Magnescale

Digital Indicator
LU20 (F)

Read all the instructions in the manual carefully before use and strictly follow them.
Be sure to keep this manual for future reference.

Operating Manual

Trademarks

Microsoft®, Microsoft® Windows®, and Microsoft® Office Excel® are registered trademarks of Microsoft Corporation.

Apple is a trademark of Apple Inc., registered in the U.S. and other countries and regions.

The iPhone trademark is used under license from AIPHONE CO., LTD.

App Store is a service mark of Apple Inc.

iOS is the name of an operating system developed by Apple Inc.

IOS is a trademark or registered trademark of Cisco in the U.S. and other countries and regions and is used under license.

Android, the Android logo, Google Play, and the Google Play logo are trademarks or registered trademarks of Google LLC.

microSD, the microSD logo, microSDHC, and the microSDHC logo are registered trademarks of SD-3C, LLC. in the U.S. and other countries.

The Bluetooth® word mark and logo are registered trademarks of Bluetooth SIG, Inc., and are used by Magnescale Co., Ltd. under license.

USB Type-A and USB Type-C are trademarks of USB Implementers Forum, Inc.

Other system names, product and service names described in this instruction manual are trademarks or registered trademarks of their corresponding manufacturers.

- ・In no event will Magnescale Co., Ltd. or its suppliers be liable to you for any consequential or inconsequential damages, including any lost profits or lost savings or any claims made by a third party arising out of use of the unit or the software supplied with the unit described in this manual.
- ・The specifications of this unit and the software supplied with this unit may be changed without prior notice.

Safety Precautions

Magnescale Co., Ltd. products are designed in full consideration of safety. However, improper handling during operation or installation is dangerous and may lead to fire, electric shock or other accidents resulting in serious injury or death. In addition, these actions may also worsen machine performance.

Therefore, be sure to observe the following safety precautions in order to prevent these types of accidents, and to read these "Safety Precautions" before operating, installing, maintaining, inspecting, repairing or otherwise working on this unit.

⚠ Warning

RISK OF FIRE

FORCE

Failing to follow the precaution items given below may lead to severe injury or death.

· Be sure to use our dedicated batteries supplied with the product or our dedicated accessory DZ60 (sold separately)

  In no event will Magnescale Co., Ltd. be liable to you for any accident or malfunction arising out of use of batteries other than the dedicated batteries.

· When charging the batteries, do not remove them from the LU20. Be sure to charge the batteries via the LU20 main unit.

· Be careful not to mistake the plus and minus when replacing the batteries.

· Do not drop or apply strong shocks to the product. This could result in a malfunction or battery trouble.

· Discontinue use of the product if there is any abnormality such as deformation, abnormal appearance, unusual odor, or heat generation.

· Avoid storage in the status with the batteries fully charged or completely discharged. When storing for a long time, charge the unit once every 2 or 3 months to avoid accidents due to over-discharge.

· Avoid use in an atmosphere charged with inflammable gases as this may result in fire.

⚠ CAUTION

CAUTION

Failing to follow the precaution items given below may lead to injury or damage to surrounding objects.

· Provide adequate safety measures to prevent damages in case our products should develop malfunctions.

· The accessory mounting stand uses a powerful magnet.

  Be careful as if electronic devices, magnetic recording media, or magnetic cards etc. are brought close to it, recorded contents may be destroyed or items may become magnetized, making them unusable.

Contents

1. Before use

1-1. General precautions

When using Magnescale Co., Ltd. products, observe the following general precautions along with those given specifically in this manual to ensure proper use of the products.

・ Before and during operations, be sure to check that our products function properly.
・ Provide adequate safety measures to prevent damages in case our products should develop malfunctions.
・ Use outside indicated specifications or purposes and modification of our products will void any warranty of the functions and performance as specified of our products.
・ When using our products in combination with other equipment, the functions and performances as noted in this manual may not be attained, depending on operating and environmental conditions.
・ Specifications and appearances of the products are subject to change for improvement without prior notice.

1-2. Handling precautions

・A USB charger is not included. A 10 W or more commercially available USB charger must be provided by the customer.
・This product is a wireless device, so it can be used only in countries where it is certified. Contact us if the product will be used outside the country of purchase.
・This product supports Bluetooth communication, but the Bluetooth function is set to OFF by default. When not using the Bluetooth function, leave it OFF.
・Check the frequencies used by surrounding devices before using the Bluetooth function. Communication may be affected if the frequencies are the same. The frequency band used by this product is used by industry, science, medical devices, factories, etc., and operated by private wireless stations and specified low-power wireless stations.
・The communication range with a connected Bluetooth device is approximately 20 m in clear line-of-sight, but will become shorter if there are obstacles or wireless interference.
・This product is equipped with lithium-ion rechargeable batteries. When transporting, be sure to observe the laws and regulations of each country and the transport company's instructions.
・This product is an industrial device and is not intended for general consumers. The user is responsible for disposal of this product and the batteries in accordance with laws and regulations.
・The batteries are consumables and the service life will vary according to the operating environment. The operating time from the fully charged status will gradually decrease with the number of charging times and the passage of time since the start of use. Replace the batteries when they become depleted due to prolonged use.

2. Outline

The LU20 is a digital indicator that can be used in combination with a DM series digital lever gauge (in development) or DS series digital gauge to display and save measurement data, make various settings, and communicate with a host device via Bluetooth or USB.

2-1. System configuration

Smartphone or tablet PC
iOS or Android

Computer

Bluetooth®

Bluetooth® or USB

LU20

DM10-01/DM10-02
(in development)

DS series
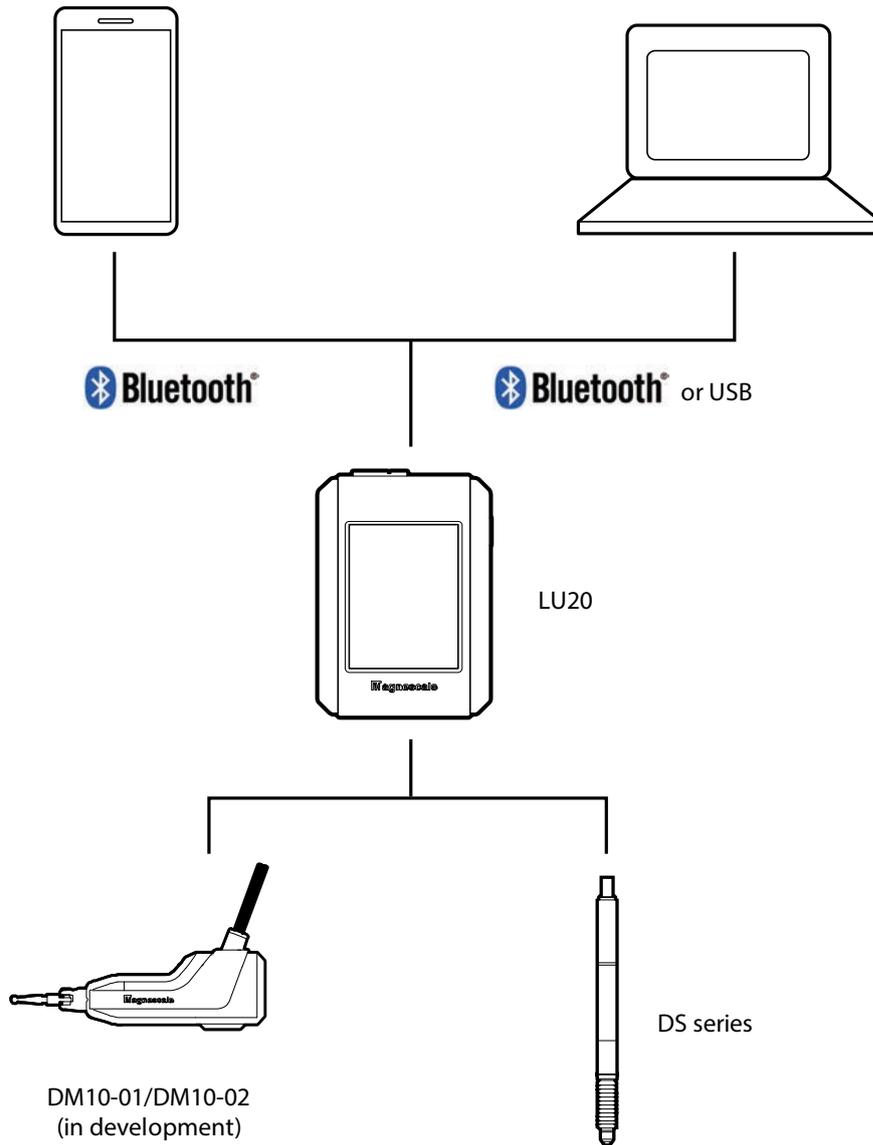
3. Name and function of each part

3-1. Name of each part

Connector for charging or
connecting a PC
(USB Type-C)

Measuring unit connector
(USB Type-A)

Battery cover

Power button

Operation screen

microSD card slot
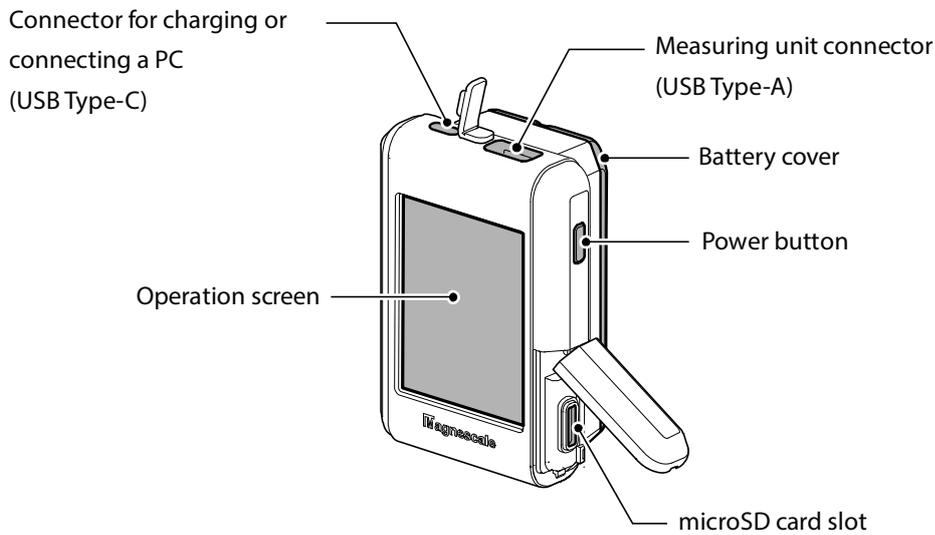
3-2. Charging

3-2-1. Open the rubber cover of the charging connector (USB Type-C).

3-2-2. Connect the USB cable (accessory) to the charging connector and to the USB charger.
Check that the charging indication appears on the operation screen.

  * A USB charger is not included. A 10 W or more commercially available USB charger
must be provided by the customer.

USB cable
(accesspry)

Rubber cover

USB Type-C
connector

Charging indicator

USB charger

🔋
100%
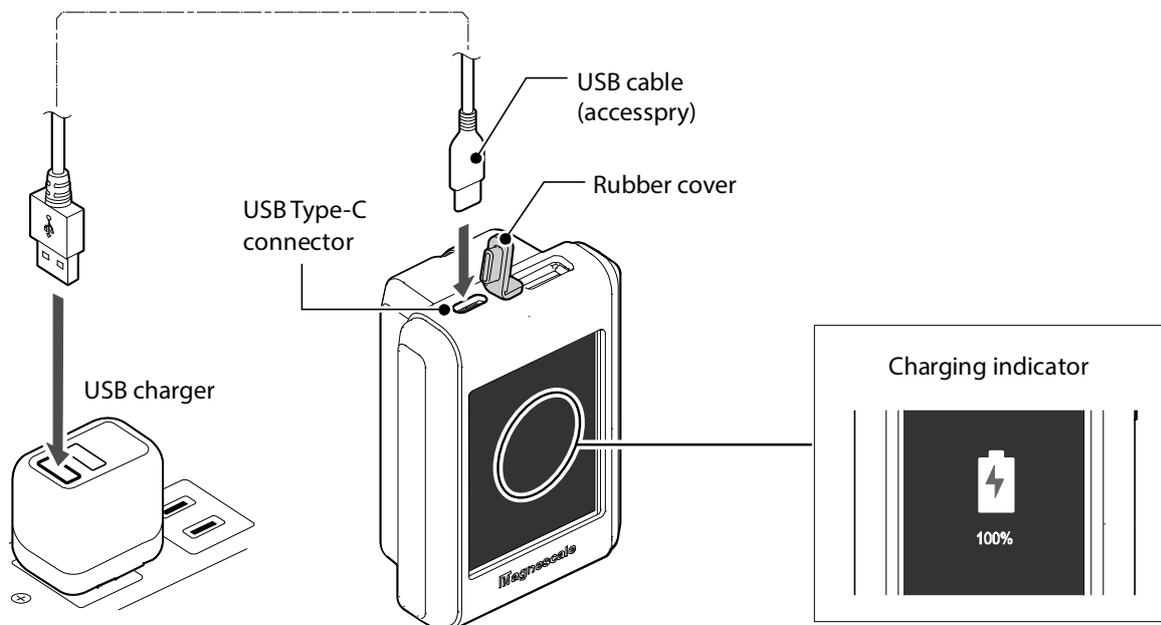
3-2-3.　After charging, firmly close the rubber cover.

