Cali.Value | The result of calibration measurement has exceeded the allowable calibration range. | Check the Ra value of the roughness specimen and the nominal value you input.<br>Also, check that the roughness specimen and this product are correctly arranged. |
| L 3,000 um | Result obtained with an insufficient number of peaks and valleys. | − |
| E 0110 | Calculation has failed due to an insufficient number of peaks and valleys. | − |
| E 0116 | The acquisition of the equivalent line failed. | − |
| E 0117 | Calculation failed because the number of local peaks that meet the peak height conditions in a roughness motif is insufficient (there must be two or more such local peaks). | − |
| E 0118 | There was something that exceeded the upper limit length A in the first roughness motif. | − |
| E 0121 | Calculation failed because there were not three or more motifs. | − |
| Result is abnormal. (Value is too large / Value is too small / Value does not change regardless of the workpiece) | The detector is not correctly connected to the drive unit. | Correctly connect the detector to the drive unit. |
| | The cable between the drive unit and display unit has not been correctly connected. | Correctly connect the drive unit to the display unit. |
| | Calibration measurement was not performed correctly, for example due to inappropriate arrangement of this product. | Perform the calibration again. |
| | The stylus has worn down.<br>Or, something other than the above. | • Replace the detector.<br>**Tips**<br>For details, see 📖 "4 Attaching and Removing the Detector" on page B-8 in "PART B Setting Up".<br>• Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |

| Problem / Error display | Cause | Solution |
|---|---|---|
| The GO/NG judgment result does not appear. | The GO/NG judgment has not been set for parameters. | Select the desired parameters for the GO/NG judgment settings.<br>**Tips**<br>For details, see 📖 "2.3 GO/NG Judgment" on page D-54 in "PART D Measurement Conditions and Parameters". |
| | The upper and lower tolerance limits are set to 0. | Set the upper tolerance limit or lower tolerance limit.<br>**Tips**<br>For details, see 📖 "2.3 GO/NG Judgment" on page D-54 in "PART D Measurement Conditions and Parameters". |
| CalculationError | An error occurred during the calculation process.<br>• Insufficient number of data points during the calculation process.<br>• Excess number of notched workpiece data points.<br>• The maximum number of measurement data points was exceeded.<br>• Cutoff value (λc) setting error.<br>• Cutoff value (λs) setting error.<br>• Low-pass filter calculation error.<br>• High-pass filter calculation error. | Check the evaluation conditions again. Perform the measurement again. |
| No Data | – | Perform measurement. |

## ■ External output

| Problem/Error display | Cause | Solution |
|---|---|---|
| Measurement results cannot be output. | The wrong data output type has been set. | Check the set data output type on the status bar, etc. |
| Data cannot be output to the Digimatic device. | The data output type is not set to [SPC]. SPC icon on the status bar: SPC | Set the data output type to [SPC].<br>**Tips**<br>For details, 📖 "2.3.1 SPC Output" on page F-7 in "PART F Environment Settings". |
| | Poor connection of the Digimatic connection cable (1 m) (optional accessory). | Correctly connect the Digimatic connection cable (1 m) (optional accessory). |
| | The power to the Digimatic Mini-Processor is off. | Turn on the power to the Digimatic Mini-Processor. |
| | No paper was loaded in the Digimatic Mini-Processor when printing was started. | Load paper in the Digimatic Mini-Processor. |
| Printing-out to the external printer can not be performed. | The data output type is not set to [Printer].<br>Printer icon on the status bar: | Set the data output type to [Printer].<br>**Tips**<br>For details, 📖 "2.3.2 Printer Output" on page F-9 in "PART F Environment Settings". |
| | Poor connection between the printer and this product. | Correctly connect the printer to this product. |
| | No paper was loaded in the printer when printing was started. | Load paper in the printer. |
| | The printer head unit is raised. | Return the printer head unit to its original position. |
| | The communication baud rate of this product and that of the printer are different. | Set the same communication baud rate for this product and the printer. (On the [Set Environ.] screen, set the data output type to [Printer], and then execute ⇄ (communication check).)<br>Next, turn off the power to the printer and this product (this product is in Auto-OFF mode), and then turn on the power to them again.<br>**Tips**<br>For details, 📖 "2.3.2 Printer Output" on page F-9 n "PART F Environment Settings". |
| | Printer head abnormal temperature. | Turn off the power to the printer, wait for a while, and then turn it on again. |
| | Printer power supply malfunction. | Use the AC adapter supplied with the printer. |
| No record paper | No paper was loaded in the printer when printing was started. | Load paper in the printer. |
| Printer Cover Open | The printer cover has not been properly set. | Set the printer cover properly. |

| Problem/Error display | Cause | Solution |
|---|---|---|
| Print failed. | The [POWER/DATA] key was pressed on a screen where printing is not available.<br>Printer anomaly | Press the [POWER/DATA] key again on a screen where printing is available.<br>Check the condition (power status (on or off), cable connections, errors, etc.) of the printer. |
| RS-232C communication cannot be established. | The communication has been disabled on the Comm. PC screen. | Enable the communication on the Comm. PC screen.<br>**Tips**<br>For details, 📖 "2.15 PC Communication Setting" on page F-58 in "PART F Environment Settings". |
| | The communication baud rate of the PC and this product do not match. | Set the same communication baud rate for the PC and this product.<br>**Tips**<br>For details, 📖 "2.15 PC Communication Setting" on page F-58 in "PART F Environment Settings". |
| Communicat.Error | USB communication error.<br>RS-232C communication error (printer, communication with the PC).<br>SPC communication error. | Connect the cables properly.<br>Check the condition (power status (on or off), running status of communication software, etc.) of the connected equipment. |
| | Product failure. | Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1). |
| The memory card cannot be accessed. | [DataStora.] is not set on the Data Output screen.<br>Data save icon on the status bar:  | Set [DataStora.] on the Data Output screen.<br>**Tips**<br>For details, see 📖 "2.3.3 Saving Data" on page F-17 in "PART F Environment Settings". |
| | [Hard copy] is not set on the Data Output screen.<br>Hard copy icon on the status bar:  | Set [Hard copy] on the Data Output screen.<br>**Tips**<br>For details, 📖 "2.3.4 Hard Copy (Screenshot)" on page F-19 in "PART F Environment Settings". |
| | The memory card was removed and inserted again while the card was being accessed. | Remove or insert the memory card while the power to this product is turned off. |
| | A file on the memory card was edited with a PC. | Do not edit files with a PC or other device. |

| Problem/Error display | Cause | Solution |
|---|---|---|
| The memory card cannot be accessed.<br>(continuing from the above) | The memory card was not formatted with this product. | Use this product to format memory cards.<br>**Tips**<br>For details, see 📖 "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".<br>**IMPORTANT**<br>This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210) or with the exFAT file system.<br>Use only memory cards listed as an optional accessory (Part No. 12AAY917) or memory cards that were formatted with the FAT32 file system. |
| Over File Capacity | The capacity of the memory card has been exceeded.<br>Excess number of saved files. | Change the folder where files are saved to one with free space.<br>**Tips**<br>For details, see 📖 "1.3.2 Setting the Main Folder on a Memory Card" on page E-14 in "PART E Measurement Data Management".<br>Delete unnecessary files, and then save the data again.<br>**Tips**<br>For details, see 📖 "1.6 Deleting Measurement Data Saved on the Memory Card" on page E-24 in "PART E Measurement Data Management".<br>Use a new memory card. |
| Memory Card Error | The memory card was removed and inserted again while the card was being accessed. | Remove or insert the memory card while the power to this product is turned off. |
| | A file on the memory card was edited with a PC. | Do not edit files with a PC or other device. |
| | The memory card was not formatted with this product. | Use this product to format memory cards.<br>**Tips**<br>For details, see 📖 "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".<br>**IMPORTANT**<br>This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210) or with the exFAT file system.<br>Use only memory cards listed as an optional accessory (Part No. 12AAY917) or memory cards that were formatted with the FAT32 file system. |

