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Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001:2001



Instruction Manual

Pocket TrapMan.

PT3

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Introduction

Thank you for purchasing the PT3 TLV Pocket TrapMan pocket-size diagnostic instrument.

When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

To ensure safe and correct use of this product, be sure to observe the safety precautions listed in this manual as they relate to installation, operation, maintenance and repair of the product. Please keep it in a safe place for future reference.

TLV accepts no responsibility for incorrect use of the product by the customer or any third-party, malfunction occurring during use, other defects and any damage caused by this product, excluding cases in which it is under obligation to pay reparations by law.

This product has undergone strict quality management and product inspection before being shipped from the factory. However, in the event of malfunction or defects, please contact your local TLV representative or the TLV customer service center.

This instruction manual and product are subject to modification without notice, for the purpose of improvement.

Unauthorized reprinting or reproduction, in whole or in part, of this instruction manual or product is strictly prohibited.

Safety considerations

Read the safety precautions carefully and follow the instructions to ensure proper use of the device.

The precautions listed in this manual are designed to ensure safety and prevent personal injury to yourself and others as well as equipment damage. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential danger and damage: DANGER, WARNING and CAUTION. All three types of cautionary items are important for safety; be sure to observe all of them. To ensure using the device safely, be sure to read the instruction manual (safety and explosion-proof requirements).

Cautionary items and definitions



Danger

Indicates an urgent situation which poses a threat of death or serious injury



Warning

Indicates that there is a potential threat of death or serious injury



Caution

Indicates that there is a possibility of injury or equipment/product damage

General Precautions



Danger

DO NOT disassemble or modify the device or battery. Failure to observe this precaution could result in fire or malfunction. Failure to observe this precaution could result in leakage of the battery fluid, excessive heat generation, rupture or ignition. If battery fluid leaks and comes into contact with your body or gets into your eyes, immediately rinse the affected area with clean water and see a doctor.



Danger

DO NOT apply heat to the batteries or throw them into a fire. Whether the battery or the device is new or used, do NOT dispose of them by throwing them into a fire, as they may EXPLODE causing injury.



Danger

DO NOT let the device become immersed in water. If the device is submerged, immediately stop using it and return it to TLV. Do not immerse or let the device become immersed in water or other liquids.

Charging Precautions



Warning

DO NOT charge the battery with anything other than the device. Failure to observe this precaution could result in excessive heat generation or fire.



Warning

After charging is complete, disconnect the USB cable from the device. Failure to do so may result in heat generation or fire.

**Warning**

DO NOT plug or unplug the charger with wet hands. Failure to observe this precaution could result in electrocution.

**Warning**

DO NOT charge the battery in hazardous areas. Failure to observe this warning may result in explosion, fire or injury.

Battery Precautions

**Danger**

DO NOT replace the battery in hazardous areas. Make sure to replace the battery in non-hazardous areas. Failure to observe this precaution could result in explosion, fire or injury.

**Danger**

DO NOT open, disassemble or crush the battery. Failure to observe this precaution could result in leakage of the battery fluid, battery overheating, rupture or ignition. If battery fluid leaks and comes into contact with your body or gets into your eyes, immediately rinse the affected area with clean water and see a doctor.

**Danger**

DO NOT apply heat to the battery or throw it into a fire. Do not throw the battery into a fire or heat it, neither before nor after use. Both are very dangerous and could result in explosion, ignition or rupture. The temperature should be kept between 0 to 40 °C while charging and -10 to 50 °C while in use.

**Danger**

DO NOT let the battery become immersed in water. Do not immerse or let the battery become immersed in water or other liquids. Failure to observe this precaution could result in leakage of the battery fluid, battery overheating, rupture or ignition.

**Danger**

DO NOT use the battery if damaged. Do not use the battery in the case of any abnormalities such as battery overheating, unusual odors, discoloration or deformation, etc. Battery damage could result in overheating, expansion, leakage, smoke, ignition or explosion.

**Danger**

DO NOT incinerate the battery. Failure to observe this precaution may result in fire or explosion.

**Danger**

DO NOT use a battery other than the specified model. When replacing the battery, use only the TLV CO., LTD. model P11-22050-x battery. Failure to observe this precaution may result in fire or injury.