Rubber cover

⚠ CAUTION
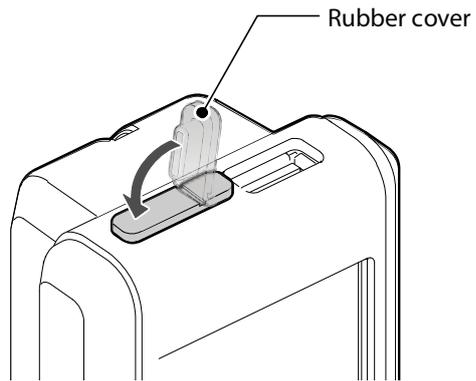
Do not apply excessive force when connecting and disconnecting the connector.

Reference
・Power can also be supplied from a commercially available USB charger (10 W or more) or a PC.
・The main unit also works while charging.

3-3.   Installation with the mounting stand

⚠ CAUTION

The accessory mounting stand uses a strong magnet.

Be careful as if electronic devices, magnetic recording media, or magnetic cards, etc. are brought close to it, recorded contents may be destroyed or items may become magnetized, making them unusable.

3-3-1.   Mount the mounting stand to the installation face.

When magnet fixing to the installation face is not possible, attach the mounting stand plate (accessory) to the installation face and install the mounting stand.

3-3-2.   Attach the main unit to the mounting stand.

Mounting stand

When magnet fixing is not possible

Mounting stand plate

Release paper
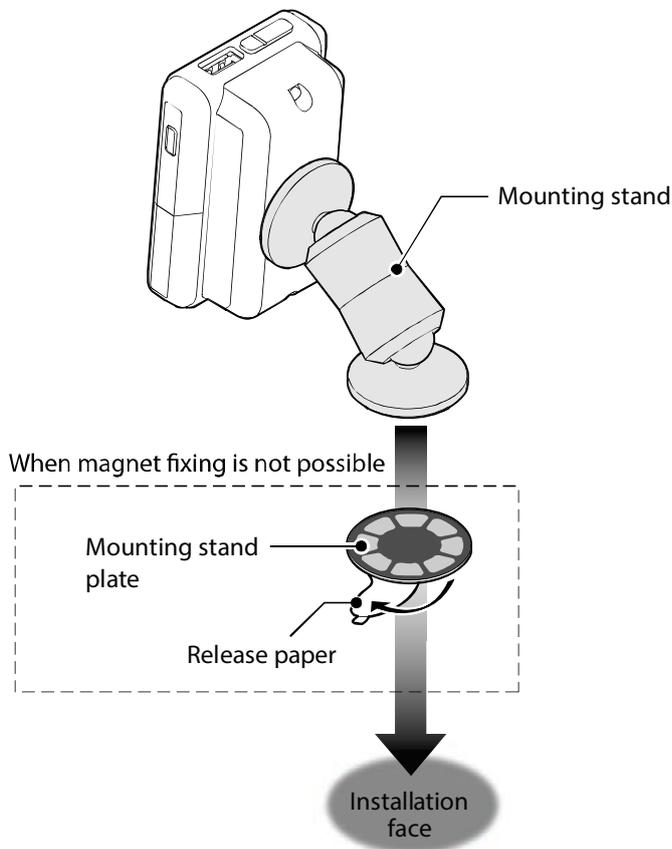
Installation face

3-4. Installation using the main unit mounting hole

The bottom of the main unit can be fixed by a screw.

⚠ CAUTION

・The mounting hole on the bottom face of the LU20 main unit is M3 depth: 4.5 mm. In consideration of the mounting screw length and the dimension of the mating mounting part, the screwing depth should not exceed 4.5 mm and a tightening torque of 0.3 N・m. Otherwise, a mounting defect or damage may occur.
・We recommend using a spring washer to prevent loosening.

Mountring hole
(M3 depth: 4.5 mm)

Mounting plate

Spring washer

Mounting screw (M3)
Tightening torque 0.3 N•m
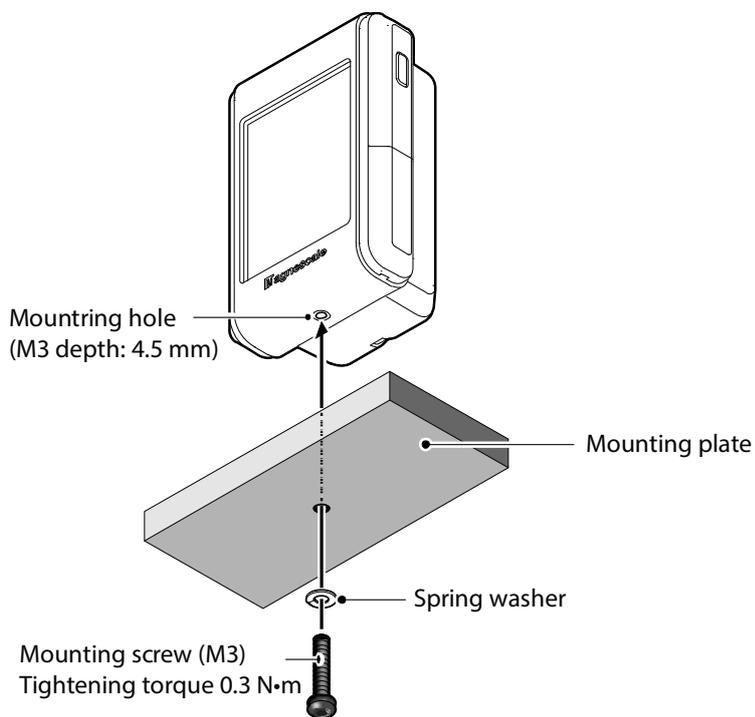
3-5.　Turning the power ON and OFF

・Power ON

Press the Power button until a beep sounds.

The operation screen display appears.

・Power OFF

Press the Power button until a beep sounds.

The operation screen display disappears.

Power button
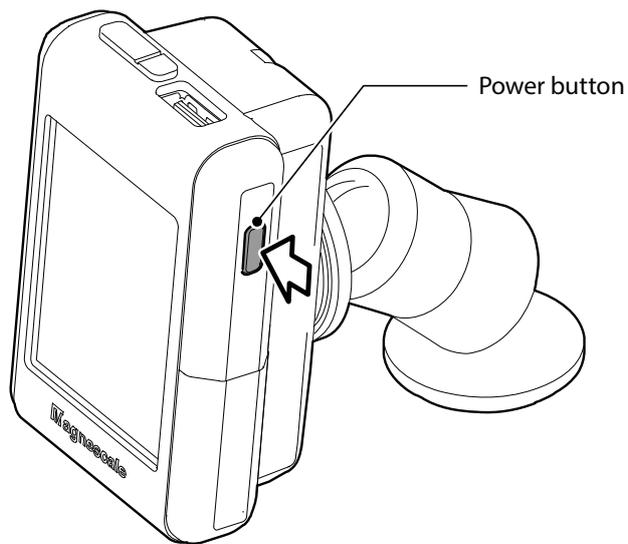
3-6.　Connection with a measuring unit

Connect a measuring unit to the measuring unit connector (USB Type-A) of the main unit.

Measuring unit connectoer
(USB Type-A)

Measuring unit
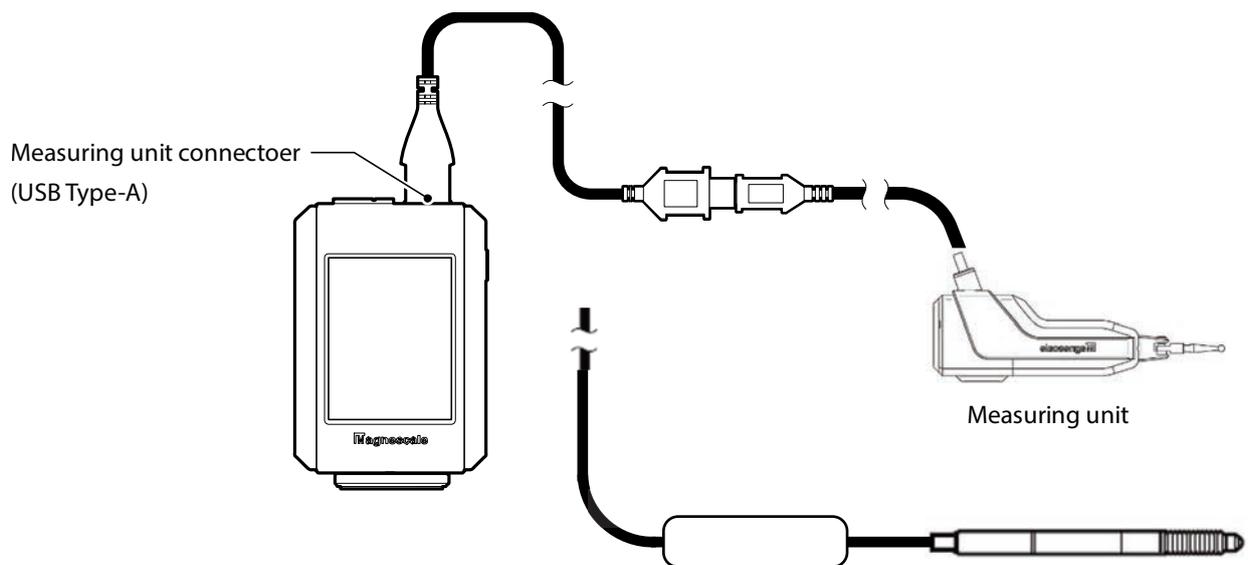
3-7.　Inserting and removing a microSD card

Slide the cover in the direction of arrow A to open it.

Cover

Ⓐ
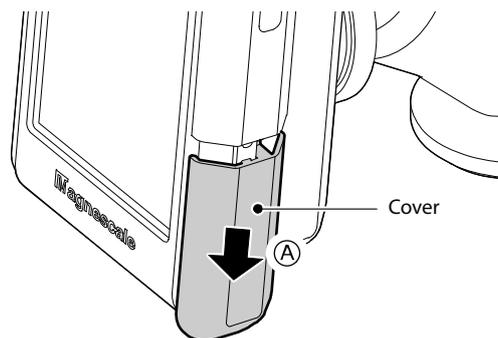
3-7-1.　Inserting a microSD card

Open the cover and insert the microSD card
straight into the slot facing as illustrated.
When inserting the microSD card, push it in
Until it clicks.

Cover

microSD card slot
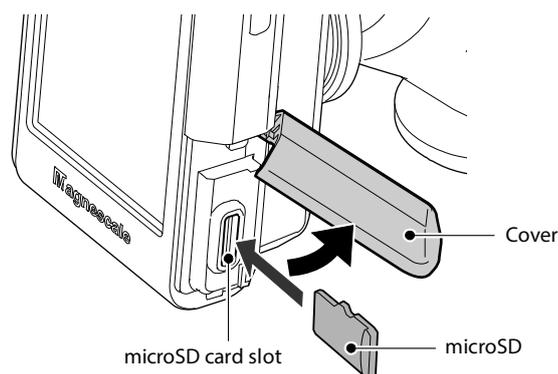
microSD

3-7-2.　Removing a microSD card

Disconnect the microSD to avoid destroying the data.
Tap the Remove microSD card button in the submenu area
so that the microSD card can be removed safely.
* For details of the submenu area, refer to "4-3. Submenu area".

REAL　COMP3　mm
2023 / 01 / 01　16 : 45

To remove the microSD card, press it in once so that it
pops out and can be pulled out.

⚠ CAUTION

・The compatible data storage media is only microSDHC.
・The microSD card must be formatted with the FAT32 file system.
・The media is to be prepared by the customer.
・Do not insert or remove the microSD card during the data saving operation.

3-8. Battery replacement

⚠ Warning

・Be sure to use our dedicated batteries supplied with the product or our dedicated accessory DZ60 (sold separately).
Failure to use the dedicated batteries may lead to fire, electric shock, or other accidents resulting in injury or death.
・Be sure to replace both batteries together as a set.
・When replacing the batteries, turn off the main unit power and disconnect all connections.
・Be careful that dust, metal fragments or other foreign matter do not enter the main unit.

⚠ CAUTION

・When the batteries are removed, the internal clock is reset and must be set again.

3-8-1.　Remove the two screws on the back of the LU20 and remove the battery cover.

Screw — Battery cover — Screw
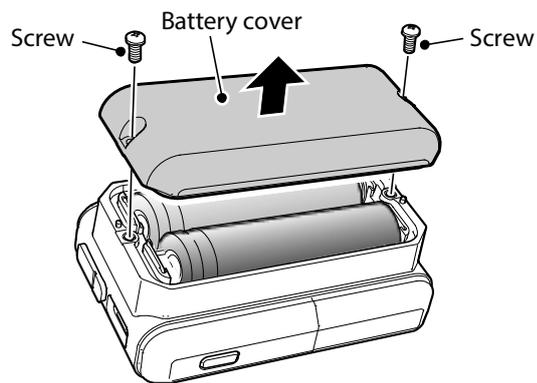
3-8-2.　Remove the two batteries.
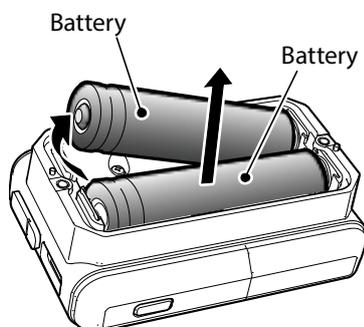
Battery — Battery

3-8-3.   Install two new batteries.