| Problem/Error display | Cause | Solution |
|---|---|---|
| Not inserted | A memory card is not inserted | Insert a memory card. |
| No file | A file does not exist. | Check whether the memory card contains the specified measurement results or evaluation conditions. |
| Unformatted | The memory card has not been formatted. | Do not edit files with a PC or other device.<br>Use this product to format memory cards.<br>**Tips**<br>For details, 📖 "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".<br>**IMPORTANT**<br>This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210) or with the exFAT file system.<br>Use only memory cards listed as an optional accessory (Part No. 12AAY917) or memory cards that were formatted with the FAT32 file system. |
| Incompatible | The memory card cannot be recognized. | Use only memory cards listed as an optional accessory (Part No. 12AAY917)*1 or memory cards that were formatted with the FAT32 file system.<br>*1 Memory cards listed as an optional accessory comply with microSDHC standards. |
| File write error | The memory card was removed and inserted again while the card was being accessed. | Remove or insert the memory card while the power to this product is turned off. |
| | A file on the memory card was edited with a PC. | Do not edit files with a PC or other device. |
| | The memory card was not formatted with this product. | Use this product to format memory cards.<br>**Tips**<br>For details, see 📖 "2.10.1 Formatting" on page F-37 in "PART F Environment Settings".<br>**IMPORTANT**<br>This product cannot recognize or use memory cards that were formatted with a measuring instrument other than this product (except SJ-210) or with the exFAT file system.<br>Use only memory cards listed as an optional accessory (Part No. 12AAY917) or memory cards that were formatted with the FAT32 file system. |
| The wireless communication unit for measuring instruments (optional accessory) cannot be recognized. | Wrong connection. | Check that connection is correctly established.<br>Restart this product. |
| | The terminals are dirty. | |

| Problem/Error display | Cause | Solution |
|---|---|---|
| Communication with the smartphone application cannot be established. | The wireless communication unit for measuring instruments (optional accessory) is connected to another smartphone. | Cut the connection to the smartphone that is not going to be connected to the unit. (Cut the connection on the smartphone.) Restart this product, and then connect the unit to the smartphone that is going to be used.<br>**Tips**<br>For details, see the User's Manual for the wireless communication unit for measuring instruments (optional accessory). |
| | On the [Wireless] screen, the option button for [Power] is set to (OFF). | On the [Wireless] screen, set the option button for [Power] to (ON). |
| | Signal reception is weak. | Check the signal reception conditions. |
| | The distance between this product and the smartphone is too far. | Operate the smartphone near this product. |

## MEMO

# PART H
# Specifications


| | | |
|---|---|---|
| 1 | Main Unit Specifications | H-1 |
| 2 | Standard Accessories | H-12 |
| 3 | Optional Accessories | H-13 |
| 4 | List of Consumables | H-15 |
| 5 | Communication Specifications | H-16 |
| 6 | Error Codes | H-25 |


*No. 99MBB794A*

# 1 Main Unit Specifications

## 1.1 Basic Specifications

| Model name | SJ-220 | | | | | |
|---|---|---|---|---|---|---|
| | Standard type | | Retractable type | | Transverse-tracing type | |
| Code No.: millimeter specification | 178-741-11 | 178-742-11 | 178-743-11 | 178-744-11 | 178-745-11 | 178-746-11 |
| Code No. : inch/millimeter specification | 178-741-13 | 178-742-13 | 178-743-13 | 178-744-13 | 178-745-13 | 178-746-13 |
| Measurement range | 360 µm (-200 µm to +160 µm)<br>14400 µin (-8000 µm to +6400 µin) | | | | | |
| Drive range | 21 mm (0.827 in) | | | | 5.6 mm (0.221 in) | |
| Measuring speed | During measurement: 0.25 mm/s, 0.5 mm/s, 0.75 mm/s, 1.0 mm/s<br>(0.01 in/s, 0.02 in/s, 0.03 in/s, 0.04 in/s)<br>During returning period: 1 mm/s (0.04 in/s) | | | | | |
| Measuring force | 0.75 mN | 4 mN | 0.75 mN | 4 mN | 0.75 mN | 4 mN |
| Detection method | Differential inductance method | | | | | |
| Radius of skid curvature | 40 mm (1.575 in) | | | | | |
| Detector retraction function | Available | | | | Not available | |
| Radius of stylus | 2 µm<br>(80 µin) | 5 µm<br>(200 µin) | 2 µm<br>(80 µin) | 5 µm<br>(200 µin) | 2 µm<br>(80 µin) | 5 µm<br>(200 µin) |
| Material of stylus | Diamond | | | | | |
| Display unit | 2.8" LCD touch panel | | | | | |
| Display language | 25 languages are supported.<br>Japanese, English, German, French, Italian, Spanish, Portuguese, Korean, Chinese (traditional), Chinese (simplified), Czech, Polish, Hungarian, Turkish, Swedish, Dutch, Russian, Slovenian, Romanian, Bulgarian, Finnish, Thai, Malaysian, Indonesian, Vietnamese | | | | | |
| Calculation result display | Portrait orientation: 1-row display, 3-row display, trace display<br>Landscape orientation: 1-row display, 4-row display, trace display<br>("Right-handed" display or "left-handed" display can be selected.) | | | | | |
| External input / output function | USB, Digimatic input / output, RS-232C output, Foot switch input | | | | | |
| GO/NG judgment function | Max rule, 16 % rule, Mean rule | | | | | |
| Saving function | Internal memory: Up to 10 measurement conditions files<br>Memory card (optional accessory): Up to 500 measurement conditions files, up to 10,000 measurement data files | | | | | |
| Power saving function | Auto-OFF function (the wait time can be set to a value from 10 to 600 seconds.) | | | | | |

| Model name | SJ-220 | | | | | |
|---|---|---|---|---|---|---|
| | Standard type | | Retractable type | | Transverse-tracing type | |
| Code No.: millimeter specification | 178-741-11 | 178-742-11 | 178-743-11 | 178-744-11 | 178-745-11 | 178-746-11 |
| Code No. : inch/millimeter specification | 178-741-13 | 178-742-13 | 178-743-13 | 178-744-13 | 178-745-13 | 178-746-13 |
| Power source | AC adapter (with interchangeable AC pin adapters, USB type)<br>Input voltage: 100 VAC to 240 VAC±10 % (50 Hz / 60 Hz)<br>Output rating: 5.0 VDC, 2.0 A<br>Internal battery (Ni-MH)<br>Supported USB standard: USB 2.0 (Full speed)<br>USB charging standard: BC1.2<br>The following USB ports are supported:<br>• SDP "SDP (Standard Downstream Port)"<br>• CDP "CDP (Charging Downstream Port)"<br>• DCP "DCP (Dedicated Charging Port)" | | | | | |
| Electric power consumption | Max. 6.5 VA | | | | | |
| Number of measurements with the internal battery | Approx. 1,000 times (under measurement conditions with full charge) | | | | | |
| Internal battery charging time | Max. 4 hours (operable during charging)*1 | | | | | |
| Ambient temperature for charging the internal battery | 5 °C to 40 °C*2 | | | | | |
| Dimensions | Display unit: 164.6 (W) × 67 (D) × 50.5 (H) mm<br>6.48 (W) × 2.638 (D) × 1.988 (H) in<br>Drive unit: 115 (W) × 23 (D) × 26 (H) mm<br>4.528 (W) × 0.906 (D) × 1.023 (H) in<br>Detector: 71.5 (W) mm × ø9 mm (connector section: ø6.6 mm)<br>2.816 (W) in × ø0.354 in (connector section: ø0.260 in) | | | | | |
| Mass | Display unit: 330 g, Drive unit: 180 g, Detector: 7.8 g | | | | | |
| Operating temperature range | 5 °C to 40 °C | | | | | |
| Operating humidity range | 85 %RH or below (with no condensation) | | | | | |
| Storage temperature range | -10 °C to 50 °C | | | | | |
| Storage humidity range | 85 %RH or below (with no condensation) | | | | | |
| Altitude | 2,000 m or below | | | | | |
| Airborne noise | A-weighted sound pressure level, 70 dB(A) or less | | | | | |
| CE marking / UKCA marking | EMC Directive / Electromagnetic Compatibility Regulations:<br>EN IEC 61326-1<br>Immunity test requirement: Clause 6.2 Table 2<br>Emission limit: Class A<br>Machinery Directive / Supply of Machinery (Safety) Regulations:<br>EN ISO 12100, EN 60204-1<br>RoHS Directive / Regulation on the restriction of hazardous substances in electric/electronic devices:<br>EN IEC 63000 | | | | | |

*1: Charging time when using the supplied AC adapter. When the battery is charged via USB connection with a PC, etc., the charging may take at least 4 hours to complete.

