

Mitutoyo

Rebound Type Portable Hardness Tester

HH-V400



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 reading order of the related User's Manuals, see "■ Positioning of this document" on page 5.

No. 99MBG536A

Date of publication: May 1, 2025



■ Product names and model numbers covered in this document

Product name	Model number
Rebound Type Portable Hardness Tester	HH-V400

■ 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 (📖 "SERVICE NETWORK" on page App-1).
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety" on page 10.
- 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

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

Rebound Type
Portable Hardness Tester
HH-V400
User's Manual
(This document)

Includes descriptions of the overview, usage instructions, maintenance, specifications, and troubleshooting of this product, as well as the functions of each part.

Rebound Type
Portable Hardness Tester
HH-V400
Quick Start Guide

Describes the procedure for performing a hardness test from preparation to completion of the test.

Rebound Type
Portable Hardness Tester
HH-V400
Instruction Manual

This edition, excerpted from the User's Manual, includes descriptions of the overview, safety precautions, configuration, maintenance and inspection, troubleshooting, and specifications of this product.

■ Intended readers of this document

This document is intended for operators who are using a hardness tester for the first time.

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

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 Alerts the user to a specific hazardous situation that means "Caution, risk of electric shock".
	Flammable material 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. Example: For details about XX, see  "1 Overview" on page 31.

■ 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	Represents items displayed on the screen (menus, dialogs, buttons, tabs, etc.) and the name of an operation key.
1 , 2 , 3 1 , 2 , 3 , ...	Indicates the order and the contents of tasks. (1 : indicates main tasks, 1 : indicates detailed tasks)
»	Indicates the action resulted from some operation(s).

■ Example of conventions use

Important information

Supplementary information

Indicates an alert.

Indicates an alert.

Indicates an operating procedure to be performed or its outline.

A "»" mark at the beginning of a sentence indicates the result of an operation.

X Operation

X Operation

X.X Precautions for Use

X.X.X Connecting the Power Cable

Mitutoyo service personnel or the agent where you purchased the product will connect the power cable at the installation of the main unit.

IMPORTANT

Use only the power cable that is supplied with this product.

Tips

In case of emergency or for maintenance purposes, after unplugging the power cable from the AC inlet, plug it in again.

X.X.X Mounting the Probe

Mount the probe onto the probe head by "auto joint connection". This section explains connection procedure.

CAUTION

There is a risk of injury due to accidents that accompany the movements of the probe.

! Turn off the main unit before mounting the probe.

NOTICE

There is a risk of damage to this product due to the instability of input signals.

! Turn off the main unit before mounting the probe even if the input signals are disabled.

- 1** Make sure that the keyway on the rear of the probe is set to the unlock position.
- 2** Align the marks on the probe head and the probe.
- 3** Using the accessory tool, turn the keyway on the rear of the probe to the lock position.

» The probe mounting is completed.

X
Operation

XX No. XXXXXXXXXX

Personal Protective Equipment

Personal protective equipment is useful for protecting workers against hazards to their health and safety at their workplaces.

Operators must wear their protective equipment while performing tasks with this product.

In addition to the protective equipment stipulated in this document, operators must wear the protective equipment specified by the operating company as well as the equipment required at their workplace.

The following are descriptions of the personal protective equipment.



Protective suit

Use a protective suit that is close fitting, has low tear resistance as well as narrow cuffs, and does not have any parts that stick out.



Protective eyewear

Use protective eyewear that is effective for protecting your eyes against parts or liquids that fly in your direction.



Safety gloves

Use safety gloves that are effective for protecting your hands against friction, scrapes, puncture wounds, external deep wounds, and contact with hot surfaces.



Inspection gloves

Inspection gloves are used to prevent rust from forming on the sample due to the temperature during handling or contact with fats or oils, and are also used as a simple protection against external wounds.



Safety shoes

Use safety shoes that are effective for protecting your feet against falling parts, slipping on slippery surfaces, and crushing-related injuries.

Requirements for Operators

In order for a worker to perform tasks with this product, the worker must be an employee of the operating company where this product is used and must understand the contents of this document. Moreover, the worker must make inquiries to the agent where this product was purchased or a Mitutoyo sales office (☰ "SERVICE NETWORK" on page App-1) as needed to resolve any unclear points before using the product.

CAUTION

If the requirements for operators are not satisfied, there is a risk of injury.



- All tasks must be performed by appropriately qualified operators.
- For details about the working areas and the hazardous areas of this product, see ☰ "■ About the working areas and the hazardous areas" on page 12.

Safety

Intended Purpose

This product can be used only for the purpose of performing a hardness test on a sample.

The intended purpose also includes handling this product in accordance with the contents of this document.

Any use that is not intended as well as any use that is considered to be incorrect are referred to as "improper use" in this document.

■ Improper use

Using this product improperly may lead to a hazardous situation.



When there are hazardous items in the vicinity of this product, there is a risk of electric shocks, burn injuries, or fires occurring.
In the event of an abnormality with this product, turn off the power immediately and remove the AC adapter from the outlet.



- Check that there are no substances such as water, oil, chemicals, organic solvents, or corrosive gases in the vicinity of this product.
- Do not install this product in the following locations.
 - Where there is a potential risk of explosion
 - Where the temperature is higher or lower than the operation-guaranteed temperature range
 - Where noise is generated due to static electricity, etc.
 - Where there is strong electrical field intensity
 - Where power cables and power transmission lines are running through nearby
 - Where there is a risk of exposure to radiation
 - Where there is a risk of exposure to corrosive gases, etc.



There is a risk of this product malfunctioning or of electric shocks occurring.



Do not disassemble or modify the product. Failure to do so may result in unexpected accidents such as electric shocks. In addition, failure to do so may affect the testing accuracy and functions. Such cases are not covered by the warranty.

For the inspection or repair of the inside of this product, 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 result in property damage.

- Cases in which the product has been disassembled by the customer are not covered by the warranty from Mitutoyo.
- Do not customize either hardware or software without permission from Mitutoyo.

For the repair of this product, please make a request to the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).

Residual Risk

A "residual risk" is a risk that remains even after efforts against foreseeable risks have been made. Here, the "residual risks" associated with this product are explained.

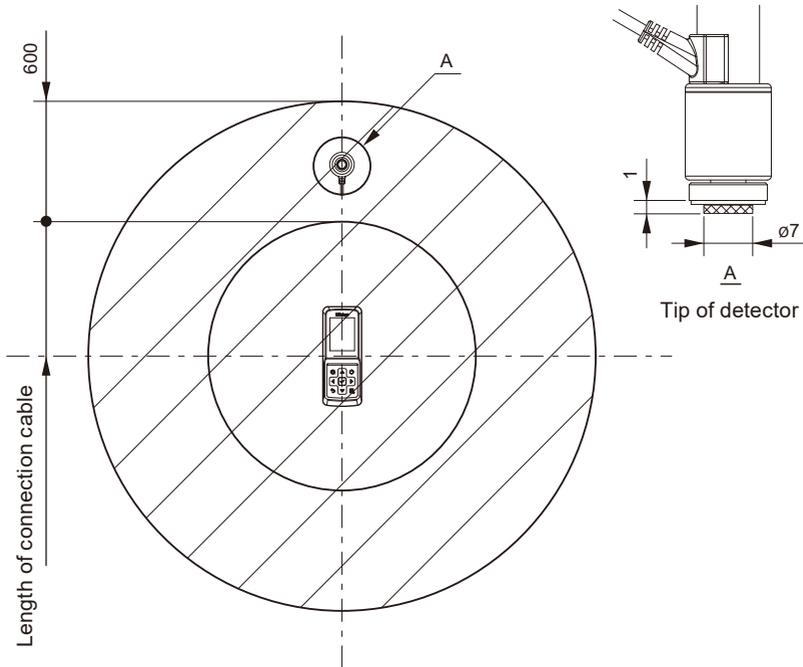
■ About the working areas and the hazardous areas

The figure below shows the working areas (maintenance spaces) and the hazardous areas of this product.

The working areas (maintenance spaces) are located on the front, back, and sides of this product.

Any area of this product in which there are moving parts is a hazardous area.

Unit: mm



■ About the dangers of electricity

● Electric current



Improperly supplying electric power poses a risk of electric shocks.



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



Touching parts through which live current passes or parts with damage to their insulation poses a risk of electric shocks.



- Do not disassemble the detector while this product is turned on.
- During cleaning work, be absolutely sure that no liquids accidentally enter the inside of this product.
- Be absolutely sure not to use a high-pressure washer on this product while performing work such as cleaning.

In the event that an abnormality is found in the electrical outlet, please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office ( "SERVICE NETWORK" on page App-1).

■ About the measures to be taken if an abnormality occurs

 **WARNING**



Continuing to use this product after the occurrence of an abnormality poses a risk of causing electric shocks, fires, or malfunctions of this product.



- In the event of abnormalities such as heat, smoke, or foul odors emanating from the product, turn off the power immediately and remove the power plug of the AC adapter from the outlet. Continuing to use the product in such cases may lead to electric shocks or fires. Subsequently, please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office ( "SERVICE NETWORK" on page App-1).
- If a foreign material (water, metal debris, etc.) has entered the product, turn off the power immediately and remove the power plug of the AC adapter from the outlet. Subsequently, please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office ( "SERVICE NETWORK" on page App-1).
- If the housing has been damaged due to colliding with a hard object, turn off the power to this product and remove the power plug of the AC adapter from the outlet. Subsequently, please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office ( "SERVICE NETWORK" on page App-1).

■ About the power supply and the connection cable



The following behavior poses a risk of causing electric shocks or fires.



- If the supplied AC adapter (standard accessory) has been damaged, stop using this product immediately. Continuing to use the product in such cases may lead to electric shocks or fires.
- Do not insert or remove the power plug of the AC adapter with wet hands.
Failure to do so may result in electric shocks.
- Do not use an AC adapter other than the supplied AC adapter (standard accessory) or another specified one.
Failure to do so may result in injuries, fires, or malfunctions of the internal circuitry.



- In the event that a lightning strike has occurred nearby, remove the power plug of the AC adapter from the outlet.
Continuing to use the product in such cases may lead to faulty operations, electric shocks, or fires.
- Connect the AC adapter to a power source other than the ones carrying high-voltage currents (for machining equipment, large CNC measuring instruments, etc.). Also, do not use a power strip.
- In the event of dust, water, oil, etc. adhering to the outlet where the power plug of the AC adapter is to be inserted, wipe and dry it with a dry cloth before use.
Continuing to use the product in such cases may lead to fires due to short circuiting, etc.
- When connecting the power plug of the AC adapter, firmly insert it all the way to the back.
Loose connections may lead to fires or malfunctions.
- When removing the power plug of the AC adapter, be sure to hold the plug head. Trying to disconnect while holding the cable may cause core wire exposure or cable cut, and moreover, electric shocks or fire.

■ About the use of this product

 **WARNING**



The following behavior poses a risk of causing electric shocks or fires.



- Do not disassemble or modify the product. Failure to do so may result in fires or electric shocks.
- Do not install the instruments on top of an unstable base. Failure to do so may result in injuries due to the instruments falling over.
- Do not place flower vases or other vessels that contain water or other liquids near the product. A liquid entering the inside of an instrument may lead to fires or electric shocks.
In the event that a liquid has entered the inside, please contact Mitutoyo. Continuing to use the product in such cases may lead to fires or electric shocks.
- Do not use this product in locations where there is a risk of volatile gases being generated in the vicinity. Otherwise, a fire may occur.
- Do not use this product with a power voltage other than the one specified. Otherwise, a fire or electric shock may occur.
- Be careful that foreign materials such as metal debris, water, or liquids do not enter from the openings in the vicinity of the connectors.
- Do not subject the LCD screen to any shocks. Also, do not press it forcefully with any sharply pointed tools.
Failure to do so may result in the LCD screen breaking.
In the event that the LCD screen has broken and its liquid contents have leaked out and adhered to your skin, rinse the area of exposure with running water for at least 15 minutes. If the contents have gotten into your eyes, rinse your eyes with running water for at least 15 minutes and then consult a doctor.
LCD screens contain irritative substances.
- Do not use the product if there are any abnormalities, such as nothing being displayed on the screen even though the power is on.
Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).
- Do not use accessories other than the ones specified. Using accessories other than the ones specified may lead to fires, electric shocks, or malfunctions.

 **CAUTION**

There is a risk of injury to your hands or fingers.



When attaching or removing an accessory, be careful not to pinch or hit your fingers. Failure to do so may lead to injury.



- When unpacking this product, take precautions such as wearing safety gloves so that your hands or fingers do not get injured by any scraps of cardboard.
- If the tester package from which you are unpacking this product is damaged or old, your hands or fingers may be injured.
Please contact the agent where you purchased the product or a Mitutoyo sales office (📖 "SERVICE NETWORK" on page App-1).
- When storing this product in the tester package, close the lid securely. Injuries may result from your fingers getting caught in any gaps remaining due to the lid not being closed securely.
- The tip of the impact hammer is sharply pointed.
When inserting the impact hammer into the detector, take precautions such as wearing safety gloves so that your hands or fingers do not get injured.
- Wear protective eyewear when inserting the impact hammer into the detector.
Looking into the inside of the detector while the support rings are not attached may lead to eye injuries due to faulty ejection of the impact hammer.
- During a test, wear safety shoes.
Foot injuries may be caused by the sample (the object being tested) getting caught on a cable and falling off.

NOTICE

There is a risk of this product malfunctioning.

- Do not apply an excessive external force to this product. Failure to do so may result in malfunctions or damage.
- Do not subject the product to powerful shocks such as dropping it or hitting it against another object. Failure to do so poses a risk of faulty operations, damage, or misalignment of adjusted parts.
- The detector and the display are not water proof. Absolutely do not get them wet or immerse them in a solution during use.
In cases where the tester has gotten wet accidentally, please contact a Mitutoyo sales office (☎ "SERVICE NETWORK" on page App-1).
- Do not oil this product. (Oiling is not necessary.)

NOTICE

The obtained test results may not be accurate.

- If a solution (water, oil, etc.) or coating is applied to the target surface of the sample (the object to be tested), accurate testing cannot be ensured.
Before the test, wipe off the solution or strip off the coating film.
- Use a sample (the object to be tested) that does not have scratches or damage on its surface.
If the sample has major scratches or damage on its surface, accurate measurement values cannot be obtained. An optimally sized sample is one that is at least 5 mm thick and has a mass of 5 kg or more.
Be sure to use a sample with the specified thickness and mass for testing. Accurate measurement values may not be obtained if the sample does not meet the specified conditions.
For details, see ☰ "4.4 Checking the Sample" on page 169.
- In order to demonstrate conformance to the standards, perform tests in accordance with the test method (tester) specified by each standard.
- Do not perform testing twice or more at the same point.
- To obtain hardness numbers of greater accuracy, perform testing at several points on each sample.
- The sample must be firmly secured during testing.
- For a cylindrical sample, secure the sample by supporting it with V-blocks to prevent it from rolling during testing. In addition, this product is intended for testing flat surfaces, so when testing a cylindrical surface with a curvature radius that is below the specified curvature radius, use the dedicated optional accessories (support rings).
- When performing key operations, firmly press the keys for approximately one second.

■ About samples

CAUTION

Samples with sharp edges or corners pose injury risks.



When handling a sample, wear the protective equipment specified in  "Personal Protective Equipment" on page 8.

■ About other dangers

● Insufficient illuminance of the lighting system

CAUTION

There is a risk of injury due to insufficient illuminance of the lighting system in the operating environment.



- The operator is to ensure that there is always sufficient illuminance in the operating environment.
- Any defective lighting devices must be replaced immediately.



If the lighting system is malfunctioning or deficient, do not use this product.

● Malfunction of the display unit

CAUTION

Malfunctions of the display unit may lead to incorrect judgments and pose a risk of injury to the operator.



- Before starting work, check that the main screen is displayed on the display unit.
- A defective display unit must be replaced immediately. 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 this product, see  "3 Features" on page 79.

Handling the Battery

A Ni-MH (nickel–metal hydride) battery (hereafter referred to as "internal battery") is used as the main power supply. Observe the following precautions during use.



Improper handling of the internal battery poses a risk of a serious injury due to liquid leakage, overheating, explosion, or combustion.



To prevent liquid leakage, overheating, explosion, or combustion of the internal battery, be sure to observe the following precautions.

- Do not place the battery in fire or heat it up.
- Do not connect the positive terminal (+) and negative terminal (-) of the internal battery with metal wire, etc.
Also, do not store the battery in the same place as other metal goods.
- Do not disassemble the battery.
- Do not modify the battery.
The internal battery is equipped with a protection circuit to prevent danger. Modification may impair this function.
- The positive end (+) and the negative end (-) are determined by the connector that connects the internal battery to this product. If the connector cannot be readily connected, do not connect it forcibly.
Failure to do so may cause breakdowns of the circuitry in the display unit, abnormal reactions in the internal battery, or abnormal electrical currents when electrical current is discharged.
- Do not use the internal battery with any devices other than the display unit.
- Do not immerse or moisten the internal battery or its connector in liquids such as water or brine.
Failure to do so may cause overheating or rusting.
- Do not peel or scratch the exterior of the internal battery.
Failure to do so makes it easy for short circuiting to occur.
- If an abnormality such as liquid leakage, discoloration, or deformation is found, do not use this product.



To prevent liquid leakage, overheating, explosion, or combustion of the internal battery, be sure to observe the following precautions.

- Before charging the internal battery, attach it to the display unit.
If an unspecified battery charger is used, charging and charging control may not be able to be performed due to excess current.
- In the event that the internal liquids have gotten into your eyes due to a liquid leak or an explosion of the internal battery, do not rub your eyes. Rinse your eyes thoroughly with clean water such as tap water and then receive medical treatment by a doctor immediately. Failure to do so may lead to loss of eyesight.
- When the internal battery has reached the end of its service life, discharge the battery, insulate its connector by wrapping it in plastic tape, and then dispose of the battery as non-combustible waste. However, note that disposal methods differ among municipalities and countries. Follow the local disposal rules and regulations.
- If charging cannot be completed within the designated charging period, stop charging the internal battery.
Continuing to charge the internal battery may lead to it being over-charged.
- In the event of the liquid contents adhering to your skin or clothes due to a liquid leak or an explosion of the internal battery, rinse them away with clean water such as tap water immediately. Failure to do so may cause burns or inflammation on your skin.
- The power draining much more quickly than usual is a sign that the internal battery has reached the end of its service life. Replace it with a new internal battery (Part No. 12AAZ222).

CAUTION

Improper handling of the internal battery poses a risk of injury due to liquid leakage, overheating, explosion, or combustion.



- Do not subject the internal battery to powerful shocks or throw it. Failure to do so may cause overheating, explosion, or combustion.
- Do not carry it while holding the connector or the lead wires.



- Store the internal battery in a location that is out of reach of toddlers and small children.
- Charge the internal battery only when the temperature of the battery and the temperature of the air surrounding the battery both fall within the range of 5 °C to 40 °C.
Charging it when either of the temperatures is out of this range poses a risk of not only liquid leakage or overheating, but also of degrading the performance of the internal battery or shortening its service life. Additionally, when the surrounding temperature is too high, the battery may not charge fully.
- For details about how to charge the internal battery, see  "4.6 Replacing the Internal Battery" on page 174.
Depending on the operating environment and the operating conditions, approximately 8 hours of testing is possible with a fully charged internal battery.
Once the charging capacity starts to degrade, replace the internal battery with a new one (Part No. 12AAZ222).
- In cases where this product is to be out of operation for a prolonged period (for at least 30 days), remove the internal battery from the display unit and then store them both in a place with minimal humidity.

Liabilities of the Operating Company

This product is installed in an industrial environment. Therefore, the company that operates this product is subject to legal requirements pertaining to occupational safety.

In addition to the safety guidelines described in this document, the company must observe the safety, labor, and environmental requirements stipulated in the region where this product is operated.

In particular, the following requirements apply.

- The operating company must collect information on the applicable health and safety regulations. In terms of risk assessment, the company must identify other hazards that arise from working conditions specific to the operating site. In addition to operating the product in accordance with this document, the operating company must fulfill these requirements.
- Throughout the entire period that this product is in operation, the operating company must verify whether this document is compatible with the regulations that are currently in effect, and must take actions as necessary.
- The operating company must clearly specify and determine who is responsible for installation, operation, troubleshooting, maintenance, and cleaning.
- The operating company must ensure that all workers who handle this product have read and understood the contents of this document. Also, the operating company must provide periodic training to the workers in charge of this product and inform them of hazards.
- The operating company must provide the required protective equipment to the workers in charge of this product and emphasize that wearing protective equipment is mandatory.

The operating company has an obligation to store this product under appropriate technical conditions.

Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive and the UK Electromagnetic Compatibility Regulations. However, if it is exposed to electromagnetic interference that exceeds the limits specified in these directives and regulations, the warranty will be invalidated and appropriate measures will be required.

This product is for industrial usage. This product is not intended for use in a 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-provision of the technology (including program), you are obligated to 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-乙基己)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。

Disassembly and Disposal

■ Disassembly

Prior to disassembly

- Remove the power plug of the AC adapter from the outlet to terminate the external power supply.
- Bring the product to a complete halt.

Subsequently, clean the product and its parts and then disassemble them in accordance with the local rules and regulations regarding health, safety, and environmental protection.

■ Disposal

When disposing of this product oneself, sort the components as follows.

- Remove and scrap the metal components.
- Recycle the plastic components.
- Remove the motor and its accessories. Dispose of them with care.
- Sort the disassembled parts according to material type or disposal method.

Subsequently, dispose of them in accordance with the local rules and regulations regarding health, safety, and environmental protection.

NOTICE

Improper disposal may harm the environment.

- For disposal of electrical appliances, electronics, lubricants, or equivalent materials, make a request to an authorized waste disposal agency.
- Batteries contain harmful substances. Do not put them in household waste containers. Dispose of them in accordance with the disposal methods appropriate to the region and municipality.
- For the disposal of questionable components and materials, consult an authorized agency 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 Mitutoyo sales office (☰ "SERVICE NETWORK" on page App-1). This warranty, however, shall not affect any provisions of the Mitutoyo Software End User License Agreement.

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 instrument is properly installed and operated in conformance with the instructions in this manual 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.

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.



1 Overview

This product is a tester for measuring the hardness of metal.

In this part, basic knowledge needed to correctly use this product is explained.

1.1 Features of the HH-V400

This product is a compact type portable hardness tester for metal.

● Wide variety of detectors

In addition to the general-purpose detector (D-type detector) that is provided as standard, there are optional detectors that are designed for specialized applications (DC-type/D+15-type/DL-type detectors).

DC-type detector: For narrow spaces

D+15-type detector: For bearings, gears, and uneven surfaces

DL-type detector: For narrow surfaces, such as the grooves between the teeth of gears

● Automatic angle-correcting function

The direction in which the detector is pressed against objects is automatically recognized, and the influence of gravitational acceleration is automatically corrected. An omni-directional hardness test can be conducted without setting the test angle of the detector.

● Test scales appropriate for your testing objectives

This product has a function that performs conversion to Vickers, Brinell, Rockwell C scale, Rockwell B scale, and Shore hardnesses, as well as to tensile strength, based on Leeb hardness numbers. You can convert the values after a test, and you can also switch to the test scale that you want to display before you perform a test.

Tips

- Tensile strengths and non-Leeb hardnesses are numbers converted from the test readings (Leeb hardness) obtained by this product. Since the converted values are ones approximated from readings obtained through comparison tests, they are only reference values.
- The test principles employed by this product do not have a direct relation to other hardness test methods (such as the Vickers and Rockwell hardness test methods) or to tensile strength test methods. If it is necessary for the hardness you are testing to comply with a National Standard and to be traceable, conduct tests by using a hardness tester specific to your needs, such as a Vickers-hardness or Rockwell-hardness tester.

1.2 Confirming the Package Contents

After unpacking the purchased product, check it by referring to the following pages. If the product or its accessories have any defects or damage, 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 injury to your hands or fingers.



At the time of purchase, this product and its standard accessories are vacuum-sealed in plastic bags and stored in the package. Cut open the plastic bags by using a pair of scissors.

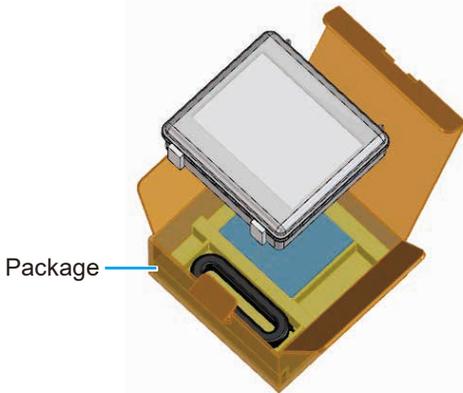


Avoid using a utility knife to open the plastic bags, as there is a risk of injuring your hands or fingers.

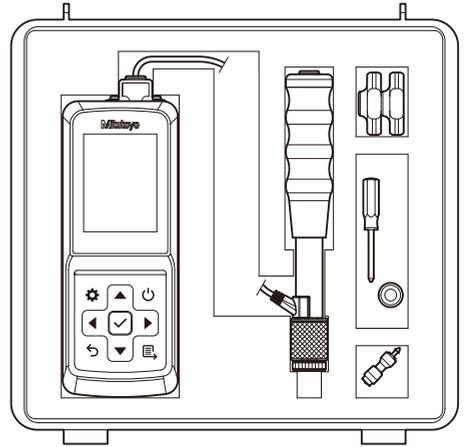
NOTICE

There is a risk of this product malfunctioning.

Be sure to use the AC adapter supplied with this product. Using an AC adapter other than the one supplied may cause this product to malfunction.



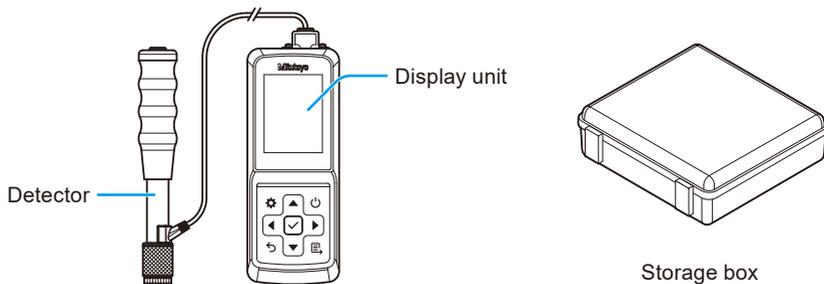
Package



Storage box

■ List of packaged contents

The following items are packaged in the same box as HH-V400 (standard configuration equipped with a D-type detector).



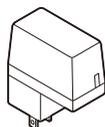
Impact hammer



Support ring (small)



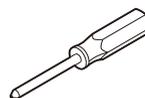
Handle (two pieces)



AC adapter



USB 2.0 cable



Phillips screwdriver

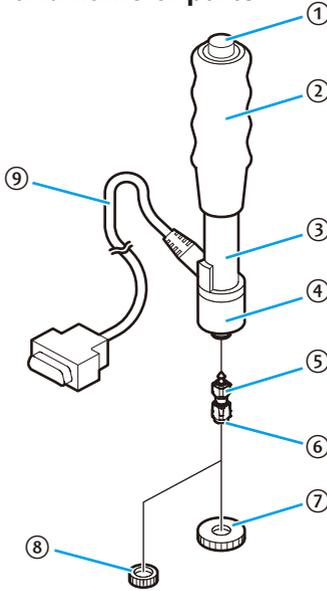
- Instruction Manual (English)
- Quick Start Guide (Japanese/English)
- EU Declaration of Conformity
- UK Declaration of Conformity
- Warranty (card)
- Certificate of inspection

1.3 Explanation of Each Part

1.3.1 Detector

■ D-type detector

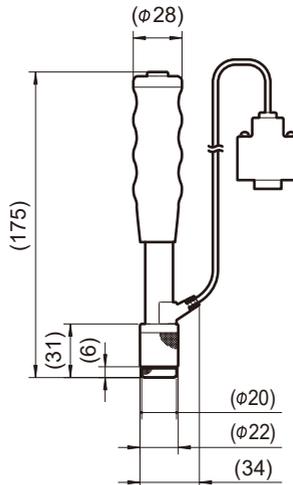
● Appearance and name of parts



- ① Push button
- ② Grip
- ③ Outer tube
- ④ Coil holder
- ⑤ Impact hammer
- ⑥ Tungsten-carbide ball (already incorporated)
- ⑦ Support ring
- ⑧ Support ring (small)
- ⑨ Detector cable

● Dimensions and mass

160 g



- **Application**

General purpose detector

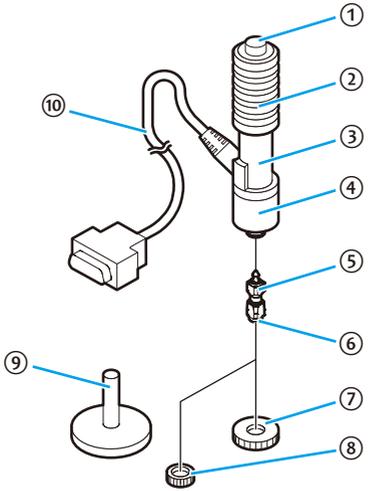
- **Testable materials**

Irons and steels including alloyed tool-steel, gray iron, spherical graphite cast iron, stainless steel, as well as brass, casting copper-based alloys, casting aluminum-based alloys, and copper–tin-based alloys

For details about which materials are testable by which types of detector, see  "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".

■ DC-type detector

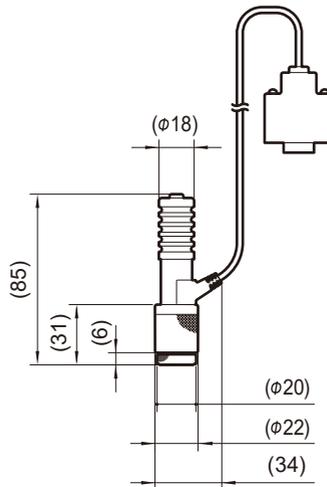
● Appearance and name of parts



- ① Push button
- ② Grip
- ③ Outer tube
- ④ Coil holder
- ⑤ Impact hammer
- ⑥ Tungsten-carbide ball (already incorporated)
- ⑦ Support ring
- ⑧ Support ring (small)
- ⑨ Hammer chuck
- ⑩ Detector cable

● Dimensions and mass

90 g



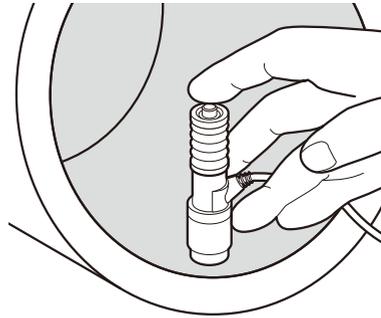
- **Application**

For performing hardness tests in narrow spaces that cannot be tested with a D-type detector

- **Testable materials**

Irons and steels including alloyed tool-steel, gray iron, spherical graphite cast iron, stainless steel, as well as brass, casting copper-based alloys, casting aluminum-based alloys, and copper–tin-based alloys

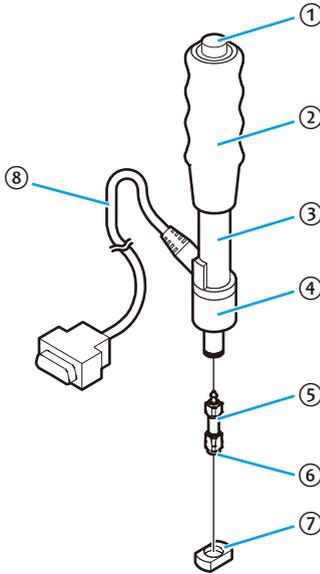
For details about which materials are testable by which types of detector, see  "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".