⚠ Warning

・Make sure the plus and minus directions are correct when installing the batteries.
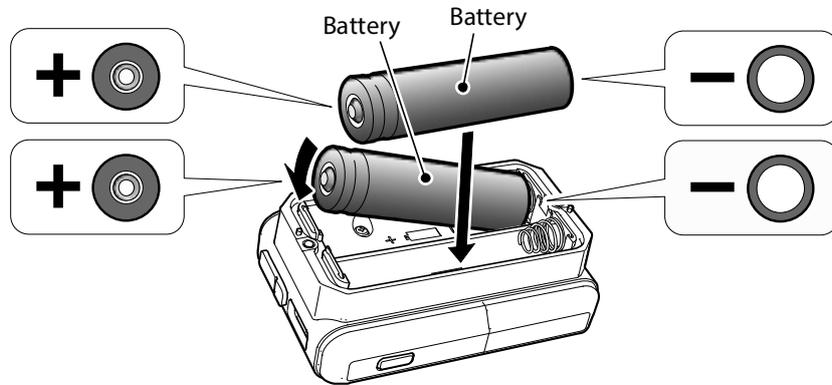
Battery   Battery

3-8-4.   Mount the battery cover with the two screws.

Battery cover
Screw   Battery
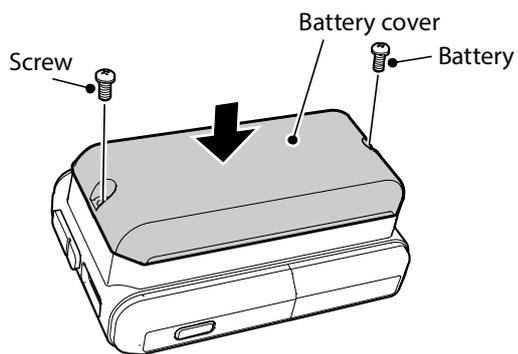
4. Operation

4-1. Screen outline

The screen has the following three areas.

Operations are performed by touch panel operations.

Main menu area

Measurement area

Operation area

4-2. Main menu area

①	②	③	④	⑤
Button	Status indication	Button	Status indication	Button
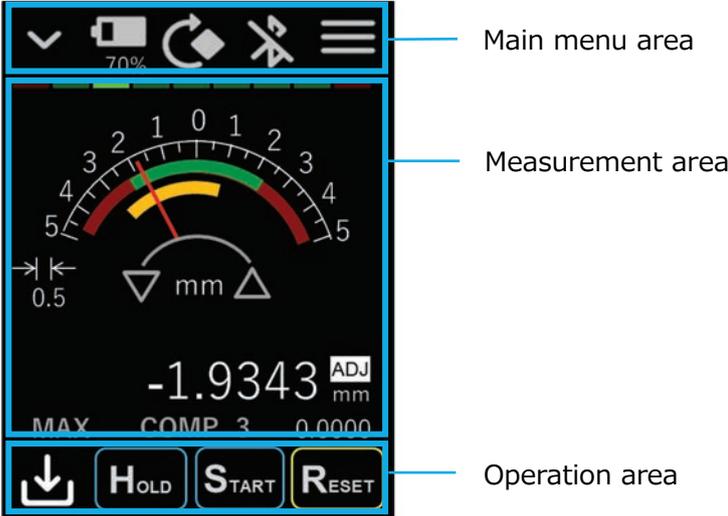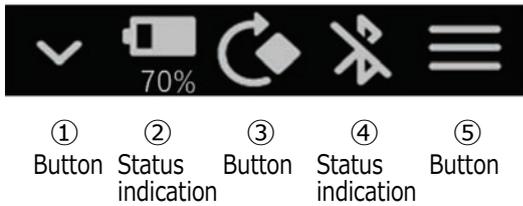
① Show/hide submenu area button

Shows and hides the submenu area.

* For details of the submenu area, refer to "4-3. Submenu area".

Submenu area
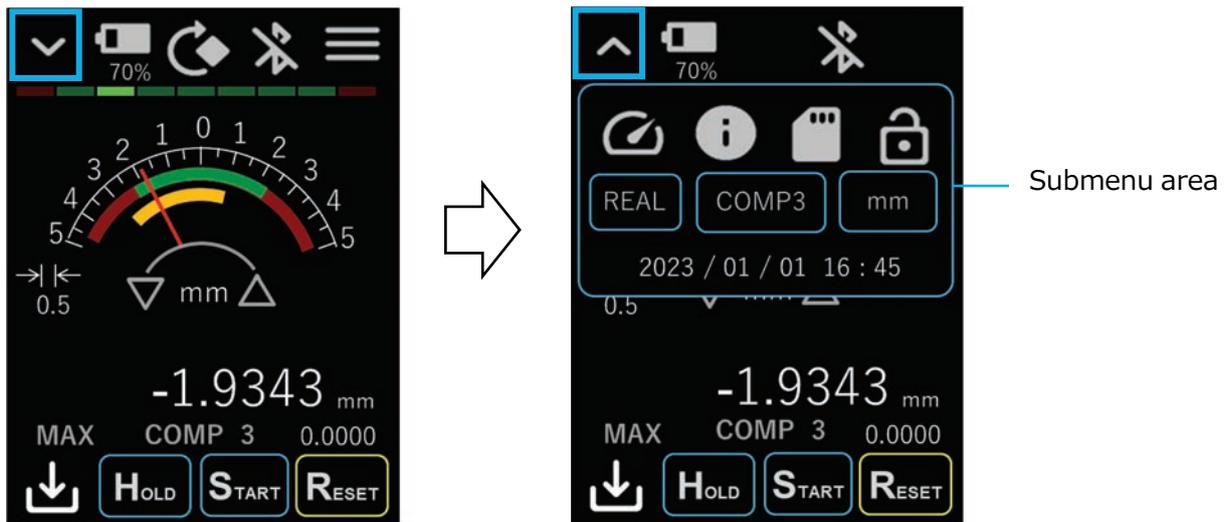
② Battery level indication

Indicates the battery level.

Example) Battery level 70%

Indication	Description
	Battery level 90% or more
	Battery level 10 to 90% 6-level indication
	Battery level less than 10%
	A lightning mark is displayed while charging.

③ Rotate screen button

The measurement area rotates 90° in the clockwise direction each time the button is tapped.
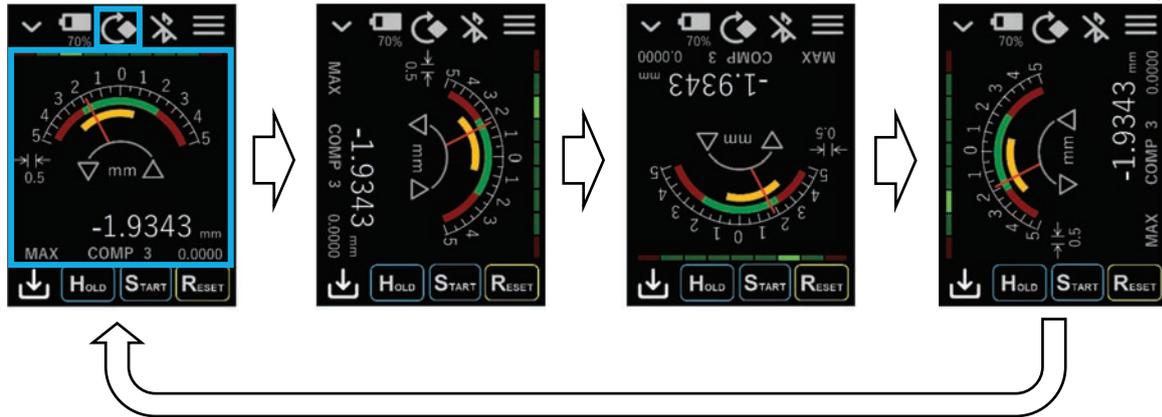
④ Bluetooth status indicator

Indicates the Bluetooth status.

Bluetooth ON/OFF is set by Setup screen:

System - Bluetooth.

Indication	Description
	Bluetooth OFF
	Bluetooth ON, connection not established
	Bluetooth ON, connection established

⑤ Go to Setup screen button

For details, refer to "5. Settings".

Indication	Description
	Goes to the Setup screen.
	Returns to the previous screen.

4-3. Submenu area

Button Button Button Button
①   ②   ③   ④

REAL   COMP3   mm
⑤Button ⑥Button ⑦Button
⑧ 2023 / 01 / 01 16 : 45
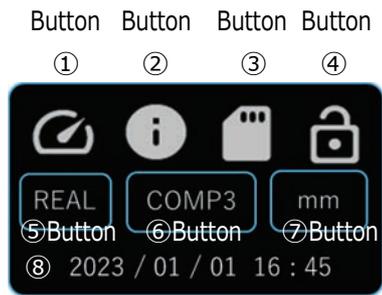
① Switch display mode button

The measurement area display mode switches
each time the button is tapped.
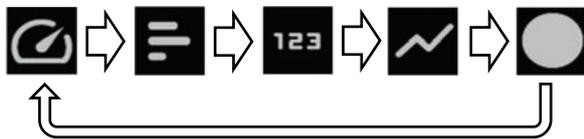
Indication	Description
	Dial display mode
	Bar meter display mode
123	Numeric display mode
	Trend chart display mode
	Simple circle measurement display mode

Dial display mode

Reproduces the movement of a needle such as when using a lever gauge or dial gauge.

Bar meter display mode

Displays the same information as dial display mode using a bar meter.

Numeric display mode

Numerically displays the current value, maximum value, minimum value, and P-P value.

Trend chart display mode
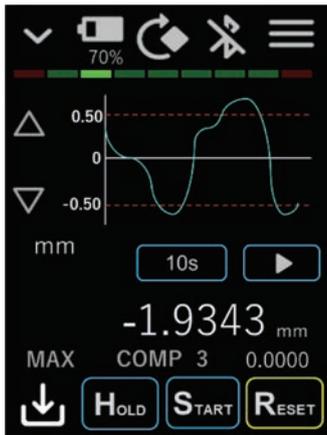
Graphs the change in the current value in real time.
The horizontal axis is swept in time.
Flat surface trends can be checked by profile measurement.

Simple circle measurement display mode
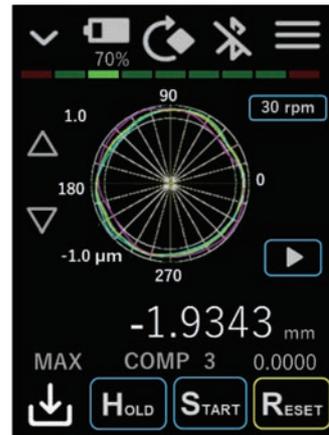
The runout amount of a rotating cylindrical workpiece can be checked.
If the speed is constant and the rotation speed are known, the measurement values are drawn in a circular shape by entering the rotation speed.
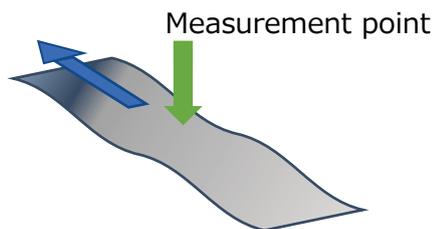
Measurement point

Measurement point
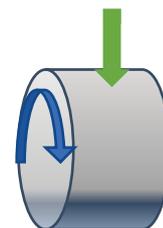
② Show device information button

Displays the information of the Setup screen: System - Sensor ID screen.

This enables to quickly check the device information.

③ Remove microSD card button

Tap this button in the microSD card connected state to end the connection.

Disconnection enables to safely remove the microSD card.

Indication	Description
	Disconnected state The microSD card can be removed safely.
	Connected state

④ Key lock switching button

In the key lock state, the START button and the RESET/PRESET button in the operation area are disabled.

Indication	Description
	Key lock OFF state
	Key lock state

Even when the submenu area is hidden, the key lock status can be checked by the color of the Show/hide submenu area button.

: Key lock OFF state

: Key lock state

⑤ Measurement mode switching button

Selects the measurement mode from among current value, maximum value, minimum value, and P-P value.

Select the values to be displayed on each screen in dial display mode, bar meter display mode, trend chart display mode, and simple circle measurement display mode.

In numeric display mode, all the values are displayed.

Indication	Description
REAL	Current value The current measurement value
MAX	Maximum value The maximum value of the measurement values
MIN	Minimum value The minimum value of the measurement values
P-P	P-P value Value of maximum value - minimum value (Peak to Peak value)

⑥ Comparator set number switching button

Switches the comparator setting set used to perform Go/No Go judgment on measurement values.

There are ten comparator sets.

Select from comparator OFF and comparator 1 to 10.

COMP : Comparator OFF

COMP1 ～ COMP10 : Comparator set 1 to comparator set 10

The upper and lower limit values are set by Setup screen: Measure - Comparator.

⑦ Unit switching button

Switches the display unit.

* When μm unit display is selected, the measurement value and preset value displays are displayed in μm units, but the Setup screen, saved data, and communication data always use mm units.

Indication	Description
mm	mm unit display
inch	inch unit display
μm	μm unit display
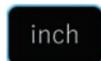
⑧ Date and time display

Displays the current date and time.

The date and time can be set with Setup screen: Clock.

* When the battery level becomes extremely low or the batteries are removed, the internal clock is reset and must be set again.

4-4. Measurement area

4-4-1. Common area

① Absolute position bar indicator

② Comparator set number display

③ Measurement mode display

④ Compensation indicator

⑤ Preset value display

① Absolute position bar indicator

The position of the measuring unit relative to the measuring range can be checked. Use within the green range.