*2: If the ambient temperature is too high, the battery may not charge sufficiently.

# 1.2 Supported Roughness Standards, Conditions Settings, Traverse Length

## 1.2.1 Supported Roughness Standards

| | | |
|---|---|---|
| JIS B 0601:1982 | JIS B 0631:2000 | ISO 21920 |
| JIS B 0601:1994 | ISO 4287 | ASME B46.1 |
| JIS B 0601 | ISO 13565:1996 | VDA |
| JIS B 0671:2002 | ISO 12085:1996 | Free (nonstandard) |

## 1.2.2 Conditions Settings

● Relationship between standard, profile, and filter

When the roughness standard is changed, the corresponding filter is automatically applied.

| Roughness standard | Profile | | | |
|---|---|---|---|---|
| | P | R | DF | R-Motif |
| JIS B 0601:1982 | NONE | 2CR75 | — | — |
| JIS B 0601:1994 | — | GAUSS | — | — |
| JIS B 0601 | GAUSS | GAUSS | — | — |
| JIS B 0671:2002 | — | — | GAUSS | — |
| JIS B 0631:2000 | — | — | — | GAUSS |
| ISO 4287 | GAUSS | GAUSS | — | — |
| ISO 13565:1996 | — | — | GAUSS | — |
| ISO 12085:1996 | — | — | — | GAUSS |
| ISO 21920 | GAUSS | GAUSS | — | — |
| ASME B46.1 | — | PC75<br>GAUSS | — | — |
| VDA | (NONE*1)<br>GAUSS | GAUSS | GAUSS | — |
| Free | (NONE*1)<br>2CR75<br>PC75<br>GAUSS | 2CR75<br>PC75<br>GAUSS | GAUSS | (NONE*1)<br>2CR75<br>PC75<br>GAUSS |

*1: When [NONE] is set for "λs"

## 1.2.3 Relationship between Cutoff Value, Section Length, Number of Sections, and Sampling Pitch

| Cutoff value (λc)*1 | Section length (ℓ) | λs | Sampling pitch | Number of data points in a section length | Number of sections |
|---|---|---|---|---|---|
| 0.08 mm (0.003 in) | 0.08 mm (0.003 in) | 2.5 µm (100 µin) | 0.5 µm (19.69 µin) | 160 | 1-10 |
| 0.25 mm (0.01 in) | 0.25 mm (0.01 in) | 2.5 µm (100 µin) | 0.5 µm (19.69 µin) | 500 | 1-10 |
| 0.8 mm (0.03 in) | 0.8 mm (0.03 in) | 2.5 µm (100 µin) | 0.5 µm (19.69 µin) | 1600 | 1-8 |
| 2.5 mm (0.1 in) | 2.5 mm (0.1 in) | 8 µm (320 µin) | 1.5 µm (59.1 µin) | 1666 | 1-6 |
| 8 mm (0.3 in) | 8 mm (0.3 in) | 25 µm (1000 µin) | 5.0 µm (196.9 µin) | 1600 | 1-2 |

*1: The cutoff value (λc) is set when the R profile is specified.

## 1.2.4 Relationship between Upper Limit Motif Length, Evaluation Length, Number of Sections, and Sampling Pitch

| Upper limit length (A) [mm (in)] | Evaluation length (L) [mm (in)] | Cutoff value (λs) [µm (µin)] | Sampling pitch Δx [µm (µin)] |
|---|---|---|---|
| 0.02 (0.001) | 0.3 ≤ L ≤ 0.64 (0.0118 ≤ L ≤ 0.0252) | 2.5 (100) | 0.5 (19.685) |
| 0.1 (0.004) | 0.65 ≤ L ≤ 3.2 (0.0256 ≤ L ≤ 0.126) | 2.5 (100) | 0.5 (19.685) |
| 0.5 (0.02) | 3.3 ≤ L ≤ 16 (0.130 ≤ L ≤ 0.630) | 8 (320) | 1.5 (59.055) |

## 1.2.5 Relationship between Roughness Standards, Evaluation Profiles, and Parameters

| Roughness standard | Evaluation profile | Parameter |
|---|---|---|
| JIS B 0601:1982 | P | Rz, Rmax |
| | R | Ra |
| JIS B 0601:1994 | R | Ra, Rz, Ry, Pc, Sm, S, mr(c) |
| JIS B 0601 | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PPc, PSm, PzJIS, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, RzJIS, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| JIS B 0671:2002 | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, RzJIS, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| JIS B 0631:2000 | R-Motif | R, Rx, AR |
| ISO 4287 | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PPc, PSm, Pz1max, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, RPc, Rc, RSm, Rz1max, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| ISO 13565:1996 | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RPc, RSm, Rz1max, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| ISO 12085:1996 | R-Motif | R, Rx, AR |
| ISO 21920 | P | Pa, Pq, Pz, Pp, Ppt, Pv, Pt, Pvt, Pzx(l), Psk, Pku, Pc, Pcx, Pcq, Ppc, Psm, Psmx, Psmq, Pda, Pdq, Pdt, Pdl, Pdr |
| | R | Ra, Rq, Rz, Rp, Rpt, Rv, Rt, Rvt, Rzx(l), Rsk, Rku, Rc, Rcx, Rcq, Rpc, Rsm, Rsmx, Rsmq, Rda, Rdq, Rdt, Rdl, Rdr |
| ASME B46.1 | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, RPc, RSm, Rmax, RΔa, RΔq, tp, Htp, Rpm |
| VDA | P | Pa, Pq, Pz, Pp, Pv, Pt, Psk, Pku, Pc, PSm, Pmax, PΔq, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | R | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RSm, Rmax, RΔq, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| | DF | Ra, Rq, Rz, Rp, Rv, Rt, Rsk, Rku, Rc, RSm, Rmax, RΔq, Rmr, Rmr(c), Rσc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2 |
| Free | P | Pa, Pq, Pz, Py, Pp, Pv, Pt, P3z, Psk, Pku, Pc, PPc, PSm, S, HSC, PzJIS, Pppi, PΔa, PΔq, Plr, Pmr, Pmr(c), Pδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Ppm |
| | R | Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, RPc, RSm, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm |
| | DF | Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, RPc, RSm, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm |
| | R-Motif | R, Rx, AR |

## 1.2.6 Relationship between Measurement Range and Resolution

| Measurement range | Resolution |
|---|---|
| Auto | 0.2 nm to 3.5 nm (8.6 nin to 137.6 nin)<br>(Depends on the measurement range) |
| 360 µm (14400 µin) | 3.5 nm (137.6 nin) |
| 100 µm (4000 µin) | 0.9 nm (34.4 nin) |
| 25 µm (1000 µin) | 0.2 nm (8.6 nin) |

## 1.2.7 Traversal Length

In this product, the traverse length is the sum of the measurement length, the approach travel length, the pre-travel length, and the post-travel length.

**IMPORTANT**

The pre-travel length and the post-travel length vary depending on the filter being used.

When the pre-travel and post-travel setting is set to OFF, the traversal length is reduced by the pre-travel length and the post-travel length.