■ D+15-type detector

● Appearance and name of parts

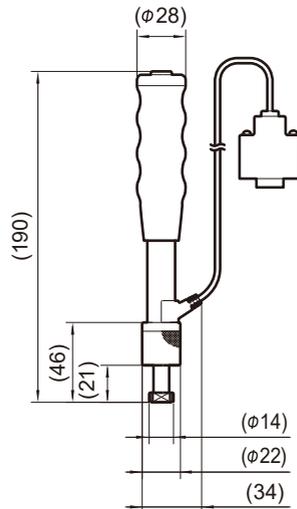
1
Overview



- ① Push button
- ② Grip
- ③ Outer tube
- ④ Coil holder
- ⑤ Impact hammer
- ⑥ Tungsten-carbide ball (already incorporated)
- ⑦ Support ring
- ⑧ Detector cable

● Dimensions and mass

170 g



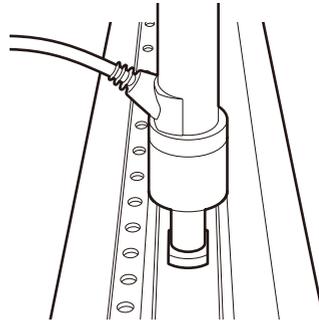
- **Application**

For performing hardness tests in gaps, grooves, and shallow, uneven parts

- **Testable materials**

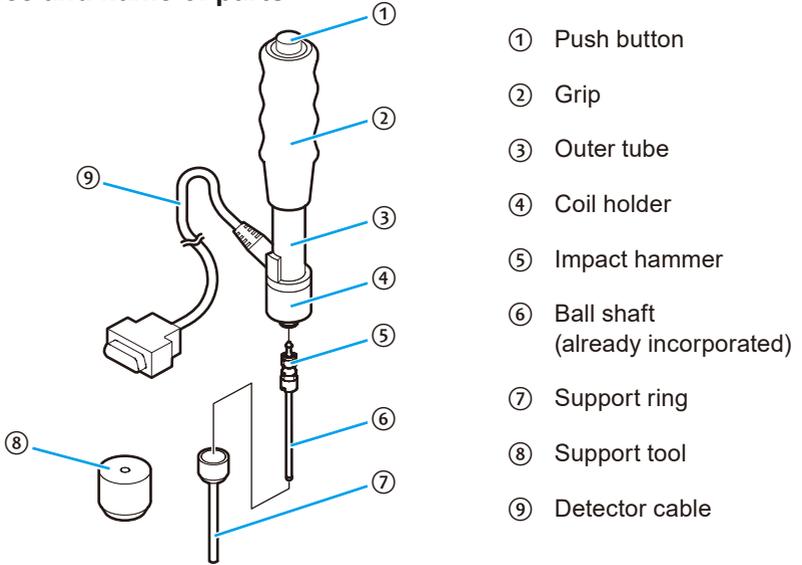
Irons and steels including tool steels for cold-work

For details about which materials are testable by which types of detector, see  "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".



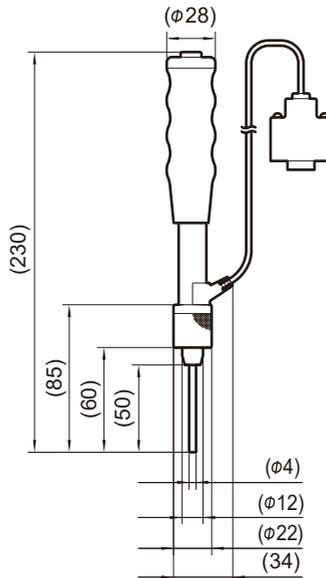
■ DL-type detector

● Appearance and name of parts



● Dimensions and mass

180 g



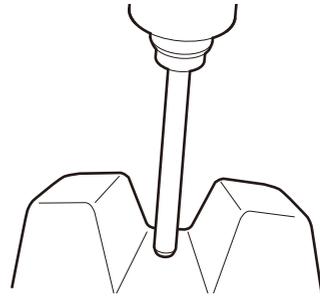
- **Application**

For testing the hardness of narrow surfaces, such as the grooves between the teeth of gears

- **Testable materials**

Irons and steels

For details about which materials are testable by which types of detector, see  "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".

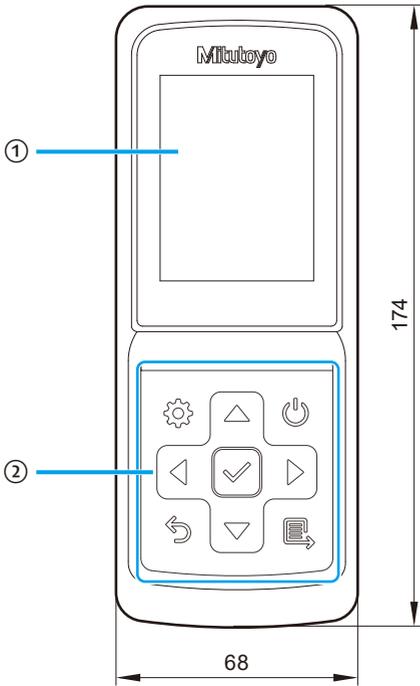


1.3.2 Display Unit

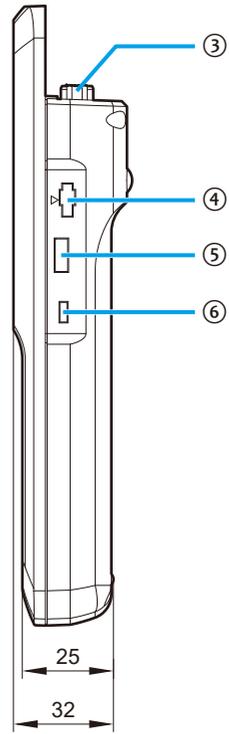
■ Appearance

1

● Front side

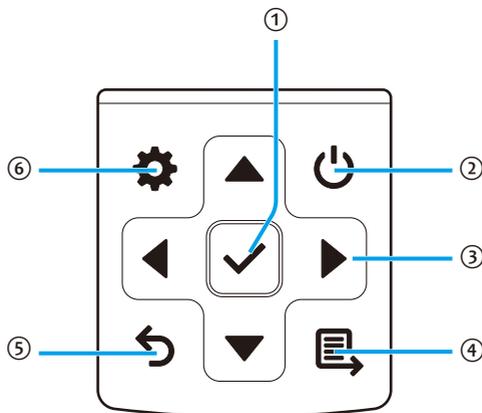


● Right side



- ① Display : Displays test results, converted values, modes, setting items, and error information.
- ② Operation keys
- ③ Connector (display unit)
- ④ SPC connector
- ⑤ USB connector
- ⑥ Internal battery switch

■ Operation keys



- ① [CHECK] key : Confirms the setting or value.
- ② [ON/OFF] key : Turns the power on or off when pressed and held for 2 seconds.
- ③ [◀▶▲▼] key : Changes the setting items or values.
- ④ [Data output] key : Outputs data manually.
The data output destination must be set in order to output data.
For details about the setting, see 📖 "3.6 Data Output Destination Settings" on page 102.
- ⑤ [BACK] key : Returns to the previous screen.
- ⑥ [MENU] key : Displays the menu screen.

1.4 Operating Environment

Stay within the following operating conditions when using this product in order to obtain optimum performance and to ensure safe testing.

■ Operating temperature and humidity

Accuracy-guaranteed temperature range	23 ± 5 °C
Operation-guaranteed temperature range	5 °C to 40 °C
Operating humidity range	20% to 80%RH (no condensation)

■ Other conditions

- Use this product in a location where there are minimal vibrations.
Using this product for a prolonged period in a location with frequent vibrations may lead to problems with the precision components inside the product, which may impair performance.
- Use the product in a location where there is no dust or grit.
Dust and grit are harmful to the mechanical and electronic components inside the product.

■ External power source (connection of the display unit to the AC adapter via USB)

The supplied AC adapter (standard accessory) can be used as an external power source.

Check that the specifications of the USB 2.0 cable to be used conform to the power source specifications shown in the table below and then connect the cable to the display unit.

Do not use an AC adapter other than the one supplied.

Power distribution system	Single-phase, two-wire system
Voltage	AC100 V to 240 V \pm 10%
	Overvoltage category II
	Pollution degree 2
Frequency	50 Hz/60 Hz
Power consumption	4 VA at maximum
Number of power outlets	1
Supported USB standard (Connector type: Type-C)	USB 2.0 (Full speed)
USB charging standard	BC 1.2 The following ports are supported. <ul style="list-style-type: none"> • SDP "SDP (Standard Downstream Port)" • CDP "CDP (Charging Downstream Port)" • DCP "DCP (Dedicated Charging Port)"

■ Electromagnetic noise

Connect the AC adapter to a power source other than the ones carrying high-voltage currents (for machining equipment, large CNC measuring instruments, etc.). When using this product, keep it at a sufficient distance from equipment that generates electromagnetic noise, such as welding machines and electrical discharge machining machines.

MEMO

1

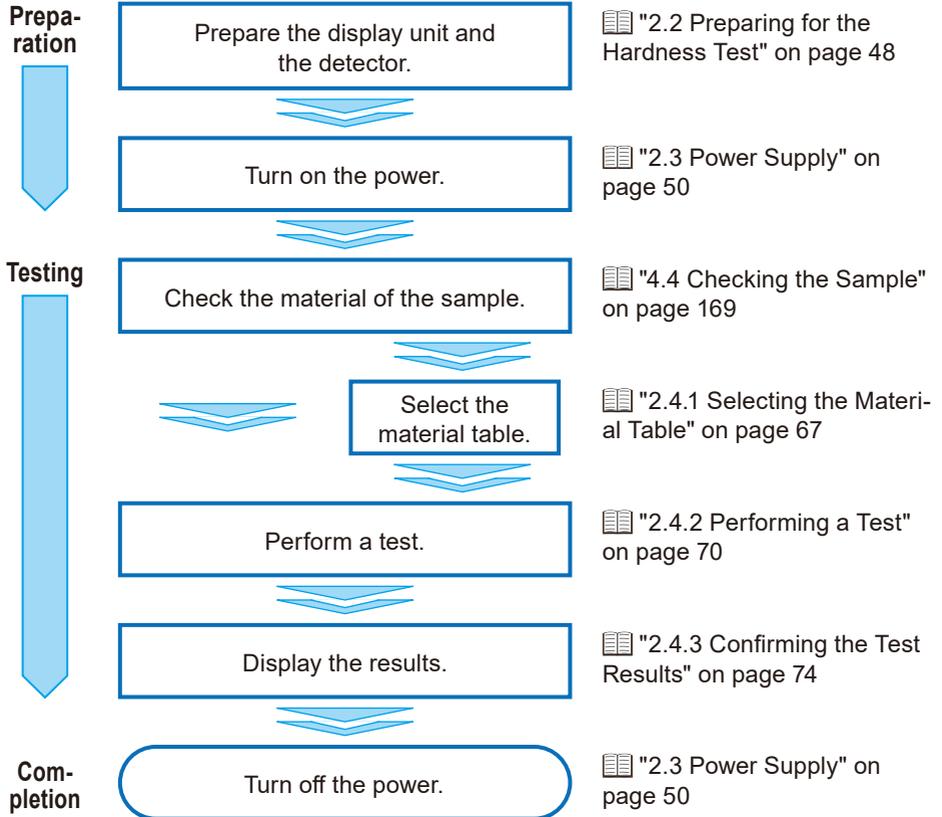
Overview

2 Basic Operations

This part explains the basic operations performed during testing.

2.1 Operation Flow

This section provides a general explanation about how to perform a hardness test.



For details about useful features (output of test results, statistics functions, etc.), see ["3 Features" on page 79](#).

For details about troubleshooting, see ["5 Troubleshooting" on page 179](#).

2.2 Preparing for the Hardness Test

2.2.1 Preparing the Detector (Impact Hammer Set)

WARNING

Indicates that there is a risk of incurring death or serious injury.

Wear knife-proof gloves and protective eyewear when setting the impact hammer in the detector.

Looking into the inside of the detector while the support rings are not attached may lead to eye injuries due to faulty ejection of the impact hammer.

NOTICE

Indicates that there is a risk of incurring property damage.

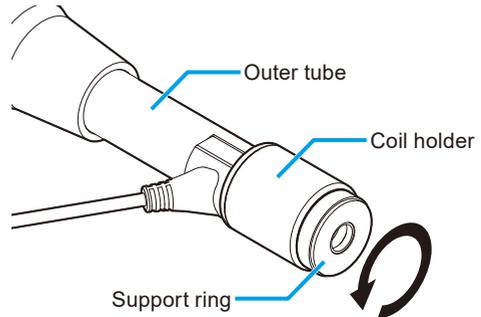
- Rotating the support ring while holding the outer tube may result in damage.
- Inserting the impact hammer in an incorrect orientation may result in damage.

1 Prepare the detector and impact hammer.

2 While holding the coil holder, rotate the support ring counterclockwise to remove it from the detector.

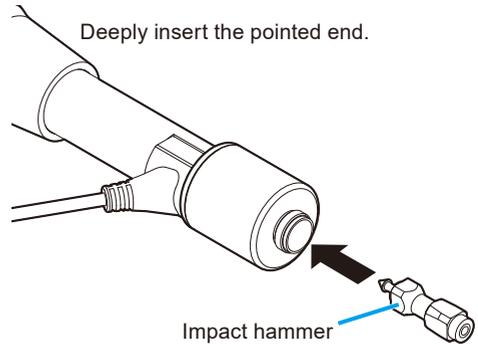
NOTICE

Do not hold the outer tube while rotating the support ring. Failure to do so may damage the detector.



3 Insert the impact hammer into the outer tube.**NOTICE**

Inserting the impact hammer backwards may damage the detector.

**4** Perform the procedure in Step 2 in reverse to attach the support ring.**Tips**

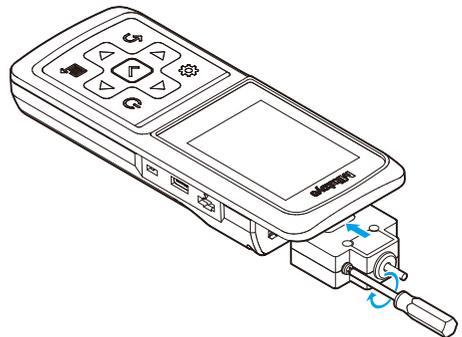
Select a detector that is appropriate for your testing objectives.

For details, see "1.3.1 Detector" on page 34 and "2.4.1 Selecting the Material Table" on page 67.

5 Connect the detector cable to the display unit.**NOTICE**

There is a risk of this product malfunctioning. Be sure to read and understand the following precautions and to exercise sufficient caution when using this product.

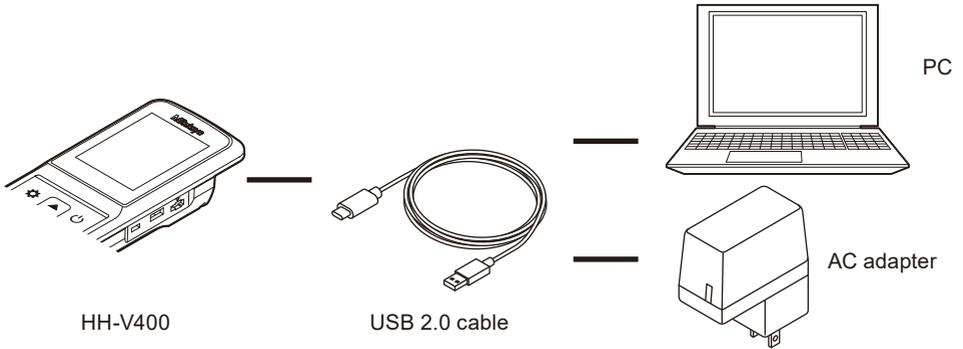
Connect or disconnect the detector cable while the power to this product is turned off and the USB 2.0 cable is unconnected. Doing this while the power to this product is on and/or the USB 2.0 cable is connected causes the product to malfunction.

6 Tighten the two screws attached to the connector (detector) by using the supplied screwdriver.

2.3 Power Supply

This product runs on the internal battery or an external power source (connected to this product via the supplied AC adapter or a PC via USB). To connect via USB, use the supplied USB 2.0 cable.

For details about the external power source and the supported USB standard, see  "■ External power source (connection of the display unit to the AC adapter via USB)" on page 45 in "1.4 Operating Environment".



2.3.1 Turning the Internal Battery Switch On/Off

At the time of purchase, the internal battery switch is set to off. When using this product, be sure to turn on the internal battery switch.

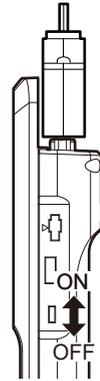
NOTICE

There is a risk of this product malfunctioning. Be sure to read and understand the following precautions and to exercise sufficient caution when using this product.

Turn on or off the internal battery switch while the power to this product is turned off and the USB 2.0 cable is unconnected. Turning the internal battery switch on or off while the power to this product is on and/or the USB 2.0 cable is connected causes the product to malfunction.

IMPORTANT

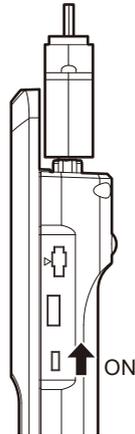
- Leave the internal battery switch on except for when this product will be out of operation for a prolonged period (approximately two weeks or more).
- When turning on the internal battery switch again soon after turning it off, wait for approximately 30 seconds after turning off the internal battery switch before turning it on again.



2 Basic Operations

Turn on the internal battery switch by following the procedure below.

- 1** Check that the power has been turned off (nothing is being displayed on the display unit) and that the USB 2.0 cable has not been connected to the display unit.
- 2** Using a pen or similar item, slide the internal battery switch in the ON direction.

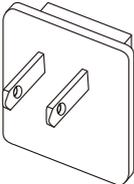
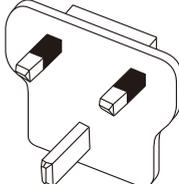
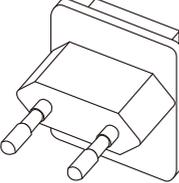
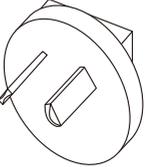
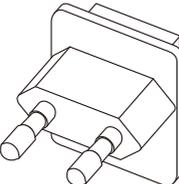
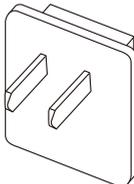


2
Basic Operations

2.3.2 Preparing the AC Adapter (Replacing the AC Pins)

The six AC pins shown in the following table are included at the time of purchase. National and regional power sources can be accommodated by replacing the AC pins.

List of AC pins

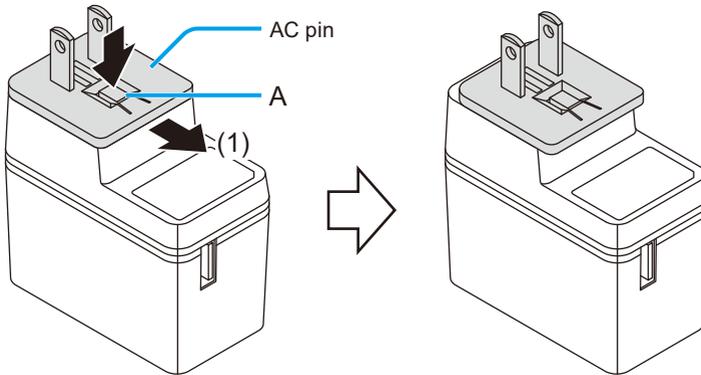
Applicable regions	Shape of AC pin	Applicable regions	Shape of AC pin
Japan Taiwan United States		United Kingdom	
Europe		Australia	
South Korea		China	

■ Removing an AC pin

Remove an AC pin by following the procedure below.

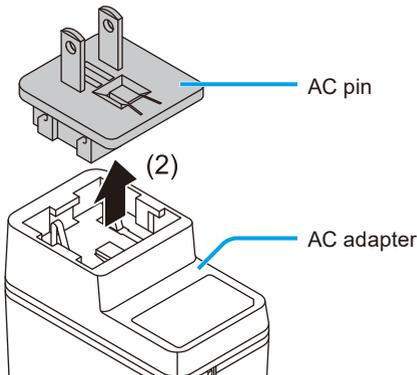
- 1** While pressing down the A part of the AC pin with one of your thumbs, push the AC pin in the direction of (1).

» The lock of the AC pin will be released, and the AC pin will then shift in the direction of (1).



- 2** Lift the AC pin in the direction of (2).

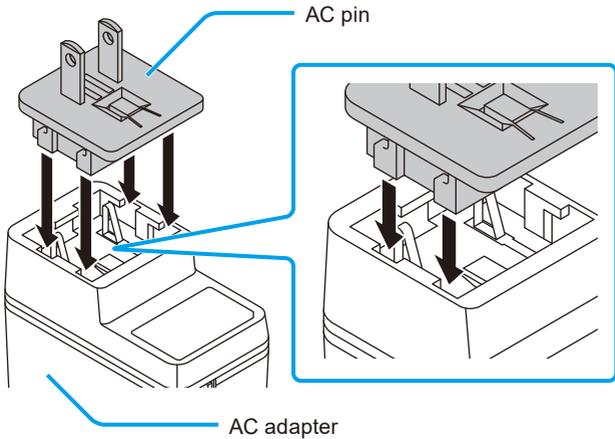
» The AC pin will separate from the AC adapter.



■ Attaching the AC pin

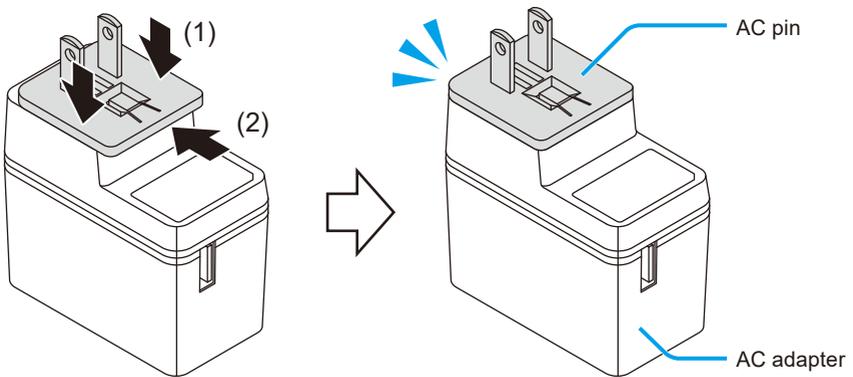
Attach the AC pin by following the procedure below.

- 1 Insert the four convex parts on the sides of the AC pin into the four grooves on the sides of the AC adapter.



- 2 While pressing down the AC pin in the direction of (1), slide it in the direction of (2).

» A clicking sound indicates that the AC pin has been secured to the AC adapter.



2.3.3 Charging the Internal Battery

Before using this product, charge the battery by using an external power source (connected to this product via the supplied AC adapter or a PC via USB).

The battery takes approximately 4 hours to fully charge with the supplied AC adapter. When charging via USB from a PC, it may take over 4 hours for the battery to charge fully.

NOTICE

There is a risk of this product malfunctioning.

- Be sure to use the AC adapter supplied with this product. Using an AC adapter other than the one supplied may cause this product to malfunction.
- When disconnecting the external power source, turn off the power to this product beforehand. Disconnecting the external power source while the power is on may cause this product to malfunction.

IMPORTANT

- If the internal battery is charged in a high-temperature environment, the battery will become very hot. If the internal battery temperature rises to a certain temperature, charging may be interrupted to prevent an accident or a malfunction from occurring. To fully charge the internal battery, recharge the battery once the temperature of the surroundings and the sample are within 5 °C to 40 °C.
- Connect this product to an external power source as soon as possible upon the internal battery power level display changing to .
- Connect this product to an external power source immediately upon the internal battery power level display changing to . If the capacity of the internal battery is left at 0%, test results and other stored data may be lost.
- Inserting or removing the USB 2.0 cable while charging is in progress may cause charging to be interrupted before the battery is fully charged.

Charge the internal battery by following the procedure below.

- 1** Check that the power has been turned off (nothing is being displayed on the display unit).

- 2** Check that the internal battery switch has been turned on. If the switch is in the off position, turn it on.

IMPORTANT

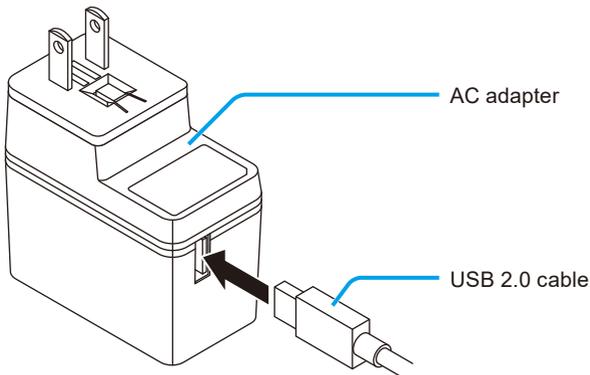
- Charging cannot be performed if the internal battery switch is turned off. Before charging, be sure to turn on the internal battery switch by following the procedure described in  "2.3.1 Turning the Internal Battery Switch On/Off" on page 51.
- If this product is connected to an external power source while the internal battery switch is turned off, a charging-error icon is displayed. Remove the USB 2.0 cable, turn on the internal battery switch, and then reconnect the USB 2.0 cable.



Connect this product to the power source by following the procedure in Step **3** or Step **4** below.

- 3** When using an AC adapter to charge the battery, connect the AC adapter by following the procedure below.

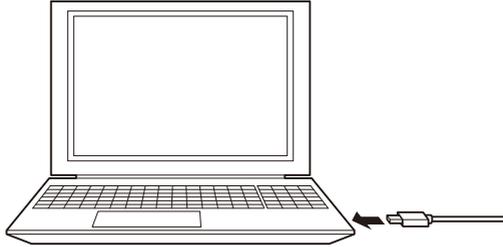
- 1** Connect the supplied USB 2.0 cable to the AC adapter.



- 2** Insert the plug of the AC adapter into the power outlet.

For details about replacing the AC pins, see  "2.3.2 Preparing the AC Adapter (Replacing the AC Pins)" on page 53.

- 4 When charging the battery from a power source device such as a PC via USB, turn on the power to the power source device and then connect the USB 2.0 cable.



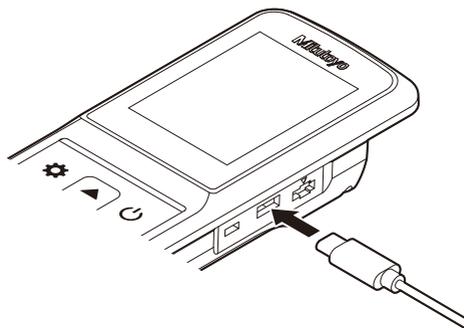
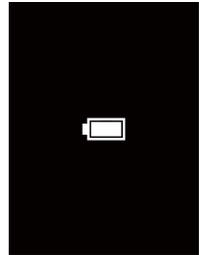
- 5 Connect the USB 2.0 cable to the USB connector of the display unit.

IMPORTANT

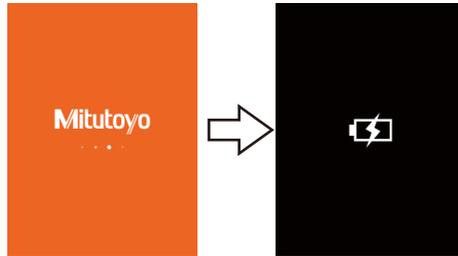
Due to the product being unable to recognize USB signals, charging may not start if the USB 2.0 cable is connected to the display unit again immediately after removing the cable from the display unit. When reconnecting the USB 2.0 cable, wait for approximately 10 seconds after removing the cable before connecting it again.

Tips

When the internal battery power is at full capacity or close to full capacity, the internal battery cannot be charged any further even if this product is connected to an external power source. Immediately after the external power source is connected, the icon indicating a full charge will be displayed for approximately 30 seconds. Subsequently, the screen returns to its power-off state (a state where nothing is being displayed).



- » The display unit will start automatically. After the startup process, the charging icon will be displayed.



- » Approximately 30 seconds after charging is completed, the charging-state display screen will change from the [Charging] screen to the [Fully charged] screen. A short time after that, the power will turn off.

Tips

If the USB 2.0 cable is connected to the display unit with no detector connected, [E003: No Connect] is displayed. Charging is performed, but the indication will not change even when charging completes.

Turning off the power clears [E003: No Connect] and stops charging.

- 6 Remove the USB 2.0 cable from the display unit upon completion of charging (once the battery is fully charged).**

2.3.4 Running the Product by Means of an External Power Source

NOTICE

There is a risk of this product malfunctioning.

Be sure to use the AC adapter supplied with this product.

Using an AC adapter other than the one supplied may cause this product to malfunction.

IMPORTANT

When running this product by means of an AC adapter, do not use a power source connected to a power line that generates a large amount of electromagnetic noise.

Sufficient countermeasures against contamination by electromagnetic noise originating from the power source have been taken for this product. However if a power source connected to a power line that generates a large amount of electromagnetic noise is used, testing may not be performed correctly due to the influence of the noise.

Connect this product to the external power source by following the procedure below.

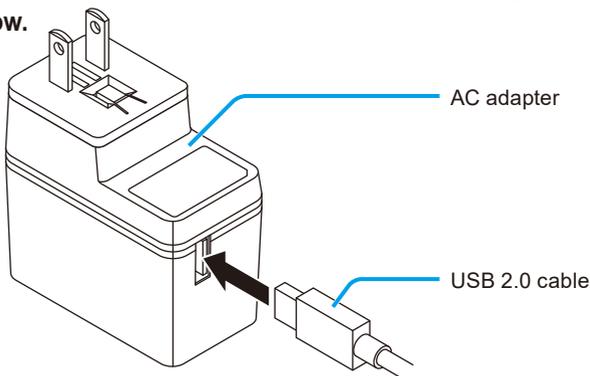
- 1 Check that the power has been turned off (nothing is being displayed on the display unit).
- 2 Turn on the internal battery switch.

For details about turning the internal battery switch on and off, see  "2.3.1 Turning the Internal Battery Switch On/Off" on page 51.

Connect this product to the power source by following the procedure in Step 3 or Step 4 below.

- 3 When using an AC adapter to run this product, connect the AC adapter by following the procedure below.

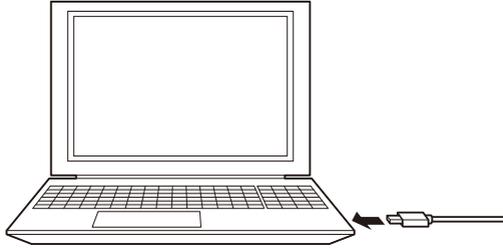
- 1 Connect the supplied USB 2.0 cable to the AC adapter.



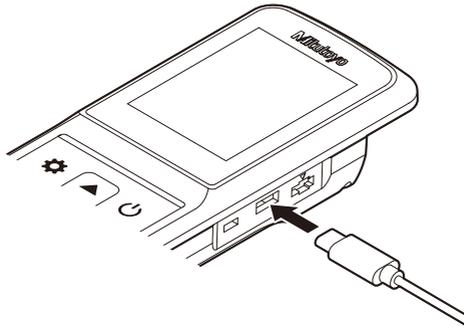
- 2 Insert the plug of the AC adapter into the power outlet.

For details about replacing the AC pins, see  "2.3.2 Preparing the AC Adapter (Replacing the AC Pins)" on page 53.

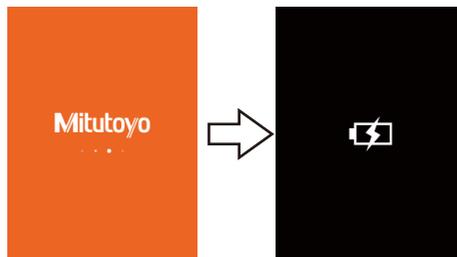
- 4 When running this product via connection to the USB port of a PC or other device, turn on power to the device and then connect the USB 2.0 cable.



- 5 Connect the USB 2.0 cable to the USB connector of the display unit.



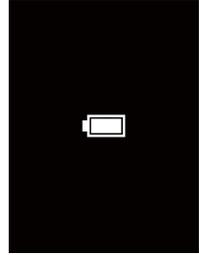
- » The display unit will start automatically. After the startup process, the charging icon will be displayed.