This is displayed when using a DM series digital lever gauge as the measuring unit.

It is not displayed when a DS series is connected.

Outside the range

Inside the range

Outside the range

② Comparator set number display

Displays the currently selected comparator set number.

③ Measurement mode display

Displays the currently selected measurement mode.

It is not displayed when current value mode (REAL) is selected.

④ Compensation indicator

This is displayed when scaling or angle compensation is applied to the measurement value.

Scaling and angle compensation can be set by Setup screen: Measure - Adjustment.

⑤ Preset value display

Displays the preset value when using the preset function that changes the current value to an arbitrary value.

The preset value can be edited by long-pressing the RESET/PRESET button in the operation area.

4-4-2. Dial display mode

① Upper/lower limit area indicator
② P-P value display
③ Display range switching button
④ Measurement value display
⑤ Measurement value sub display

① Upper/lower limit area indicator
The range within the upper and lower limit values of the measurement values for the selected comparator set number is indicated by green, and outside that range is indicated by red.
This indicator is not displayed when "comparator OFF" is selected.
The upper and lower limit values are set by Setup screen: Measure - Comparator.

② P-P value display
The range over which the needle moves (= P-P value) is colored in.
The range within the upper limit value of the P-P values for the selected comparator set number is indicated by yellow, and outside that range is indicated by red.
The upper limit value is set by Setup screen: Measure - Comparator.

③ Display range switching button
The display range of the dial display can be changed.

④ Measurement value display
Displays the measurement value in the selected measurement mode (REAL/MAX/MIN/P-P).

⑤ Measurement value sub display
This is displayed when measurement value sub display is set.
It is displayed only in dial display mode and bar meter display mode.
Measurement value sub display is set by Setup screen: Measure - Display.

4-4-3.　Bar meter display mode

①　Current value display

②　P-P value display

③　Display range switching button

④　Measurement value display

⑤　Measurement value sub display
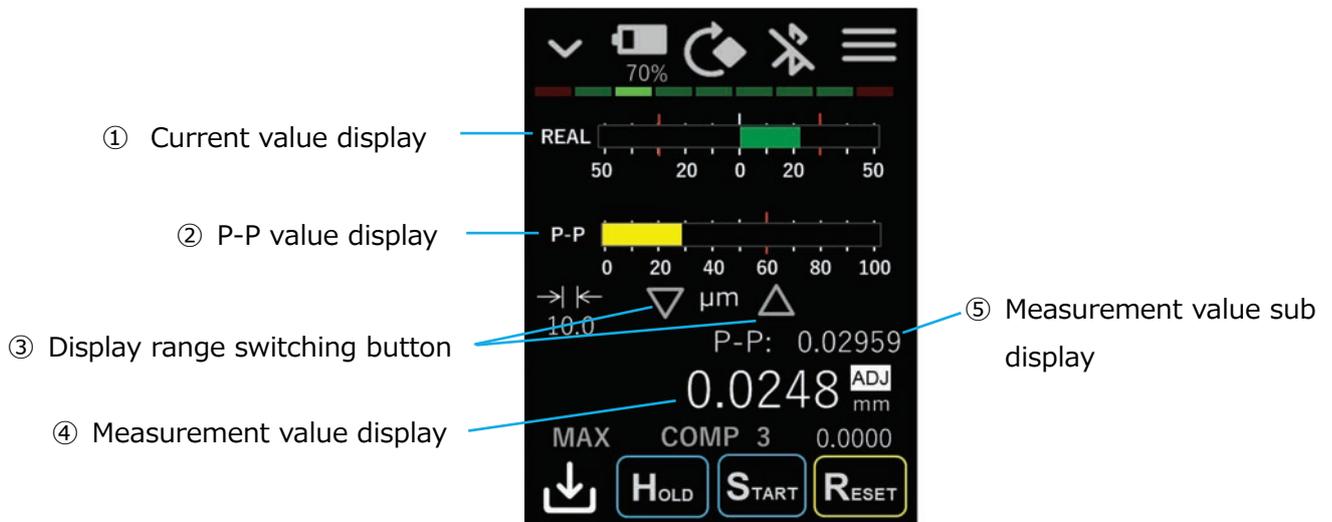
①　Current value display

Displays the current value with a bar graph.

The range within the upper and lower limit values of the current value for the selected comparator set number is indicated by green, and outside that range is indicated by red.

The upper and lower limit values are set by Setup screen: Measure - Comparator.

②　P-P value display

Displays the P-P value with a bar graph.

The range within the upper limit value of the P-P values for the selected comparator set number is indicated by yellow, and outside that range is indicated by red.

The upper limit value is set by Setup screen: Measure - Comparator.

③　Display range switching button

The display range of the bar meter display can be changed.

④　Measurement value display

Displays the measurement value in the selected measurement mode (REAL/MAX/MIN/P-P).

⑤　Measurement value sub display

This is displayed when measurement value sub display is set.

It is displayed only in dial display mode and bar meter display mode.

Measurement value sub display is set by Setup screen: Measure - Display.

4-4-4. Numeric display mode

Displays four measurement values: current value, maximum value, minimum value, and P-P value.

Values outside the upper and lower limit value ranges for the selected comparator set number are displayed in red.

4-4-5. Trend chart display mode
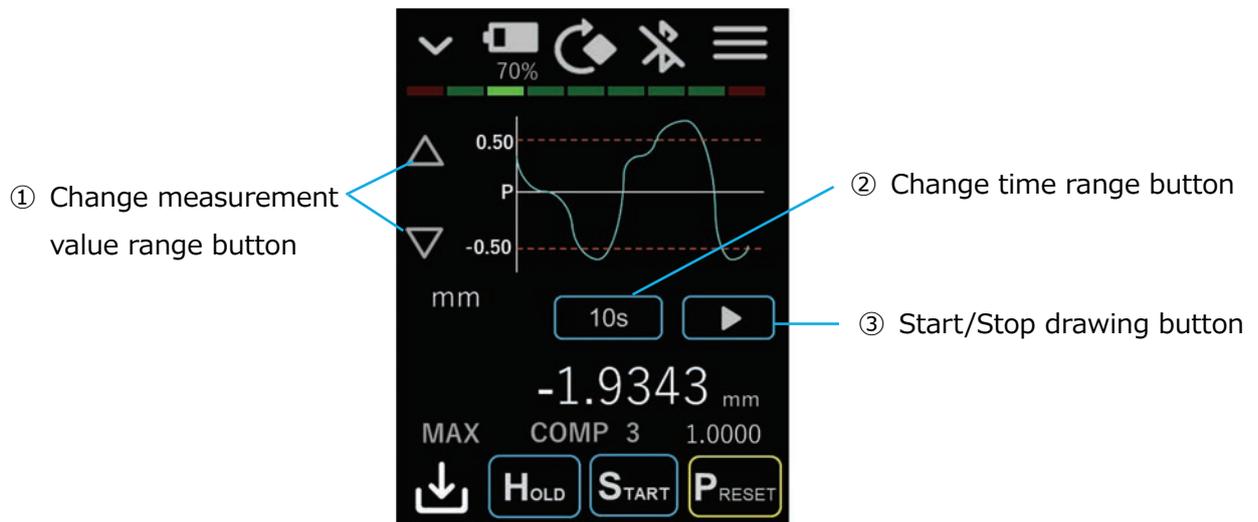
① Change measurement value range button

② Change time range button

③ Start/Stop drawing button

① Change measurement value range button
The measurement value (vertical axis) range can be changed.

② Change time range button
The time (horizontal axis) range can be changed.

③ Start/Stop drawing button
Starts and stops drawing of the trend chart

4-4-6. Simple circle measurement display mode

① Change measurement
value range button

② Change rotation speed button

③ Start/Stop drawing button

① Change measurement value range button

The measurement value drawing range can be changed.

② Change rotation speed button

Sets the workpiece rocation speed in rpm units. The input range is 1 to 30 rpm.

The measurement values are drawn around the circumference based on this setting.

③ Start/Stop drawing button

Starts and stops drawing of the measuring values.

4-5. Operation area

① Data Save button

This is used to send measurement values to a host device such as a smartphone, tablet PC, or PC, and to save measurement values on a microSD card.

② HOLD button

Stops updating of the four measurement values: current value, maximum value, minimum value, and P-P value.

The maximum and minimum values are as shown in the figure below depending on the hold ON/OFF status.
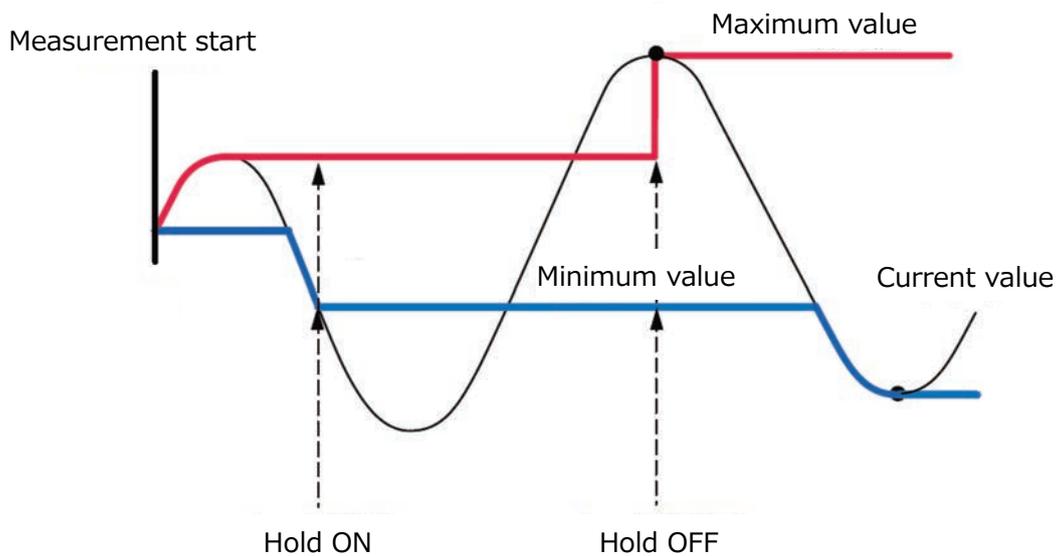
③ START button

Initializes the three measurement values: maximum value, minimum value, and P-P value, and restarts measurement.

The maximum and minimum values are set to the current value and the P-P value is set to 0.

④ RESET/PRESET button

Long-press the button to set the preset value.

When the preset values are 0, the button indication is "RESET", and when the preset values are other than 0, the button indication is "PRESET".

Tap the button to set the preset values in the current value, maximum value, and minimum value, and set the P-P to 0.

Indication	Description
RESET	RESET indication The preset values are 0.
PRESET	PRESET indication The preset values are other than 0.

Preset value input range (Values below the display resolution setting cannot be entered.)

In mm unit display: -999.9999 to 999.9999 mm

In µm unit display: -999999.9 to 999999.9 µm

In inch unit display: -40.000000 to 40.000000 inch

When the preset function is used, the center of the dial display, bar meter display, and trend chart display is the preset value and the indication changes to "P".
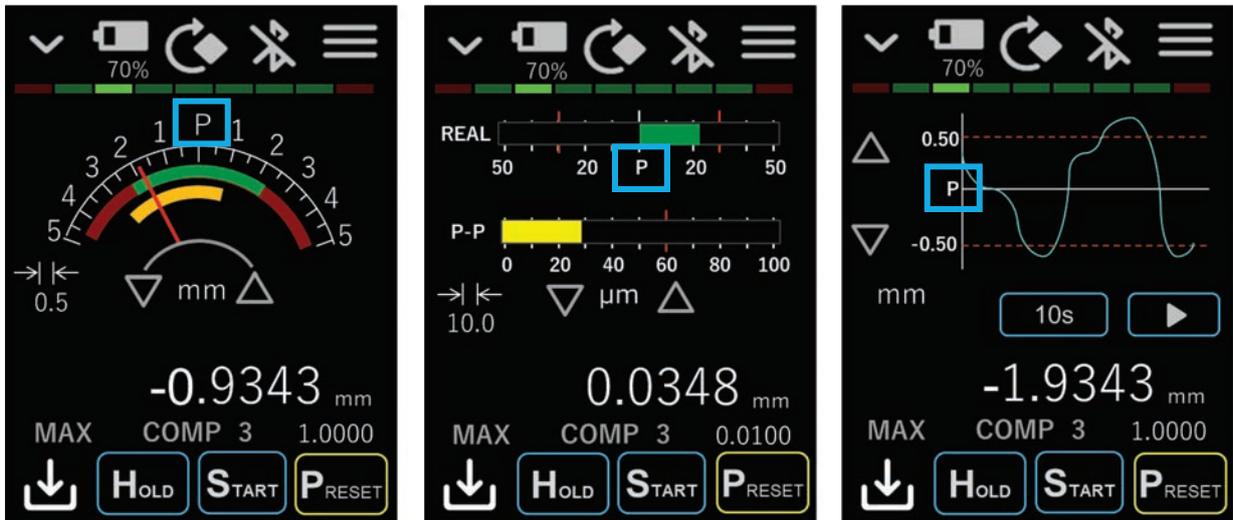
The measurement value comparator upper and lower limit values are set based on the preset value.

When the upper limit is set to 0.3 mm, the lower limit is set to -0.3 mm, and the preset value is 1 mm, the P display position is 1 mm, the upper limit value is 1.3 mm, and the lower limit value is 0.7 mm.