For details about setting the pre-travel and post-travel setting to ON or OFF, see "1.1.9 Pre-Travel/Post-Travel" on page D-20 in "PART D Measurement Conditions and Parameters".

| Conditions | Pre-travel / Post-travel | Remarks |
|---|---|---|
| When P (primary profile), or Motif is selected | Pre-travel length = 0 mm (0 in), post-travel = 0 mm (0 in) | Approach travel length (approx. 0.5 mm/0.02 in) and the pre-travel and post-travel lengths for λs are included. |
| When R (roughness profile) and 2CR are selected | Pre-travel length = λc, post-travel length = 0 mm (0 in) | |
| When R (roughness profile) and PC75 are selected | Pre-travel length = λc, post-travel length = λc | |
| When R (roughness profile) and GAUSS are selected, or DF is selected | Pre-travel length = λc / 2, post-travel length = λc / 2 | |

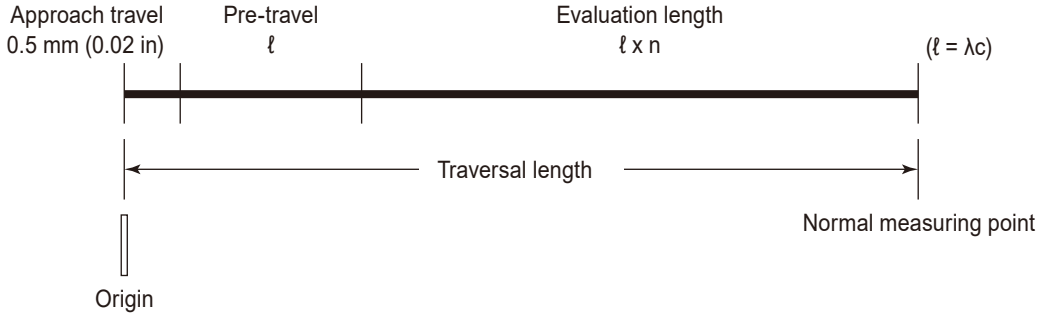
**Measuring operation**

1 cycle Reciprocal motion ⇄ 1 mm/s (0.02 in/s)

Measurement starts from the origin position. When measurement is complete, the detector returns to the origin.

### ■ Traversal length when using the standard type or transverse-tracing type drive/detector unit

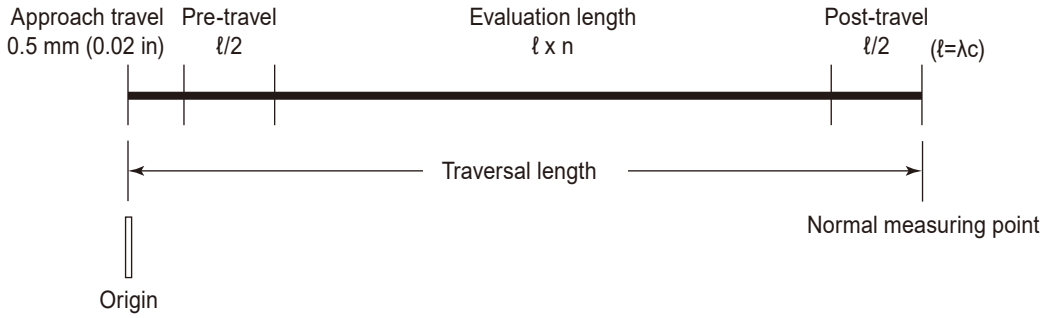
● When the 2CR filter is selected





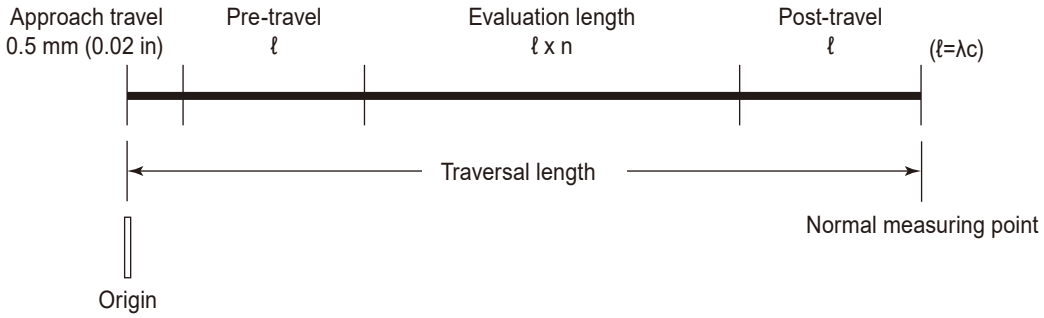

No. 99MBB794A

- When the GAUSS filter is selected



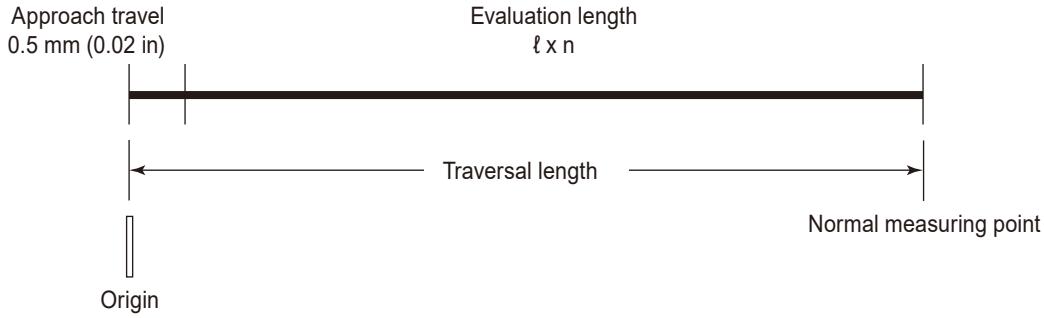

The calculation is performed assuming that each of the pre-travel and post-travel lengths is ℓ / 2.

- When the PC75 filter is selected




The calculation is performed assuming that each of the pre-travel and post-travel lengths is ℓ.

- When measuring with the primary profile (P)

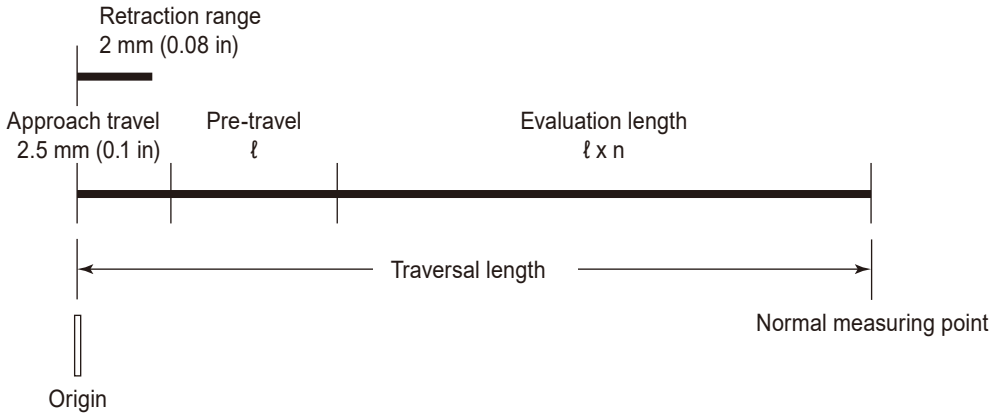



**Tips**

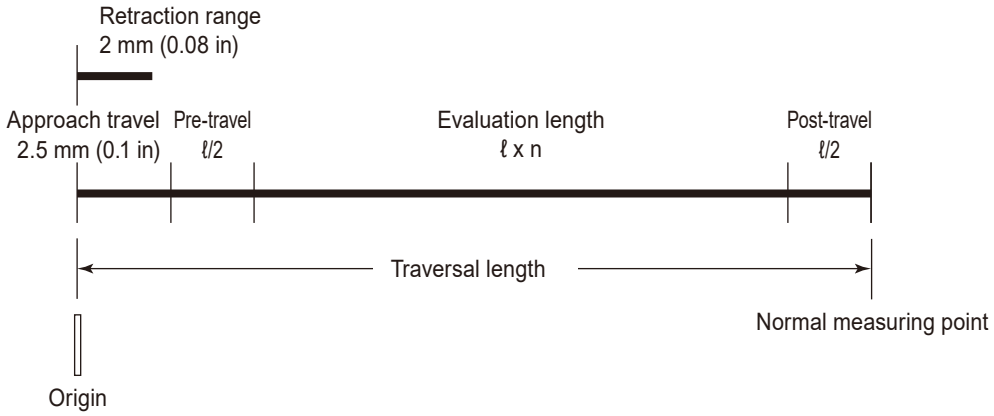
When the roughness profile is selected and pre-travel and post-travel are disabled, calculation is performed with the pre-travel and post-travel data created by copying both ends of the evaluation profile.