Tips

When the internal battery power is at full capacity or close to full capacity, the internal battery cannot be charged any further even if this product is connected to an external power source.

Immediately after the external power source is connected, the icon indicating a full charge will be displayed for approximately 30 seconds. Subsequently, the screen returns to its power-off state (a state where nothing is being displayed).

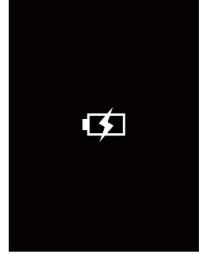


2.3.5 Turning the Power On/Off

■ Turning on the power

Tips

Even when the power is off, the [Charging] screen will be displayed as long as the internal battery is being charged.



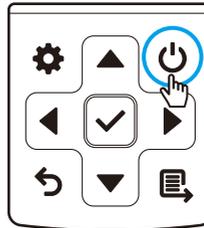
2

Basic Operations

Turn on the power by following the procedure below.

● When this product is connected to an external power source

- 1 Press and hold the [ON/OFF] key.



- » The home screen will be displayed (when the internal battery is being charged).

2024/08/01 12:34		E	
001	HLD		
↑		0.0	
29	GO	783.0	
28	GO	782.0	
27	-NG	611.0	
26	-NG	613.0	
25	-NG	613.0	
24	-NG	612.0	

2 Basic Operations

- » After the startup process, the home screen will be displayed (when the internal battery power is at full capacity or close to full capacity).

The image shows a smartphone home screen. At the top, it displays the date and time '2024/08/01 12:34' and a battery icon. Below this, there are two tabs labeled '001' and 'HLD'. A large '0.0' is displayed in the center, with an upward arrow above it. At the bottom, there is a table with data rows.

	001	HLD
		↑
	0.0	
29	GO	783.0
28	GO	782.0
27	-NG	611.0
26	-NG	613.0
25	-NG	613.0
24	-NG	612.0

- When this product is not connected to an external power source

- 1 Press and hold the [ON/OFF] key.



- » After the startup process, the home screen will be displayed.

The image shows a smartphone home screen. At the top, it displays the date and time '2024/08/01 12:34' and a battery icon. Below this, there are two tabs labeled '001' and 'HLD'. A large '0.0' is displayed in the center, with an upward arrow above it. At the bottom, there is a table with data rows.

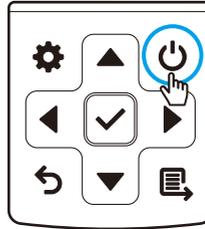
	001	HLD
		↑
	0.0	
29	GO	783.0
28	GO	782.0
27	-NG	611.0
26	-NG	613.0
25	-NG	613.0
24	-NG	612.0

■ Turning off the power

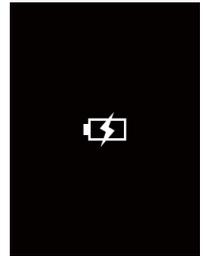
Turn off the power by following the procedure below.

● When this product is connected to an external power source

- 1 Press and hold the [ON/OFF] key.



- » The [Charging] screen will be displayed (when the internal battery is being charged).
The power will turn off automatically once the battery is fully charged.

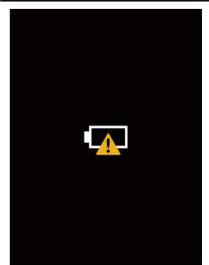


Tips

To discontinue charging and turn off the power, remove the USB 2.0 cable from the display unit.

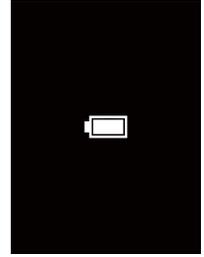
A charging-error icon will be displayed after the USB 2.0 cable is removed. Press and hold the [ON/OFF] key to turn off the power.

If you do not press the [ON/OFF] key, the power will turn off automatically after approximately 30 seconds.



2 Basic Operations

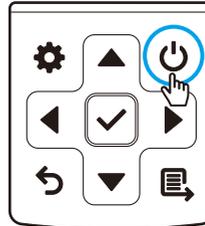
- » The screen returns to its power-off state (a state where nothing is being displayed) approximately 30 seconds after the icon indicating a full charge is displayed (when the internal battery power is at full capacity or close to full capacity).



- When this product is not connected to an external power source

1 Press and hold the [ON/OFF] key.

- » The power will turn off.



IMPORTANT

When the power is turned off and then immediately turned on, be sure to perform power on after an interval of at least 5 seconds.

2.4 Performing a Hardness Test

2.4.1 Selecting the Material Table

Select the material table to be used based on the material of the sample and the type of detector.

For details, see  "3.2 Setting the Material Table" on page 80.

Tips

The testable sample materials differ depending on the type of detector.

For details, see  "■ Hardness conversion range for the detector" on page 68.

■ Material table

Screen display	Sample material
A-1	Irons and steels
A-2	Alloyed tool-steel
A-3	Gray iron
A-4	Spherical graphite cast iron
A-5	Stainless steel
A-6	Tool steels for cold-work
B-1	Brass
B-2	Casting copper-based alloys
B-3	Casting aluminum-based alloys
B-4	Copper–tin-based alloys

Tips

If the applicable metal material is not in the material tables, select the material table with the broadest conversion range (for hard items, [A-1]; for flexible items, [B-1]).

■ **Hardness conversion range for the detector**

The testable sample materials and test scales differ depending on the type of detector.

The following table shows the hardness conversion range for each detector.

Tests cannot be performed under the conditions corresponding to the shaded cells, so no test scales will be displayed. Additionally, if the converted value falls outside the conversion range, [---] will be displayed. Take note.

● **D-type detector (standard accessory), DC-type detector (optional accessory)**

Test scale Sample material	HV (Vickers hardness)	HB (Brinell hardness)	HRC (Rockwell C-scale hardness)	HRB (Rockwell B-scale hardness)	HS (ASTM) (Shore hardness)	VHS (JIS) (Shore hardness)	MPa (Tensile strength)
A-1 (irons and steels)	80 to 940	80 to 647	20.0 to 68.0	38.4 to 99.5	30.1 to 99.5	13.2 to 98.0	390 to 1999
A-2 (alloyed tool-steel)	80 to 898		20.4 to 67.1				
A-3 (gray iron)		93 to 334					
A-4 (spherical graphite cast iron)		131 to 387					
A-5 (stainless steel)	85 to 802	85 to 655	19.6 to 62.4	46.5 to 101.7			
B-1 (brass)	43 to 196	40 to 173		13.5 to 95.3			499 to 701
B-2 (casting copper-based alloys)		45 to 315					
B-3 (casting aluminum-based alloys)		20 to 159					
B-4 (copper-tin-based alloys)		60 to 290					

● **D+15-type detector (optional accessory)**

Test scale Sample material	HV (Vickers hardness)	HB (Brinell hardness)	HRC (Rockwell C-scale hardness)	HRB (Rockwell B-scale hardness)	HS (ASTM) (Shore hardness)	VHS (JIS) (Shore hardness)	MPa (Tensile strength)
A-1 (irons and steels)	80 to 937	80 to 638	19.3 to 67.9		33.3 to 99.3	35.3 to 97.8	394 to 1991
A-6 (tool steels for cold-work)	80 to 935		19.8 to 68.2				

● **DL-type detector (optional accessory)**

Test scale Sample material	HV (Vickers hardness)	HB (Brinell hardness)	HRC (Rockwell C-scale hardness)	HRB (Rockwell B-scale hardness)	HS (ASTM) (Shore hardness)	VHS (JIS) (Shore hardness)	MPa (Tensile strength)
A-1 (irons and steels)	80 to 950	81 to 638	20.6 to 68.2	37.0 to 99.9	30.6 to 96.8	32.3 to 98.6	390 to 1976

2.4.2 Performing a Test

The test method differs depending on the type of detector.

● Precautions when testing

- Ensure that the contact surface of both the sample and the rigid base (surface plate, etc.) is flat and smooth.
- Perform the test in a location where there is minimal vibration.
It is recommended that tests be performed in a location where the acceleration level is 2 Gal or less (at a frequency of 200 Hz or above). For example, if no visible waves are produced on the surface of the water contained in a cup that has been placed in the test area, it can be said that the environment will not influence testing.
- Ensure that the detector is set perpendicularly to the surface of the sample.
- When the surface of the sample is flat, hold the detector so that the support ring is in full contact with the surface.
- Keep the detector stable during testing. Instability of the detector during testing may lead to variance in the hardness numbers.
- Perform the test at three to five different points, and use the average value as the effective hardness number.
- Test points must be approximately 5 mm or more inwards from the edge of the sample.
- Test points must be 3 mm or more apart from each other. Testing the same point repeatedly will produce higher hardness numbers.
- Testing must be performed at an interval of at least 10 seconds.

Tips

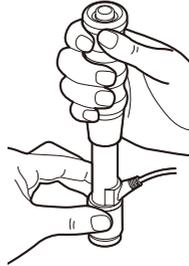
When "Auto Save" is set to "ON", the test results will automatically be stored in the internal memory (up to 1,800 values). If the capacity of 1,800 values is exceeded, [E007 : FULL] will be displayed. In such cases, the test results will not be displayed, and further tests cannot be performed.

If [E007 : FULL] has been displayed, delete the internal memory data.

For details about deleting test results, see  "3.8 Batch Deletion of Test Data" on page 106.

- D-type detector (standard accessory), D+15-type detector (optional accessory), DL-type detector (optional accessory)

1 Hold the detector coil holder with one hand and the grip with the other hand.



2 Slide the grip towards the coil holder until you hear a click.

- » This indicates that impact hammer inside the coil holder has been set.
- » The grip returns to its original position and the impact hammer is ready for testing.



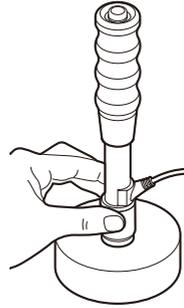
NOTICE

Indicates that there is a risk of incurring property damage.

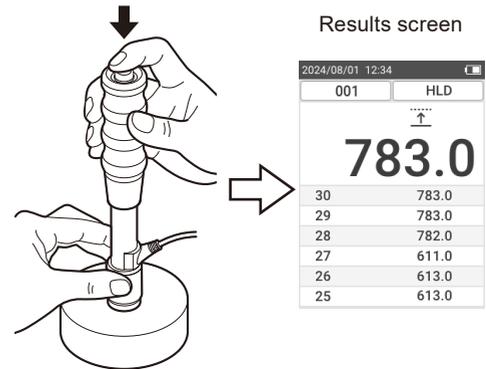
Do not set the impact hammer while the tip of the detector is in contact with an object.

2 Basic Operations

- 3 Place the detector on the sample and firmly steady the coil holder with your hand.



- 4 Press the push button.



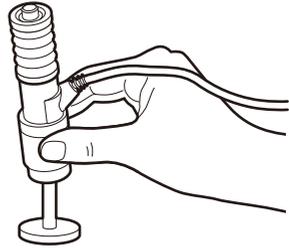
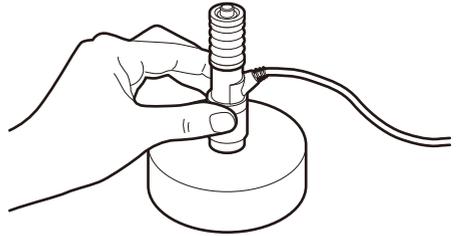
- » After the impact hammer is released and an impact sound is heard, the hardness number will be displayed on the display unit. (A small impact mark will be left on the sample.)

- 5 To perform tests in succession, repeat Step 1 to 4.

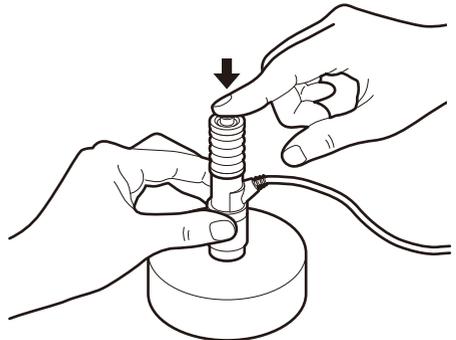
- » Testing is complete.

■ DC-type detector (optional accessory)**1** Insert the detector into the hammer chuck.

- » The impact hammer will be set and ready for testing.

**2** Remove the detector from the hammer chuck.**3** Place the detector on the sample and firmly steady the coil holder with your hand.**4** Press the push button.

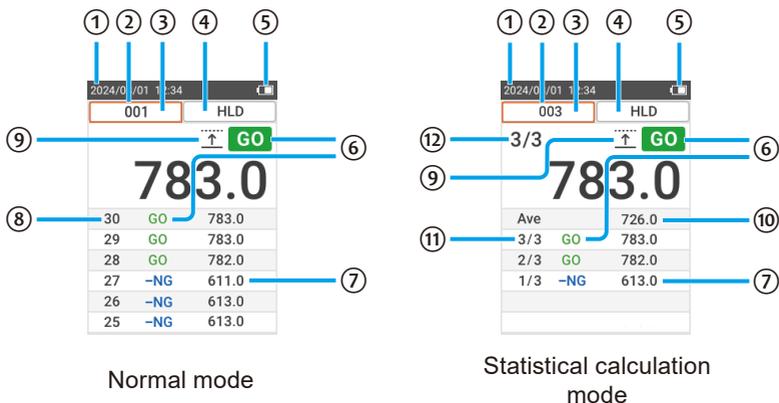
- » After the impact hammer is released and an impact sound is heard, the hardness number will be displayed on the display unit.

**5** To perform tests in succession, repeat Step **1** to **4**.

- » Testing is complete.

2.4.3 Confirming the Test Results

The test results are displayed according to the test scale that has been set.



2
Basic Operations

No.	Description
①	Date
②	Cursor
③	Sample No. Displays the sample number that is currently selected. [---] will be displayed when no sample is selected.
④	Test scale Displays the test scale that is currently selected. For details, see [] "2.4.4 Changing the Test Scale" on page 76.
⑤	Internal battery power level
⑥	Acceptance judgment "GO" or "NG" will be displayed on the test results screen when the test was performed with acceptance judgment function set to "ON". For details, see [] "3.3 Setting/Performing Acceptance Judgments" on page 83.
⑦	Test result
⑧	Test number
⑨	Offset The offset icon will be displayed on the test results screen when the offset function is set to "ON". For details, see [] "3.4 Setting the Offset Value" on page 88.
⑩	Average value Displays the average of all the stored test results.

No.	Description
⑪	Displays which one of the set number of tests is currently in progress.
⑫	Displays how many of the set number of tests have been completed.

When in normal mode, the display items can be toggled by pressing the [◀▶] keys.

001	HLD
↑	
783.0	
30	783.0
29	783.0
28	782.0
27	611.0
26	613.0
25	613.0

Acceptance judgment results and test numbers

001	HLD
↑	
783.0	
08/01 12:34	783.0
08/01 11:20	783.0
08/01 10:22	782.0
08/01 10:11	611.0
08/01 09:22	613.0
08/01 08:20	613.0

Dates and times at which tests were performed

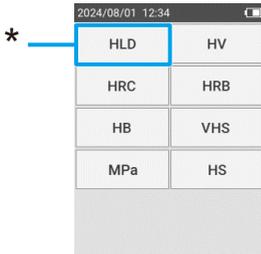
001	HLD
↑	
783.0	
MITU0011	783.0
MITU0011	783.0
MITU0011	782.0
MITU0011	611.0
MITU0011	613.0
MITU0011	613.0

Sample names

For toggling the display items on the statistical calculation results screen, see "3.5.2 Performing Statistical Calculations" on page 94.

2.4.4 Changing the Test Scale

This product supports eight different test scales.



* The readable values differ depending on the detector currently in use.

- D-type detector and DC-type detector: HLD
- D+15-type detector: HLD+15
- DL-type detector: HLDL

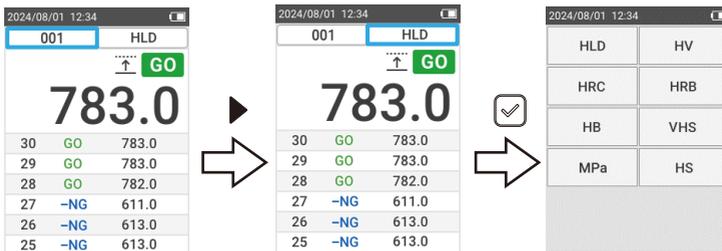
- HLD scale (Leeb hardness)
- HV scale (Vickers hardness)
- HB scale (Brinell hardness)
- HRC scale (Rockwell C-scale hardness)
- HRB scale (Rockwell B-scale hardness)
- HS scale (ASTM, Shore hardness)
- VHS scale (JIS, Shore hardness)
- Tensile strength (MPa)

Change the test scale on the test results screen according to your testing objectives. Display the test scale selection screen by following the procedure below.

1 Press the [◀▶] keys.

» The test scale displayed in the upper right of the screen will be enclosed by a frame.

2 Press the [CHECK] key.



Example: For conversion of HV scale test results to HLD scale values; all the hardness numbers in the test results list will be converted to HLD scale hardness numbers.

2024/08/01 12:34	
001	HV
628.0	
10	628.0
9	659.0
8	448.0
7	404.0
6	269.0
5	297.0

2024/08/01 12:34	
001	HLD
778.0	
10	778.0
9	792.0
8	680.0
7	650.0
6	538.0
5	564.0

Tips

- This product converts the test result obtained through the Leeb hardness testing method into a value expressed in another test scale and then displays the converted value as the test result.
However, the converted value is for reference only. For details, see [icon] "1.1 Features of the HH-V400" on page 31.
- The test scales can be changed either before or after testing.
Before testing: On the test scale selection screen, specify the test scale to which the values are to be converted before performing testing.
After testing: On the test scale selection screen, change the test scale to the one to which the values are to be converted after performing testing with a given test scale.
- If you change the test scale before the number of tests set in statistical calculation mode have been completed, testing will recommence from the first test.

If the converted value falls outside the conversion range, [---] will be displayed instead of a hardness number.

For details, see [icon] "5.1 Error Display List" on page 184.

2024/08/01 12:34	
001	HLD
898.0	
10	898.0
9	870.0
8	880.0
7	895.0
6	888.0
5	876.0

2024/08/01 12:34	
001	HV

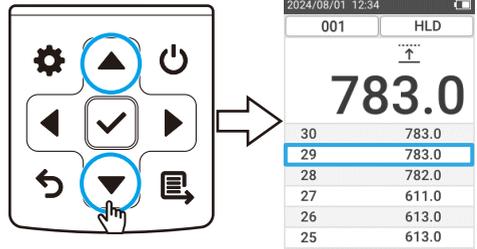
10	---
9	870.0
8	880.0
7	---
6	888.0
5	876.0

2.4.5 Deleting the Test Results

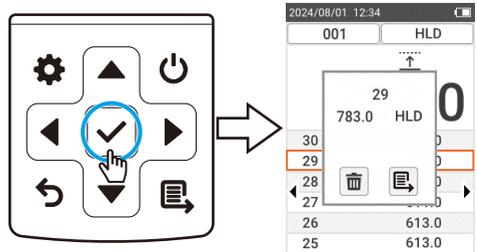
You can delete the test results individually by following the procedure below.

For batch deletion of test results, see "3.8 Batch Deletion of Test Data" on page 106.

- 1 On the test results screen, press the [**▲▼**] keys to place the cursor over the test result to be deleted.



- 2 Press the [**CHECK**] key.

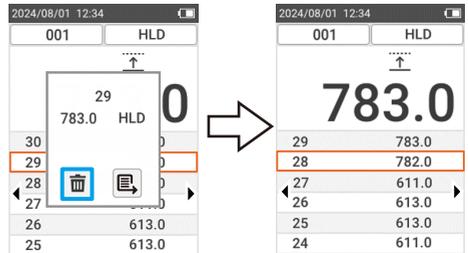


- 3 Select .

» The test result will be deleted.

Tips

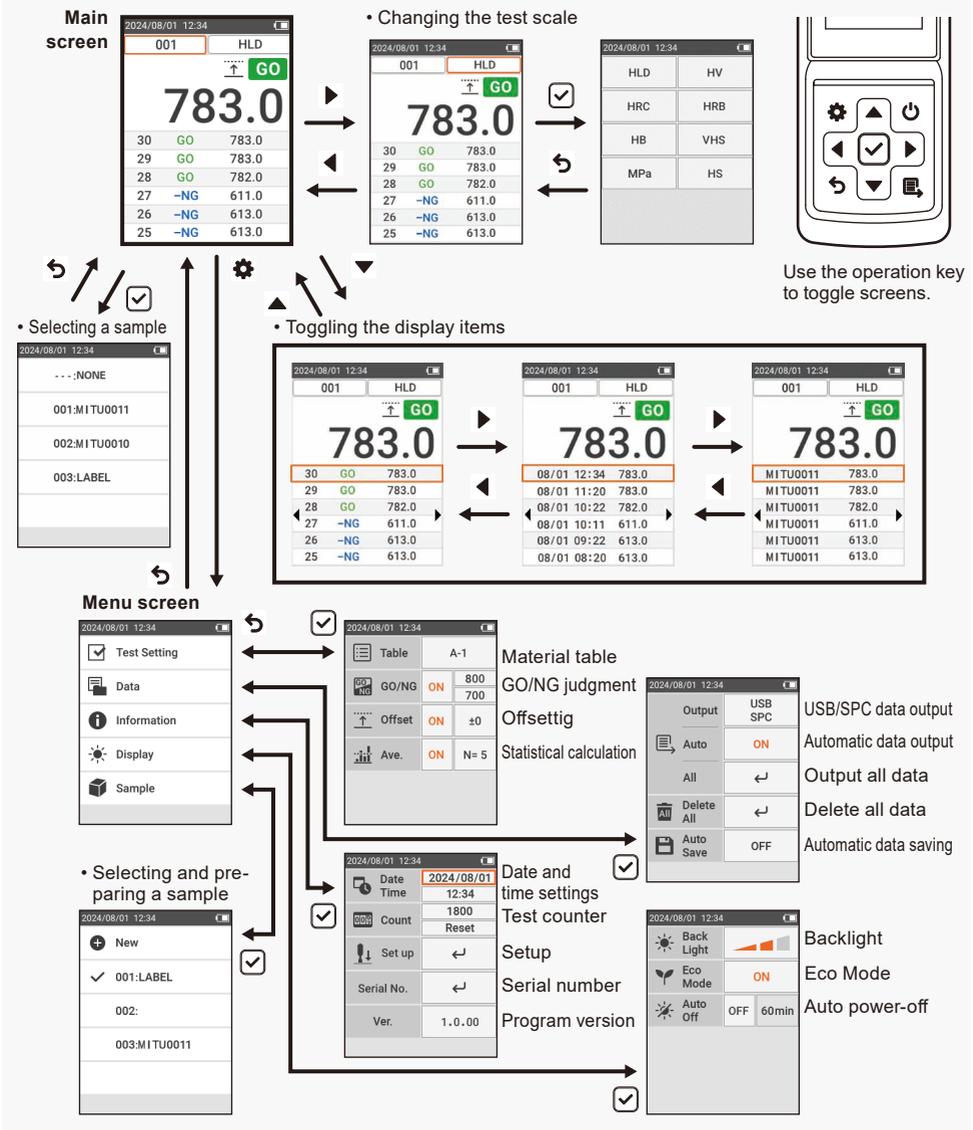
To cancel the deletion of the test result, press the [**BACK**] key.



3 Features

This chapter explains the features of this product.

3.1 Display Hierarchy Diagram



Tips

[Set up] is used for maintenance purposes.

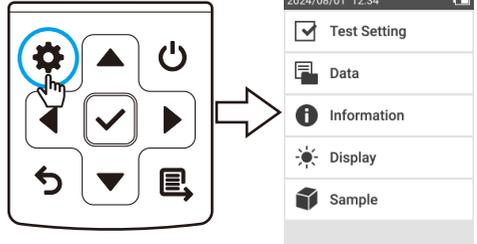
If this window has been displayed by accident, press the [BACK] key to return to the previous screen.

3.2 Setting the Material Table

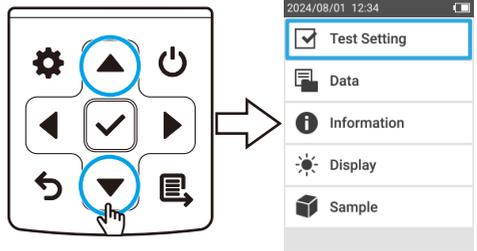
The following is an explanation of the procedure for setting the material table.

1 Display the Test Setting screen.

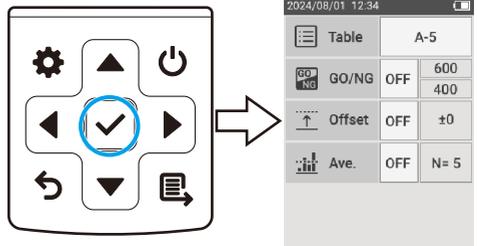
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Test Setting].

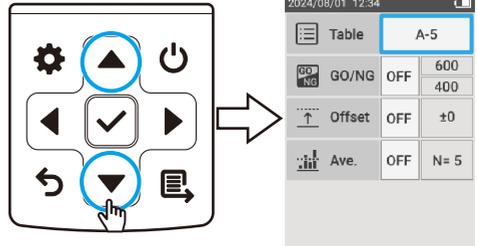


- 3 Press the [CHECK] key.
 - » The Test Setting screen will be displayed.

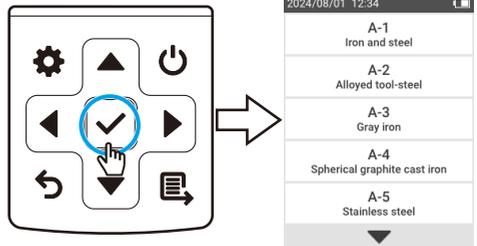


2 Set the value for [Table].

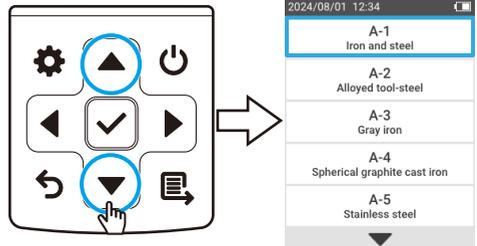
- 1 Press the [▲▼] keys to select the field containing the value for [Table].



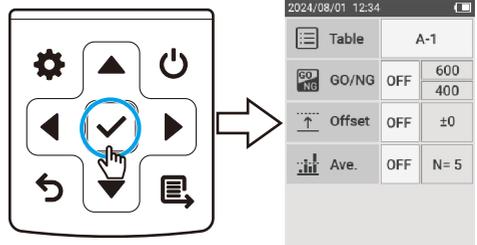
- 2 Press the [CHECK] key.
 - » The table selection screen will be displayed.



- 3 Press the [▲▼] keys to select the sample material to be tested.



- 4 Press the [CHECK] key.
 - » The set material table will be displayed.



Screen display	Sample material
A-1	Irons and steels
A-2	Alloyed tool-steel
A-3	Gray iron
A-4	Spherical graphite cast iron
A-5	Stainless steel
A-6	Tool steels for cold-work
B-1	Brass
B-2	Casting copper-based alloys
B-3	Casting aluminum-based alloys
B-4	Copper–tin-based alloys

Tips

- If the applicable metal material is not in the material tables, select the material table with the broadest conversion range (for hard items, [A-1]; for flexible items, [B-1]).
- The material table differs depending on the type of detector.
For details, see  "2.4.1 Selecting the Material Table" on page 67.

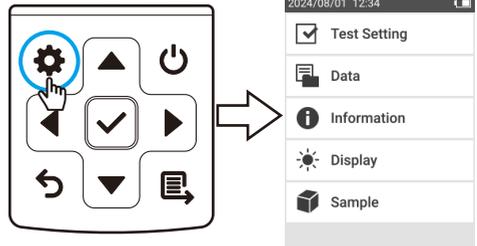
3.3 Setting/Performing Acceptance Judgments

The following is an explanation of the procedure for setting and performing acceptance judgments.

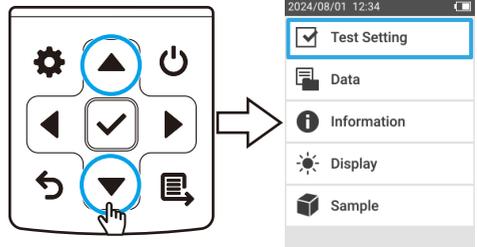
Setting an upper specification limit and lower specification limit (an allowable range) for the test results allows this product to determine (make acceptance judgments as to) whether the test results fall within the allowable range specified in the design drawing.

1 Display the Test Setting screen.

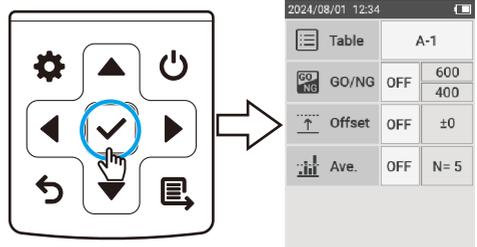
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Test Setting].

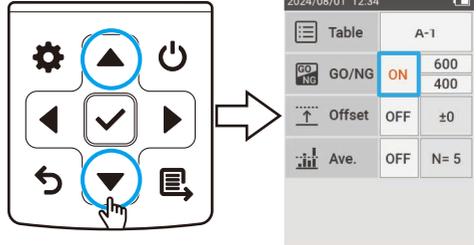


- 3 Press the [CHECK] key.
 - » The Test Setting screen will be displayed.



2 Set [GO/NG] to either [ON] or [OFF].

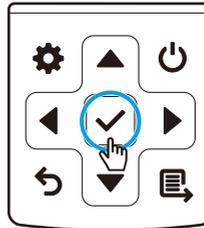
- 1 Press the [▲▼] keys to select the field next to [GO/NG] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

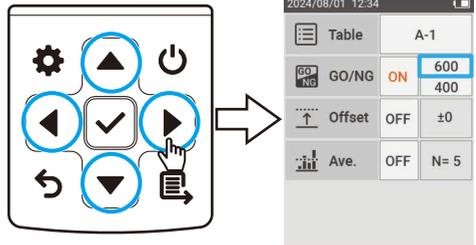
Tips

You can only proceed to the following setting procedure when [ON] has been set.

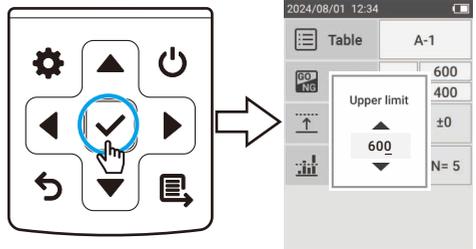


3 Set the upper specification limit.

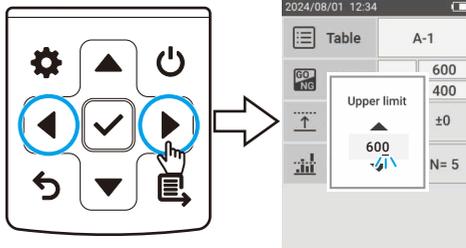
- 1 Press the [▶] key to select the upper specification limit.



- 2 Press the [CHECK] key.
 - » The Upper Limit setting screen will be displayed.



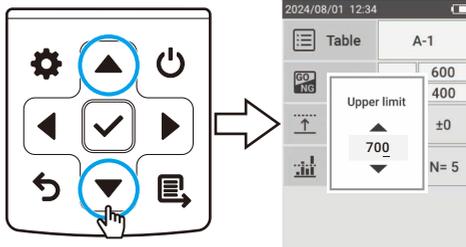
- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



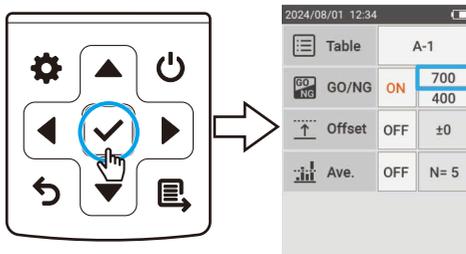
- 4 Press the [▲▼] keys to set the upper specification limit.