■ When the preset value is 0 mm
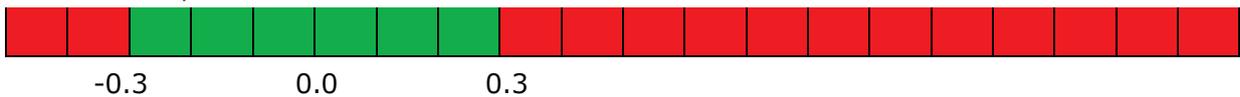
■ When the preset value is 1 mm
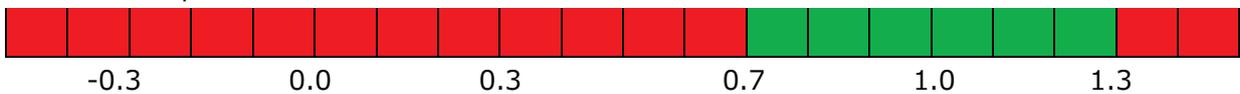
4-6.　Bluetooth communication

4-6-1.　App mode

In App mode, the LU20 communicates with a dedicated app on a host device such as a smartphone, tablet PC, or PC.

The LU20 can be operated from the dedicated app.

Refer to the Instruction Manual of each app for how to connect in App mode.

Setup screen: System - Bluetooth
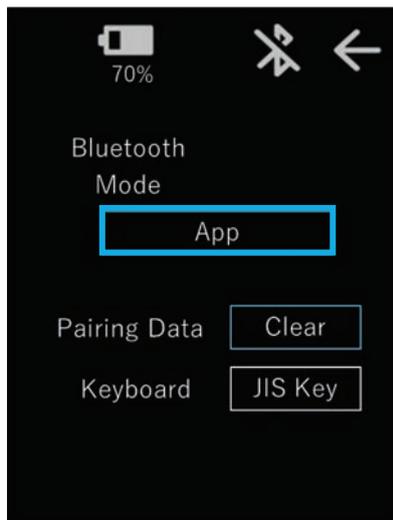
4-6-2.　HID mode

In HID* mode, the LU20 is recognized as a Bluetooth keyboard by the PC. Even if there is no dedicated communication software on the PC side, the measurement values can be input to an arbitrary application such as Excel or Notepad by tapping the Data Save button of the LU20.

*HID (Human Interface Device)

　A device such as a keyboard or mouse used by a human to operate a computer

■　How to connect with a Windows PC (for Windows 10)

①　Set Bluetooth Mode of the LU20 to HID.

Setup screen: System - Bluetooth
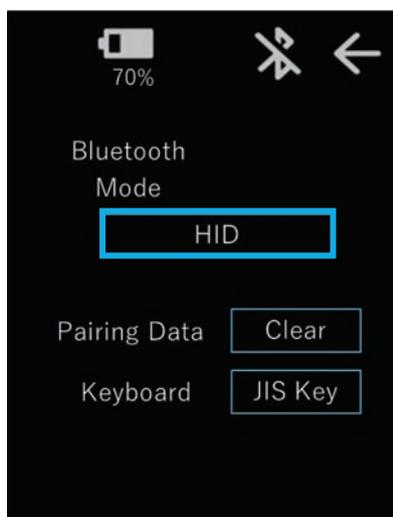
② Open Windows Settings on the PC to connect with the LU20, then open "Devices".
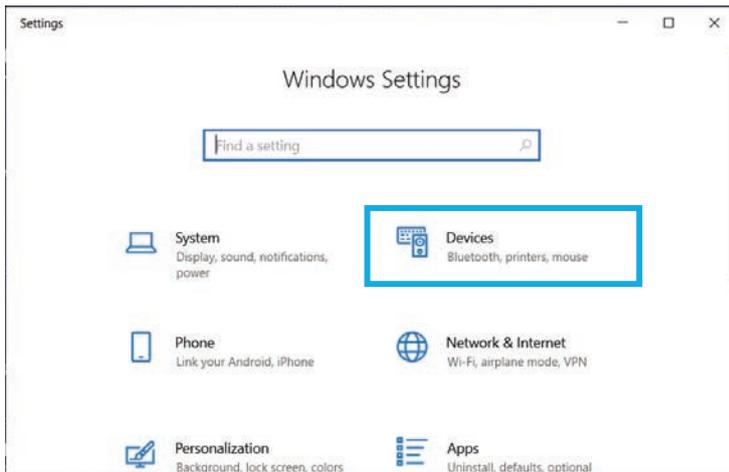
③ Select "Bluetooth & other devices", and turn on "Bluetooth".
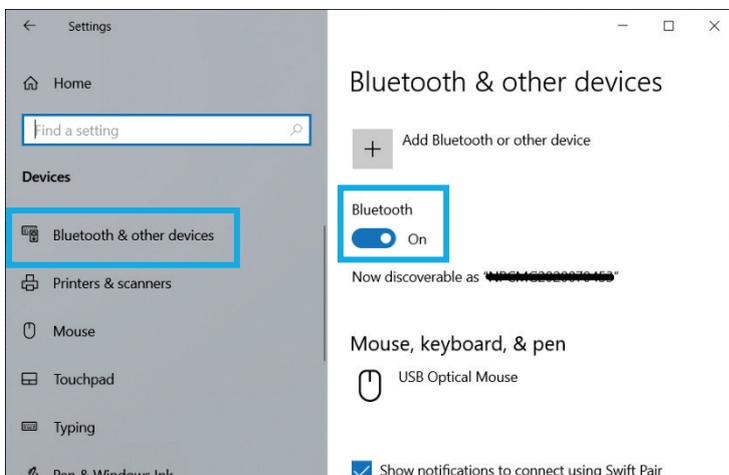
④ Select "Add Bluetooth or other device" and look for the LU20.
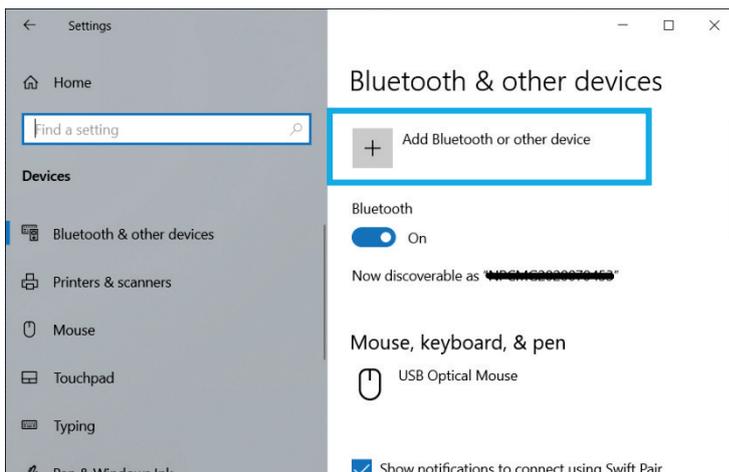
The name found here is "HID-" + Sensor ID.

In HID mode, "HID-" is attached to the front.

* In App mode, "MGS-" is attached to the front. Do not connect on this screen in App mode.

The Sensor ID is the name assigned to the connected measuring unit, and can be edited at the following screen.

Setup screen: System - Sensor ID
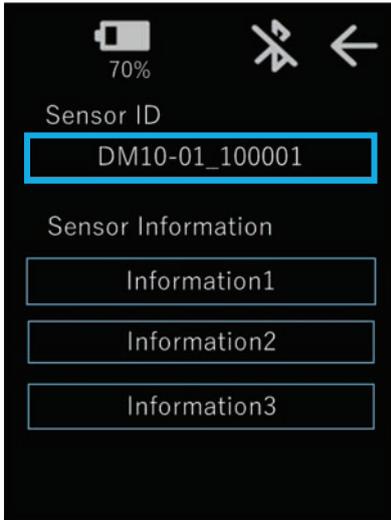
* The Sensor ID contents are stored in the measuring unit.

■　How to disconnect from a Windows PC (for Windows 10)

①　Open Windows Settings on the connected PC, then open "Devices".
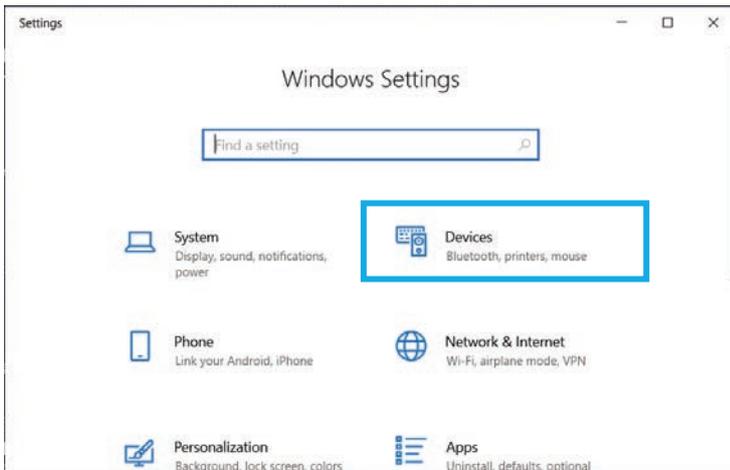
②　Select "Bluetooth & other devices", and delete the device.

27
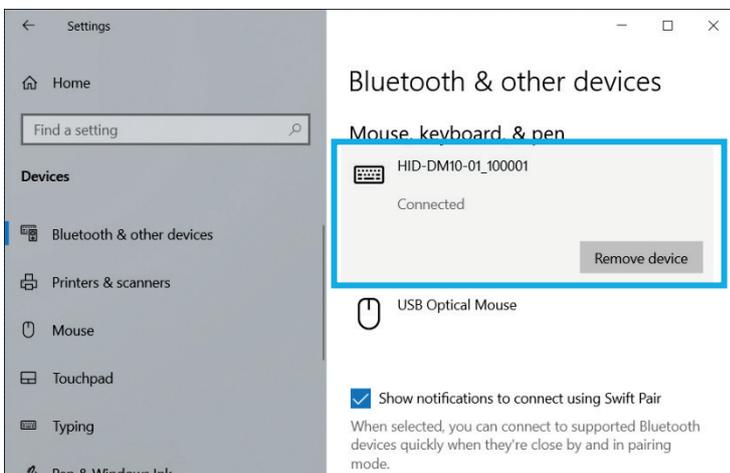
③ Set Bluetooth Mode of the LU20 to OFF.
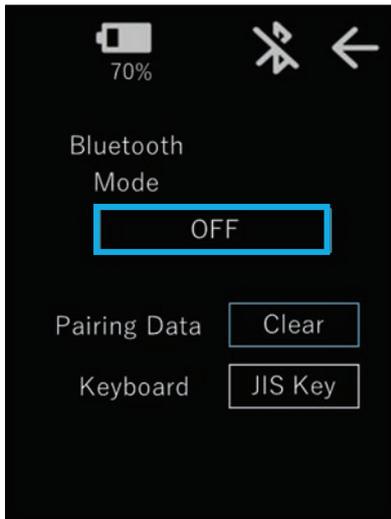
④ Clear the pairing data.

If the pairing data with the connected PC is not cleared, connection with another PC will not be possible.
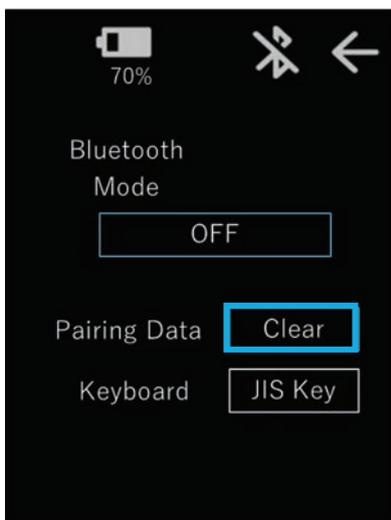
* To disconnect only temporarily, perform only step ③.

   When not connecting again after disconnection, perform steps ① to ④.

■ How to input data

Open the application to which the data will be input beforehand on the PC.

・One-shot save

① Set the Timer save setting to OFF.

Setup screen: Data Save - Mode
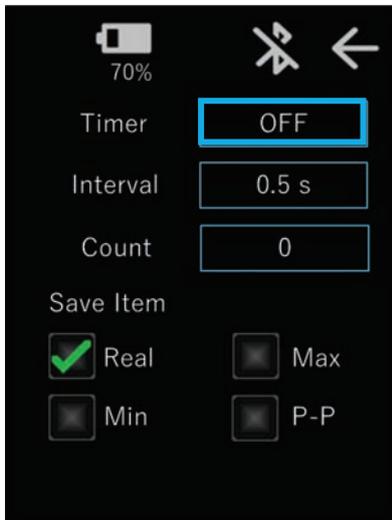
② Tap the Data Save button.

The measurement values are input each time the Data Save button is tapped.

・Timer save

① Set the Timer save setting to ON.
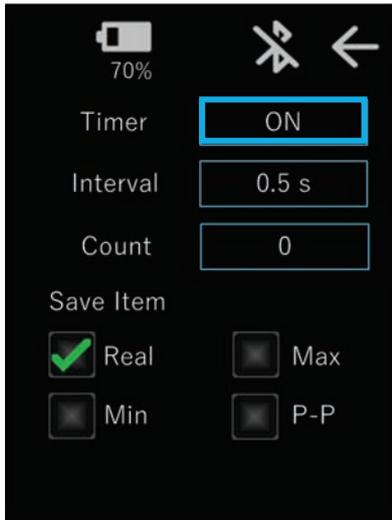
② Tap the Data Save button to start and stop the timer.