## ■ Traversal length when using the retractable type drive/detector unit

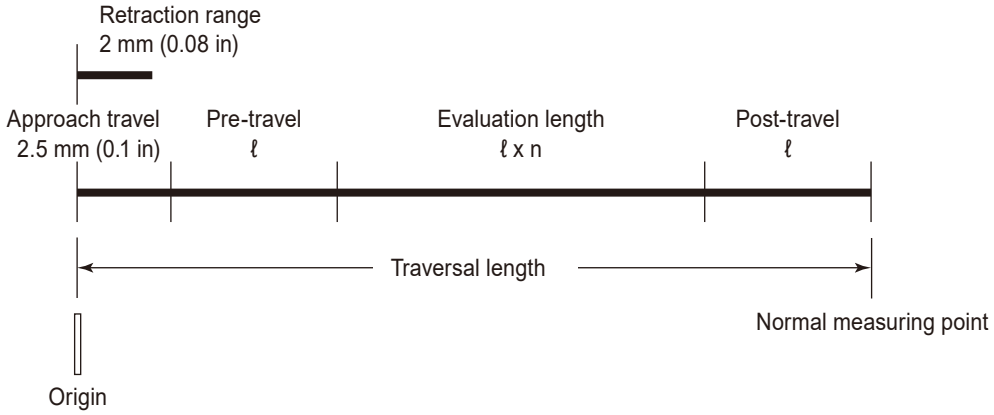
### ● When the 2CR75 filter is selected



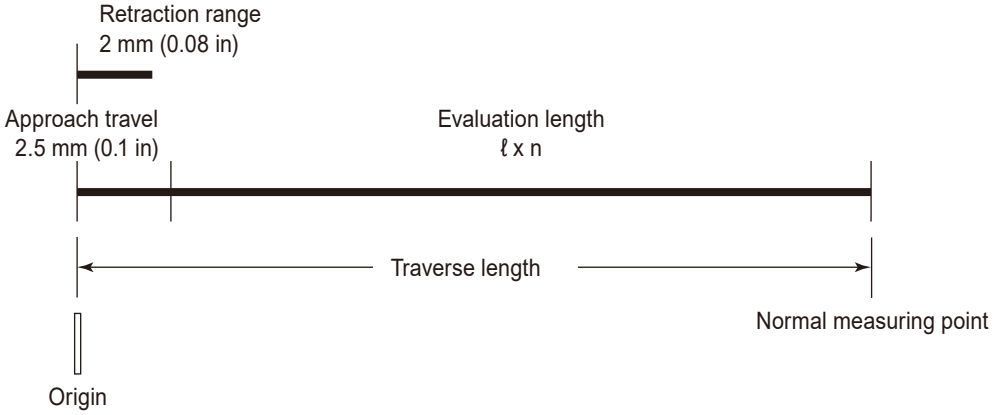

### ● When the GAUSS filter is selected



● When the PC75 filter is selected




● When measuring with the primary profile (P)



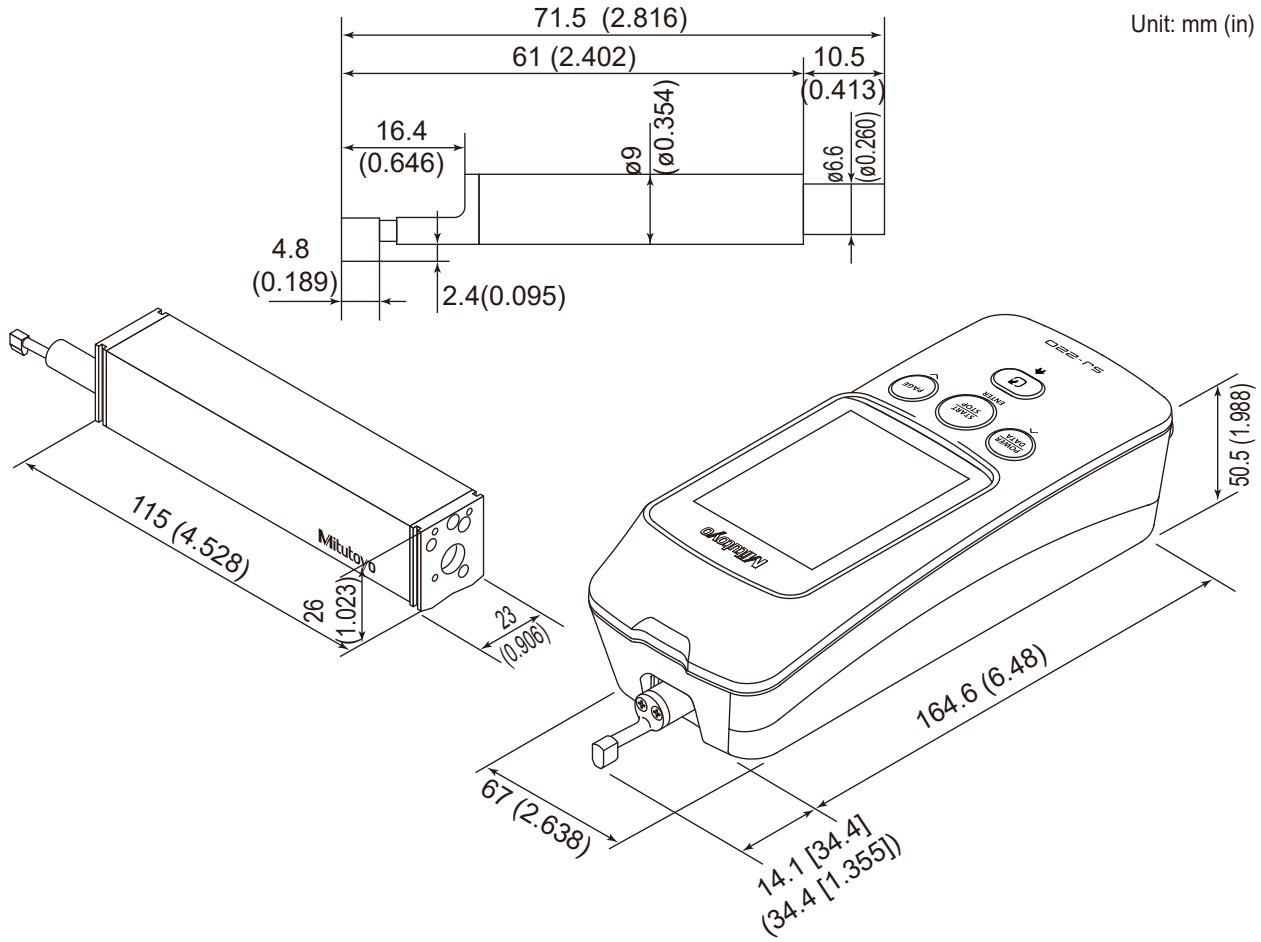

**Tips**

When the roughness profile is selected and pre-travel and post-travel are disabled, calculation is performed with the pre-travel and post-travel data created by copying both ends of the evaluation profile.

# 1.3 Dimensions

## ■ Display unit, drive/detector unit

Unit: mm (in)

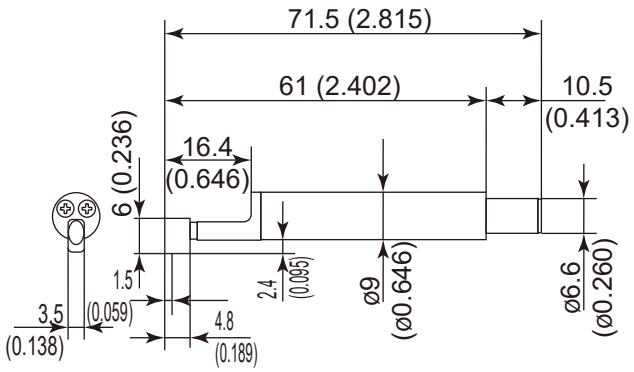



Values in [ ] indicate the dimensions for the transverse-tracing type.