Tips

- The setting range differs depending on the test scale. For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The upper specification limit can only be set to a value that is larger than the one for the lower specification limit.

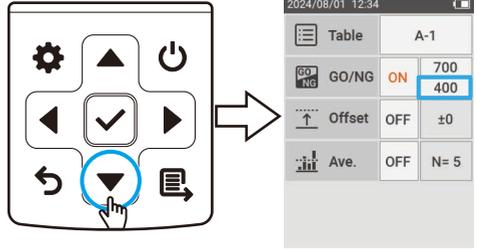


- 5 Press the [CHECK] key.
- » The set upper specification limit will be displayed.

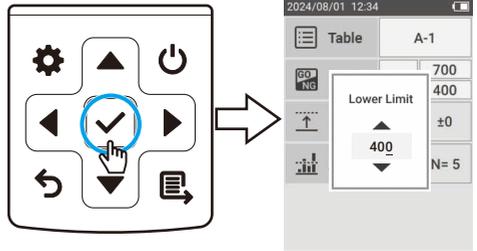


4 Set the lower specification limit.

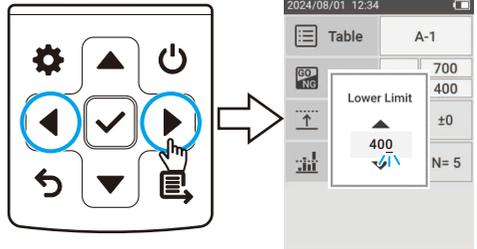
1 Press the [▼] key to select the lower specification limit.



2 Press the [CHECK] key.
 » The Lower Limit setting screen will be displayed.



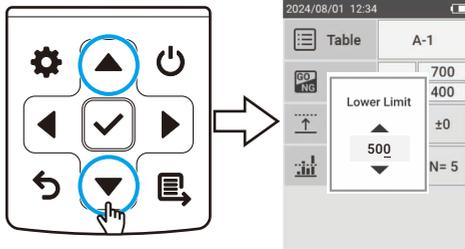
3 Press the [◀▶] keys to move the cursor to the digit to be changed.



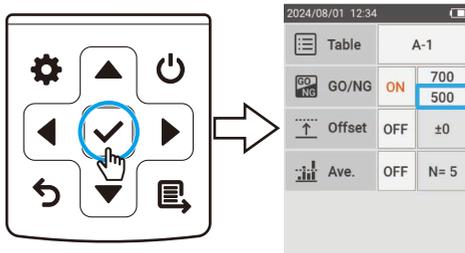
- 4 Press the [▲▼] keys to set the lower specification limit.

Tips

- The setting range differs depending on the test scale.
For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The lower specification limit can only be set to a value that is smaller than the one for the upper specification limit.



- 5 Press the [CHECK] key.
- » The set lower specification limit will be displayed.



3.4 Setting the Offset Value

The following is an explanation of the procedure for setting the offset value.

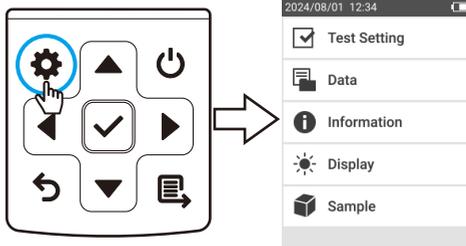
This product adds the offset value to or subtracts the offset value from the test result to produce a display value (test result + offset value = display value).

Tips

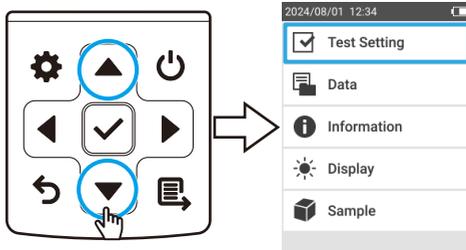
The set offset value will be applied starting from the next test to be performed.

1 Display the Test Setting screen.

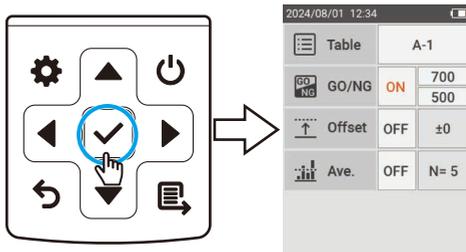
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Test Setting].

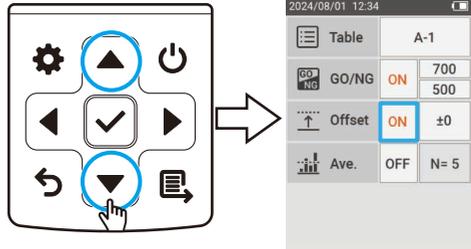


- 3 Press the [CHECK] key.
 - » The Test Setting screen will be displayed.



2 Set [Offset] to either [ON] or [OFF].

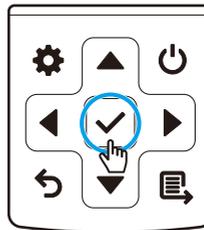
- 1 Press the [▲▼] keys to select the field next to [Offset] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

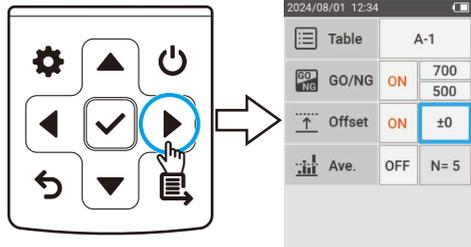
Tips

You can only proceed to the following setting procedure when [ON] has been set.

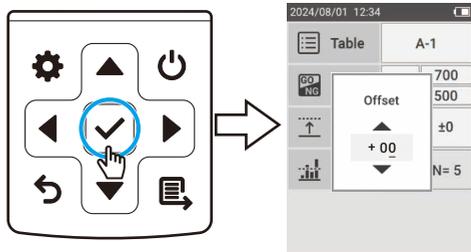


3 Set the offset value.

- 1 Press the [▶] key to select the offset value.

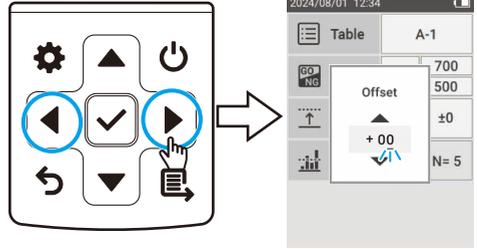


- 2 Press the [CHECK] key.
 - » The Offset setting screen will be displayed.



3 Features

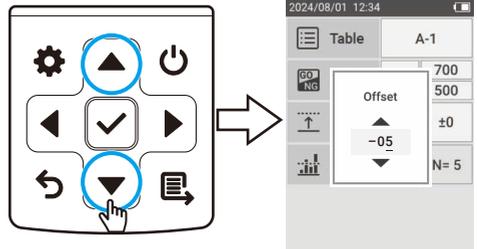
- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



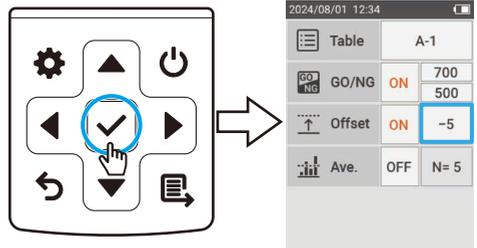
- 4 Press the [▲▼] keys to set the offset value.

Tips

- The setting range differs depending on the test scale. For details, see "3.16.1 Sample Registration" on page 127.
- Pressing the [▲▼] keys changes the sign (+ / -) or value.
- Holding down the [▲▼] keys accelerates the pace at which values change.



- 5 Press the [CHECK] key.
- » The set offset value will be displayed.



3.5 Statistics Function

Use the statistics function to calculate the Ave (average), Max (maximum value), Min (minimum value), Rng (variance), or SD (standard deviation (n-1)) of the test data.

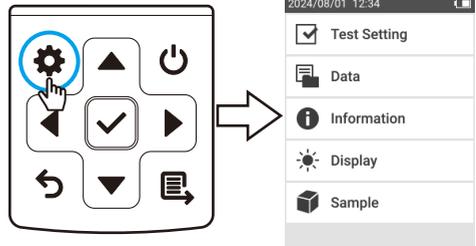
This section explains the procedure for setting the number of test repetitions to ten and then calculating the results.

3.5.1 Statistics Function Settings

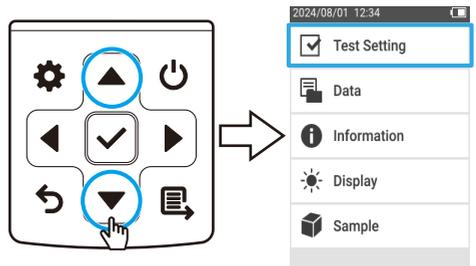
This section explains the procedures for setting the number of test repetitions and the data output method for statistical calculations.

1 Display the Test Setting screen.

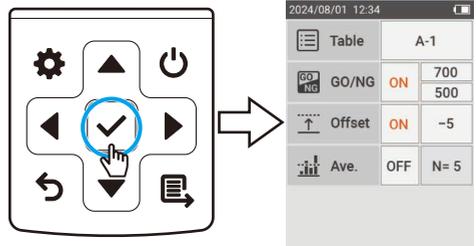
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Test Setting].

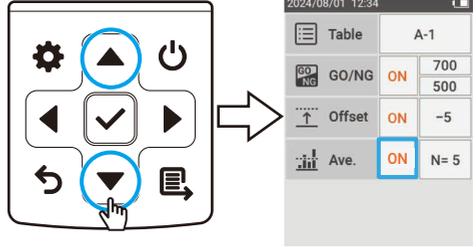


- 3 Press the [CHECK] key.
- » The Test Setting screen will be displayed.



2 Set [Ave.] to either [ON] or [OFF].

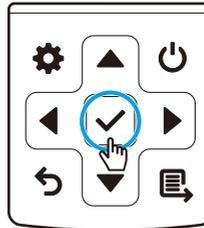
- 1 Press the [▲▼] keys to select the field next to [Ave.] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

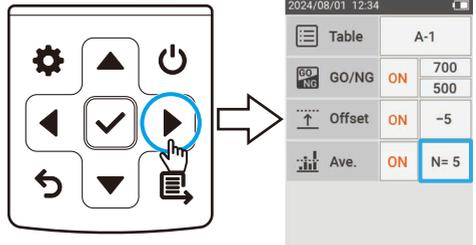
Tips

You can only proceed to the following setting procedure when [ON] has been set.

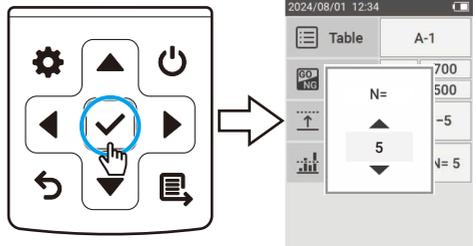


3 Set the number of test repetitions.

- 1 Press the [▶] key to select the N-value.



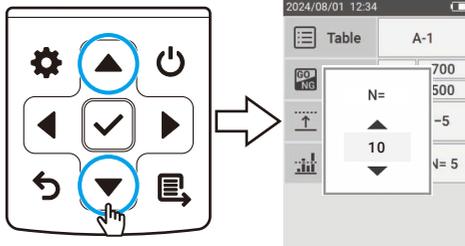
- 2 Press the [CHECK] key.
 - » The screen for setting the N-value of test repetitions will be displayed.



- 3 Press the [▲▼] keys to set the number of test repetitions.

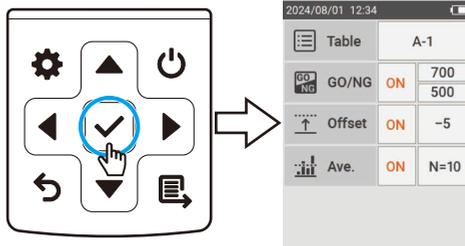
Tips

The number of test repetitions can be set within the range from 3 to 10.



2024/08/01 12:34	
Table	A-1
GO/NG	700
N=	500
	-5
	10
	N= 5

- 4 Press the [CHECK] key.
- » The set number of test repetitions will be displayed.



2024/08/01 12:34	
Table	A-1
GO/NG	ON 700
	500
Offset	ON -5
Ave.	ON N=10

4 Set the data output method.

Tips

Use the Data screen to set the data output method.

For details, see ["3.6 Data Output Destination Settings"](#) on page 102 and ["3.7 Automatic Output Settings"](#) on page 104.

3.5.2 Performing Statistical Calculations

This section explains the procedure for performing statistical calculations in which N is set to 3.

For details about each setting procedure, see  "3.5.1 Statistics Function Settings" on page 91.

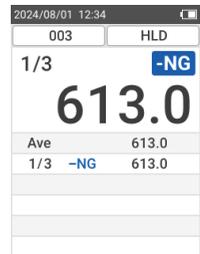
1 Enable the statistics function.



Table	A-1	
GO/NG	ON	800 700
Offset	OFF	±0
Ave.	ON	N=3

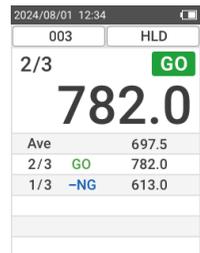
2 Repeat testing three times.

- 1 Perform the first test.
 - » When testing is finished, "1/3" will be displayed in the upper left, and the test result will appear in the test results list.



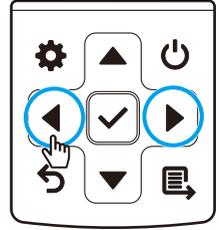
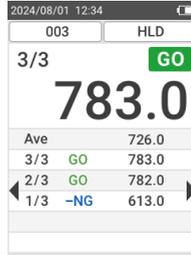
003	HLD
1/3	-NG
613.0	
Ave	613.0
1/3	-NG 613.0

- 2 Perform the second test.
 - » When testing is finished, "2/3" will be displayed in the upper left, and the test result will appear in the test results list.



003	HLD
2/3	GO
782.0	
Ave	697.5
2/3	GO 782.0
1/3	-NG 613.0

- 3 Perform the third test.
 - » When testing is finished, "3/3" will be displayed in the upper left, and the test result will appear in the test results list.
 - » Once ◀▶ appear on the screen, you can change the test results display with the [◀▶] keys.

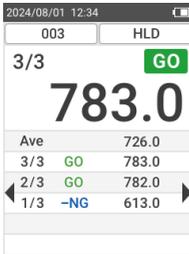


IMPORTANT

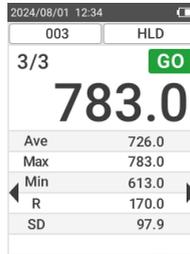
By performing a new round of testing after the set number of test repetitions has been completed, the test results will be confirmed and retesting will become impossible. Perform retesting either while statistical testing is being performed or prior a new round of testing being initiated. For details, see "3.5.3 Retesting" on page 96.

3 Toggle the test results display.

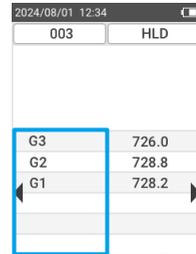
Lists of test results, statistical calculation results, and lists of past statistical calculation results (displayed by group number, date and time at which testing was performed, sample name, or test scale) can be displayed by pressing the [◀▶] keys.



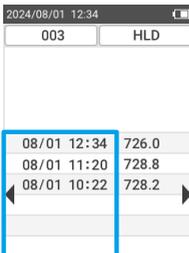
List of test results



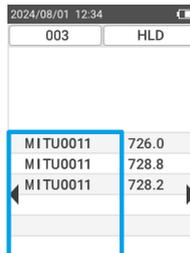
Statistical calculation results



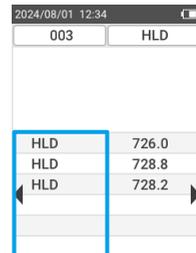
List of past statistical calculation results (displayed by group number)



List of past statistical calculation results (displayed by date and time at which testing was performed)



List of past statistical calculation results (displayed by sample name)



List of past statistical calculation results (displayed by test scale)

For how to confirm past statistical calculation results, see  "3.5.4 Confirming, Outputting, or Deleting Past Statistical Calculation Results" on page 98.

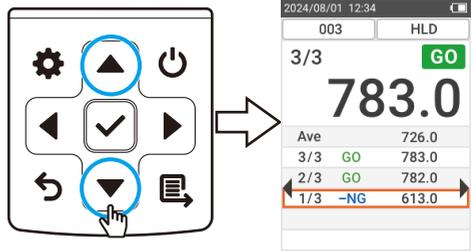
3.5.3 Retesting

This section introduces an example of retesting the first of the three tests in total that have been performed.

3

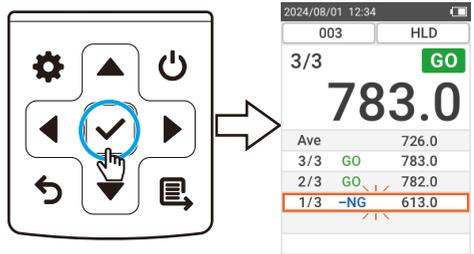
Features

1 Press the [**▲▼**] keys to select the test result to be retested.



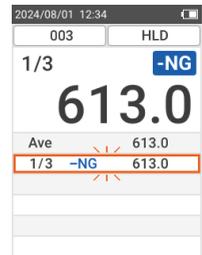
2 Press the [**CHECK**] key.

» The cursor starting to blink indicates that retesting is ready to be started.



Tips

Retesting can be performed even while statistical calculation tests are in progress (example: After the first test).



3 Perform retesting while the cursor is blinking.

- » The test result will be updated and the cursor will stop blinking.

2024/08/01 12:34	
003	HLD
3/3	GO
783.0	
Ave	782.1
3/3	GO 783.0
2/3	GO 782.0
1/3	GO 780.0

3.5.4 Confirming, Outputting, or Deleting Past Statistical Calculation Results

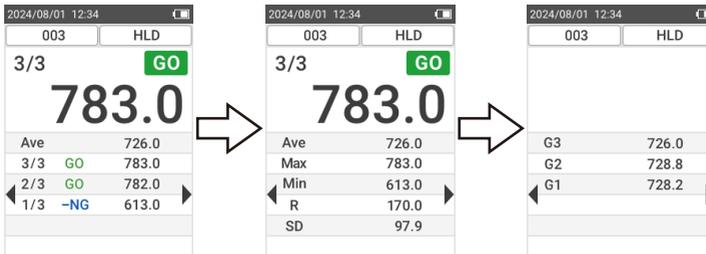
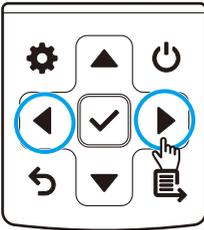
While ◀▶ are displayed on the screen (upon completion of the set number of test repetitions), press the [◀▶] keys to display the list of past statistical calculation results (displayed by group number, sample name, date and time at which testing was performed, or test scale).

IMPORTANT

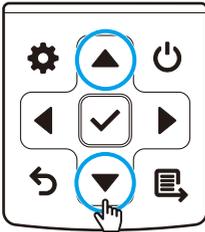
Past statistical calculation results can only be displayed.

Statistical calculation results are unchangeable once confirmed. Consequently, retesting is not possible.

- 1 Press the [◀▶] keys to move to the list of past statistical calculation results.
(Example: Displayed by group number)



- 2** Press the [▲▼] keys to select the statistical calculation results to be confirmed or deleted.



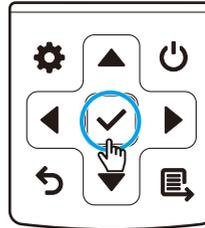
2024/08/01 12:34	
003	HLD
G3	726.0
G2	728.8
G1	728.2

→

2024/08/01 12:34	
003	HLD
G3	726.0
G2	728.8
G1	728.2

- 3** Press the [CHECK] key.

- »  (Deletion), , and  (Statistical calculation results) icons will be displayed.



2024/08/01 12:34	
003	HLD
G2 728.8 HLD	
G3	
G2	
G1	
  	

- 4** Select any one of the following icons:  (Deletion),  (Output),  (Statistical calculation results).

 (Deletion): For deleting the statistical calculation results

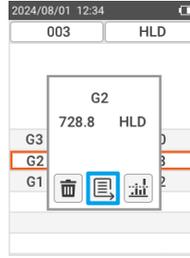
- » The selected statistical calculation results will be deleted, and then the screen will return to step **1**.

2024/08/01 12:34	
003	HLD
G2 728.8 HLD	
G3	
G2	
G1	
  	

3 Features

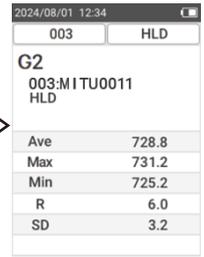
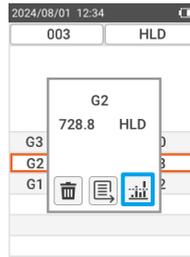
 (Output): For manually outputting the statistical calculation results

- » Output of the selected statistical calculation results begins with the test results (of three to ten tests) and then continues in the order Ave, Max, Min, Rng, SD. Once output is complete, the screen will return to step **1**.



 (Statistical calculation results): For confirming the statistical calculation results

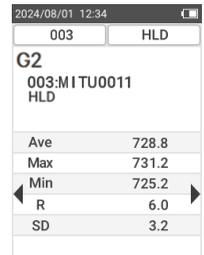
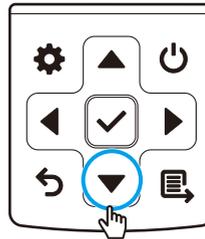
- » A screen with details regarding the selected statistical calculation results will be displayed.



2024/08/01 12:34	
003	HLD
G2	
003:MITU0011	
HLD	
Ave	728.8
Max	731.2
Min	725.2
R	6.0
SD	3.2

5 Press the [▼] key.

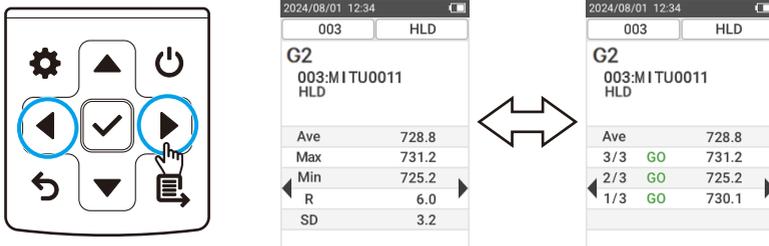
- » [◀▶] will be displayed.



2024/08/01 12:34	
003	HLD
G2	
003:MITU0011	
HLD	
Ave	728.8
Max	731.2
◀ Min	725.2 ▶
R	6.0
SD	3.2

6 Press the [◀▶] keys.

- » The screen will toggle between the details of the statistical calculation results and the results of each test.

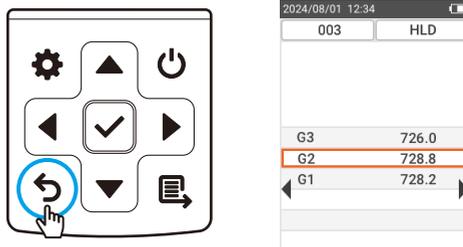


7 Press the [BACK] key.

- » The screen will return to the list of statistical calculation results.

Tips

You can return to the list of statistical calculation results from either the screen with details regarding the statistical calculation results or the one with the results of each test.

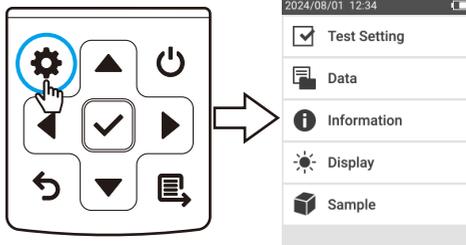


3.6 Data Output Destination Settings

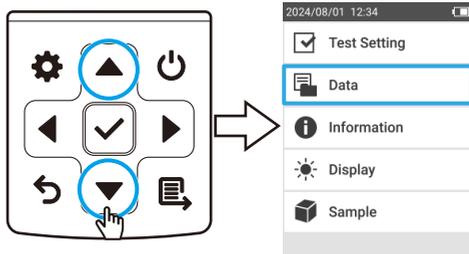
This section explains the procedure for setting the destination (an external device) of data output (manual or automatic).

1 Display the Data screen.

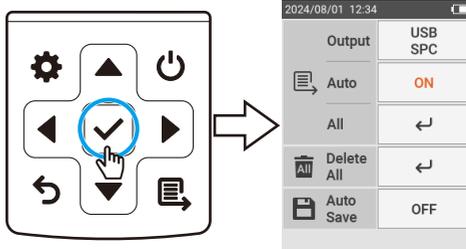
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Data].

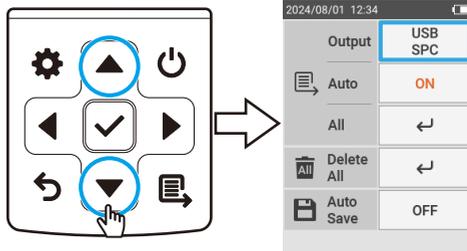


- 3 Press the [CHECK] key.
 - » The Data screen will be displayed.

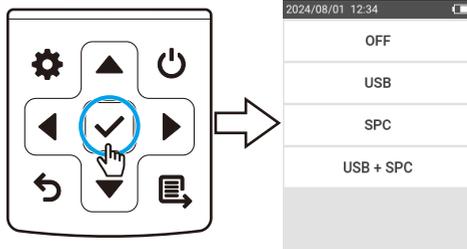


2 Set the value for [Output].

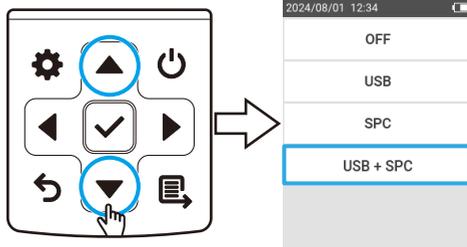
- 1 Press the [▲▼] keys to select [Output].



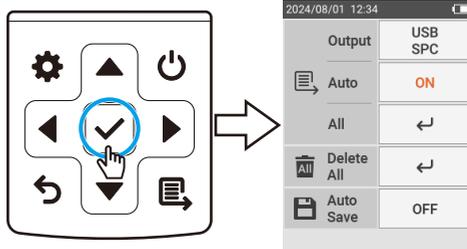
- 2 Press the [CHECK] key.
 - » The screen for setting the data output destination will be displayed.



- 3 Press the [▲▼] keys to select the output destination. For the connector at the output destination, see [1.3.2 Display Unit](#) on page 42.



- 4 Press the [CHECK] key.
 - » The selected data output destination will be displayed.



3.7 Automatic Output Settings

This section explains the procedure for enabling and disabling automatic output of test data.

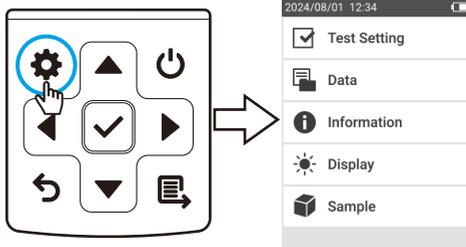
IMPORTANT

While the data output destination is set to "OFF", data will not be output even if automatic output is set to "ON". Set the data output destination.

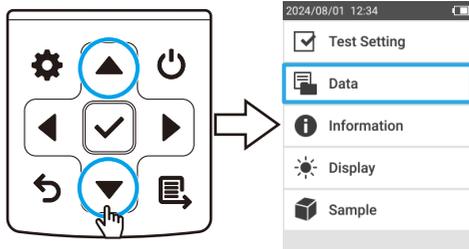
For details, see  "3.6 Data Output Destination Settings" on page 102.

1 Display the Data screen.

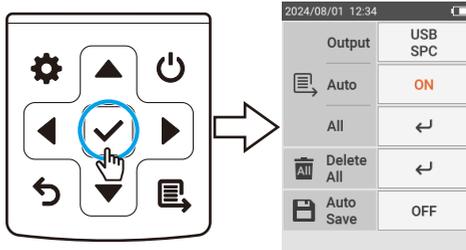
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



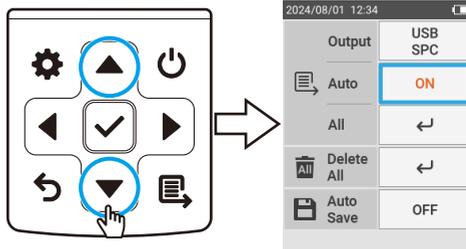
- 2 Press the [▲▼] keys to select [Data].



- 3 Press the [CHECK] key.
 - » The Data screen will be displayed.



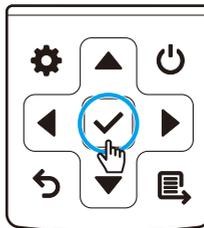
- 2 Press the [▲▼] keys to select the field next to [Auto] containing either [ON] or [OFF].



- 3 Press the [CHECK] key to toggle between [ON] and [OFF].

Tips

When [ON] has been set, data will be output immediately after the completion of testing.



Tips

If output of data is performed without connecting the output device (printer or PC) to the data output destination specified in "Data Output Destination Settings", [E005 : OutputErr] will be displayed.

Either change the data output destination or connect the output device to the specified data output destination.

For details, see "5.1 Error Display List" on page 184.

3.8 Batch Deletion of Test Data

This section explains the procedure for performing batch deletions of test data.

When "Auto Save" is set to "ON", the display unit can store up to 1,800 test results and up to 100 statistical calculation results.

If either of the upper limits is exceeded, [E007 : FULL] will be displayed. In such cases, the test results will not be displayed, and further tests cannot be performed.

If [E007 : FULL] has been displayed, delete the test data stored in the internal memory.

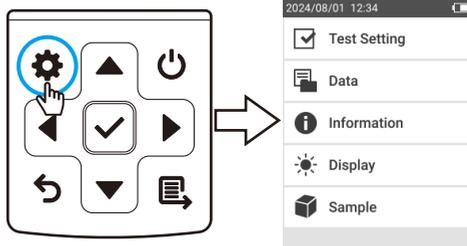
IMPORTANT

Before deleting the test data, set [Ave.] on the Test Setting screen to [OFF].

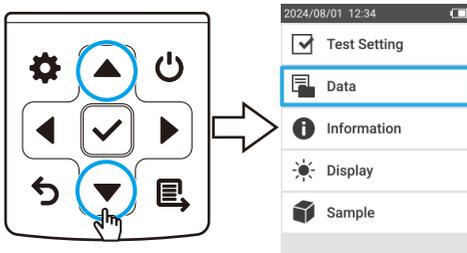
If [Ave.] on the Test Setting screen is set to [ON], statistical calculation results will be deleted.

1 Display the Data screen.

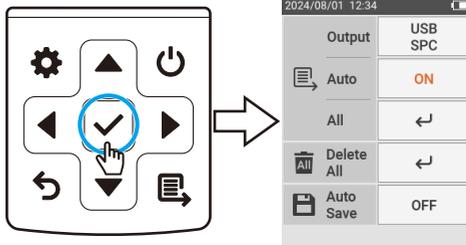
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Data].

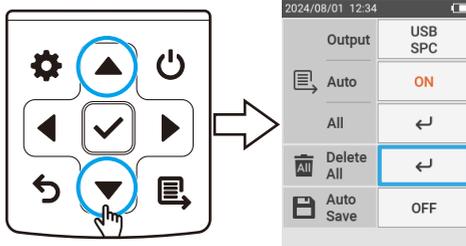


- 3** Press the [CHECK] key.
 » The Data screen will be displayed.

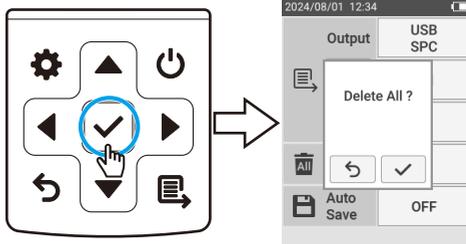


2 Perform a batch deletion of the test data.

- 1** Press the [▲▼] keys to select the field next to [Delete All] containing



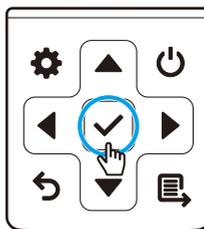
- 2** Press the [CHECK] key.
 » A confirmation screen will be displayed.