* Make sure that the keyboard input setting of the PC is set to single-byte alphanumeric input.

* "_" (underscore) in the Sensor ID is converted to "-" (hyphen) for input.

■ Setting items

For details, refer to "5. Settings".

The following Setup screens are related to HID mode.

・Data Save – Mode

・Data Save – HID Format

・System – Bluetooth

・System – Sensor ID

■ Data format

2023/04/05 09:48:44,DM10-01_100001,1.0000,1.0009,0.9999,0.0010

| ① | ② | ③ | ④ | ⑤ | ⑥ |

① Saved date and time information. YYYY/MM/DD hh:mm:ss

Added when "TimeStamp" on the Setup screen: Data Save - HID Format is turned on.

② Sensor ID of the measuring unit used for measurement.

Added when "Sensor ID" on the Setup screen: Data Save - HID Format is turned on.

③ Measured current value.

Added when a checkmark is placed in "Real" of "Save Item" on the Setup screen: Data Save - Mode.

④ Measured maximum value.

Added when a checkmark is placed in "Max" of "Save Item" on the Setup screen: Data Save - Mode.

⑤ Measured minimum value.

Added when a checkmark is placed in "Min" of "Save Item" on the Setup screen: Data Save - Mode.

⑥ Measured P-P value.

Added when a checkmark is placed in "P-P" of "Save Item" on the Setup screen: Data Save - Mode.

* The delimiter character between each data can be selected from "," (comma), ";" (semicolon), Tab, or " " (space).

It can be selected with "Delimiter" on the Setup screen: Data Save - HID Format.

* The terminal character can be selected from Enter or Tab.

It can be selected with "Terminal" on the Setup screen: Data Save - HID Format.

Select Enter for newline or Tab to move the cursor after input.

* The decimal separator can be selected from "." (dot) or "," (comma).

It can be selected with "DecPoint" on the Setup screen: Data Save - HID Format.

* When using timer save, if the timer interval time is short and there are many save items in the above data format, input cannot be completed within the interval time. Consider measures such as extending the interval time, reducing the number of save items, or using the μMATE Link app.

4-7. Saving measurement data on a microSD card

・Refer to "3-7. Inserting and removing a microSD card" for how to insert and remove a microSD card.

・To check the microSD card insertion status, refer to "4-3. Submenu area".

■   How to save data

・One-shot save

① Set the Timer save setting to OFF.

Setup screen: Data Save - Mode
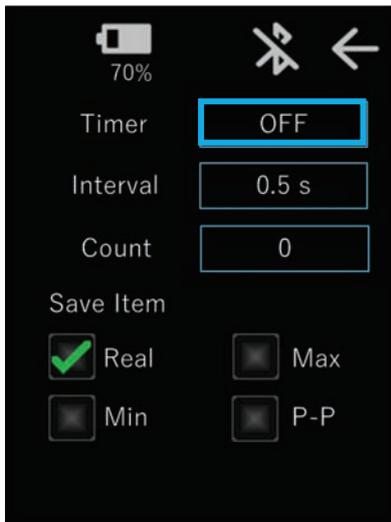
② Tap the Data Save button.

The measurement values are saved each time the Data Save button is tapped.

・Timer save

① Set the Timer save setting to ON.
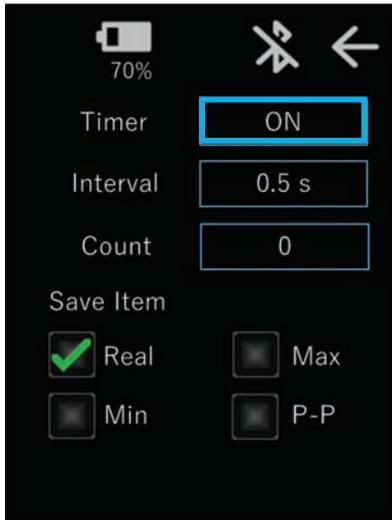
② Tap the Data Save button to start and stop the timer.

■ Setting items

For details, refer to "5. Settings".

The following Setup screens are related to saving measurement data on a microSD card.

・Data Save – Mode

・Data Save – SD Format

・System – Bluetooth

・System – Sensor ID

■ Data format

A measdata folder is automatically created on the microSD card, and a CSV file is created in the measdata folder.

・File name
[LU20 model name]+[LU20 serial number].csv
Example: LU20(F)_123456.csv

・Data format
```
        1,2023/04/05 09:48:44,DM10-01_100001,1.0000,1.0009,0.9999,0.0010
       └┘ └─────────────────┘└─────────────┘└────┘└────┘└────┘└────┘
        ①         ②                  ③          ④     ⑤     ⑥     ⑦
```
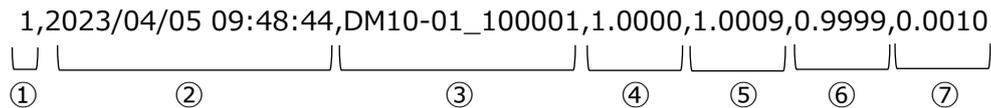
① Data recording count. This starts from 1 and increments by 1 each time data is recorded. It returns to 1 when the LU20 is turned off.

② Saved date and time information. YYYY/MM/DD hh:mm:ss
Added when "TimeStamp" on the Setup screen: Data Save - SD Format is turned on.

③ Sensor ID of the measuring unit used for measurement.
Added when "Sensor ID" on the Setup screen: Data Save - SD Format is turned on.

④ Measured current value.
Added when a checkmark is placed in "Real" of "Save Item" on the Setup screen: Data Save - Mode.

⑤ Measured maximum value.
Added when a checkmark is placed in "Max" of "Save Item" on the Setup screen: Data Save - Mode.

⑥ Measured minimum value.
Added when a checkmark is placed in "Min" of "Save Item" on the Setup screen: Data Save - Mode.

⑦ Measured P-P value.
Added when a checkmark is placed in "P-P" of "Save Item" on the Setup screen: Data Save - Mode.

* The delimiter character between each data can be selected from "," (comma), ";" (semicolon), Tab, or " " (space).
It can be selected with "Delimiter" on the Setup screen: Data Save - SD Format.
* The terminal character can be selected from CR+LF, CR, or LF.
It can be selected with "Terminal" on the Setup screen: Data Save - SD Format.
Use CR+LF with Windows.
* The decimal separator can be selected from "." (dot) or "," (comma).
It can be selected with "DecPoint" on the Setup screen: Data Save - SD Format.

5. Settings

Various settings and operations can be performed on the Setup screen.

Tap the Go to Setup screen button in the main menu area to open the Setup screen.
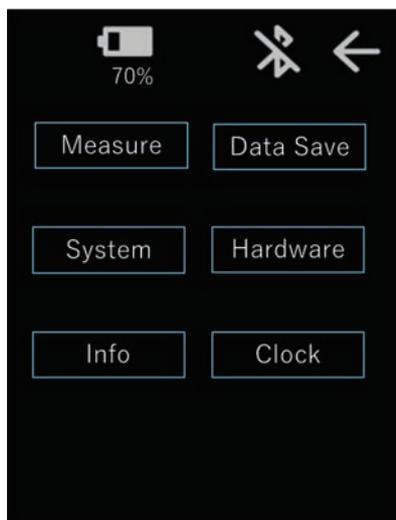
Indication	Description
Measure	Settings related to measurement.
Data Save	Settings related to saved data and HID output.
System	Settings related to Bluetooth and the device name.
Hardware	Buzzer, LCD, and other hardware settings.
Info	Main unit information and maintenance information.
Clock	Date and time setting.

5-1. Measure
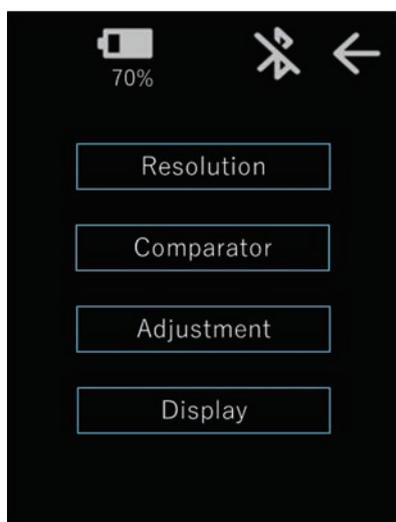
Indication	Description
Resolution	Count direction and display resolution settings.
Comparator	Measurement value comparator settings. The upper and lower limit values of the measurement values can be set.
Adjustment	Various measurement value compensation function settings.
Display	Screen display settings.

5-1-1.　Resolution
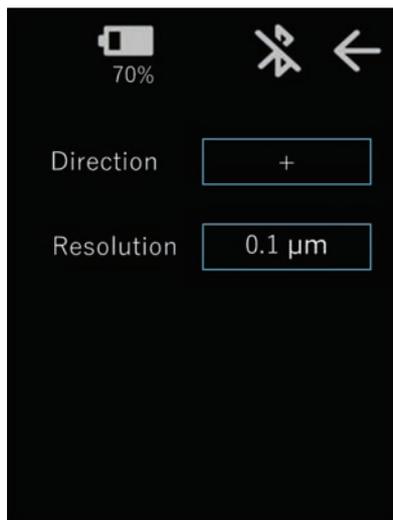
Indication	Description
Direction	Selects the count direction (+/-).
Resolution	Selects the display resolution. Measurement values are displayed and saved in the display resolution units. In mm/μm unit display: 0.1 μm / 0.5 μm / 1.0 μm / 5.0 μm / 10.0 μm In inch unit display: 0.001 thou / 0.005 thou / 0.01 thou / 0.05 thou / 0.1 thou

5-1-2.　Comparator

Indication	Description
COMP X	Selects the comparator set number for the measurement values. There are ten sets of comparator settings. Select the set number and then set the upper and lower limit values.
C1, C2	Upper and lower limit values of the measurement values. The upper and lower limit values are the relative values from the preset value. Refer to "4-5. Operation area". In mm/μm unit display: -999.9999 to 999.9999 mm In inch unit display: -40.000000 to 40.000000 inch * Values below the display resolution setting cannot be entered.
P-P	Upper limit value of the P-P value. In mm/μm unit display: 0 to 999.9999 mm In inch unit display: 0 to 40.000000 inch * Values below the display resolution setting cannot be entered.

5-1-3. Adjustment
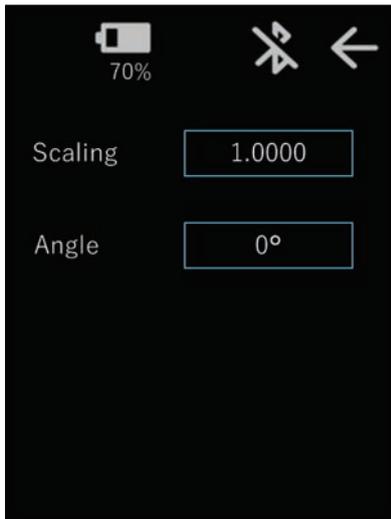
Indication	Description
Scaling	An arbitrary scaling factor can be applied to the measurement values. 0.0001 to 10.0000
Angle	This enables to compensate error due to the angle at which the stylus or spindle contacts the workpiece. The following calculation result is used as the measurement value. Sensor reading value × cosθ θ = 0 to 90°

⚠ CAUTION

Take care when using the Scaling and Angle functions, as the measurement values will change greatly.

5-1-4. Display
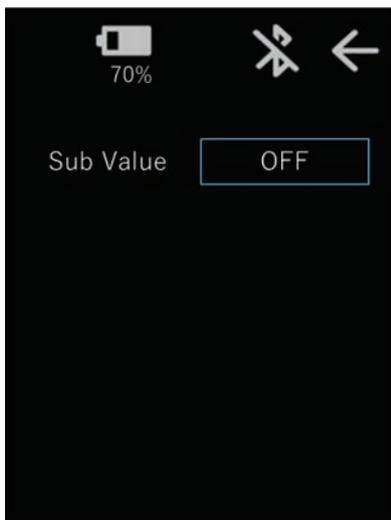
Indication	Description
Sub Value	Measurement value sub display is possible in dial display mode and bar meter display mode. Select the measurement mode (REAL/MAX/MIN/P-P) for sub display. OFF: No sub display REAL: Current value MAX: Maximum value MIN: Minimum value P-P: P-P value

5-2.　Data Save
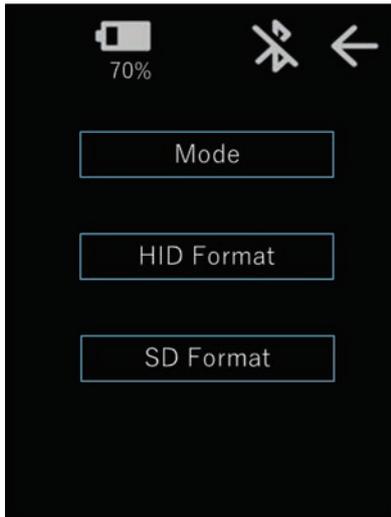
Indication	Description
Mode	Timer save and save item settings.
HID Format	Data format setting for key input of measurement values as an HID keyboard device.
SD Format	Data format setting when saving measurement values on a microSD card.