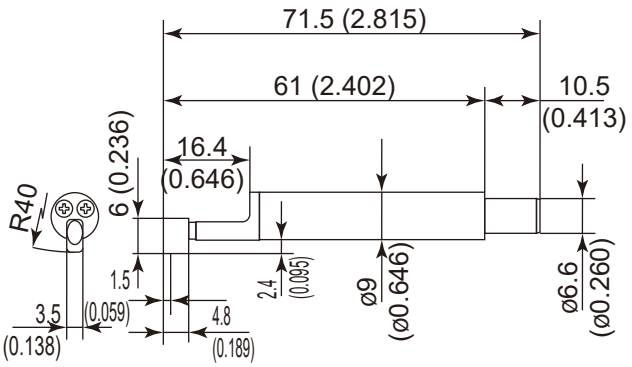
## ■ Detector

Unit: mm (in)

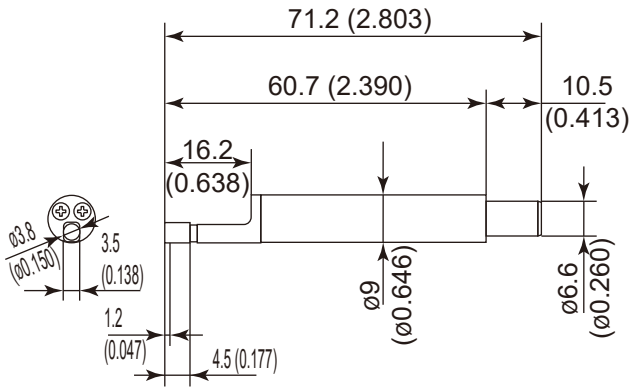
Standard detector 0.75 mN type: 178-296
4 mN type: 178-390
SR10 detector 4 mN type: 178-391



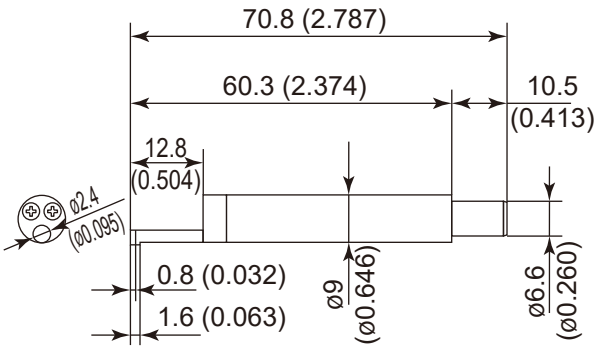

Transverse-tracing type detector
0.75 mN type: 178-387
4 mN type: 178-386



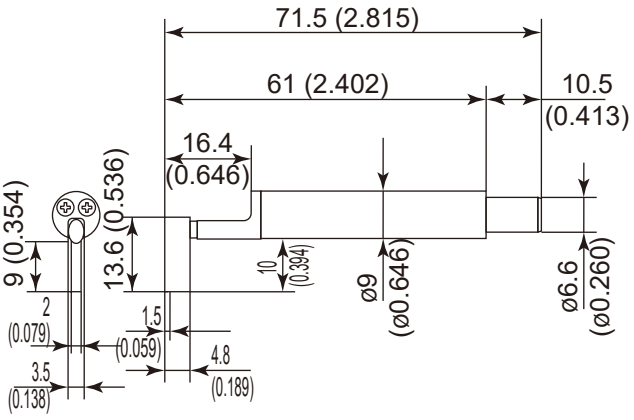

Small hole detector 0.75 mN type: 178-383
4 mN type: 178-392



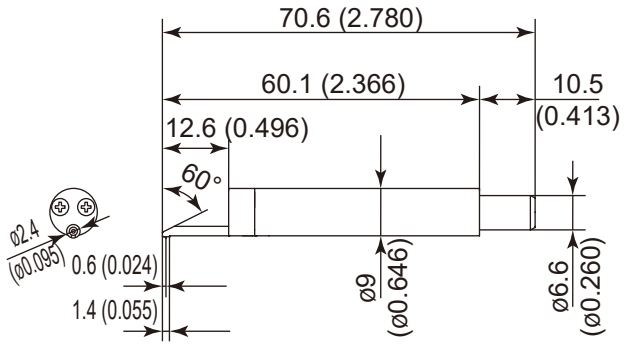

Extra-small hole detector
0.75 mN type: 178-384
4 mN type: 178-393




Deep groove detector 0.75 mN type: 178-385
4 mN type: 178-394




Gear tooth surface detector
0.75 mN type: 178-388
4 mN type: 178-398



# 2 Standard Accessories

| Part No. | Part name | Remarks | Qty. |
|---|---|---|---|
| 178-740-11 | Display unit | millimeter specification | 1 |
| 178-740-13 | Display unit | inch/millimeter specification | 1 |
| 178-747 | Standard drive unit | For the standard type only | 1 |
| 178-748 | Retractable drive unit | For the retractable type only | 1 |
| 178-749 | Transverse-tracing drive unit | For the transverse-tracing type only | 1 |
| 178-750 | Transverse-tracing drive unit set | For the transverse-tracing type only | 1 |
| 178-296 | Detector (Measuring force: 0.75 mN) | For the standard type and retractable type only | 1 |
| 178-390 | Detector (Measuring force: 4 mN) | For the standard type and retractable type only | 1 |
| 178-387 | Detector (Measuring force: 0.75 mN) | For the transverse-tracing type only | 1 |
| 178-386 | Detector (Measuring force: 4 mN) | For the transverse-tracing type only | 1 |
| 12AAY583 | Handy case | | 1 |
| 12BAA303 | Connection cable (1 m/40") | | 1 |
| 12BAS450 | AC adapter | Six AC pin adapters that are compatible with the supply voltage in each country are included with this product. | 1 |
| 12BAS451 | USB 2.0 cable | | 1 |
| 178-601-1 | Roughness specimen | Only for the standard type and retractable type, a case included (millimeter specification) | 1 |
| 178-602-1 | Roughness specimen | Only for the standard type and retractable type, a case included (inch/millimeter specification) | 1 |
| 178-605 | Roughness specimen | Only for the transverse-tracing type, a case included (millimeter specification) | 1 |
| 178-606 | Roughness specimen | Only for the transverse-tracing type, a case included (inch/millimeter specification) | 1 |
| 12BAK700 | Calibration stage | | 1 |
| 12BAS476 | Tool for operating the internal battery switch | | 1 |
| 12AAE643 | Contact adapter | For the transverse-tracing type only | 1 |
| 12AAE644 | V-shaped adapter | For the transverse-tracing type only | 1 |
| 538615 | Hexagonal wrench (Nominal size: 2.5) | For the transverse-tracing type only | 1 |
| 538613 | Hexagonal wrench (Nominal size: 1.5) | For the transverse-tracing type only | 1 |
| 390151 | Hex-socket head screw | For the transverse-tracing type only | 4 |
| 99MBB796A | Instruction Manual | English | 1 |
| 99MBB795M | Basic Operation Guide | Printed manual in Japanese, English, and Simplified Chines | 1 |
| 99MBB797M | Cases of Troubleshooting | | 1 |
| 12BAT002 | Manual CD-ROM | | 1 |
| | User's Manual | Electronic manual in Japanese, English, and Simplified Chinese | |
| | Surface Roughness Parameters | | |
| | Instruction Manual | | |
| | Basic Operation Guide | Electronic manual in Japanese, English, and Simplified Chinese written together | |
| | EU Declaration of Conformity | | |
| | UK Declaration of Conformity | | |
| DC019-0339 | EU Declaration of Conformity | | 1 |
| DC049-0339 | UK Declaration of Conformity | | 1 |
| 472730 | Warranty | | 1 |