- 3** Press the [CHECK] key.
 » The test data will be deleted all at once.

Tips

To cancel the confirmation, press the [BACK] key.

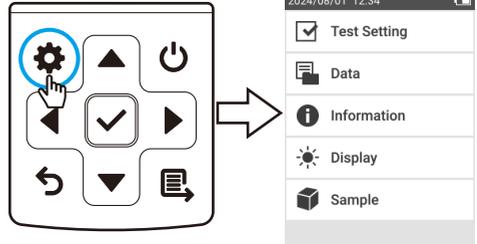


3.9 Date and Time Settings

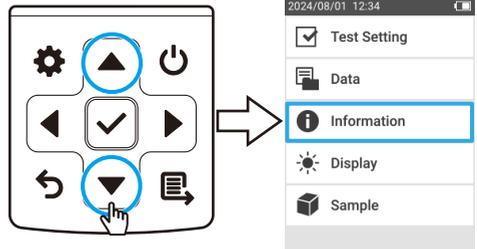
This section explains the procedure for setting the date and time of the display unit. The following is an explanation of the procedure for changing the date and time to August 1 23:59, 2024.

1 Display the Information screen.

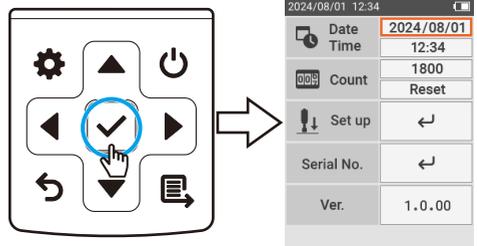
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Information].

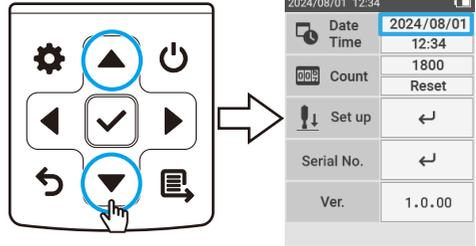


- 3 Press the [CHECK] key.
 - » The Information screen will be displayed.

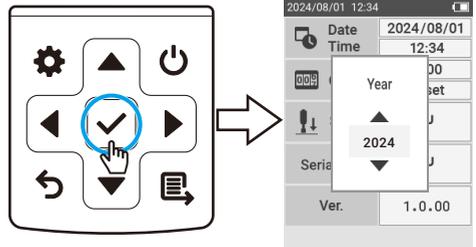


2 Select the date.

- 1 Press the [▲▼] keys to select the field next to [Date Time] containing the date.



- 2 Press the [CHECK] key.



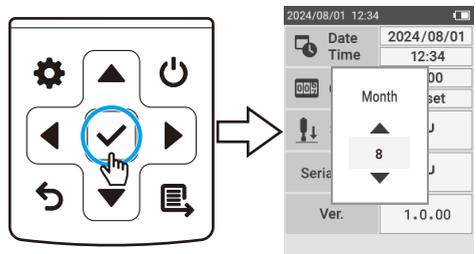
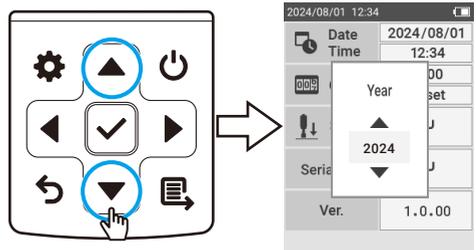
3 Set the year.

- 1 Press the [▲▼] keys to set "Year" to "2024".

Tips

- Holding down the [▲▼] keys accelerates the pace at which values change.
- To return to the previous screen, press the [BACK] key.

- 2 Press the [CHECK] key.

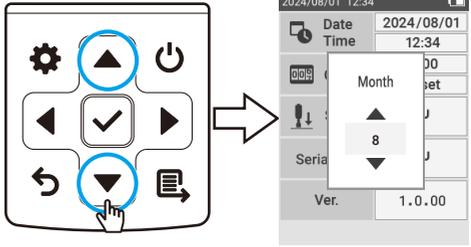


4 Set the month.

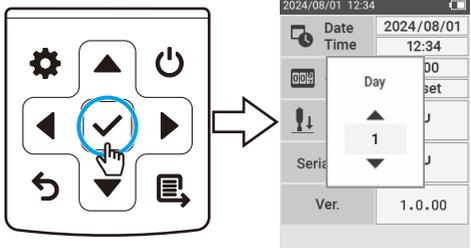
- 1 Press the [▲▼] keys to set "Month" to "8".

Tips

- Holding down the [▲▼] keys accelerates the pace at which values change.
- To return to the previous screen, press the [BACK] key.



- 2 Press the [CHECK] key.

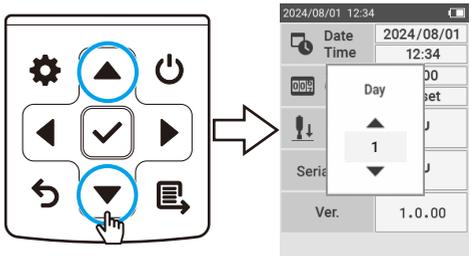


5 Set the day.

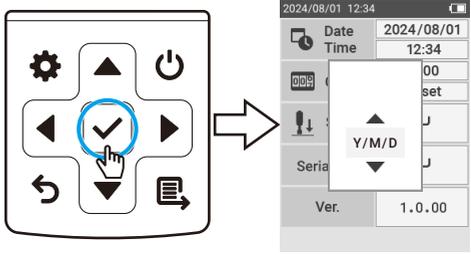
- 1 Press the [▲▼] keys to set "Day" to "1".

Tips

- Holding down the [▲▼] keys accelerates the pace at which values change.
- To return to the previous screen, press the [BACK] key.



- 2 Press the [CHECK] key.
 - » The date format (the order of the components of the date) selection screen will be displayed.

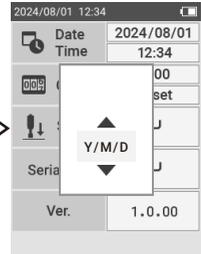
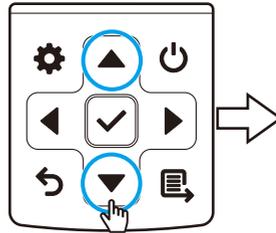


6 Set the date format (the order of the components of the date).

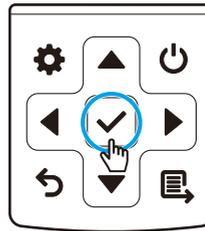
- 1 Press the [▲▼] keys to set the date format (the order of the components of the date).

Tips

- The following date formats (the order of the components of the date) can be set.
 - Year/Month/Day
 - Day/Month/Year
 - Month/Day/Year
- To return to the previous screen, press the [BACK] key.

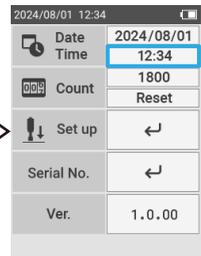
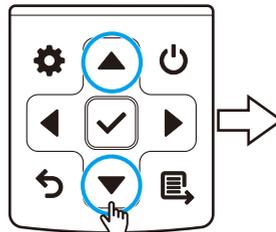


- 2 Press the [CHECK] key.



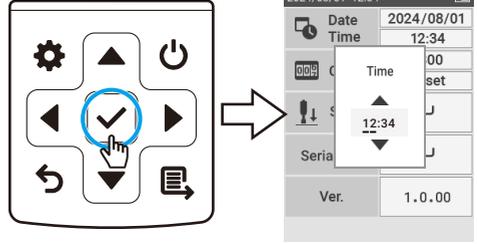
7 Set the time.

- 1 Press the [▲▼] keys to select the field next to [Date Time] containing the time.



3 Features

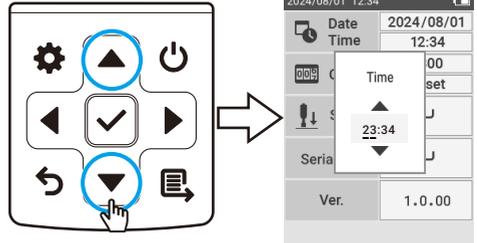
- 2 Press the [CHECK] key.



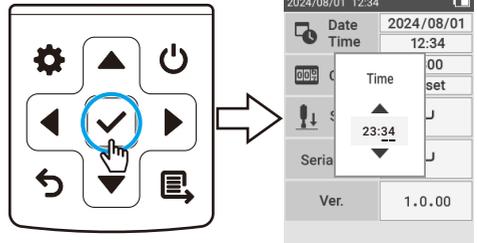
- 3 Press the [▲▼] keys to set the hour to "23".

Tips

- Holding down the [▲▼] keys accelerates the pace at which values change.
- To return to the previous screen, press the [BACK] key.



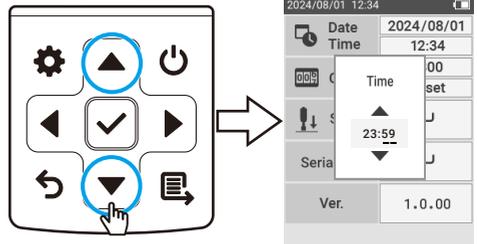
- 4 Press the [CHECK] key.



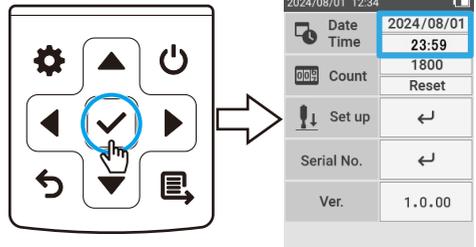
- 5 Press the [▲▼] keys to set the minute to "59".

Tips

Holding down the [▲▼] keys accelerates the pace at which values change.



- 6 Press the [CHECK] key.
 - » The set time will be displayed.

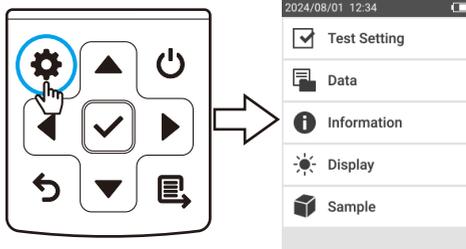


3.10 Displaying/Resetting the Impact Count

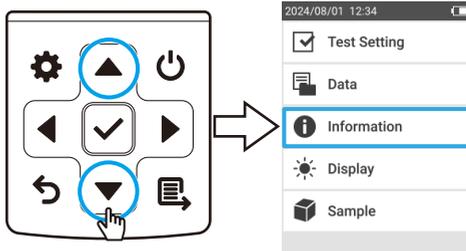
Display the impact count of the detector to check the replacement time of the tungsten-carbide ball and ball shaft. Furthermore, reset the impact count when you replace the tungsten-carbide ball and the ball shaft.

1 Display the Information screen.

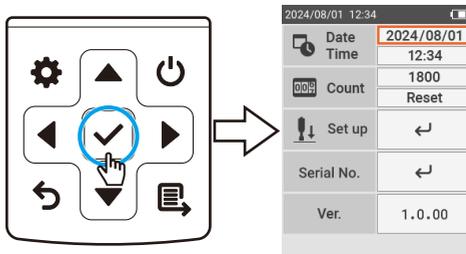
- On the main screen, press the [MENU] key.
 - The menu screen will be displayed.



- Press the [▲▼] keys to select [Information].



- Press the [CHECK] key.
 - The Information screen will be displayed.



2 Check the impact count.

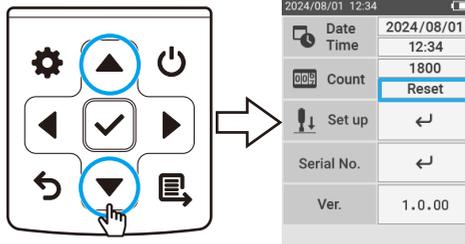
2024/08/01 12:34	
Date	2024/08/01
Time	12:34
Count	1800
	Reset
Set up	↶
Serial No.	↶
Ver.	1.0.00

Tips

- Clean the impact hammer inside the detector and the inside of the outer tube once per 1,000 to 2,000 impacts. For details, see "4.2 Cleaning the Detector" on page 160.
- Replace the tungsten-carbide ball attached to the impact hammer inside the detector with a new one once per approximately 5,000 impacts. For details, see "4.3 Replacing the Tungsten-Carbide Ball" on page 163.
- Reset the impact count when you replace the tungsten-carbide ball and the ball shaft. For details, see "3.10 Displaying/Resetting the Impact Count" on page 114.

3 Reset the impact count.

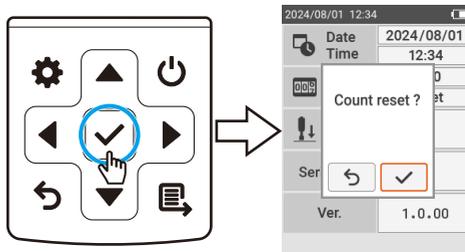
- 1 Press the [▲▼] keys to select the field next to [Count] containing [Reset].



- 2 Press the [CHECK] key.
 - » A confirmation screen will be displayed.

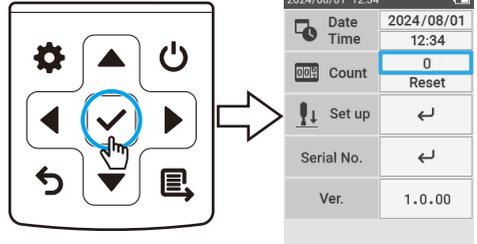
Tips

To cancel the reset of the impact count, press the [BACK] key.



3 Features

- 3 Press the [CHECK] key.
 - » The number displayed in the field next to [Count] will be 0.

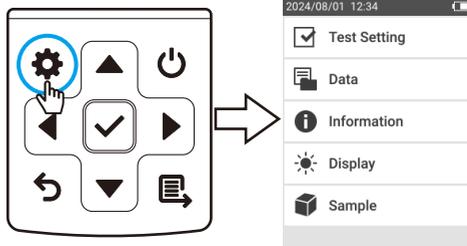


3.11 Displaying Serial Numbers

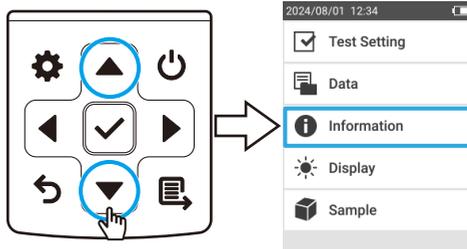
This section explains the procedure for displaying the serial numbers of the display unit and the detector as well as for displaying the type of detector.

1 Display the Information screen.

- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.

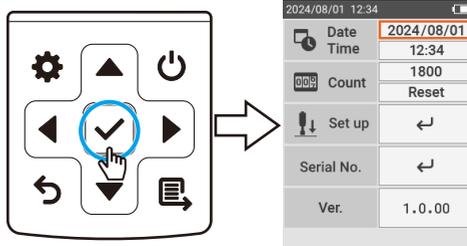


- 2 Press the [▲▼] keys to select [Information].



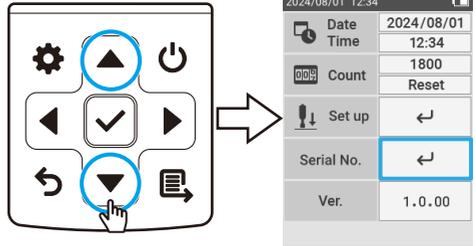
- 3 Press the [CHECK] key.

 - » The Information screen will be displayed.

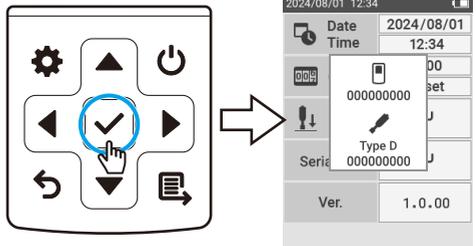


2 Confirm the serial numbers and the type of detector.

- 1 Press the [▲▼] keys to select the field next to [Serial No.] containing .



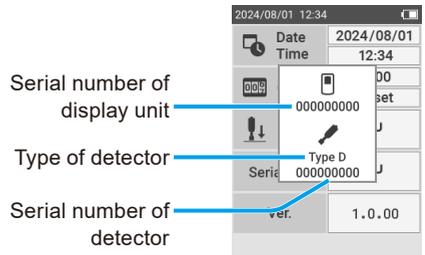
- 2 Press the [CHECK] key.



- 3 Confirm the serial numbers and the type of detector.

Tips

To return to the Information screen, press the [BACK] key.

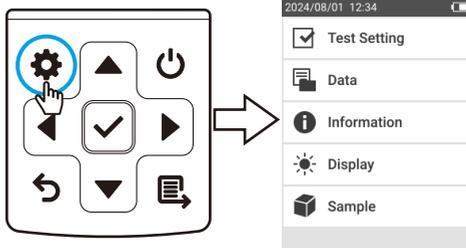


3.12 Displaying the Program Version

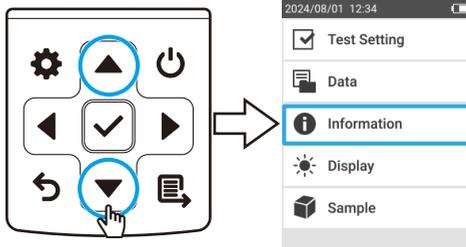
This section explains the procedure for displaying the version of the display unit program.

1 Display the Information screen.

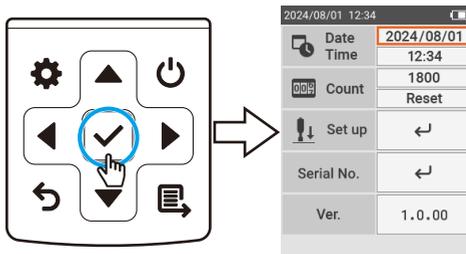
- On the main screen, press the [MENU] key.
 - The menu screen will be displayed.



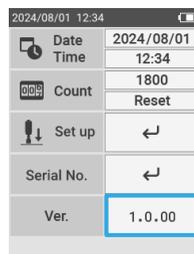
- Press the [▲▼] keys to select [Information].



- Press the [CHECK] key.
 - The Information screen will be displayed.



2 Confirm the program version.



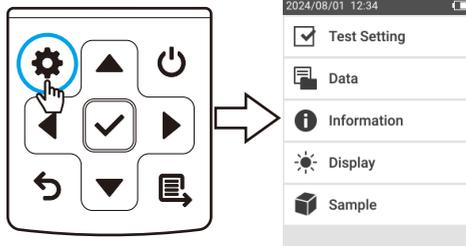
3.13 Backlight Settings

Set the backlight brightness level.

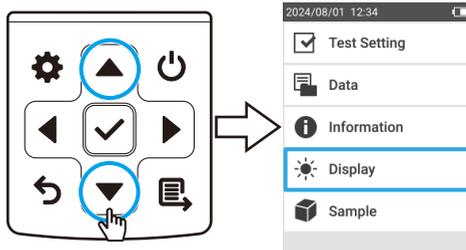
This section explains the procedure for changing the backlight brightness level to  (High).

1 Display the Display screen.

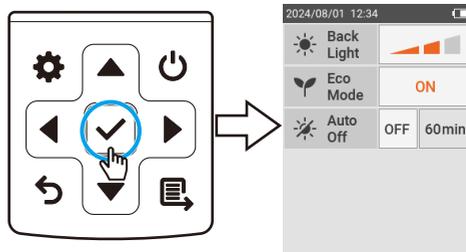
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Display].

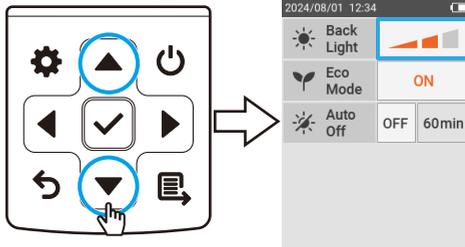


- 3 Press the [CHECK] key.
 - » The Display screen will be displayed.

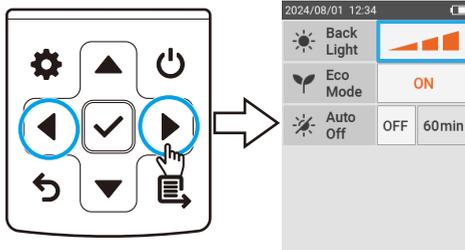


2 Change the backlight brightness level to (High).

- 1 Press the [▲▼] keys to select the field next to [Back Light] containing

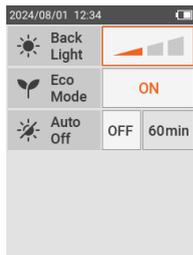


- 2 Press the [◀▶] keys to change the brightness level.

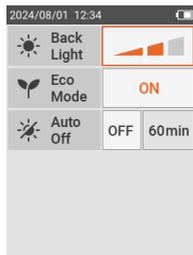


Tips

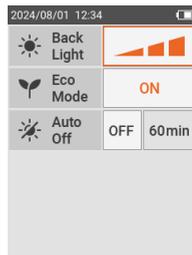
There are three levels of backlight brightness: Low, Middle, and High



Low



Middle



High

3.14 Eco Mode Settings

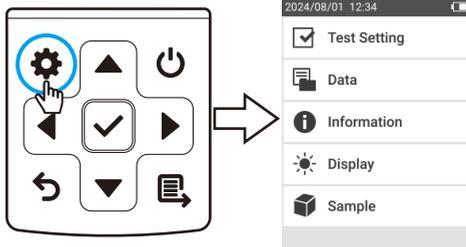
The eco mode is a function that automatically reduces the backlight brightness level when no operations are performed for approximately 10 seconds.

Performing a key operation or a hardness test restores the backlight brightness level to the original setting.

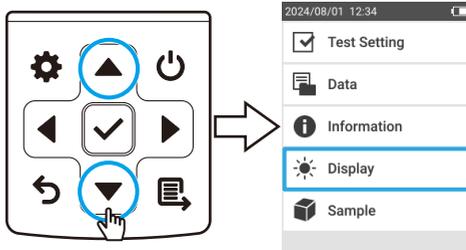
This section explains the procedure for setting eco mode.

1 Display the Display screen.

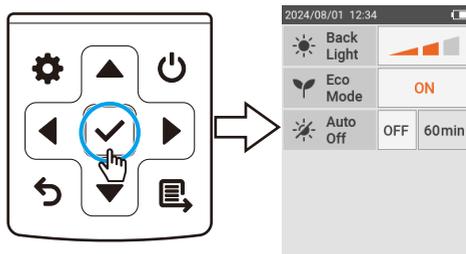
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Display].

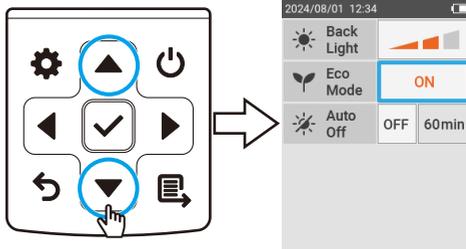


- 3 Press the [CHECK] key.
 - » The Display screen will be displayed.

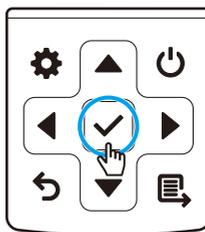


2 Set [Eco Mode] to either [ON] or [OFF].

- 1 Press the [▲▼] keys to select the field next to [Eco Mode] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].



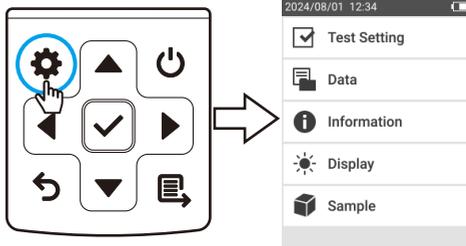
3.15 Auto Power-Off Function Settings

When no operations have been performed for a certain period of time, the power to this product is turned off automatically by the auto power-off function.

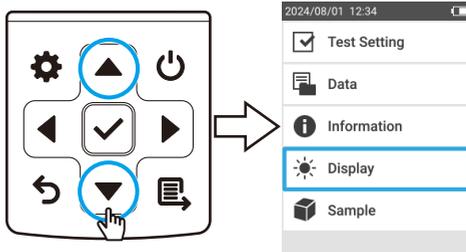
This section explains the procedure for setting the auto power-off timer to 60 minutes.

1 Display the Display screen.

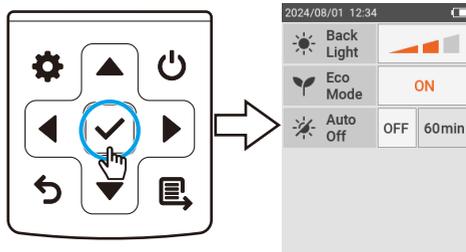
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Display].

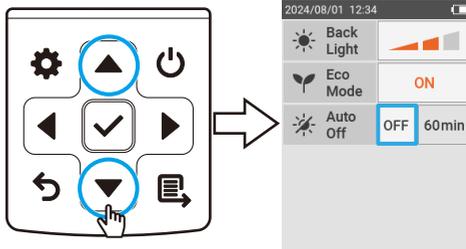


- 3 Press the [CHECK] key.
 - » The Display screen will be displayed.



2 Set [Auto Off] to either [ON] or [OFF].

- 1 Press the [▲▼] keys to select the field next to [Auto Off] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

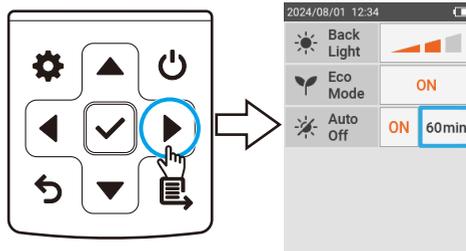
Tips

You can only proceed to the following setting procedure when [ON] has been set.

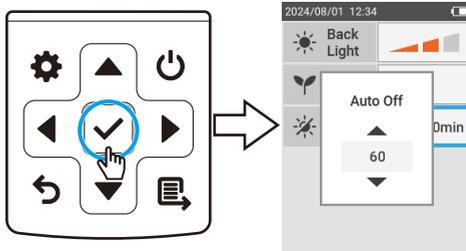


3 Set [Auto Off] to "60 min".

- 1 Press the [▶] key to select the value.

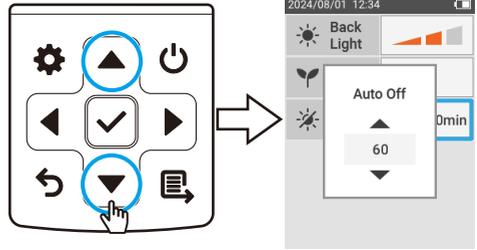


- 2 Press the [CHECK] key.
 - » The Auto Off setting screen will be displayed.

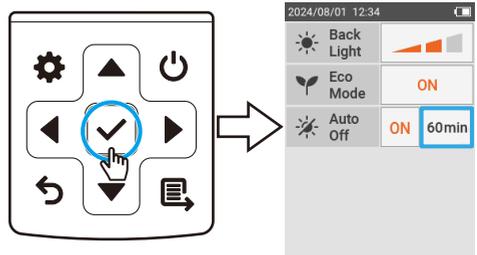


3 Features

3 Press the [▲▼] keys to set the value.



4 Press the [CHECK] key.



3.16 Registration/Selection/Deselection/Deletion/Editing of Samples

Up to 100 samples can be registered.

The following five items can be set for each sample.

- Sample name
- Test scale
- Conversion table
- Upper specification limit and lower specification limit for acceptance judgments
- Offset value

The settings above will change automatically when a registered sample is selected.

3.16.1 Sample Registration

Register the sample conditions for the sample being prepared.

IMPORTANT

The input range of each offset value as well as the lower and upper specification limits for acceptance judgments for each test scale are restricted as shown in the following table.

The input range of each offset value and the lower and upper specification limits for acceptance judgments for each test scale

Test scale	Reading		GO/NG			Offset		
	Readable range	Reading increments	Initial value ^{*1}	Input range	Setting increments	Initial value	Input range	Setting increments
HLD ^{*2}	100.0 to 999.9	0.1	500	100 to 999	1	±0	-99 to 99	1
HV	43 to 950	0.5	500	43 to 950	1	±0	-99 to 99	1
HB	20 to 655	0.5	300	20 to 655	1	±0	-99 to 99	1
HRC	19.3 to 68.2	0.1	50.0	19.3 to 68.2	0.1	±0	-9.9 to 9.9	0.1
HRB	13.5 to 101.7	0.1	50.0	13.5 to 101.7	0.1	±0	-9.9 to 9.9	0.1
VHS	13.2 to 98.6	0.1	50.0	13.2 to 98.6	0.1	±0	-9.9 to 9.9	0.1
HS	30.1 to 99.5	0.1	50.0	30.1 to 99.5	0.1	±0	-9.9 to 9.9	0.1
MPa	390 to 1999	0.5	1000	390 to 1999	1	±0	-99 to 99	1

*1: Common to the lower specification limit and upper specification limit.

*2: The readable values differ depending on the detector currently in use.

D-type detector and DC-type detector: HLD

D+15-type detector: HLD+15

DL-type detector: HLDL

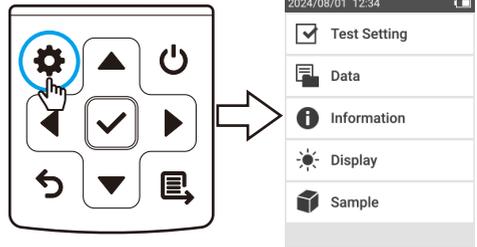
Register the sample from the menu screen.

3 Features

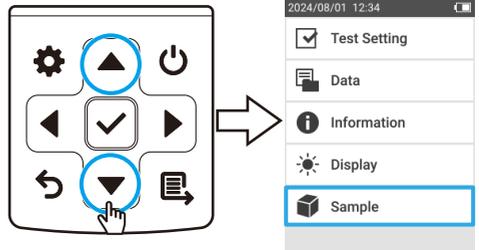
This section explains the procedure for registering the sample conditions in sample No. 001.

1 Display the Sample screen.

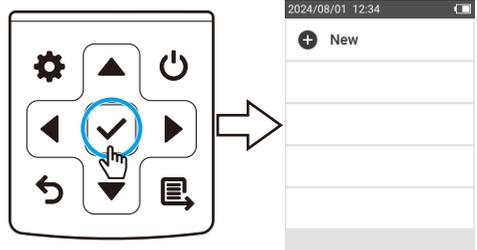
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Sample].



- 3 Press the [CHECK] key.
 - » The Sample screen will be displayed.

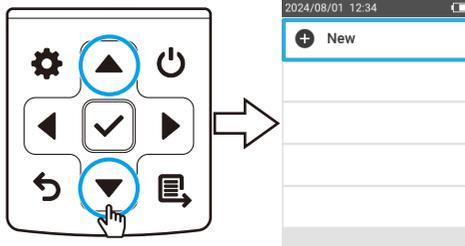


2 Register a sample.

- 1 Press the [▲▼] keys to select [+ New].

Tips

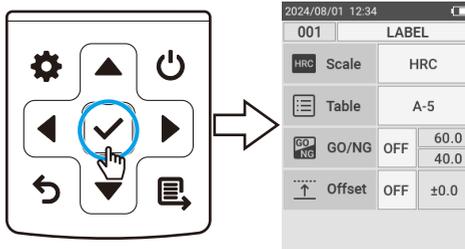
The number of samples that is allowable for registration is from 1 to 100.



- 2 Press the [CHECK] key.
 - » The Sample editing screen will be displayed.

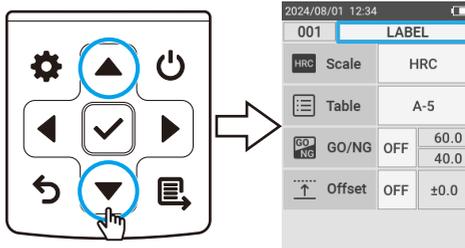
Tips

Samples are numbered automatically.
Sample numbers cannot be set or changed manually.