**Danger**

DO NOT use or leave the device in areas that will become very hot. Do not leave the device where it will be exposed to direct sunlight or in areas that will become very hot, such as interiors of cars, near heating equipment, etc. Failure to observe this precaution could result in leakage of the battery fluid, battery overheating, rupture or ignition.

**Danger**

Keep the device out of reach of children. Failure to observe this precaution could result in injuries, overheating, smoke, ignition or explosion.

**Warning**

DO NOT use the battery in the case of any abnormalities such as battery fluid leakage, unusual odors, battery overheating, discoloration or deformation, etc. Failure to observe these precautions may result in damage to the device, fire or burns.

**Warning**

If battery fluid leaks and comes into contact with the body, rinse immediately. There is danger of resultant damage to the skin. Immediately rinse any battery fluid off with clean water.

**Caution**

Be sure to charge the battery regularly. If the device is not used for a long time with the battery installed, fully charge the battery once a month. The battery will deteriorate and become unusable.

**Caution**

DO NOT remove the battery from the device. Water resistance may be impaired. If the battery has deteriorated and needs to be replaced, send it to TLV.

**Caution**

Return unnecessary batteries to your local TLV office or distributor either before or after use of the battery, insulating the contact terminals with tape or dispose according to your company regulations.

Usage/Storage Precautions

**Warning**

DO NOT operate the device with wet hands. Do not plug or unplug the charger with wet hands. Failure to observe this precaution could result in electrocution.

**Caution**

This device is explosion-proof certified. The explosion-proof marking is indicated on the device nameplate. The device should be used by trained personnel with knowledge of the hazardous locations/classifications.

**Caution**

DO NOT allow any foreign matter to enter the device. In areas with small foreign matter such as metal dust, use the device after taking measures to prevent foreign matter entering the device. Failure to observe this precaution could result in fire or malfunction.

**Caution**

Surface temperature measurement range is -40 to 350 °C. If an object with a surface temperature of 350 °C or higher is measured, the probe tip or internal parts may be damaged. If the surface temperature is expected to exceed 350 °C, stop measuring.

**Caution**

DO NOT drop the device or otherwise subject it to strong impacts. Doing so may cause damage, malfunction, battery ignition or burns.

**Caution**

DO NOT leave the device in areas that will become very hot. Do not leave device where it will be exposed to direct sunlight or in areas that will become very hot, such as interiors of cars, near heating equipment, etc. This may cause the device to malfunction or fail.

**Caution**

DO NOT use sharp objects such as pens to operate the buttons. This may damage the buttons.

**Caution**

DO NOT place any part of the device other than the tip of the probe against a hot location. Failure to observe this precaution could result in malfunction.

**Caution**

DO NOT drag the tip of the probe across the surface of the object being measured. Failure to observe this precaution could result in malfunction.

**Caution**

DO NOT leave the device in places subject to excessive dust and strong vibrations. Failure to observe this precaution could result in malfunction.

**Caution**

DO NOT remove the temperature sensor from the tip of the probe. Forcibly removing the sensor may cause malfunction.

**Caution**

Return the unnecessary device to your local TLV office or distributor for disposal, or dispose according to your company regulations.

Precautions related to Site Inspections

**Danger**

DO NOT use earphones other than those specified. Any earphones other than those specified should not be used in hazardous areas.

**Warning**

DO NOT operate the device while walking. Failure to observe this precaution could lead to accidents such as tripping or collisions.

**Warning**

Take measures to prevent getting caught in rotating machinery. When passing by or working near rotating machinery, take measures to prevent the strap, earphone cord, clothing etc. from getting caught in the machinery. This may result in accident or injury and damage to the device or equipment.

**Warning**

Before using the product, make sure to take measures to prevent burns. Take measures to prevent burns from accidentally touching hot piping.

**Caution**

Turn down the volume first when using earphones. Using earphones when measuring in locations with strong vibrations may result in hearing loss.

Standard set



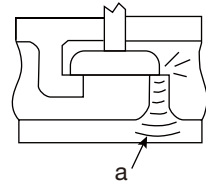
No.	Description	No.	Description
1	Explosion-proof requirements	4	Cap
2	Quick guide	5	Hex key
3	Pocket TrapMan PT3		

Principles of operation

Generation of ultrasonic sound (steam trap and valve)

When fluid leaks through the seat in a steam trap (hereinafter referred to as "trap") or valve, it emits ultrasonic sound (a). (Ultrasonic refers to the very high-frequency range of sound that is above the threshold of human hearing.)