# 3 Optional Accessories

## 3.1 List of the Optional Accessories

| Code No. / Part No. | Part name |
|---|---|
| 178-390 | Standard detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-296 | Standard detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-391 | SR10 detector (Measuring force: 4 mN, Stylus tip radius: 10 µm (400 µin)) |
| 178-392 | Small hole detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-383 | Small hole detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-393 | Extra-small hole detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-384 | Extra-small hole detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-394*1 | Deep groove detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-385*1 | Deep groove detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-398 | Gear tooth surface detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-388 | Gear tooth surface detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-747 | Standard drive unit |
| 178-748 | Retractable drive unit |
| 178-749 | Transverse-tracing drive unit |
| 178-750 | Transverse-tracing drive unit set |
| 178-386*2 | Transverse-tracing drive unit detector (Measuring force: 4 mN, Stylus tip radius: 5 µm (200 µin)) |
| 178-387*2 | Transverse-tracing drive unit detector (Measuring force: 0.75 mN, Stylus tip radius: 2 µm (80 µin)) |
| 178-033*1 | Setting attachment V type |
| 178-034*1 | Setting attachment slider type |
| 178-035*1 | Setting attachment inside diameter type |
| 178-604 | Roughness specimen W (millimeter specification) |
| 178-607 | Roughness specimen W (inch/millimeter specification) |
| 12AAA210*1 | Extension rod (50 mm (19.7 in)) |
| 12AAA216*1 | Support brackets set |
| 12AAA217*1 | Nosepiece for flat surface |
| 12AAA218*1 | Nosepiece for cylinder |
| 12AAA219*1 | Adapter for vertical application |
| 12AAA220 | Adapter for magnetic stand (ø9.5 mm (3/8 in dia.)) |
| 12AAA221 | Adapter for magnetic stand (ø8 mm (0.315 in dia.)) |
| 12AAA222 | Adapter for Height Gage (9 mm × 9 mm) (millimeter specification) |
| 12AAA233 | Adapter for Height Gage (1/4 in × 1/2 in) (inch/millimeter specification) |

| Code No. / Part No. | Part name |
|---|---|
| 12AAJ088 | Foot switch |
| 12BAS450 | AC adapter |
| 12BAA303 | Connection cable (1 m/40") |
| 12AAY688 | RS-232C communication cable |
| 12AAY917 | Memory card |
| 12BAS451*3 | USB 2.0 cable |
| 264-506 | Digimatic Mini-Processor DP-1VA |
| 06AGL011 | Bidirectional Digimatic S1 cable (flat and straight (1 m)) |
| 06AGL021 | Bidirectional Digimatic S1 cable (flat and straight (2 m)) |
| 264-628 | Wireless communication unit for measuring instruments U-WAVE-TIB |
| 264-020 | Input tool (IT-020U) |
| 12BAS476 | Tool for operating the internal battery switch |

*1: Accessories that cannot be used with the transverse-tracing type.
*2: Detectors that are exclusive to the transverse-tracing type.
*3: Used when exporting data to a PC through Mitutoyo's software.

# 4 List of Consumables

| Consumables | Part No. | Remarks |
|---|---|---|
| Replacement internal battery | 12AAZ222 | |

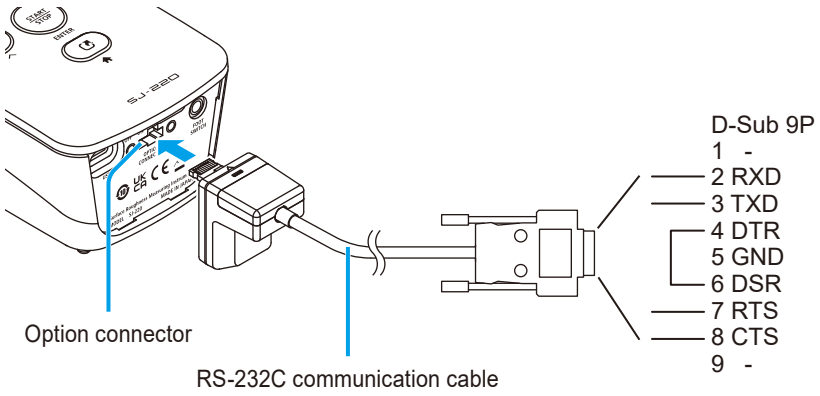
# 5 Communication Specifications

## 5.1 Specifications for the RS-232C Connection

When connecting this product to a PC or printer, use a RS-232C communication cable (Part No. 12AAY688) (optional accessory).

### 5.1.1 Communication Conditions

■ Pin assignments for the connector between this product and a PC/printer




■ Communication flow control and transmission/reception processing between this product and a PC

This section explains communication with a PC connected to this product.

Here, communication is performed by a hardware flow control method using two lines (RTS and CTS).

If the RTS signal on the PC side is de-asserted during data transmission, the transmission is interrupted. The data transmission is resumed after the RTS signal from this product is re-asserted.

If this product cannot receive data, its RTS signal is de-asserted.

| Setting name | Settable values |
|---|---|
| Baud rate | 9600, 19200, 38400 |
| Parity | NON, EVEN, ODD |
| Data length | 8 bits (fixed) |
| Stop bit | 1 bit (fixed) |

## ■ Command format

The communication command format consists of a 2-byte header section, a 3-byte sub-field section, a data section, and an EM (end mark) section.

| Header (2 bytes) | Sub-field (3 bytes) | Data*1 | EM (1 byte) |
|---|---|---|---|
| ** | *** | ***– | CR |

EM: End mark
CR: Carriage return code
*1: Data section can be omitted.

## ■ Response format

The following format is returned once processing has been completed, either normally or abnormally.

| Header (2 bytes) | Data | EM (1 byte) | | |
|---|---|---|---|---|
| OK | ****– | CR | → | Successful termination |
| NG | Error code | CR | → | Abnormal termination |

## 5.1.2 Commands

### ■ Control commands

#### ● Control command basic structure

| Header (2 bytes) | Sub-field (3 bytes) | Data*1 | EM (1 byte) |
|---|---|---|---|
| CT | *** | ****– | CR |

*1: Data section can be omitted.

#### ● Control command list

| Sub-field | Data | Meaning |
|---|---|---|
| STA | None | Starting measurement / Interrupting measurement in progress |
| OFF | 00–02 (2 bytes) | Turning off the power / Auto-OFF function setting |
| ESP | None | Retracting the detector |
| RTN | None | Returning the detector to the start position |

**STA command**

Executes the [START/STOP] button operation, and starts or interrupts measurement.

* Measurement is interrupted when this command is issued during measurement.

- Command

| Header | Sub-field | EM |
|---|---|---|
| CT | STA | CR |

- Response (normal)

| Header | EM |
|---|---|
| OK | CR |

- Response (abnormal)

| Header | Sub-field | EM | Meaning |
|---|---|---|---|
| NG | *** | CR | ***: see 📖 "6 Error Codes" in "PART H Specifications". |

### OFF command

Turns off the power, and enables or disables the Auto-OFF function.

- Command

| Header | Sub-field | Data | EM |
|---|---|---|---|
| CT | OFF | ** | CR |

00: Turns off the power immediately after accepting the command (power will be off even while charging the battery).
01: Prohibits processing the Auto-OFF function.
02: Accepts processing the Auto-OFF function.
03: Turns off the backlight.
04: Turns on the backlight.

- Response (normal)

| Header | EM |
|---|---|
| OK | CR |

### ESP command

Puts the detector in the retracted state.

- Command

| Header | Sub-field | EM |
|---|---|---|
| CT | ESP | CR |

- Response (normal)

| Header | EM |
|---|---|
| OK | CR |

### RTN command

Moves the detector to the original position. This command is used for processes such as returning the detector from the retracted state.

- Command

| Header | Sub-field | EM |
|---|---|---|
| CT | RTN | CR |

- Response (normal)

| Header | EM |
|---|---|
| OK | CR |

## ■ Write command

### ● Write command basic structure

| Header (2 bytes) | Sub-field (3 bytes) | Data*1 | EM (1 byte) |
|---|---|---|---|
| WR | *** | ****– | CR |

*1: Data section can be omitted.

### ● Write command list

| Sub-field | Data | Meaning |
|---|---|---|
| CON | ******–… | Modify the measurement conditions or evaluation conditions |

**CON command**

Command to modify measurement conditions or evaluation conditions.