5-2-1.　Mode
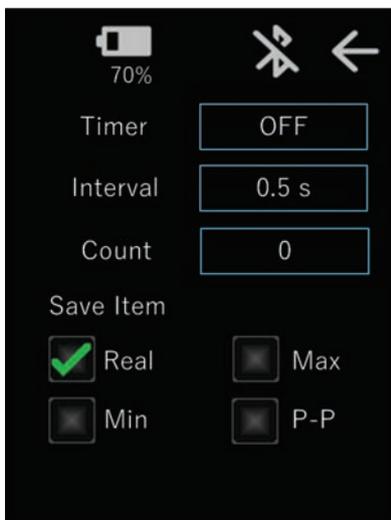
Indication	Description
Timer	Set to ON to continuously perform data save. Timer start/stop operation uses the Data Save button.
Interval	Interval time in timer save mode. 0.5 s / 1.0 s / 5.0 s / 10.0 s / 30.0 s
Count	Sets the number of data in timer save mode. Timer save stops automatically when the number of data reaches the set value. 0 to 30000 * When set to 0, timer save does not stop automatically.
Save Item	Selects the save items for key input in HID mode and when saving measurement values to a microSD card.

5-2-2. HID Format
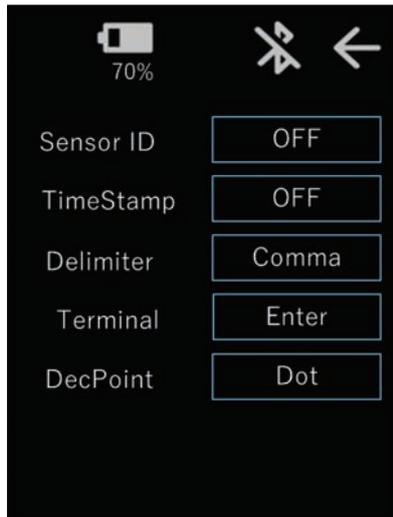
Settings related to HID keyboard input.

Indication	Description
Sensor ID	Set to ON to add the Sensor ID to the input data.
TimeStamp	Set to ON to add the date and time information to the input data.
Delimiter	Selects the delimiter character between each data. Comma: "," Semicolon: ";" Tab: Tab Space: " "
Terminal	Selects the terminal character. Enter: newline Tab: Cursor movement
DecPoint	Selects the decimal separator. Dot: "." Comma: ","

5-2-3. SD Format
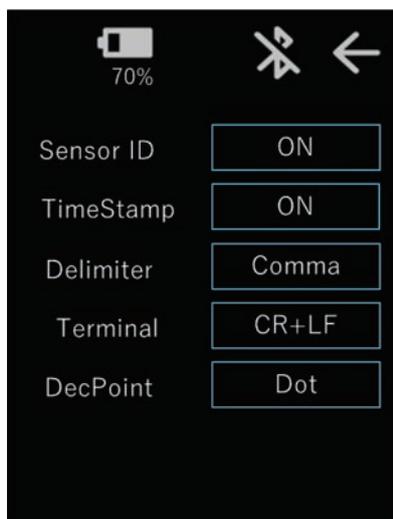
Data settings for saving measurement values on a microSD card.

Indication	Description
Sensor ID	Set to ON to add the Sensor ID to the saved data.
TimeStamp	Set to ON to add the date and time information to the saved data.
Delimiter	Selects the delimiter character between each data. Comma: "," Semicolon: ";" Tab: Tab Space: " "
Terminal	Selects the terminal character. CR+LF: Carriage return + line feed CR: Carriage return LF: Line feed
DecPoint	Selects the decimal separator. Dot: "." Comma: ","

5-3.　System
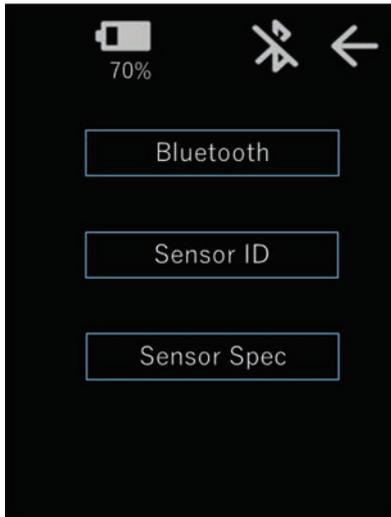
Indication	Description
Bluetooth	Bluetooth settings.
Sensor ID	Measuring unit information settings.
Sensor Spec	Measuring unit specification settings.

5-3-1.　Bluetooth

Indication	Description
Bluetooth Mode	Sets the Bluetooth mode. OFF: Bluetooth OFF HID: HID keyboard. App: App connection mode.
Pairing Data	Tap the Clear button to delete the pairing data.
Keyboard	Changes the key code transmitted in HID mode. JIS Key :　Use this when the keyboard setting of the PC to be connected is JIS. US Key :　Use this when the keyboard setting of the PC to be connected is US. DE Key :　Use this when the keyboard setting of the PC to be connected is Deutsch. This can be edited only when Bluetooth Mode is set to HID.

* If Bluetooth connection is difficult, set Bluetooth Mode to OFF, clear the Pairing Data, and redo the settings.

5-3-2. Sensor ID

Indication	Description

Sensor ID	An arbitrary name can be assigned to the measuring unit. This information is stored in the measuring unit.
	- Max. 16 characters
	- Available characters
	  Common: [A to Z], [a to z], [0 to 9]
	  DM series: [+-.&()=@~]
	  DS series: [-.]
	- First character is alphabetic only

Sensor Information	Measuring unit information that can be arbitrarily edited.
	This information is stored in the measuring unit.
	These settings are available only when using a DM series measuring unit.
	- Max. 16 characters
	- Available characters
	  [A to Z], [a to z], [0 to 9],
	  [+-.&()=@~]

5-3-3. Sensor Spec
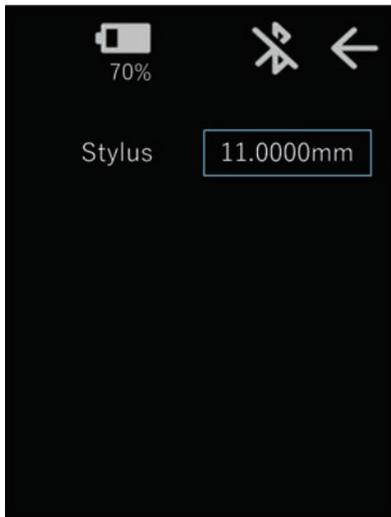
Indication	Description
Stylus	Sets the length of the measuring unit stylus. Note that if the correct setting value is not set, it will result in large error. This information is stored in the measuring unit. These settings are available only when using a DM series measuring unit. 0.0000 to 999.9999 mm

5-4. Hardware
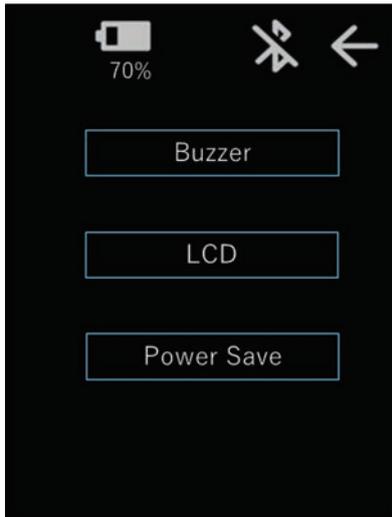
Indication	Description
Buzzer	Settings related to the buzzer.
LCD	Settings related to the LCD.
Power Save	Settings related to the power save timer.

5-4-1. Buzzer

Indication	Description
Volume	Sets the buzzer volume in three levels. 1 (Low) / 2 (Medium) / 3 (High)
Buzzer Item	Selects the conditions for sounding the buzzer. Button: The buzzer sounds when a button is tapped. Save: The buzzer sounds when data is saved. Comp Real: The buzzer sounds when the current value is outside the comparator range. Comp P-P: The buzzer sounds when the peak to peak value is outside the comparator range.

5-4-2. LCD
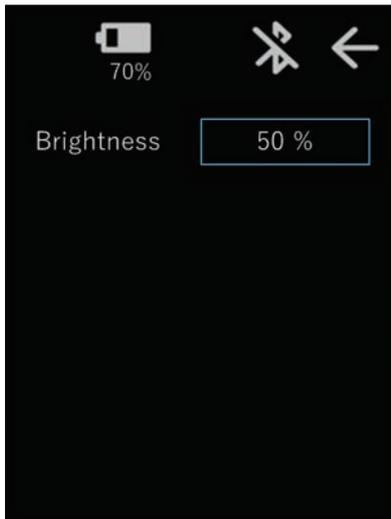
Indication	Description
Brightness	Selects the screen brightness.
	25% / 50% / 75% / 100%
	* The brighter the screen, the faster the battery charge is consumed.

LCD screen: 70%, Brightness 50 %

5-4-3. Power Save

Indication	Description
Sleep Mode	If there is no operation for the set period of time in the operating state, the device(s) will enter sleep mode. When set to OFF, the device(s) do not automatically enter sleep mode. OFF / 1 min / 5 min / 10 min
Sleep Device	This is enabled when Sleep Mode is other than OFF. Selects the device(s) to enter sleep mode when sleep mode is activated. LCD: Turns off the screen. LCD+Sensor: Turns off the screen and the measuring unit. * When using a DS series measuring unit, note that the measurement values will be reset if the measuring unit is turned off.
OFF Mode	If there is no operation for the set period of time in sleep mode, the power will turn off. When set to OFF, the power will not turn off automatically. OFF / 1 min / 5 min / 10 min

LCD screen: 70%, Sleep Mode OFF, Sleep Device LCD, OFF Mode OFF

5-5. Info
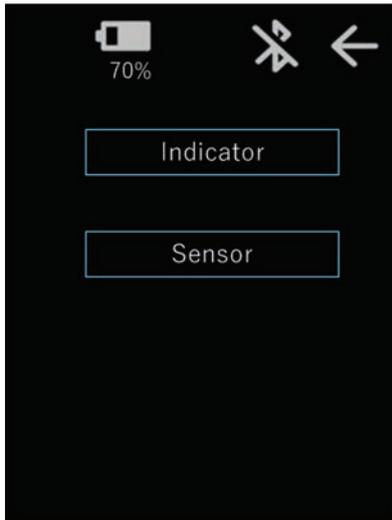
Indication	Description
Indicator	The information of the LU20 digital indicator can be set and referenced.
Sensor	The information of the measuring unit can be set and referenced.

5-5-1. Indicator
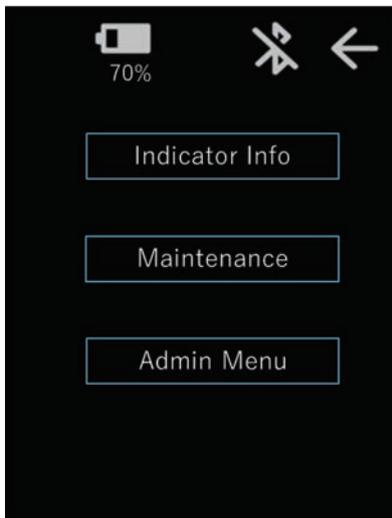
Indication	Description
Indicator Info	The information of the LU20 digital indicator can be referenced.
Maintenance	The maintenance information of the LU20 digital indicator can be referenced.
Admin Menu	The administrator settings of the LU20 digital indicator can be controlled.

5-5-1-1. Indicator Info

Indication	Description
Model	LU20 digital indicator model.
S/N	LU20 digital indicator serial number.
Ver	LU20 digital indicator firmware version.

5-5-1-2. Maintenance

Indication	Description
Hours	Cumulative operating time of the LU20 digital indicator. This can be reset on the Admin Menu screen.
Total Hours	Cumulative operating time of the LU20 digital indicator. This cannot be reset.

5-5-1-3. Admin Menu

Indication	Description
Hours Reset	Resets the cumulative operating time of the LU20 digital indicator.
Factory Reset	Resets the LU20 digital indicator settings to the factory settings.
Use Password	Set to ON to use the Setup screen password lock function. When this function is set to ON, password entry will be requested when opening the following Setup screens. ・Measure – Adjustment ・System – Bluetooth ・System – Sensor ID ・System – Sensor Spec ・Info – Indicator – Admin Menu ・Info – Sensor – Admin Menu
Password	Set a 4-digit number as the password. If the password is unknown, use the master password. Master password: 1234
CAL Notice	An alert message can be displayed prompting to check the next calibration date for the measuring unit. The alert message is displayed when the power is turned on and when connecting a measuring unit. This is available only with the DM series. The next calibration date can be edited by the CAL Date setting on the Info - Sensor - Admin Menu screen. OFF: The alert message is not displayed. 7days: Alerts from 7 days before the calibration date. 30days: Alerts from 30 days before the calibration date. 90days: Alerts from 90 days before the calibration date.

5-5-2. Sensor
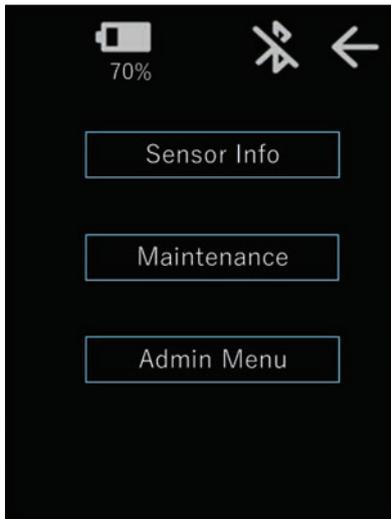
Indication	Description
Sensor Info	The information of the measuring unit can be referenced.
Maintenance	The maintenance information of the measuring unit can be referenced.
Admin Menu	The administrator settings of the measuring unit can be controlled.

All Sensor setting information is stored in the measuring unit.