Since this ultrasonic sound is generated by an amount of leakage that would otherwise be too small to be noticed by human perception, checking for ultrasonic sound enables the detection of deteriorated steam traps or valves at a very early stage.



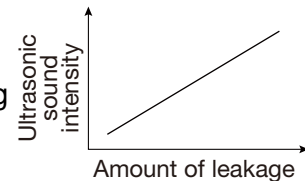
Note

- Trap inspections are for steam traps only.
- Valve inspections apply only to valves installed on piping for applicable fluids such as steam, air and other gases.

Ultrasonic intensity and steam leakage correlation

There is a correlation between the intensity of the ultrasonic sound generated by a leak and the amount of steam leakage.

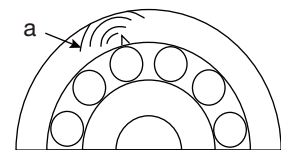
The device judges the trap or valve operational condition by measuring the intensity of the ultrasonic sound and comparing it with a standard set of precisely measured values obtained from experimentation.



Ultrasonic shock pulse generation (bearing)

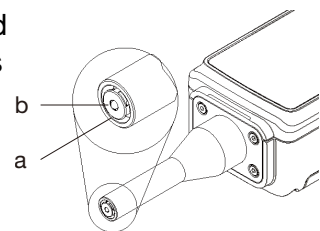
Shock pulses (a) are generated whenever two metals collide. For bearings, they are generated from contact between the races due to insufficient lubrication or damage from wear.

As there is a correlation between the intensity of the shock pulse generated, the degree of damage and the velocity of the contact (rotation frequency/shaft size), the operational condition of a bearing can be determined by measuring the intensity of the shock pulse.



Surface temperature measurement (steam trap, valve, bearing)

The device can measure surface temperature (a) and ultrasonic sound (b) simultaneously. Temperature data can be used to detect blockages in steam traps and to help determine the condition of bearings.



Functions and features

Trap inspection

PT3 automatically inspects the steam trap and makes a judgement estimate regarding the basic operational condition (Good, Caution, Leak, Leak/L, Leak/S, Blocked, Low Temp., Fail adj.-H, Fail adj.-L).



Note

Automatic inspection for Fail adj.-H and Fail adj.-L are only available for temperature control traps. Automatic inspection for Leak/L and Leak/S is only available when one of TLV's major models is selected. Ideal for systems where detailed steam trap management is not implemented, or for daily inspections of critical systems between annual steam trap surveys. Using the device for daily inspections is an effective way to determine whether maintenance is required or not.

Valve seal inspection

The device simultaneously measures vibrations and the surface temperature and automatically inspects the valve and makes a judgement estimate regarding the condition of the valve's seal (Good/Caution/Leak). The device is effective for determining whether a valve is properly closed.

Bearing deterioration inspection

The device is effective for collecting the data regarding a bearing's operational characteristic. Bearing deterioration (lack of lubricant, bearing wear, etc.) can be determined based on the collected data.



Note

Structural faults in rotating machinery, such as misalignment and unbalance, cannot be detected.

User-defined inspection

Measurement data (vibration and surface temperature values) for inspection items selected by the user (excluding steam traps, valves, and bearings) can be collected. The item names can be changed using CMRecorder.

Audio monitoring

Average values of temperature and acceleration level can be measured simultaneously while listening to sound via Bluetooth earphones.

Compatible with mobile app

Data management and reporting are available via CMRecorder.

Measurements begins and stops automatically

Measurements begin automatically when the probe is pressed against the measurement surface. Measurements stop after a certain amount of time has elapsed. In Bearing mode, measurements also stop automatically when the probe is removed from the measurement surface.

Data stored in memory

Inspection data is automatically stored in memory after each measurement. The device has the following inspection modes: "Trap", "Valve", "Bearing", and "User-defined" mode. A maximum of 3,000 records can be recorded for each mode.