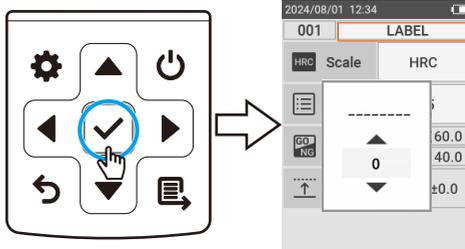


3 Register a sample name.

- 1 Press the [▲▼] keys to select [LABEL].



- 2 Press the [CHECK] key.

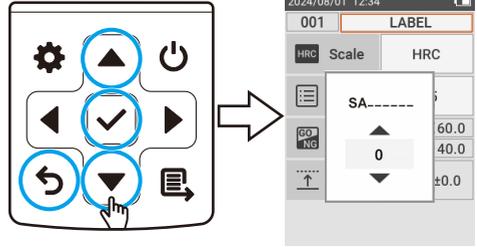


3 Features

- 3 Press the [▲▼] keys to set a sample name.

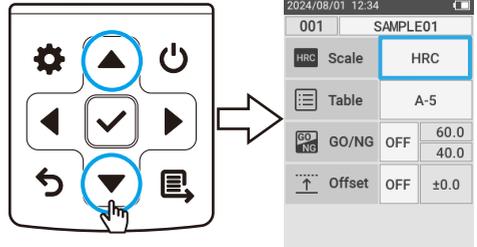
Tips

- Only the following characters can be used for sample names.
0 - 9, A - Z, [,], [-], [/], [(SPACE)]
- Press the [▶] key to proceed to the next character. To return to the previous character, press the [◀] key.
- Holding down the [▲▼] keys accelerates the pace at which characters change.
- Press the [CHECK] key to confirm the sample name. To cancel the entry, press the [BACK] key.

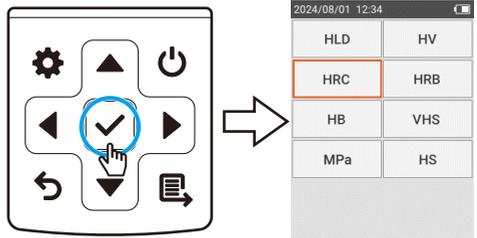


4 Register a value for [Scale].

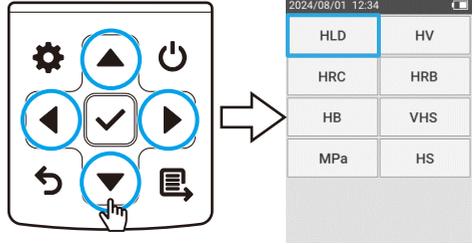
- 1 Press the [▲▼] keys to select the value for [Scale].



- 2 Press the [CHECK] key.



- Press the [◀▶▲▼] keys to select the test scale.

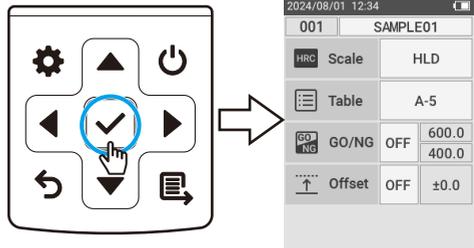


- Press the [CHECK] key.
 - The set test scale will be displayed.

Tips

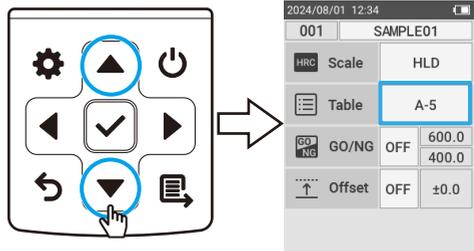
The testable sample materials and test scales differ depending on the type of detector.

For details, see [Table] "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".

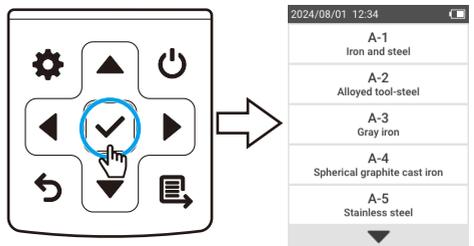


5 Register a value for [Table].

- Press the [▲▼] keys to select the field containing the value for [Table].

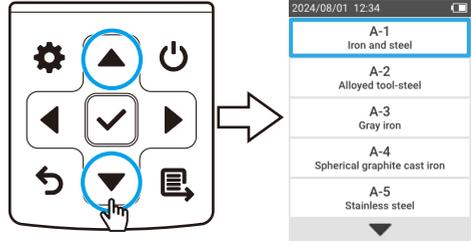


- Press the [CHECK] key.



3 Features

- 3 Press the [▲▼] keys to select the sample material.

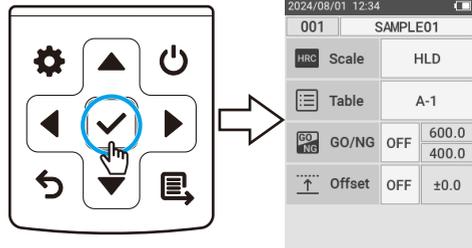


- 4 Press the [CHECK] key.
» The set material table will be displayed.

Tips

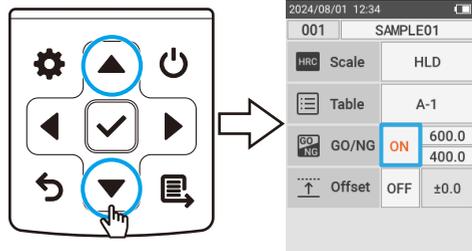
The testable sample materials and test scales differ depending on the type of detector.

For details, see "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".



- 6 Set [GO/NG] to either [ON] or [OFF].

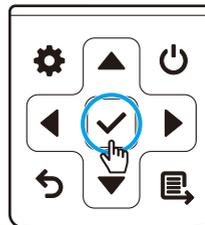
- 1 Press the [▲▼] keys to select the field next to [GO/NG] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

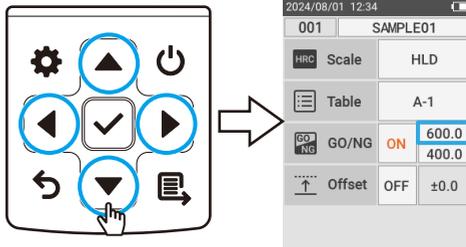
Tips

You can only proceed to the following setting procedure when [ON] has been set.

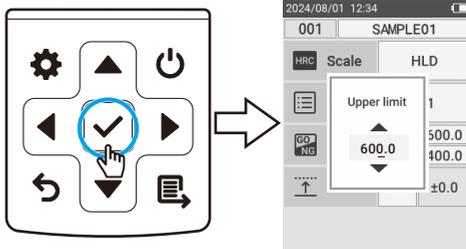


7 Set the upper specification limit for [GO/NG].

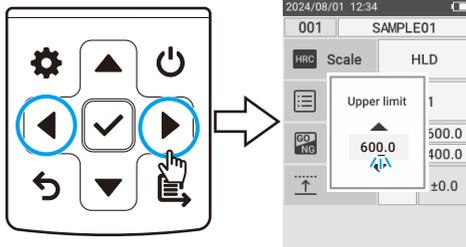
- 1 Press the [▶] key to select the upper specification limit.



- 2 Press the [CHECK] key.
 - » The Upper Limit setting screen will be displayed.



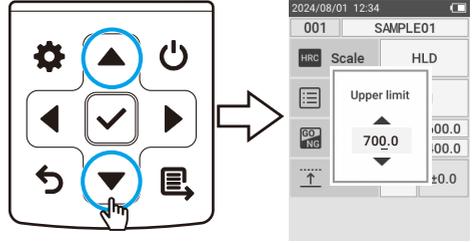
- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



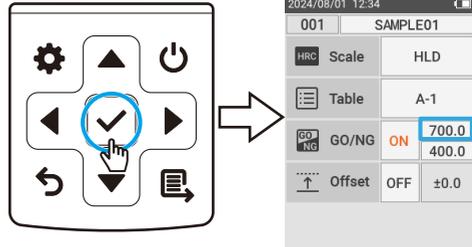
- 4 Press the [▲▼] keys to set the upper specification limit.

Tips

- The setting range differs depending on the test scale.
For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The upper specification limit can only be set to a value that is larger than the one for the lower specification limit.

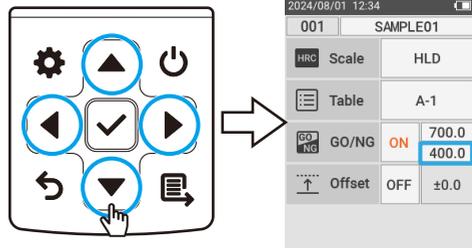


- 5 Press the [CHECK] key.
- » The set upper specification limit will be displayed.

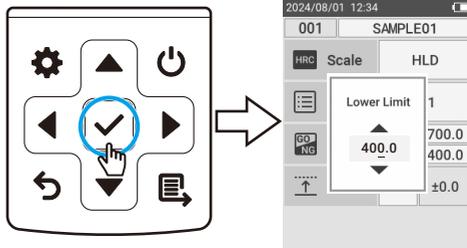


8 Set the lower specification limit for [GO/NG].

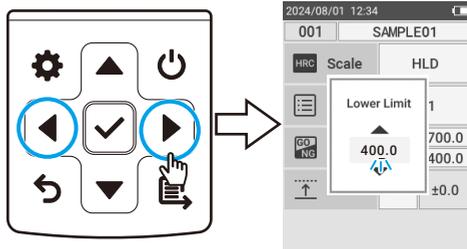
- 1 Press the [◀▶▲▼] keys to select the lower specification limit.



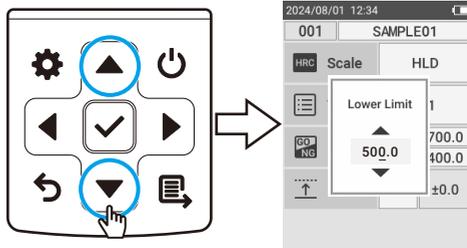
- 2 Press the [CHECK] key.
 » The Lower Limit setting screen will be displayed.



- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



- 4 Press the [▲▼] keys to set the lower specification limit.

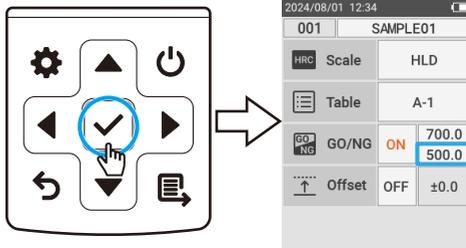


Tips

- The setting range differs depending on the test scale.
For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The lower specification limit can only be set to a value that is smaller than the one for the upper specification limit.

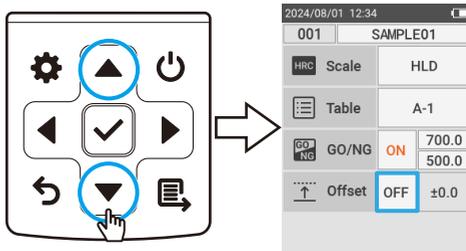
3 Features

- 5 Press the [CHECK] key.
» The set lower specification limit will be displayed.



9 Set [Offset] to either [ON] or [OFF].

- 1 Press the [▲▼] keys to select the field next to [Offset] containing either [ON] or [OFF].



- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

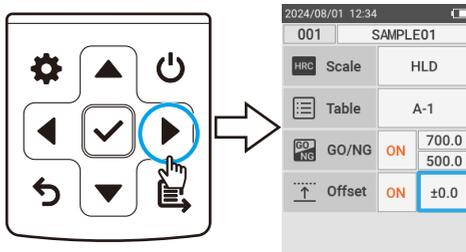
Tips

You can only proceed to the following setting procedure when [ON] has been set.

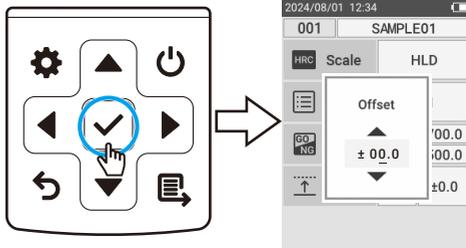


10 Set the offset value.

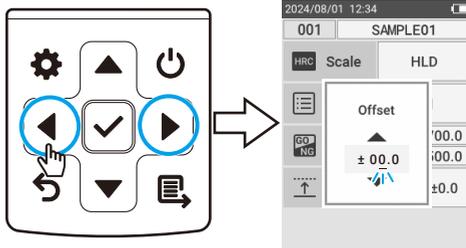
- 1 Press the [▶] key to select the offset value.



- 2 Press the [CHECK] key.
 » The Offset setting screen will be displayed.



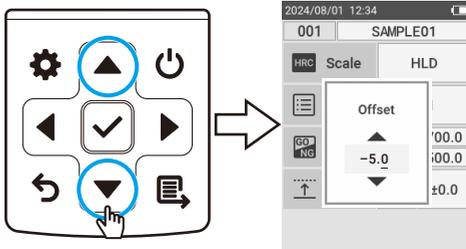
- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



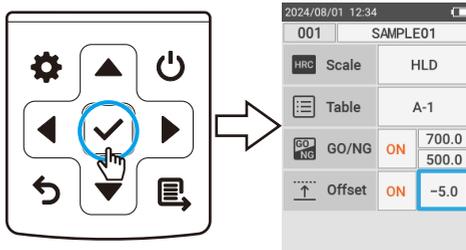
- 4 Press the [▲▼] keys to set the offset value.

Tips

- The setting range differs depending on the test scale.
For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.



- 5 Press the [CHECK] key.
 » The set offset value will be displayed.
 For details, see "3.4 Setting the Offset Value" on page 88.



3.16.2 Selection/Deselection of Samples

■ Selecting a sample

Select the number of the sample to be used from among the registered samples.

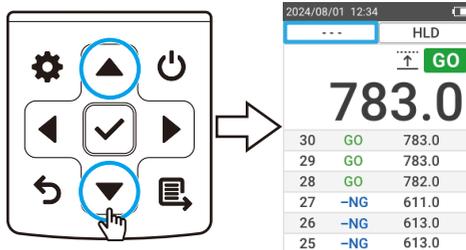
There are two ways to select the sample. Use each of them as appropriate.

- Selecting from the main screen
- Selecting from the menu screen

The following is an explanation of the procedure for selecting sample No. 003.

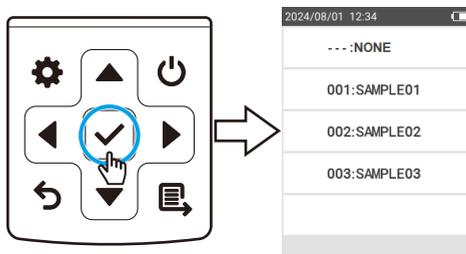
● Selecting the sample from the main screen

- 1 On the main screen, press the [▲▼] keys to select [---].

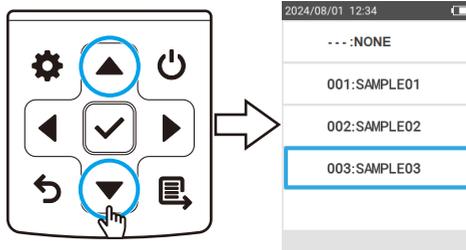


- 2 Press the [CHECK] key.

» The Sample screen will be displayed.

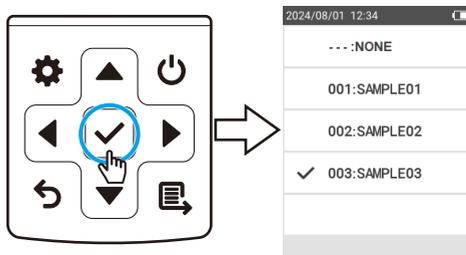


3 Press the [▲▼] keys to select sample No. 003.



4 Press the [CHECK] key.

- » The in the line for the selected sample No. will appear.



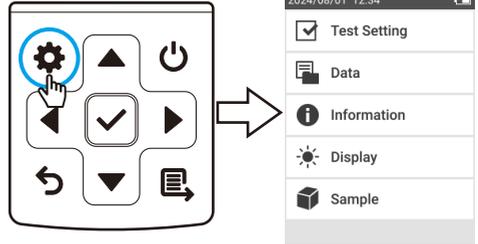
Tips

To return to the main screen, press the [BACK] key.

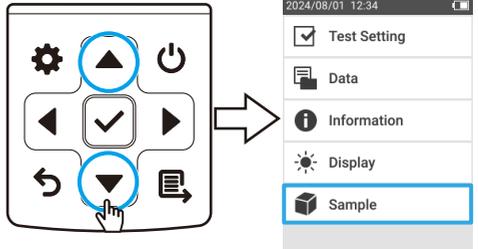
● **Selecting the sample from the menu screen**

1 Display the Sample screen.

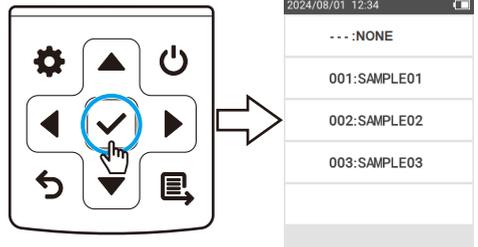
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Sample].

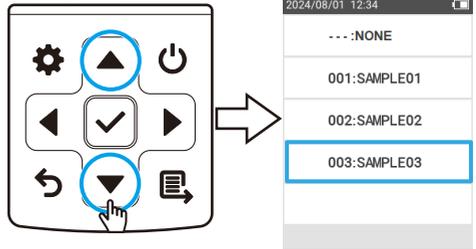


- 3 Press the [CHECK] key.
 - » The Sample screen will be displayed.

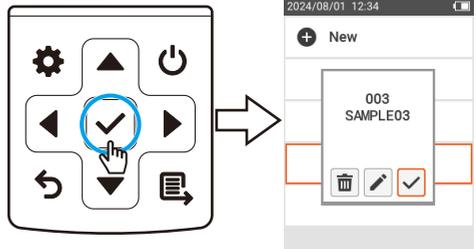


2 Select sample No. 003.

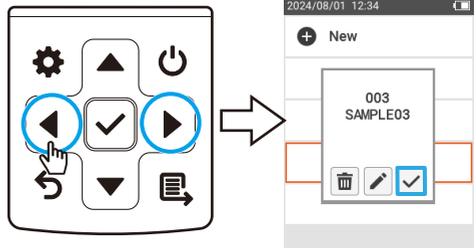
- 1 Press the [▲▼] keys to select sample No. 003.



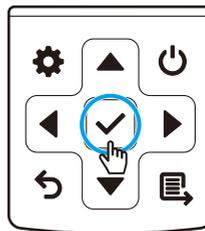
- 2 Press the [CHECK] key.
 - » The Sample selection screen will be displayed.



- 3 Press the [◀▶] keys to select .



- 4 Press the [CHECK] key.
 - » The sample information will be applied to "Test Setting" and the sample name will be displayed in the test results.

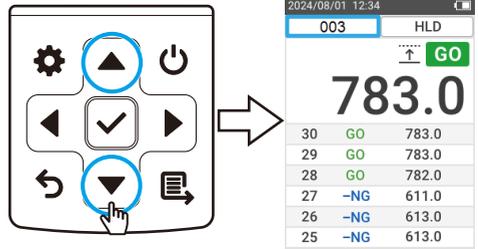


■ **Deselecting the sample**

The following is an explanation of the procedure for deselecting the selected sample.

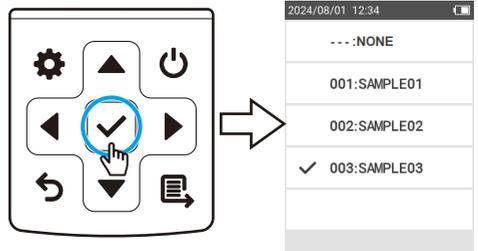
Deselect the sample from the main screen.

1 On the main screen, press the [▲▼] keys to select [003].

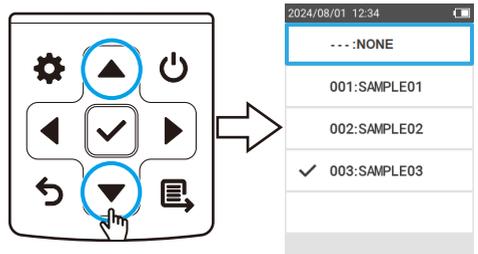


2 Press the [CHECK] key.

» The Sample screen will be displayed.

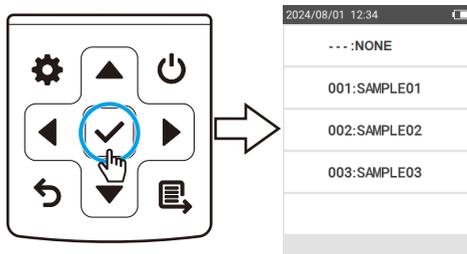


3 Press the [▲▼] keys to select [---:NONE].



4 Press the [CHECK] key.

- » The in the line for the selected sample No. will disappear.



Tips

- Additionally, when you change any of the following information from the Test Setting screen, the selected sample will be deselected, and the sample name will change to [---].
 - Test scale
 - Conversion table
 - ON/OFF setting for the acceptance judgment function
 - Upper specification limit and lower specification limit for acceptance judgments
 - ON/OFF setting for the offset function
 - Offset value
- To return to the main screen, press the [BACK] key.

3.16.3 Deletion/Editing of Samples

■ Deleting a sample

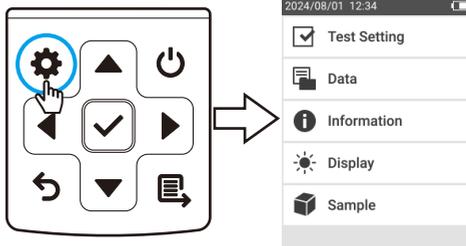
Delete a registered sample.

Delete the sample from the menu screen.

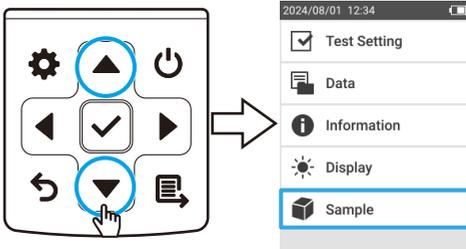
The following is an explanation of the procedure for deleting sample No. 001.

1 Display the Sample screen.

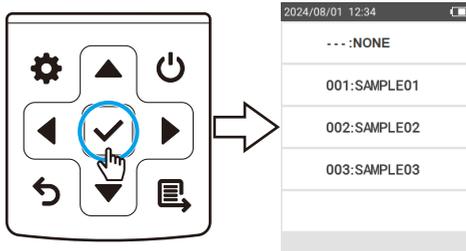
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Sample].

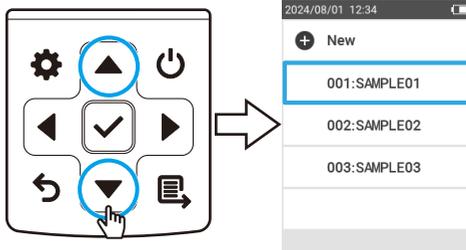


- 3 Press the [CHECK] key.
- » The Sample screen will be displayed.

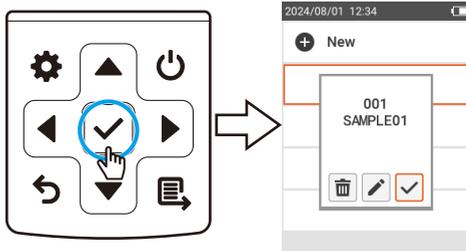


2 Delete sample No. 001.

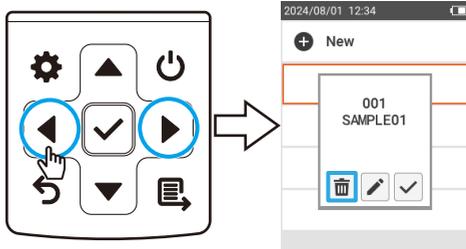
- 1 Press the [▲▼] keys to select sample No. 001.



- 2 Press the [CHECK] key.
 - » The Sample selection screen will be displayed.



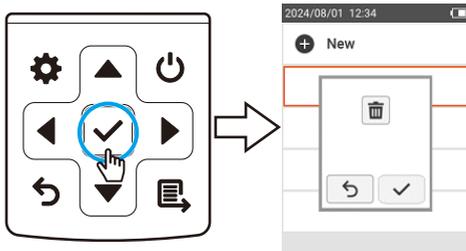
- 3 Press the [◀▶] keys to select .



- 4 Press the [CHECK] key.
 - » The sample deletion confirmation screen will be displayed.

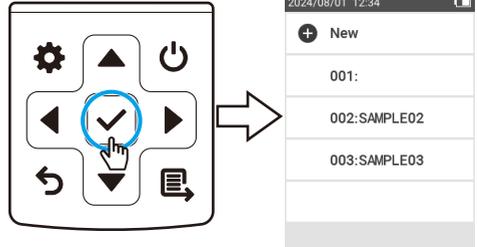
Tips

To cancel the deletion of the sample, press the [BACK] key.



3 Features

- 5 Press the [CHECK] key.
» The sample will be deleted.



Tips

- The name of the deleted sample will become blank.
- Even if you place the cursor over the deleted sample and press the [CHECK] key, the Sample edit screen will not be displayed.
- When registering a sample after performing a deletion, the smallest available number will automatically be assigned to the sample.

■ Editing a sample

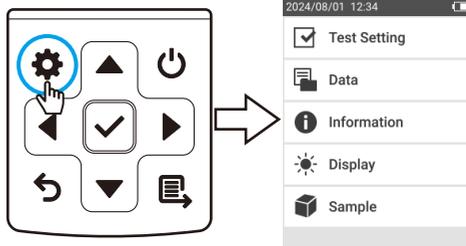
Edit the sample conditions of a registered sample.

Edit the sample from the menu screen.

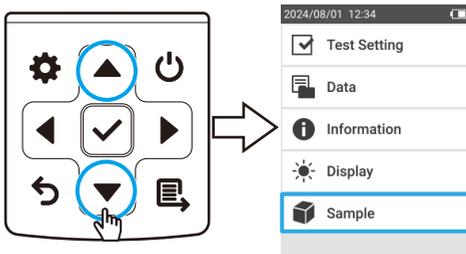
The following is an explanation of the procedure for editing the sample conditions of sample No. 002.

1 Display the Sample screen.

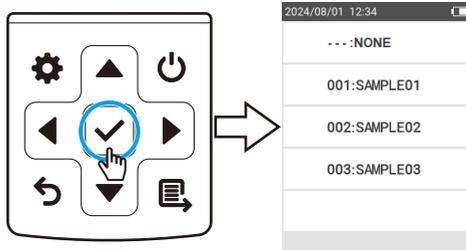
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



- 2 Press the [▲▼] keys to select [Sample].

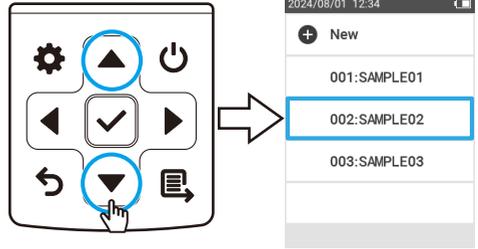


- 3 Press the [CHECK] key.
- » The Sample screen will be displayed.

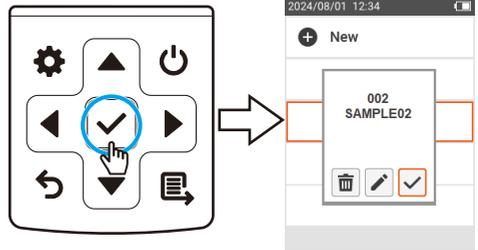


2 Select the sample No.

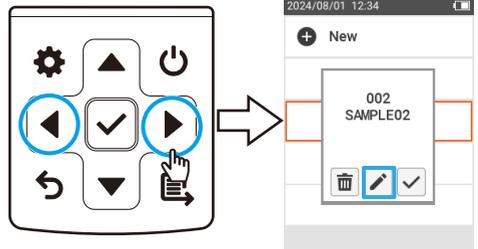
- 1 Press the [▲▼] keys to select sample No. 002.



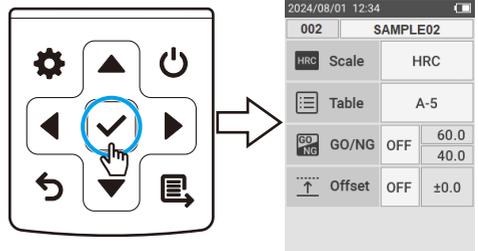
- 2 Press the [CHECK] key.
 - » The Sample selection screen will be displayed.



- 3 Press the [◀▶] keys to select .

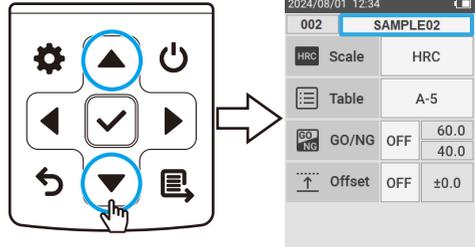


- 4 Press the [CHECK] key.
 - » The Sample editing screen will be displayed.

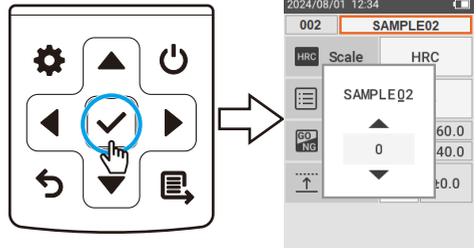


3 Edit the sample name.

- 1 Press the [▲▼] keys to select the sample name.



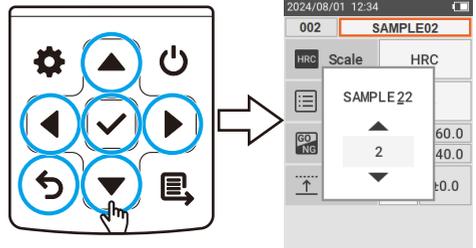
- 2 Press the [CHECK] key.



- 3 Press the [◀▶▲▼] keys to change the sample name.

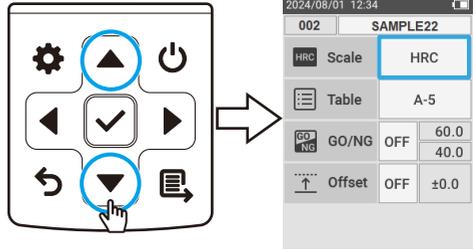
Tips

- Only the following characters can be used for sample names.
0 - 9, A - Z, [,], [-], [/], [(SPACE)]
- Press the [▲▼] keys to select the characters. Holding down the keys accelerates the pace at which characters change.
- Press the [▶] key to proceed to the next character. To return to the previous character, press the [◀] key.
- Press the [CHECK] key to confirm the sample name. To cancel the confirmation, press the [BACK] key.

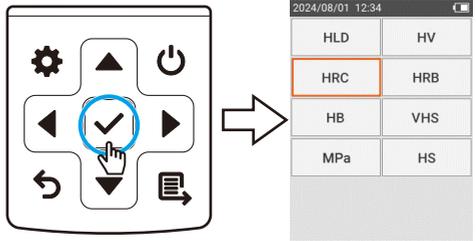


4 Change the value for [Scale].

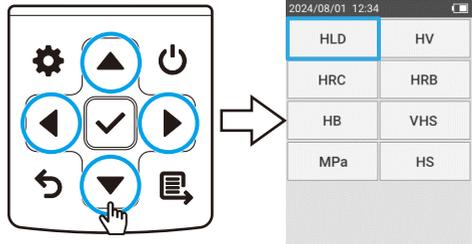
1 Press the [▲▼] keys to select the value for [Scale].



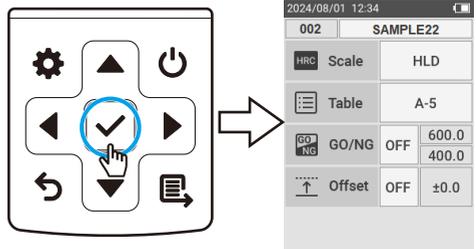
2 Press the [CHECK] key.