Data Nth byte: Number of bytes from the first byte in the data section

| Nth byte | Setting | | Settable values |
|---|---|---|---|
| 0 | * | (Standard) | 0: JIS B 0601:1982, 1: JIS B 0601:1994,<br>2: JIS B 0601, 3: ISO 4287, 4: ASME B46.1,<br>5: VDA, 6: Free, 7: ISO 21920 |
| 1 | * | (Profile) | 0: P, 1: R, 2: DF, 3: R-MOTIF |
| 2 | * | (Cutoff value λc) | 0: 0.08, 1: 0.25, 2: 0.8, 3: 2.5, 4: 8.0<br>The value for λs is determined from the value set for λc. |
| 3 | ** | (Number of sections) | 00–10 |
| 5 | **.** | (Arbitrary length) | 0.10–16.00 (available when the Number of sections is "00") Unit: [mm] |
| 10 | * | (Upper limit length A) | 1: 0.02, 2: 0.1, 3: 0.5<br>The upper limit length A is determined from the set upper limit length B. |
| 11 | * | (Filter) | 0: 2CR75, 1: PC75, 2: GAUSS, 3: None |

- Response (normal)

| Header | EM |
|---|---|
| OK | CR |

- Response (abnormal)

| Header | Sub-field | EM | Meaning |
|---|---|---|---|
| NG | ***,** | CR | ***: see 📖 "6 Error Codes" in "PART H Specifications".<br>**: Number of bytes with an error |

## ■ Read command

### ● Read command basic configuration

| Header (2 bytes) | Sub-field (3 bytes) | Data*1 | EM (1 byte) |
|---|---|---|---|
| RD | *** | ****– | CR |

*1: Data section can be omitted.

### ● Read command basic structure

| Sub-field | Data | Meaning |
|---|---|---|
| STU | 00–01 (2 bytes) | Read status information |
| SJ_ | 00–01 (2 bytes) | Read model name information or F/W version |
| CON | None | Read measurement conditions or evaluation conditions |
| PAR | None | Number of customized parameters |
| RES | **, **, ** (8 bytes) | Read calculation results |
| PSA | None | Read detector position information |

**STU command**

Reads status information.

- Command

| Header | Sub-field | Data | EM |
|---|---|---|---|
| RD | STU | ** | CR |

1) 00: Read the operation status

- Response

| Header | Data | EM |
|---|---|---|
| OK | *** | CR |

000: Detector is idling
001: Measurement in progress
002: Detector is being returned
003: Detector is being retracted
004: Detector is retracted
005: Status other than at the origin/being retracted

2) 01: Read the internal battery status

• Response

| Header | Data | EM |
|---|---|---|
| OK | *** | CR |

000: Normal internal battery voltage (60 % or more)
001: Low internal battery voltage (below 60 %)
002: Abnormality in internal battery (Temperature, voltage, no battery installed)
003: Charging in progress

**SJ_command**

Reads instrument information.

• Command

| Header | Sub-field | Data | EM |
|---|---|---|---|
| RD | SJ_ | ** | CR |

_: Space

1) 00: Read SJ drive unit type

• Response

| Header | Data | EM |
|---|---|---|
| OK | *** | CR |

000: Standard type
001: Transverse-tracing type
002: Retractable type

2) 01: Reading SJ F/W version

• Response

| Header | Data | EM |
|---|---|---|
| OK | *****··· | CR |

**CON command**

Reads measurement conditions or evaluation conditions. The format is the same as the write command.

• Command

| Header | Sub-field | EM |
|---|---|---|
| RD | CON | CR |

• Response

| Header | Data | EM |
|---|---|---|
| OK | *****··· | CR |

Data Nth byte: Number of bytes from the first byte in the data section

| Nth byte | Setting | | Settable values |
|---|---|---|---|
| 0 | * | (Standard) | 0: JIS B 0601:1982, 1: JIS B 0601:1994,<br>2: JIS B 0601, 3: ISO 4287, 4: ASME B46.1,<br>5: VDA, 6: Free, 7: ISO 21920 |
| 1 | * | (Profile) | 0: P, 1: R, 2: DF, 3: R-MOTIF |
| 2 | * | (Cutoff value λc) | 0: 0.08, 1: 0.25, 2: 0.8, 3: 2.5, 4: 8.0<br>The value for λs is determined from the value set for λc. |
| 3 | ** | (Number of sections) | 00–10 |
| 5 | **.** | (Arbitrary length) | 0.10–16.00 (available when the number of sections is "00") Unit: [mm] |
| 10 | * | (Upper limit length A) | 1: 0.02, 2: 0.1, 3: 0.5<br>The upper limit length A is determined from the set upper limit length B. |
| 11 | * | (Filter) | 0: 2CR75, 1: PC75, 2: GAUSS, 3: None |

**PAR command**

Reads number of parameters currently customized.

- Command

| Header | Sub-field | EM |
|---|---|---|
| RD | PAR | CR |

- Response

| Header | Data | EM |
|---|---|---|
| OK | ** | CR |

**: Number of pieces
RES command

**Read calculation results command**

- Command

| Header | Sub-field | Data | EM |
|---|---|---|---|
| RD | RES | **, **, ** | CR |

1) 00, aa, bb: Calculated results only
aa: Indicates the customized parameter number.
bb: For overall calculation results, 00. For when there are multiple values with the same parameter, 00–11 or results for each section length.

- Response

| Header | Data | EM |
|---|---|---|
| OK | ******* (Calculated result, 7 digits) | CR |

2) 01, aa, bb: Reading GO/NG judgment result
aa: Indicates the customized parameter number.
bb: For overall calculation results, 00. For when there are multiple values with the same parameter, 00–11 or results for each section length.

• Response

| Header | Data | EM |
|---|---|---|
| OK | * | CR |

0: GO/NG judgment OK
1: Upper limit NG
2: Lower limit NG
3: No GO/NG judgment

3) 02, aa, bb: Reading parameter name, results, units
aa: Indicates the customized parameter number.
bb: For overall calculation results, 00. For when there are multiple values with the same parameter, 00–11 or results for each section length.

• Response

| Header | Data | EM |
|---|---|---|
| OK | ****** (Parameter name, 6 digits),<br>******* (Calculation results, 7 digits),<br>*** (Unit, 3 digits) right justified | CR |

[Example] Ra 3. 123 µm CR

**PSA command**

Reads the current detector position information. Unit [µm]

• Command

| Header | Sub-field | EM |
|---|---|---|
| RD | PSA | CR |

• Response

| Header | Data | EM |
|---|---|---|
| OK | ***.*** | CR |

# 6 Error Codes

| Error No. | Error description |
|---|---|
| 003 | The origin limit cannot be detected within a given period of time. |
| 004 | The retraction limit cannot be detected within a given period of time. |
| 005 | The origin limit remains detected even after a given period of time passed. |
| 006 | The retraction limit remains detected even after a given period of time passed. |
| 007 | Detector over-range |
| 011 | Request during operation |
| 012 | Control timeout |
| 013 | Buffer overflow |
| 014 | Flash memory erase error |
| 015 | Flash memory write error |
| 016 | Program error |
| 017 | System error |
| 018 | Measurement start position error |
| 019 | Illegal set value error |
| 022 | Detector disconnected |
| 030 | Illegal command |
| 031 | Command format error |
| 032 | Command value error |
| 033 | Command in processing |
| 071 | SPC communication error |
| 101 | No calculation results |
| 102 | Calculated result out-of-range |
| 103 | Interrupted due to calculation result over-range |
| 110 | Cannot be calculated due to an insufficient number of peaks and valleys (Less Peak Valley). |
| 111 | When Rz: Less Peak Valley |
| 112 | Insufficient data points |
| 113 | Region error |
| 114 | No profile element |
| 115 | Cannot be calculated due to an insufficient peaks and valleys during BAC or ADC calculation. |
| 116 | Cannot be calculated due to being unable to perform Rk calculation. |
| 117 | R.Motif where the number of local peaks that meet the required height is fewer than 2. |
| 118 | R.Motif that exceeds the upper limit length A in the initial R.Motifs. |
| 121 | W.Motif where calculation cannot be performed because the number of motifs is fewer than 3. |
| 130 | Other calculation error |
| 150 | Memory card initialization error |
| 151 | Memory card format error |
| 152 | Memory card write error |
| 153 | Memory card read error |
| 154 | Memory card deletion error |
| 155 | A memory card has not been inserted. |

| Error No. | Error description |
|---|---|
| 156 | A file does not exist. |
| 157 | Not properly formatted or not formatted |
| 158 | Insufficient file capacity |
| 159 | File access error |
| 160 | File version is different. |
| 161 | No measurement data |
| 162 | Excess number of saved files |
| 180 | Paper out |
| 181 | Platen position error |
| 182 | Printer malfunction |
| 183 | Printer busy |
| 184 | Printer access timeout |
| 190 | The remaining capacity of the internal battery is insufficient. |
| 191 | Abnormal temperature |
| 200 | CPU failure |
| 225 | Other error |

## MEMO

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