5-5-2-1. Sensor Info
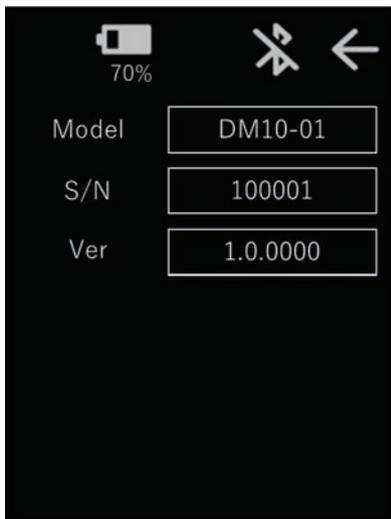
Indication	Description
Model	Measuring unit model
S/N	Measuring unit serial number
Ver	Measuring unit firmware version

5-5-2-2. Maintenance
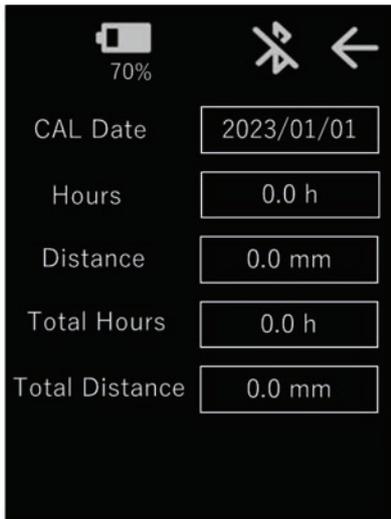
These settings are available only with a DM series measuring unit.

Indication	Description
CAL Date	The next calibration date can be referenced. It can be edited on the Admin Menu screen.
Hours	Cumulative operating time of the measuring unit. This can be reset on the Admin Menu screen.
Distance	Cumulative moving distance of the measuring unit. This can be reset on the Admin Menu screen.
Total Hours	Cumulative operating time of the measuring unit. This cannot be reset.
Total Distance	Cumulative moving distance of the measuring unit. This cannot be reset.

5-5-2-3. Admin Menu
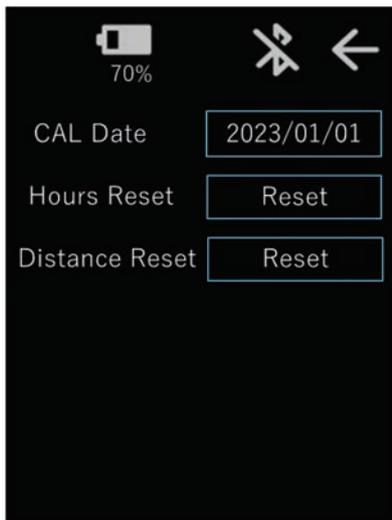
These settings are available only with a DM series measuring unit.

Indication	Description
CAL Date	The next calibration date can be set. When the CAL Notice setting on the Info - Indicator - AdminMenu screen is other than OFF, this setting is referenced and the calibration date alert message is displayed.
Hours Reset	Resets the cumulative operating time of the measuring unit.
Distance Reset	Resets the cumulative moving distance of the measuring unit.

5-6. Clock
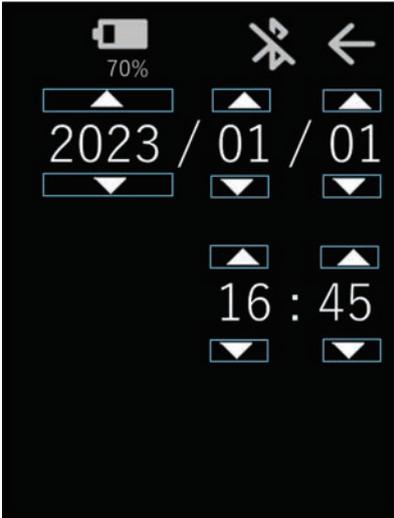
Sets the date and time.

⚠ CAUTION

When the battery level becomes extremely low or the batteries are removed, the internal clock is reset and must be set again.

5-7. Factory settings

Item				Setting value
Measure	Resolution		Direction	+
			Resolution	0.1 µm
	Comparator		C1	-0.0300 mm
			C2	0.0300 mm
			P-P	0.0600 mm
	Adjustment		Scaling	1.0000
			Angle	0°
	Display		Sub Value	OFF
Data Save	Mode		Timer	OFF
			Interval	0.5 s
			Count	0
		Save Item	Real	ON
			Max	OFF
			Min	OFF
			P-P	OFF
	HID Format		Sensor ID	OFF
			TimeStamp	OFF
			Delimiter	Comma
			Terminal	Enter
			DecPoint	Dot
	SD Format		Sensor ID	ON
			TimeStamp	ON
			Delimiter	Comma
			Terminal	CR+LF
			DecPoint	Dot
System	Bluetooth		Bluetooth Mode	OFF
			Pairing Data	-
			Keyboard	US Key
	Sensor ID		Sensor ID	-
			Sensor Information	-
	Sensor Spec		Stylus	-

* Items with a hyphen as the setting value are not LU20 settings.

Item				Setting value
Hardware	Buzzer		Volume	1
		Buzzer Item	Button	ON
			Save	ON
			Comp Real	OFF
			Comp P-P	OFF
	LCD		Brightness	50%
	Power Save		Sleep Mode	OFF
			Sleep Device	LCD
			OFF Mode	OFF
Info	Indicator	IndicatorInfo	Model	-
			S/N	-
			Ver	-
		Maintenance	Hours	-
			Total Hours	-
		AdminMenu	Hours Reset	-
			Factory Reset	-
			Use Password	OFF
			Password	1111
			CAL Notice	OFF
	Sensor	SensorInfo	Model	-
			S/N	-
			Ver	-
		Maintenance	CAL Date	-
			Hours	-
			Distance	-
			Total Hours	-
			Total Distance	-
		AdminMenu	CAL Date	-
			Hours Reset	-
			Distance Reset	-

* Items with a hyphen as the setting value are not LU20 settings.

6. Errors

6-1. Alert messages

The following alert messages are displayed when operation cannot continue normally.

Message	Cause	Action
SD system error 1	Data save to the microSD card failed.	If the error occurs repeatedly, replace the microSD card.
SD system error 2	MicroSD card mounting failed.	
SD system error 3	File generation on the microSD card failed.	
SD format error	A microSD card format error was detected. A file system other than FAT32 was detected.	Format the microSD card with FAT32.
Sensor error	An error occurred in setting the measuring unit.	Set the input range setting values of the measuring unit. Do not set unavailable characters in Sensor ID.
Battery low!	The battery level is less than 10%.	Charge the batteries.
Cannot save data	Data save was executed with a microSD card not inserted and Bluetooth connection not established.	Insert a microSD card or establish a Bluetooth connection and prepare the save destination.
SD memory < 20MB	The remaining capacity of the microSD card is less than 20MB. Data can be saved.	Replace with a microSD card with sufficient remaining capacity.
SD memory < 1MB	The remaining capacity of the microSD card is less than 1MB. Data save stops.	

6-2. Measuring unit errors

When the measurement values of the measuring unit cannot be acquired normally, the measurement value display changes as follows.

・ When the measuring unit is not connected or
　measurement values cannot be acquired due to a
　communication error.
　Current value: S-Err
　Maximum value, minimum value, P-P value: ----
・When an error has occurred in the measuring unit
　Current value: M-Err
　Maximum value, minimum value, P-P value: ----

7. Specifications

7-1. Product specifications

Model	LU20
Display / Touch panel	TFT liquid crystal 2.7-inch QVGA 240 × RGB × 320 / Resistive film type
Compatible measuring units	DM series, DS series (USB2.0FS Type-A)
Input/output interface	USB2.0FS Type-C
Wireless	Bluetooth5.2 (Bluetooth Low Energy) Frequency band: 2402 MHz to 2480 MHz Power Class: Class1.5
Data storage media[*1]	microSD card (microSDHC[*2])
Operating voltage / Charging voltage	DC+5 V ±5%
Maximum power consumption[*3]	5 W (with DM connected), 6 W (with DS800S/DS connected)
Battery[*4]	Dedicated lithium-ion rechargeable batteries 3.6 V / 3200 mAh × 2
Battery continuous operating time[*5]	Approx. 50 hours (with DM connected) Approx. 40 hours (with DS connected)
Battery charging time[*5]	6 to 8 hours (0 → Fully charged)
Vibration resistance	15 m/s^2 (10 to 200 Hz)
Impact resistance	360 m/s^2 (11 ms)
Operating temperature and humidity	0 to +40°C (No condensation)
Storage temperature and humidity	-10 to +60℃ (No condensation)
Product mass	230 g (Main unit only)
Mounting stand mass	150 g
Dimensions	91 × 64 × 40 mm (Not including protrusions)
Accessories	USB cable (Type-A⇔Type-C 1.2 m)[*6] Mounting stand Mounting stand plate, 2 types of different thickness × 2 each Alcohol wipe × 2 LCD protective sheet × 2

*1 The media is to be prepared by the customer.

*2 Only the FAT32 file system can be used.

*3 When operating and charging the main unit at the same time

*4 Use our dedicated batteries supplied with the product.

    The batteries are replaceable. Use our dedicated accessory DZ60 (sold separately).

*5 Varies according to the method of use and the battery status.

*6 The structure is not bend resistant or oil resistant.

7-2. Dimensions diagrams

7-2-1. LU20
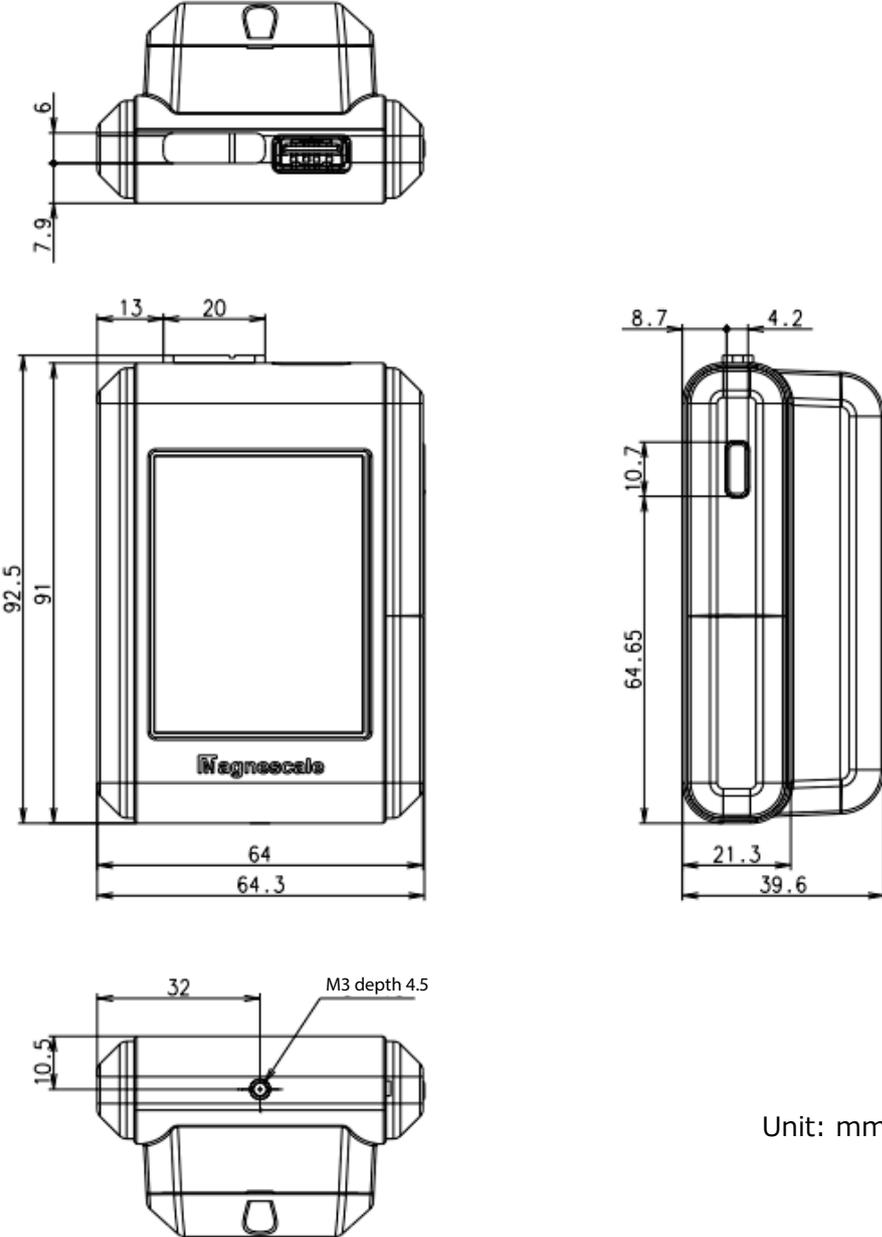
Unit: mm

7-2-2. Mounting stand

Ø38.1
Ø29.7
(16.7)
(77.4)
44

Unit: mm

日本から輸出時における注意

本製品（および技術）は輸出令別表第1の16の項（外為令別表16の項）に該当します。キャッチオール規制による経済産業省の許可要否につきましては、輸出者様にてご確認ください。

For foreign customers

Note: This product (or technology) may be restricted by the government in your country. Please make sure that end-use, end user and country of destination of this product do not violate your local government regulation.

Magnescale Co., Ltd.

45 Suzukawa, Isehara-shi, Kanagawa 259-1146, Japan