3 Press the [◀▶▲▼] keys to select the test scale.



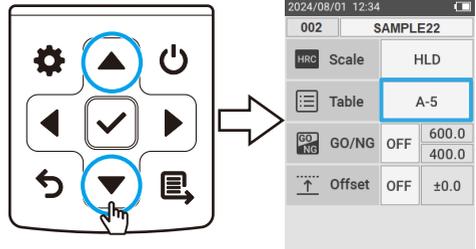
4 Press the [CHECK] key.
 » The set test scale will be displayed.



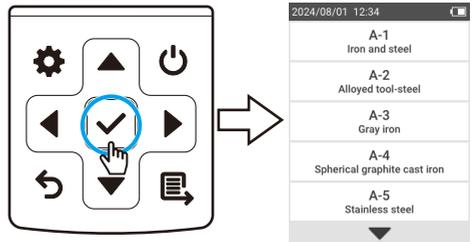
Tips
 The testable sample materials and test scales differ depending on the type of detector.
 For details, see [Table Icon] "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".

5 Change the value for [Table].

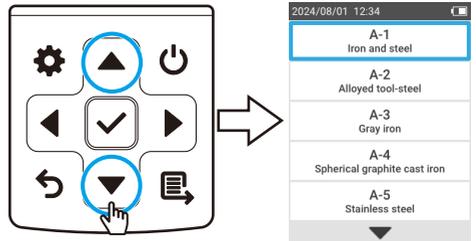
- 1 Press the [▲▼] keys to select the field containing the value for [Table].



- 2 Press the [CHECK] key.



- 3 Press the [▲▼] keys to select the sample material.

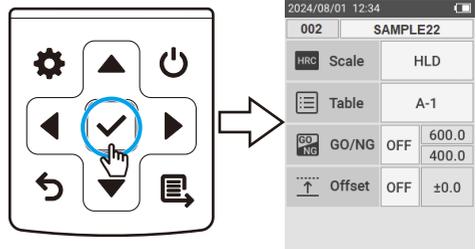


- 4 Press the [CHECK] key.

Tips

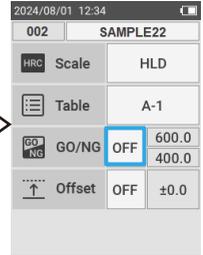
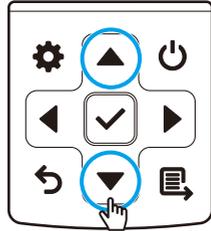
The testable sample materials and test scales differ depending on the type of detector.

For details, see  "■ Hardness conversion range for the detector" on page 68 in "2.4.1 Selecting the Material Table".



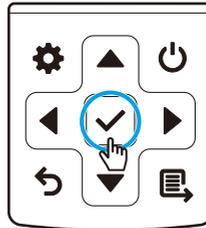
6 Change [GO/NG] to either [ON] or [OFF].

- 1 Press the [▲▼] keys to select the field next to [GO/NG] containing either [ON] or [OFF].



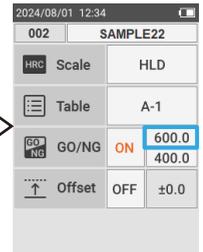
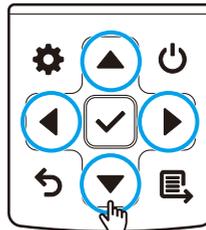
- 2 Press the [CHECK] key to toggle between [ON] and [OFF].

Tips
You can only proceed to the following setting procedure when [ON] has been set.

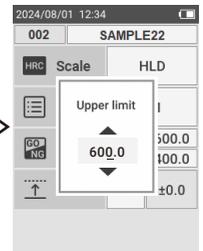
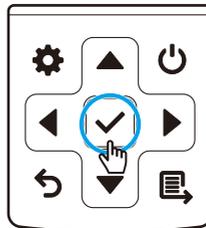


7 Change the upper specification limit for [GO/NG].

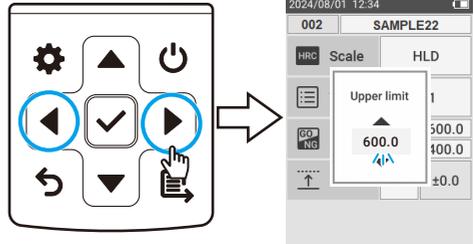
- 1 Press the [▶] key to select the upper specification limit.



- 2 Press the [CHECK] key.
 - » The Upper Limit setting screen will be displayed.



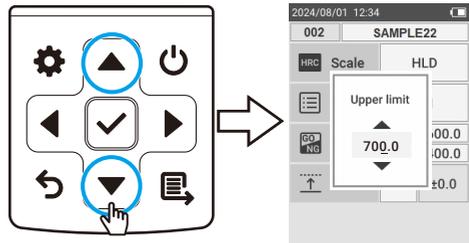
- 3 Press the [◀▶] keys to move the cursor to the digit to be changed.



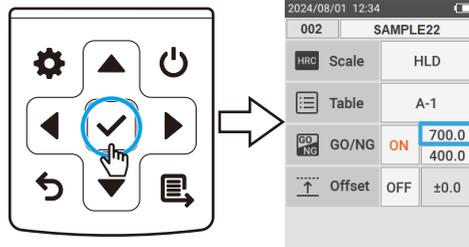
- 4 Press the [▲▼] keys to change the upper specification limit.

Tips

- The setting range differs depending on the test scale. For details, see ["3.16.1 Sample Registration"](#) on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The upper specification limit can only be set to a value that is larger than the one for the lower specification limit.

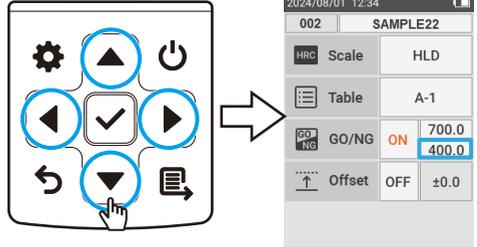


- 5 Press the [CHECK] key.
- » The set upper specification limit will be displayed.

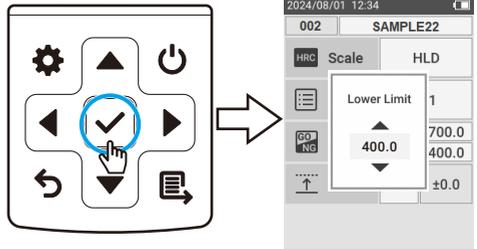


8 Change the lower specification limit for [GO/NG].

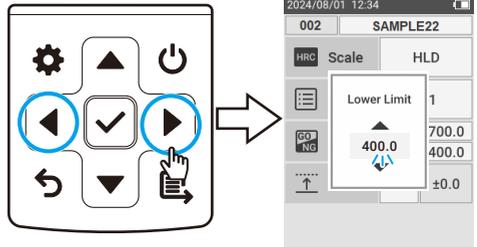
1 Press the [▼] key to select the lower specification limit.



2 Press the [CHECK] key.
» The Lower Limit setting screen will be displayed.



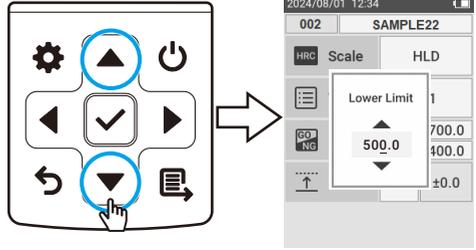
3 Press the [◀▶] keys to move the cursor to the digit to be changed.



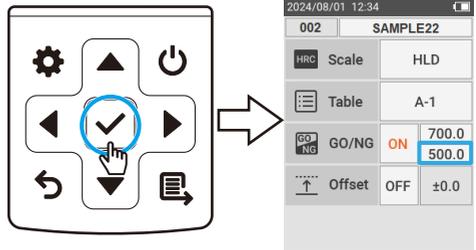
4 Press the [▲▼] keys to change the lower specification limit.

Tips

- The setting range differs depending on the test scale.
For details, see "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.
- The lower specification limit can only be set to a value that is smaller than the one for the upper specification limit.

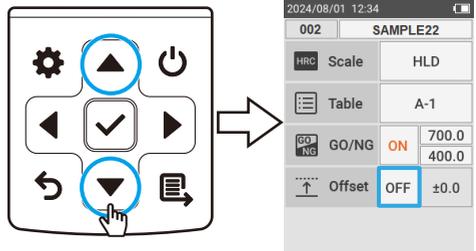


5 Press the [CHECK] key.
» The set lower specification limit will be displayed.



9 Change [Offset] to either [ON] or [OFF].

1 Press the [▲▼] keys to select the field next to [Offset] containing either [ON] or [OFF].



3 Features

- Press the [CHECK] key to toggle between [ON] and [OFF].

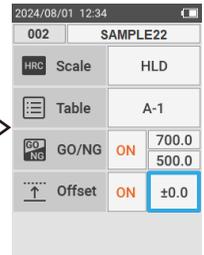
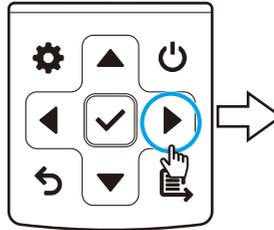
Tips

You can only proceed to the following setting procedure when [ON] has been set.

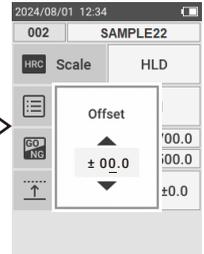
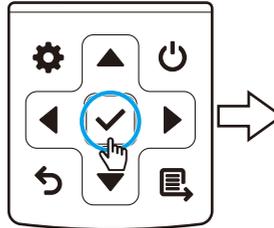


10 Change the offset value.

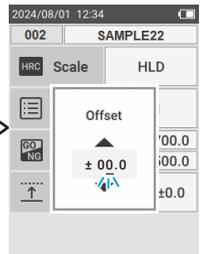
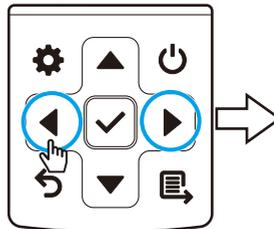
- Press the [▶] key to select the offset value.



- Press the [CHECK] key.
 - » The Offset setting screen will be displayed.



- Press the [◀▶] keys to move the cursor to the digit to be changed.

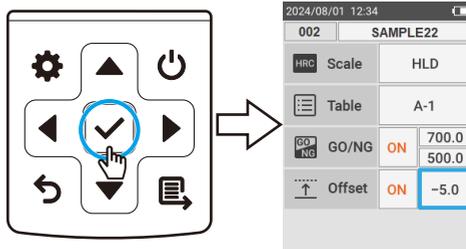
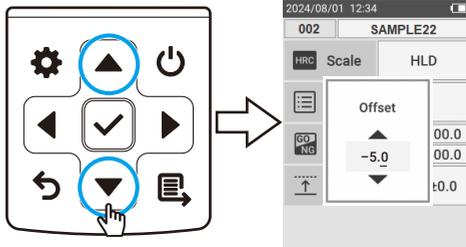


- 4 Press the [▲▼] keys to set the offset value.

Tips

- The setting range differs depending on the test scale.
For details, see  "3.16.1 Sample Registration" on page 127.
- Holding down the [▲▼] keys accelerates the pace at which values change.

- 5 Press the [CHECK] key.
- » The set offset value will be displayed.
For details, see  "3.4 Setting the Offset Value" on page 88.



4 Maintenance

This part explains the daily inspection and cleaning of this product, replacement of its consumables, and solutions to problems that may occur during the operation of the product.

4.1 Daily Inspection

● Inspection of each part

Check the appearance of the product for dirt, scratches, and worn parts.

NOTICE

In some cases, the coating on this product may peel off, or its surfaces may become discolored.

When wiping off dirt, do not use benzine, thinner, or chemically processed cloths.

Gently wipe off any dirt with a soft, lint-free cloth. If the dirt is difficult to remove, use a cloth soaked in a neutral detergent to wipe off the dirt and then gently wipe the product with a dry cloth or a cloth that has been thoroughly wrung after being soaked in water.

Refer to the consumables list if necessary. For details, see  "6 Specifications" on page 191.

● Checking the accuracy

Before using this product, check its accuracy by performing a test with a commercially-available hardness reference block.

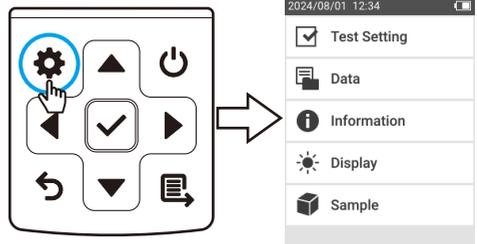
For details about the test procedure, see  "2.4 Performing a Hardness Test" on page 67.

● Checking the impact count

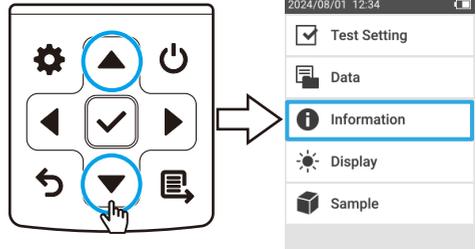
Display the impact count of the detector to check the replacement time of the tungsten-carbide ball and ball shaft.

1 Display the Information screen.

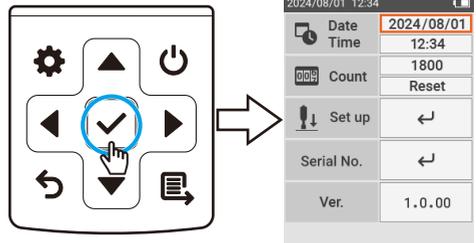
- 1 On the main screen, press the [MENU] key.
 - » The menu screen will be displayed.



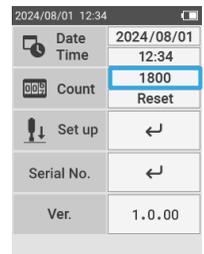
- 2 Press the [▲▼] keys to select [Information].



- 3 Press the [CHECK] key.
» The Information screen will be displayed.



- 2 Check the impact count.



Tips

- Clean the impact hammer inside the detector and the inside of the outer tube once per 1,000 to 2,000 impacts. For details, see [☰](#) "4.2 Cleaning the Detector" on page 160.
- Replace the tungsten-carbide ball and ball shaft attached to the impact hammer inside the detector with new ones once per approximately 5,000 impacts. For details, see [☰](#) "4.3 Replacing the Tungsten-Carbide Ball" on page 163.
- Clear the impact count when you replace the tungsten-carbide ball and the ball shaft. For details, see [☰](#) "3.10 Displaying/Resetting the Impact Count" on page 114.

4.2 Cleaning the Detector

Clean the impact hammer inside the detector and the inside of the outer tube once per 1,000 to 2,000 impacts.

NOTICE

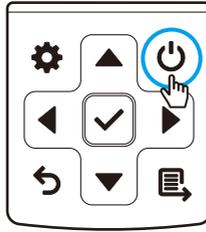
In some cases, the coating on this product may peel off, or its surfaces may become discolored.

When wiping off dirt, do not use benzine, thinner, or chemically processed cloths.

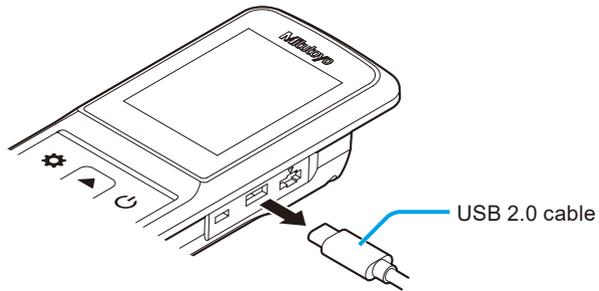
Tips

- As a maintenance cycle, clean once per 1,000 to 2,000 tests.
For how to check the impact count, see  "3.10 Displaying/Resetting the Impact Count" on page 114.
- In the event that the hardness numbers are low or they vary more than usual, cleaning the detector may solve the problem.
- For the appearance of the detector, see  "1.3 Explanation of Each Part" on page 34.

- 1 Press and hold the [ON/OFF] key to turn off the power.

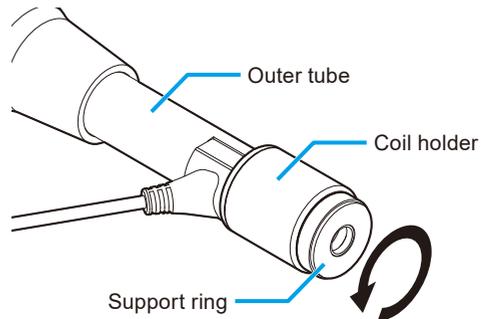


- 2 When the AC adapter has been connected, remove the USB 2.0 cable from the display unit.



- 3 Remove the impact hammer from the outer tube of the detector.

- 1 While holding the coil holder, rotate the support ring counterclockwise to remove it.

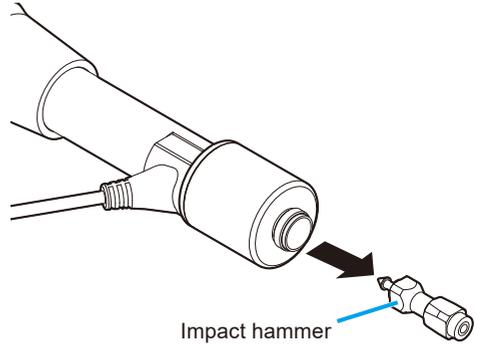


NOTICE

Do not hold the outer tube while rotating the support ring. Failure to do so may damage the detector.

4 Maintenance

- 2 Remove the impact hammer from the outer tube.



4

4 Clean.

- 1 Use a dry cloth to remove any dirt or dust adhering to the impact hammer.
- 2 Use a cotton swab to clean the inside of the outer tube.

NOTICE

While slowly inserting a cotton swab into the outer tube, clean to the point just short of where the swab would make contact with the internal spring.

5 Assemble the detector.

- 1 Insert the clean impact hammer into the outer tube.
- 2 Attach the support ring to the detector.

NOTICE

Do not apply oil or other lubricants to the impact hammer.

Because oils impair the sliding motion, it may become impossible not only to obtain accurate test results, but also to perform tests at all.

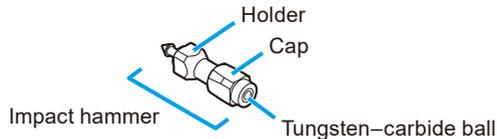
If oil or other lubricants have been accidentally applied to the impact hammer, clean the entire hammer by using a cloth moistened with alcohol.

4.3 Replacing the Tungsten–Carbide Ball

The tungsten–carbide ball attached to the impact hammer directly strikes the sample and receives the ensuing impact. Therefore, its surface will gradually wear down from a sphere to a flattened shape. After it has been used a predetermined number of times, it must be replaced with a new one.

Tips

- The benchmark for replacing the tungsten–carbide ball is once per 5,000 impacts. Continuing to use the product without replacing the ball causes errors in accuracy, such as increases or variations in the hardness numbers of the reference block.
- For how to check the impact count, see  "• Checking the impact count" on page 158 in "4.1 Daily Inspection".
- The impact hammer consists of a holder and a cap that are connected with a screw and the tungsten–carbide ball that is incorporated inside them.



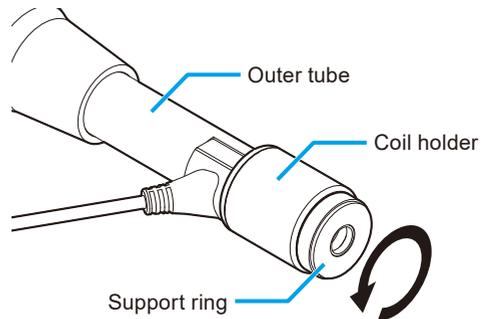
■ Replacement procedure (for D-, DC-, and D+15-type detectors)

This section explains the procedure for disconnecting the screw caps by using the supplied handles (standard accessory) and replacing the ball inside with a new one.

For information about purchasing replacement tungsten–carbide balls, see  "6 Specifications" on page 191.

1 Remove the impact hammer from the outer tube of the detector.

- 1 While holding the coil holder, rotate the support ring counterclockwise to remove it.

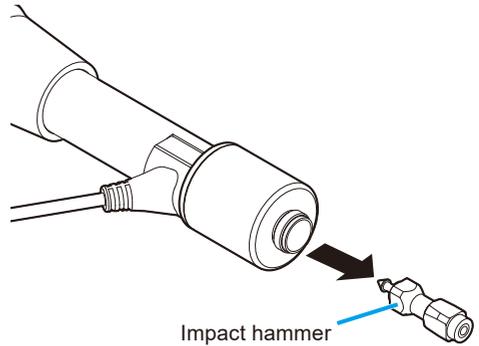


NOTICE

Do not hold the outer tube while rotating the support ring. Failure to do so may damage the detector.

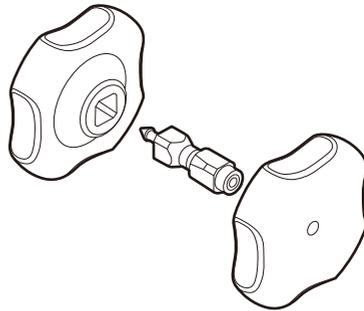
4 Maintenance

- 2 Remove the impact hammer from the outer tube.



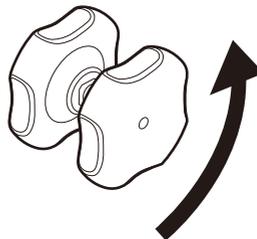
Impact hammer

- 2 Attach the handles to both ends of the impact hammer.



- 3 Rotate one handle counterclockwise to loosen the screw and then remove the screw caps.

- » The impact hammer separates into two parts.



- 4 Replace the ball inside with a new one.

NOTICE

The ball will be inside one of the screw caps. The ball is very small. Be careful not to lose it.

- 5 Attach the two screw caps and rotate them clockwise until they are lightly tightened.
- 6 Tighten the screw caps completely while holding the two handles with your thumbs and index fingers.
- 7 Remove the handles and use your hands to check that the impact hammer is not loose.
- 8 Insert the impact hammer from its pointed end into the outer tube.
- 9 To adapt the tungsten–carbide ball to the impact hammer, repeatedly perform hardness tests approximately 20 times on a sufficiently-hard sample such as a piece of metal.

For details about the test procedure, see  "2.4 Performing a Hardness Test" on page 67.

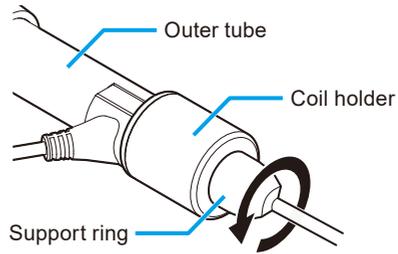
Tips

In the event that the test result values vary, repeat Step **6** to **9**.

■ Replacement procedure (for DL-type detectors)

1 Remove the impact hammer from the outer tube of the detector.

- 1 While holding the coil holder, rotate the support ring counterclockwise to remove it.

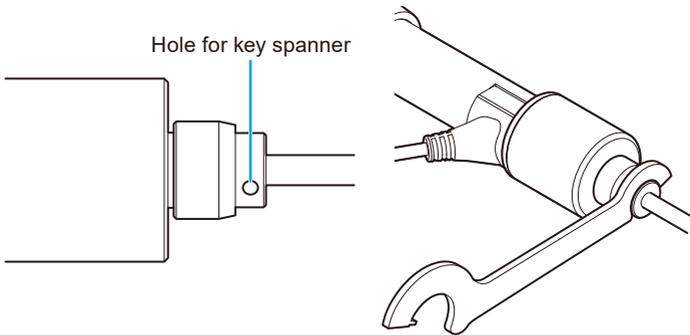


NOTICE

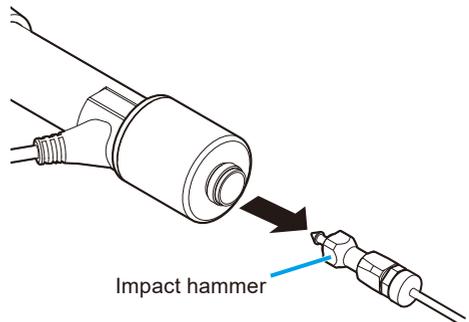
Do not hold the outer tube while rotating the support ring. Failure to do so may damage the detector.

Tips

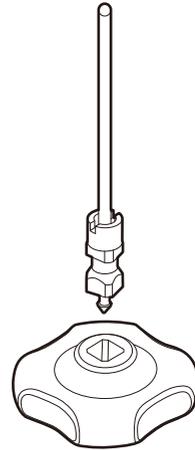
If it is difficult to rotate the support ring by hand, use the key spanner to loosen prior to removal.



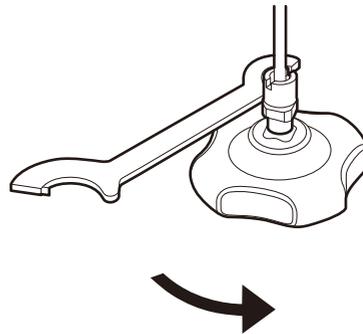
- 2 Remove the impact hammer from the outer tube.



- 2** Attach a handle to the pointed end of the impact hammer.



- 3** Hook the supplied key spanner (standard accessory only for DL-type detectors) onto the notched part on the other side of the impact hammer and then rotate it counterclockwise to loosen the screw and remove the screw cap.



- 4** Replace the ball shaft with a new one.
- 5** Attach the screw cap and then tighten it by using the key spanner to rotate it clockwise.
- 6** Remove the handle and use your hands to check that the screw cap is not loose.
- 7** Insert the impact hammer from its pointed end into the outer tube.

- 8** To adapt the tungsten–carbide ball to the impact hammer, repeatedly perform hardness tests approximately 20 times on a sufficiently-hard sample such as a piece of metal or a granite surface plate.

For details about the test procedure, see  "2.4 Performing a Hardness Test" on page 67.

Tips

In the event that the test result values vary, repeat Step **5** to **8**.

4.4 Checking the Sample

The material, temperature, thickness, mass, surface finish, and magnetic fields of the sample affect the test results.

To obtain accurate and consistent test results, check the following before testing.

■ Material

Samples made of common metals, such as steel, cast steel, cast iron, copper–zinc alloy, etc. can be tested.

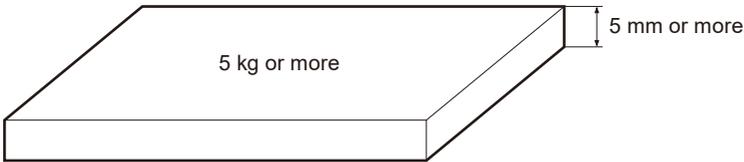
Tips

- High polymer samples with characteristics similar to metal can also be tested.
- This product is a tester that determines hardnesses based on the rebound speed produced by a mild impact. Samples made of a material with elastic properties like rubber cannot be tested.

■ Thickness and mass

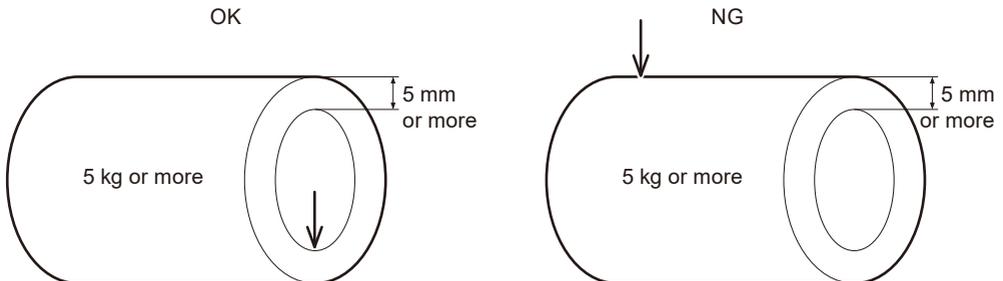
● Sample requirements

Samples with a thickness of 5 mm or more and a mass of 5 kg or more can be tested.



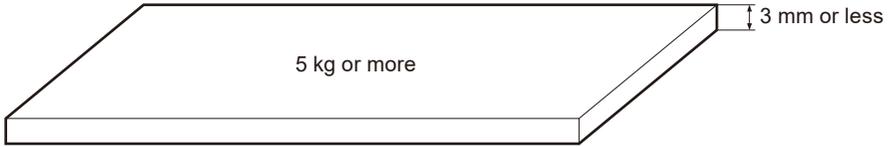
Tips

- This product is a tester that determines hardnesses based on the rebound speed produced by a mild impact. Testing a thin sample may produce inconsistent test results.
- Samples that meet the thickness and mass requirements but that are hollow or warped may produce inconsistent test results due to rebound-force absorption or dispersion. For samples like the one shown in the following figure, perform testing on the inside of the pipe.



● **If the sample does not meet the thickness requirements**

Firmly fix the sample to a rigid base before testing.



4

Maintenance

1 Check the rigidity of the rigid base and the condition of its contact surface with the sample.

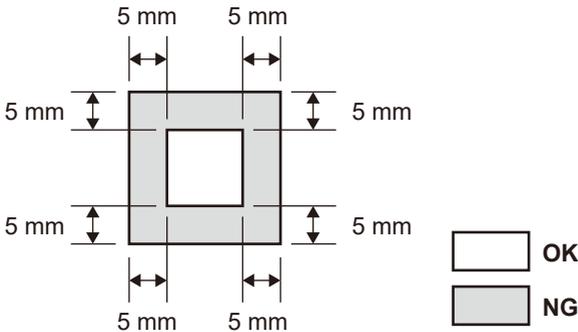
Tips

- In cases where a sample is fixed to a rigid base when tested, the test results may vary greatly due to the rigidity of the base. In such cases, check the rigidity of the rigid base.
- Using a different rigid base for each test will result in measurement errors. Perform all tests under the same conditions.

2 Firmly fix the sample to the rigid base before testing.

IMPORTANT

- Test points must be approximately 5 mm or more inwards from the edge of the sample.



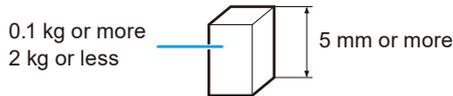
- Test points must be 3 mm or more apart from each other. Testing the same point repeatedly will produce higher hardness numbers.

Tips

The sample can be tested if there are no gaps between the contact surface of the rigid base and the contact surface of the sample.

- **If the sample does not meet the mass requirements**

Apply coupling paste or a metal adhesive to the sample to firmly fix it to the rigid base before performing the test.



- 1 Check the rigidity of the rigid base and the condition of its contact surface with the sample.**

Tips

- In cases where a sample is fixed to a rigid base when tested, the test results may vary greatly due to the rigidity of the base. In such cases, check the rigidity of the rigid base.
- Using a different rigid base for each test will result in measurement errors. Perform all tests under the same conditions.

- 2 Apply coupling paste or a metal adhesive to the sample.**



Do not apply coupling paste or the metal adhesive in a thick layer. Doing so will increase the amount of energy lost and cause a measurement error.

Tips

- Recommended adhesive: Oil compound KS64 or HIVAC-G (manufactured by Shin-Etsu Silicone).
- Using a different type of adhesive for each test will result in measurement errors. Perform all tests under the same conditions.

- 3 Firmly fix the sample to the rigid base before testing.**

■ **Samples with curved surfaces**

The following shows the requirements for the radius of curvature of the test surface.

● **D-type detector (standard accessory) and DC-type detector (optional accessory)**

The requirements in the following table apply to both concave and convex surfaces.

Radius of curvature (mm)	Type of support ring to be used	Remarks
$20 \leq R < 50$	Support ring (small)	13 mm outer diameter
$50 \leq R$	Support ring	20 mm outer diameter

Tips

- If the radius of curvature is smaller than 20 mm, use the applicable support ring (optional accessory).
For details, see  "6.3 Optional Accessories" on page 195.
- The D+15- and DL-type detectors (optional accessories) are for testing the hardness of narrow spaces like gaps and grooves. They cannot be used to test curved surfaces.

■ **Surface finish**

The surface finish of the sample will affect the test results.

In order to obtain reliable data, be sure that the surface finish is as follows.

- The surface roughness (Ra) of the sample must be 2 µm or less.
(This is equivalent to the state obtained by polishing the surface with a piece of commercially available sandpaper of P320 grade or higher.)
- We recommend filing or mechanically grinding the test surface as much as possible before polishing it.
- Completely remove paint, rust, scratches, and coating from the test surface before testing.

■ **Magnetized samples**

The magnetic flux density of the sample must be 0.4 mT or less.

An electromagnetic coil is employed in the impact hammer speed detection mechanism of this product. Therefore, magnetized samples will affect the test results.

4.5 Replacing the Detector

This product has an automatic gain adjustment function that is enabled while a detector is connected. No adjustments are needed in cases where the detector has been replaced.

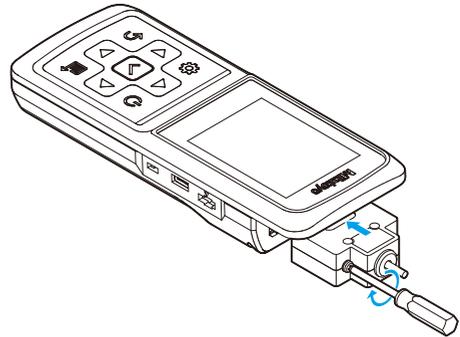
4.5.1 Connecting the Detector and the Display Unit

IMPORTANT

The procedure must be performed under the following conditions.

- Power to the product has been turned off.
- The USB 2.0 cable has been disconnected.

- 1** Insert the connector (detector) into the connector (display unit).
- 2** Tighten the two screws attached to the connector (detector) by using the supplied screwdriver.



4.6 Replacing the Internal Battery

This section explains the procedure for replacing the internal battery.

Prepare a new replacement internal battery (part No. 12AAZ222).

NOTICE

There is a risk of the product malfunctioning or being damaged.

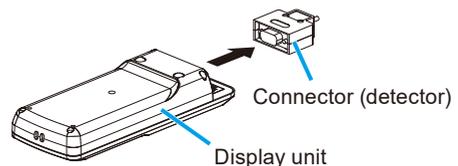
- Before replacing the internal battery, read the replacement procedure thoroughly. During work, take sufficient caution not to damage the printed circuit board or cut the cables.
- Replace the internal battery in an environment where no dust, dirt, chips, or oil mist will enter the product. During work, the printed circuit board of the product is temporarily uncovered. Dust, dirt, chips, or oil mist adhering to the printed circuit board may cause the product to malfunction.
- Perform replacement on top of a flexible surface such as a soft cloth. Placing this product directly on a hard surface may damage the display unit.
- Remove only the screws located in the designated areas. Removing screws that are located in undesignated areas may cause injuries or malfunctions. Also, be careful not to drop parts such as screws into the inside of the display unit. Failure to do so may cause malfunctions.
- Be careful not to touch your hand to the lugs on the printed circuit board. Touching the lugs may cause injuries. Moreover, malfunctions may occur.
- Before replacement, discharge any static electricity from your body by touching your hand to a metal object. Because the internal printed circuit board consists of components that are extremely vulnerable to static electricity, it may break due to exposure to the static electricity that builds up in human bodies. Additionally, do not touch your hand to any areas other than those necessary for operation of this product. If you touch an area that is unnecessary for operation, malfunctions may occur.

1 When the AC adapter has been connected, remove the USB 2.0 cable from the display unit.

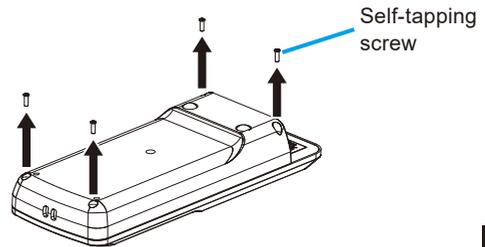
2 Turn off the internal battery switch.

For details, see  "2.3.1 Turning the Internal Battery Switch On/Off" on page 51.

3 Remove the connector (detector) from the display unit.

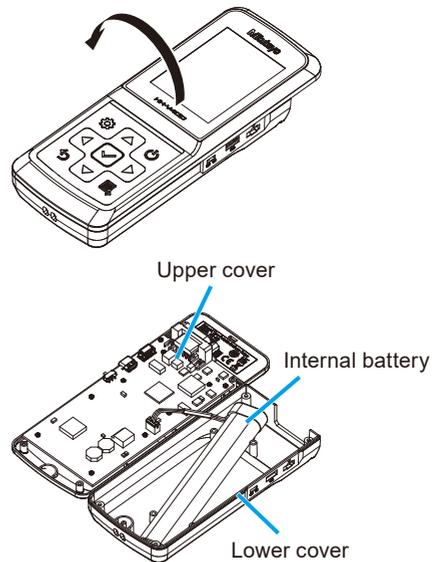


- 4** Remove the four self-tapping screws on the display unit by using a Phillips #0 or #1 screwdriver (with a shaft diameter of 3.5 mm or less).

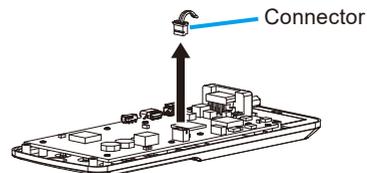


- 5** Remove the upper cover of the display unit.

Hold the display unit with its front face oriented upwards and then open the cover by turning it over in the direction indicated by the arrow.

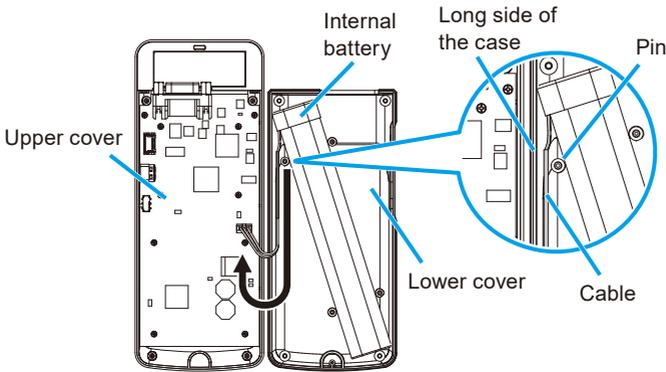


- 6** Remove the connector of the internal battery.



7 Attach the new internal battery.

- 1 Route the cable of the internal battery as shown in the figure.



Tips

The cable is wrapped in a shrinkable tube.

- 2 Insert the connector with the cable already routed.

NOTICE

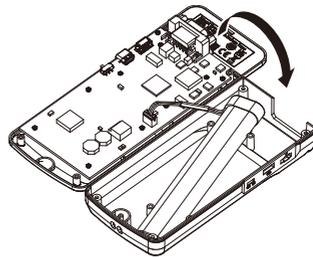
There is a risk that this product may not operate properly.

Firmly insert the connector while taking care regarding its orientation.

If the connector is not correctly and firmly inserted, this product may not operate properly.

8 Attach the upper cover.

Attach the upper cover by turning it over in the direction indicated by the arrow.



NOTICE

There is a risk of damaging the cable or the display unit.

When attaching the upper cover to the lower cover, be careful not to pinch the cable between the covers or in the printed circuit board. Pinching the cable may sever it or damage the display unit.

- 9 Tighten and secure the four self-tapping screws on the display unit by using a Phillips #0 or #1 screwdriver (with a shaft diameter of 3.5 mm or less).**

NOTICE

There is a risk of damaging the display unit.

When tightening the screws, do not tighten them to a torque exceeding 29.4 N·cm (3 kgf/cm²). There is a risk of damaging the display unit.

- 10 Attach the detector to the display unit.**

For details, see  "4.5.1 Connecting the Detector and the Display Unit" on page 173.

- 11 Turn on the internal battery switch.**

For details, see  "2.3.1 Turning the Internal Battery Switch On/Off" on page 51.

- 12 Connect the USB 2.0 cable to the display unit to supply the power.**

For details, see  "2.3.3 Charging the Internal Battery" on page 56.

MEMO

4

Maintenance

5 Troubleshooting

Refer to this chapter to diagnose the cause of your problem from the symptoms being manifested and to find a solution. If this does not remedy the problem, please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office (☎ "SERVICE NETWORK" on page App-1).

● The device does not start normally

- The power does not turn on. Nothing appears on the display.

Cause / Conditions	Solution
Battery power is low () or battery power is at 0% of its capacity ().	Charge the battery. See ☎ "2.3.3 Charging the Internal Battery" on page 56.
Malfunction of the display unit.	Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See ☎ "SERVICE NETWORK" on page App-1.

● Charging cannot be performed normally

- The charging icon () is not displayed on the status bar.

Cause / Conditions	Solution
The battery power is at its full capacity ().	Charge the battery once the battery power has dropped by one level ().
An AC adapter other than the AC adapter supplied with this product has been used.	Use the supplied AC adapter.
The battery was charged in a high-temperature environment.	Recharge the battery once the temperature of the surroundings and the sample are within 5 °C to 40 °C. If the battery temperature rises to a certain temperature, charging may be interrupted to prevent an accident or a malfunction from occurring.

- On the charging-state display screen, the charging icon changes from charging () → battery power level display () → charging () every few seconds.

Cause / Conditions	Solution
Power is not being properly supplied from the USB power source.	Connect this product to an external power source. See ☎ "2.3.3 Charging the Internal Battery" on page 56.

5 Troubleshooting

- A charging-error icon () is displayed.

Cause / Conditions	Solution
The internal battery switch is off.	Turn on the internal battery switch. See  "2.3.1 Turning the Internal Battery Switch On/Off" on page 51.
When the internal battery was replaced, the connector was not fully inserted.	Firmly insert the connector of the internal battery. See  "4.6 Replacing the Internal Battery" on page 174.
The internal battery has degraded.	Replace the internal battery. See  "4.6 Replacing the Internal Battery" on page 174.

● Unable to perform a test

- Unable to set the impact hammer in preparation for a test.

Cause / Conditions	Solution
The impact hammer has been inserted into the outer tube with its orientation reversed.	Check the insertion orientation of the impact hammer and set it again. See  "2.2.1 Preparing the Detector (Impact Hammer Set)" on page 48.
The impact catch part inside the detector is defective.	Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See  "SERVICE NETWORK" on page App-1.
The impact hammer has been lost.	Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See  "SERVICE NETWORK" on page App-1.
The impact hammer has been damaged.	Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See  "SERVICE NETWORK" on page App-1.

- The hardness number does not change after a test (the number is not updated).

Cause / Conditions	Solution
The connector (detector) has come loose.	Perform the following operations. <ol style="list-style-type: none"> 1 Press and hold the [ON/OFF] key to turn off the power and then remove the detector temporarily. 2 Connect the connector (detector) to the display unit again and then screw it tightly. 3 Press and hold the [ON/OFF] key to turn on the power.

Cause / Conditions	Solution
Battery power is low ().	Charge the battery. See  "2.3.3 Charging the Internal Battery" on page 56.

- A test does not start after the push button is pressed.

Cause / Conditions	Solution
The impact hammer is still in the hold state and has not been released.	Please make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See  "SERVICE NETWORK" on page App-1.

- [ResultErr] is displayed when testing a sample.

Cause / Conditions	Solution
The material table has been set incorrectly.	<ul style="list-style-type: none"> • Change the material table (for a hard sample, [A-1]; for a flexible sample, [B-1]) and then redo the test. See  "2.4.1 Selecting the Material Table" on page 67. • Check the material of the sample and change the material table.

● The hardness numbers are abnormal or inconsistent

There are many conceivable causes, but the following ones are representative.

Cause / Conditions	Solution
The support ring attached to the detector is loose.	Screw the support ring tightly to secure it.
The support ring surface is not in close contact with the sample surface during the test (is not pressed firmly against it).	Press the detector firmly against the sample surface. See  "2.4 Performing a Hardness Test" on page 67.
The sample is unstable or moves during the test.	Firmly secure the sample. See  "4.4 Checking the Sample" on page 169.
The sample is too thin.	Use a sample that is at least 5 mm thick. See  "4.4 Checking the Sample" on page 169.
The sample is too light.	Use a sample that has a mass of 5 kg or more. See  "4.4 Checking the Sample" on page 169.
The sample surface is rough (scratched or coated).	Polish the sample surface. See  "4.4 Checking the Sample" on page 169.

5 Troubleshooting

Cause / Conditions	Solution
The sample material is not uniform.	Use a different hardness testing method to attempt a test. (Example: The Rockwell hardness test or the Vickers hardness test)
The sample material does not match the material table.	Check the material table. See  "2.4.1 Selecting the Material Table" on page 67.

- A Leeb hardness number fell outside the allowable range.

Cause / Conditions	Solution
<p>In cases where the output hardness number is too small:</p> <ul style="list-style-type: none"> • The sample is too thin or the material is too flexible. • The inside of the outer tube of the detector or the impact hammer is dirty. • An offset value has been set. 	<p>Perform the following operations.</p> <ol style="list-style-type: none"> 1 Check the sample material. See  "2.4.1 Selecting the Material Table" on page 67. 2 Check the thickness and mass of the sample. (The mass is to be 5 kg or more and the thickness is to be at least 5 mm.) See  "4.4 Checking the Sample" on page 169. 3 Clean the detector. See  "4.2 Cleaning the Detector" on page 160. 4 Check the offset value and set it to zero. See  "3.4 Setting the Offset Value" on page 88.
<p>In cases where the output hardness number is too large:</p> <ul style="list-style-type: none"> • The tungsten–carbide ball or ball shaft incorporated into the impact hammer has worn out. (The impact count has exceeded 5,000.) • An offset value has been set. 	<p>Perform the following operations.</p> <ol style="list-style-type: none"> 1 Check the sample material. See  "2.4.1 Selecting the Material Table" on page 67. 2 Replace the tungsten–carbide ball. See  "4.3 Replacing the Tungsten–Carbide Ball" on page 163. 3 Check the offset value and set it to zero. See  "3.4 Setting the Offset Value" on page 88.

- A hardness number of a test scale other than Leeb hardness fell outside the allowable range.

Perform the following operations to check the Leeb hardness number.

- 1 Change the test scale to Leeb hardness.
- 2 Use a hardness reference block to perform a test, and then check the Leeb hardness number.
- 3 If the hardness number has fallen outside the allowable range, perform the operations described for the above "A Leeb hardness number fell outside the allowable range." scenario.

Tips

When an offset value has been set, we recommend leaving a comment in the test result as a record of adding the offset value.

For details, see  "3.4 Setting the Offset Value" on page 88.

- The hardness number in the converted test scale does not match (for example HRC).

Cause / Conditions	Solution
—	<p>Test results other than HLD values are converted data, so they are only to be used as reference values.</p> <p>If there is a hardness tester available for comparison, we recommend comparing the test results to determine the rule before using this product.</p>

● Problems when using an AC adapter

- Power to the product suddenly terminates.

Cause / Conditions	Solution
The power plug of the AC adapter is loose or disconnected.	Firmly connect the power plug of the AC adapter. See  "2.3.3 Charging the Internal Battery" on page 56.
A momentary or brief power failure has occurred.	Check the power supply. If power is being supplied from a power strip, connect the product to a dedicated power supply. See  "2.3.3 Charging the Internal Battery" on page 56.
The USB 2.0 cable is poorly connected.	Correctly connect the USB 2.0 cable. See  "2.3.3 Charging the Internal Battery" on page 56.

5.1 Error Display List

If the problem persists or shows no signs of improvement, please contact the agent where you purchased the product or a Mitutoyo sales office (☰ "SERVICE NETWORK" on page App-1).

- E001: DetectorErr
- E002: DisplayErr

Cause	Solution
A malfunction in the detector, or a defect in the display unit internal data.	If the error indication repeatedly appears after turning on the power, please record the displayed error information and then make a request for repair to the agent where you purchased the product or a Mitutoyo sales office. See ☰ "SERVICE NETWORK" on page App-1.

- E003: No Connect

Cause	Solution
The detector is not connected or the connector is connected poorly.	<ul style="list-style-type: none"> • Perform the following operations. <ol style="list-style-type: none"> 1 Press and hold the [ON/OFF] key to turn off the power and then remove the detector temporarily. 2 Connect the connector (detector) to the display unit again and then screw it tightly. 3 Press and hold the [ON/OFF] key to turn on the power. • If the error indication repeatedly appears after turning on the power, please make a request for repair to the agent where you purchased the product or to a Mitutoyo sales office. See ☰ "SERVICE NETWORK" on page App-1.

• E004: ResultErr

Cause	Solution
<ul style="list-style-type: none"> • Out of the readable range of the test scale • Incorrect setting of the material table • Miscellaneous 	<ul style="list-style-type: none"> • Change the test scale to a different one and then perform testing. • Check the material of the sample and change the material table. Select the material table appropriate for the material (for hard items, [A-1]; for flexible items, [B-1]) and then redo the test. See  "2.4.1 Selecting the Material Table" on page 67. • Perform a check by testing a hardness reference block that does not result in the output of an error, or by changing the offset setting. In cases where it is possible to repeatedly obtain equivalent test results, the problem is not in the tester itself, but in the testing conditions at the time the error occurred. • If the error indication persists even when the above measures have been implemented, please contact the agent where you purchased the product or a Mitutoyo sales office. See  "SERVICE NETWORK" on page App-1.

• E005: OutputErr

Cause	Solution
The external output function has been set to off.	Enable the external output function.
The power supply to the external output device is off.	Turn on the power supply to the external output device.
The external output device is offline.	Bring the external output device online.
<p>The connector is connected poorly.</p> <p>The connection cable is disconnected.</p>	Connect the connector correctly.

5 Troubleshooting

- E006: Low Battery

Cause	Solution
The battery is empty.	<ul style="list-style-type: none"> Charge the battery. See  "2.3.3 Charging the Internal Battery" on page 56. The internal battery is approaching the end of its service life. Replace the internal battery with a new one (part No. 12AAZ222). See  "4.6 Replacing the Internal Battery" on page 174.

- E007: FULL

Cause	Solution
<ul style="list-style-type: none"> The test data has exceeded the memory storage capacity. The statistical calculation results have exceeded the memory storage capacity. 	Delete the test data stored in the memory.

- E008: Unmatch

Cause	Solution
The detector that is connected is different from the type of detector used at the time of sample registration.	Either register a new sample or change the detector to the one used at the time of sample registration.
The type of detector that is connected is different from the one used for the previous testing.	If there are no problems with the detector, press the [CHECK] key to use it.

- E009: Out of range

Cause	Solution
<ul style="list-style-type: none"> One of the limit values that have been set for acceptance judgments is out of the input range. The offset value is out of the input range. 	Input a number that falls within the input range. See  "3.16.1 Sample Registration" on page 127.

5.2 Q&A

If your questions remain unresolved, contact Mitutoyo.

● Setup

Q	A
I do not know how to orient the impact hammer when inserting it into the outer tube.	Insert the sharp end of the impact hammer into the outer tube. The sharp end is called the "pointed end". This part will be secured.
I do not know how to set the impact hammer.	Slide the grip towards the coil holder until you hear a click. The impact hammer inside the coil holder is now set.

● Operation

Q	A
I got confused partway through an operation.	Press the [BACK] key to return to the main screen and then retry the operation. Tips If the screen does not return to the main screen after pressing the [BACK] key, press and hold the [ON/OFF] key to turn off the power and then press and hold the [ON/OFF] key again to turn on the power.
The power does not turn off even after I press the [ON/OFF] key on the display unit (the display is still on).	Press and hold the [ON/OFF] key for approximately 2 seconds.

● Testing accuracy

Q	A
I want to distinguish between 25HRC and 30HRC.	Converted data cannot be distinguished due to insufficient resolution.

● Sample

Q	A
I want to test a sample other than metal.	This product is a hardness tester for metal. It cannot test the hardness of nonmetallic materials such as resins (plastics or rubbers).
Indents form on the part of sample where pressure was applied.	When you press the push button of the detector, the chucked impact hammer is ejected and collides with the sample. The indent is made by the impact. After the collision, you will hear the sound of the impact hammer springing for a brief moment.
How large an indent will be left on the sample by the test?	It varies depending on the hardness of the sample. A spherical indent of approximately 2 mm at maximum is created.
The metal material to be tested is not listed in the material table.	Select the material table with the broadest conversion range (for hard items, [A-1]; for flexible items, [B-1]). See  "2.4.1 Selecting the Material Table" on page 67.
Can materials that are not listed in the material tables for this product be tested?	Testing is possible. Select a material that has similar qualities to the sample.
I want to test FC200 (cast iron) after machining its casting surface.	If the material has a surface roughness of Ra 2 µm or less, which is a requirement for machining casting surfaces, it can be tested.

● Posture and shape of the sample

Q	A
I want to test horizontally as well as vertically.	All test angles are corrected with the automatic angle-correcting function.
I want to test a sample with a cylindrical or spherical surface.	Use the support rings for testing cylindrical surfaces (optional accessories) or the support rings for testing spherical surfaces (optional accessories). See  "6.3 Optional Accessories" on page 195.
I want to test the hardness of the surface of a steel pipe.	<p>The following conditions must be checked or satisfied.</p> <ul style="list-style-type: none"> – Thickness and mass – Cylindrical surface R – Surface roughness: Ra 2 μm or less <p>Confirm that the support rings for cylinders (optional accessories) are useable before performing a test. See  "6.3 Optional Accessories" on page 195.</p>
I want to test a thin sample.	<p>Place the sample on a sturdy base, such as a granite surface plate, and perform a test with the sample firmly in contact with the base. Because the testing method measures the rebound, the sample must be at least 5 mm thick and have a mass of 5 kg or more.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Tips</p> <p>If you test a thin, warped, or unstable sample, the sample may move or vibrate. As a result, the rebound force may be absorbed or dispersed, and you will not obtain correct hardness values.</p> </div>

● Maintenance and calibration requests

- For details about daily maintenance and checking, see  "4.1 Daily Inspection" on page 158 first.
- If your product is in need of calibration, inspection, or repair, please contact the agent where you purchased the product or a Mitutoyo sales office ( "SERVICE NETWORK" on page App-1). Note that the calibration method to be used is Mitutoyo's own method.

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6 Specifications

The following information is provided in this part.

6.1 Main Specifications

Item	Specification
Model number	HH-V400
Testing hardness and range	Leeb hardness: 100.0 HLD to 999.9HLD
Testing accuracy	±12HLD (830HLD ± 1.5%) *The accuracy is applicable to tests performed with a commercially-available reference block firmly attached to the granite surface plate and the detector facing downward.
Conversion function *It varies depending on the selected material.	Vickers hardness : 43 HV to 950 HV Brinell hardness : 20 HB to 655 HB Rockwell hardness (C-scale) : 19.3 HRC to 68.2 HRC Rockwell hardness (B-scale) : 13.5 HRB to 101.7 HRB Shore hardness (HS (ASTM)) : 30.1 HS to 99.5 HS Shore hardness (VHS (JIS)) : 13.2 HS to 98.6 HS Tensile strength : 390 MPa to 1999 MPa
Configuration	Separate detector and display unit type
Detector	A tungsten-carbide ball is used in the tip of the impact hammer. The tungsten-carbide ball should be replaced approximately once per 5,000 impacts.
Display	2.8" (320 × 240) RGB
Functions	Impact angle: Based on the automatic angle-correcting function (can be oriented at any angle) Offset function Acceptance judgment function Data memory storage: 1,800 values, data deletion function Conversion function: HV, HB, HRC, HRB, HS (ASTM), VHS (JIS), MPa Statistics function (average, maximum value, minimum value, variance, standard deviation) Eco mode settings Auto power-off function settings (settable to 1 to 60 minutes in 1 minute intervals) Automatic gain adjustment function for when the detector is connected Backlight settings Sample condition settings (selection, deselection, registration, clearing, editing)

6 Specifications

Item	Specification
Sample conditions	<p>The sample must be at least 5 mm thick and have a mass of 5 kg or more. (However, samples with a mass from 0.1 to 5 kg can be tested if they are firmly secured to a rigid base.)</p> <p>Testing location: 5 mm or more from the edge of the sample with test points spaced at least 3 mm apart Sample surface roughness: Ra 2 µm or less</p> <p>If the above conditions cannot be satisfied, see  "4.4 Checking the Sample" on page 169.</p>
Output	USB and Digimatic interfaces (single or simultaneous outputs are possible)
Power supply	<p>AC adapter (switchable AC pins, USB-type) Input voltage: AC 100 V to 240 V ± 10% (50 Hz/60 Hz) Rated output: DC 5.0 V, 2.0 A</p> <p>Internal battery (Ni-MH) Supported USB standard: USB 2.0 (full speed) USB charging standard: BC 1.2</p> <p>The following ports are supported:</p> <ul style="list-style-type: none"> - SDP "SDP (Standard Downstream Port)" - CDP "CDP (Charging Downstream Port)" - DCP "DCP (Dedicated Charging Port)"
Power consumption	4 VA at maximum
Battery run time	8 straight hours (charges fully in 4 hours at the longest ^{*1})
Battery charging temperature	5 °C to 40 °C ^{*2}
Accuracy-guaranteed temperature range and humidity	23 ± 5 °C, 20% to 80%RH (no condensation)
Operation-guaranteed temperature range and humidity	5 °C to 40 °C, 20% to 80%RH (no condensation)
Storage temperature and humidity	-10 °C to 50 °C, 5% to 90%RH (no condensation)
External dimensions	<p>Display unit: 174 × 68 × 32 mm D-type detector: ø28 × 175 mm (excluding cable)</p>
Mass	400 g (display unit: approximately 250 g, D-type detector: approximately 150 g)

Item	Specification
CE marking / UKCA marking	EMC Directive / Electromagnetic Compatibility Regulations: EN IEC 61326-1 Immunity test requirement: Clause 6.2 Table 2 Emission limit: Class A Machinery Directive / Supply of Machinery (Safety) Regulations: EN ISO 12100, EN60204-1 RoHS Directive / Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations: EN IEC 63000

*1: Charging time when the supplied AC adapter is used. When charging via USB from a PC, it may take over 4 hours for the battery to charge fully.

*2: When the surrounding temperature is too high, the battery may not charge fully.

● Consumables list

Part No.	Name	Specifications, etc.	Quantity
19BAA457	Replacement tungsten-carbide ball	For D-, DC-, and D+15-type detectors Replacement tungsten-carbide ball used in the impact hammer Must be replaced approximately once per 5,000 impacts	1
19BAA458	Replacement ball shaft	For DL-type detectors Replacement ball shaft used in the impact hammer	1
11AAA842	Support ring	ø22 mm	1
11AAA857	Support ring (small)	ø14 mm	1
12AAZ222	Internal battery	For the display unit	1

Tips

Individual impact hammers are not available for purchase. When performing maintenance, confirm the type of detector before purchasing the replacement tungsten-carbide ball or ball shaft and performing replacement.

6.2 Standard Accessories

The following items are packaged in the same box as HH-V400 (standard configuration equipped with a D-type detector).

Part No.	Name	Remarks	Quantity
—	Display unit	—	1
—	D-type detector	—	1
—	Impact hammer	—	1
12BAS450	AC adapter	—	1
12BAS451	USB 2.0 cable	—	1
11PAA429	Storage box	—	1
11BAB687	Handle*	Ball-replacement tool	2
11AAA857	Support ring (small)*	ø14 mm	1
05CAA952	Phillips screwdriver*	Used for replacing the detector	1
99MBG537A	Instruction Manual*	English	1
99MBG538B	Quick Start Guide*	Japanese/English	1
—	EU Declaration of Conformity*	—	1
—	UK Declaration of Conformity*	—	1
—	Certificate of inspection*	—	1
—	Warranty (card)*	—	1

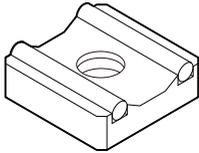
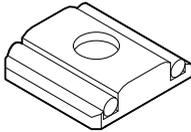
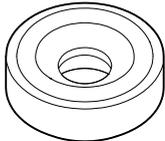
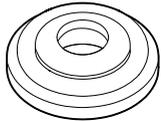
* Contained in the storage box when shipped.

6.3 Optional Accessories

Code No./ Part No.	Name	Specification
Printer with statistics function (printing of test data, various statistical calculations)		
264-505	Digimatic Mini-Processor DP-1VA LOGGER	For Japan: 100 V
264-505A		For North America: 120 V
264-505D		For Europe: 220 V
264-505E		For UK: 240 V
264-505DC		For China: 220 V
264-505K		For Korea: 220 V
09EAA082	Recording paper	For the DP-1VA LOGGER (10 rolls)
Input Tool		
264-020	USB Input Tool IT-020U	
Connection cable		
06AGL011	Straight standard type (1 m)	For connecting Digimatic Mini-Processor (DP-1VA LOGGER) and Input Tool (IT-020U)
06AGL021	Straight standard type (2 m)	
U-WAVE		
02AZD730G	U-WAVE-T (transmission unit)	IP67 type
02AZD880G		Buzzer type
02AZD810D	U-WAVE-R (reception unit)	
02AZG011	Connection cable for dedicated use with U-WAVE-T (160 mm)	For standard
Tungsten-carbide ball		
19BAA457	Tungsten-carbide ball (one piece)	For the D-, DC-, and D+15-type detectors
19BAA458	Replacement ball shaft (one piece)	For DL-type detectors
Detector		
11AAE902	HH-V400 D-type detector	Approximately $\varnothing 28$ mm \times 175 mm, approximately 120 g (tip diameter: $\varnothing 22$ mm)
11AAE903	HH-V400 DC-type detector	Approximately $\varnothing 22$ mm \times 85 mm, approximately 50 g (tip diameter: $\varnothing 22$ mm)
11AAE904	HH-V400 D+15-type detector	$\varnothing 28$ mm \times 190 mm, approximately 130 g (tip width: 11 mm)
11AAE905	HH-V400 DL-type detector	$\varnothing 28$ mm \times 230 mm, approximately 140 g (tip diameter: $\varnothing 4$ mm)

6 Specifications

● Support ring

Part No.	Name	Specification	Appearance
19BAA248	Support ring for convex cylinder surfaces (one piece)	Radius of the convex cylinder surface: R 10 mm to 20 mm	
19BAA249	Support ring for concave cylinder surfaces (one piece)	Radius of the concave cylinder surface: R 14 mm to 20 mm	
19BAA250	Support ring for convex sphere surfaces (one piece)	Radius of the convex sphere surface: R 10 mm to 27.5 mm	
19BAA251	Support ring for concave sphere surfaces (one piece)	Radius of the concave sphere surface: R 13.5 mm to 20 mm	

7 External Output Function

This product can output data via USB or SPC.

7.1 Data Output via USB

- USB2.0
- Data is output to a PC (terminal software/terminal emulator).

Tips

The terminal software and terminal emulator must be procured by the customer.

7.2 Data Output via SPC

The following output devices are supported.

- Digimatic Mini-Processor DP-1VA LOGGER (optional accessory)
- U-WAVE-T (optional accessory)
- USB Input Tool IT-020U (optional accessory)

Tips

- This product does not support Digimatic bidirectional communication.
- For information about using Digimatic devices, see the Instruction Manual supplied with each product.

■ Digimatic interface

1	2	3	4	5	6	7		
		8	8	8	.	8	HLD , HLD + 15 , HLDL	Units of 0.1
		7	0	1	.	5	HV	Units of 0.5
		6	6	6	.	5	HB	Units of 0.5
			6	5	.	2	HRC	Units of 0.1
			9	1	.	8	HRB	Units of 0.1
			7	5	.	9	VHS	Units of 0.1 Only the hardness number is output
			7	2	.	4	HS	Units of 0.1 The number of digits after the decimal separator is fixed at one.
	1	3	5	7	.	5	MP a	Units of 0.5 No units

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*As of May 2025

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Revision History

Date of publication	No. of revisions	Revision details
May 1, 2025	First edition	Printed

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20-1, Sakado 1-Chome, Takatsu-ku, Kawasaki-shi, Kanagawa 213-8533, Japan

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For the UK Regulation, Authorized representative and importer in the UK:

Mitutoyo (UK) Ltd.

Joule Road, West Point Business Park, Andover, Hampshire SP10 3UX, UNITED KINGDOM

Printed in Japan

No. 99MBG536A