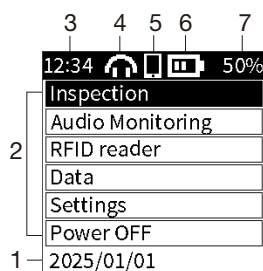
Components, features and functions

Hardware



A	Battery cover	—
B	Probe	Press and hold the tip of the probe against the measurement surface to detect internal abnormalities.
C	Cap	Protects the probe when in storage or not in use with a heat resistance up to 120 °C.
D	Display	Shows the modes of operation and measurement results.
E	Directional buttons	Move the cursor up, down, left and right.
F	ENT button	Used for turning the device on, screen transfer, confirmation of the input value.
G	LED indicator	Display status of the present measurement by being lit or by flashing.
H	RFID tag reader	Place the reader close to the tag to scan the information.
I	Strap hole	Attach the strap as necessary.
J	USB type C connector	When not in use, make sure to close the connector cover.

Names and functions of icons displayed on the home screen



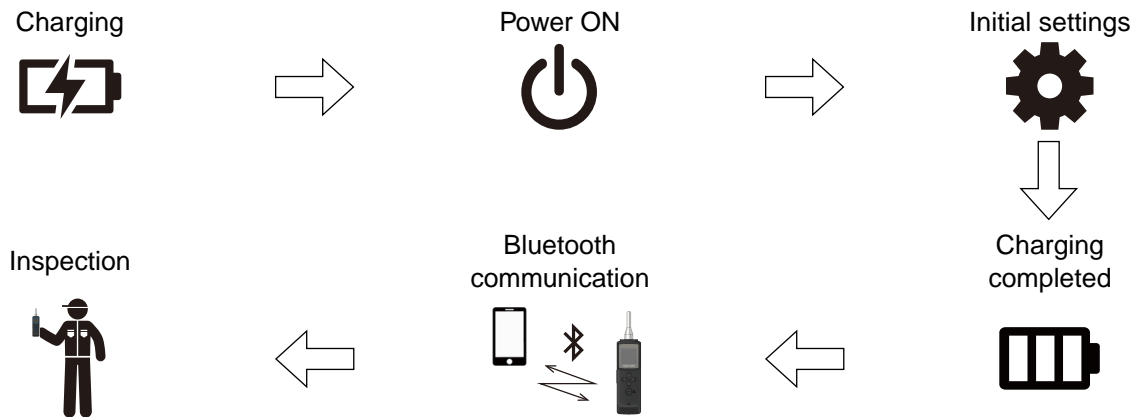
No.	Description
1	Date
2	Menu
3	Time
4	This icon is displayed when earphones are connected with Bluetooth.
5	This icon is displayed when a device is connected to CMRecorder.
6	Battery charge indicator
7	Battery percentage indicator

Menu item	Description
Inspection	Used to perform inspections.
Audio monitoring	Used to measure ultrasonic sound. Average values of temperature and acceleration level can be confirmed simultaneously.
RFID reader	Used to read RFID tags (only when the device is connected to CMRecorder).
Data	Search and display data stored on the device.
Settings	Used to set various items.
Power off	Turn off the device.

Getting started

Preparing for inspection

Before starting the inspection, you should prepare the hardware with the procedures indicated by the graphics below. When charging begins, the power turns on automatically.



Bluetooth communication is available when CMRecorder (data management app for mobile devices) is used.



Note

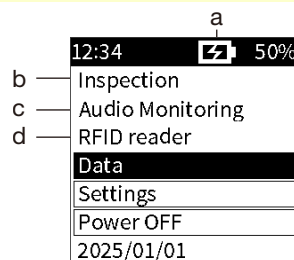
When the device is started for the first time, the language selection, measurement unit, and date & time settings screen are displayed. Set each item by referring to the explanation described in the "Setting details" section.

Charging the battery



Caution

- The ambient temperature during the charging process should be between 0 to 40 °C.
- To prevent battery deterioration the battery should be fully charged once a month even if it is not used for an extended period of time.
- Make sure to use a USB-IF certified type-C cable.



1. Use a USB type-C cable for charging the battery.
2. The LED lights up red while battery is being charged. The LED lights up green when the battery is fully charged.
3. Charging status (a) is displayed on the home screen while charging the battery. Items [Inspection] (b), [Audio monitoring] (c), [RFID reader] (d) are unavailable while the battery is charging.
4. After charging is complete, disconnect the USB cable from the device.

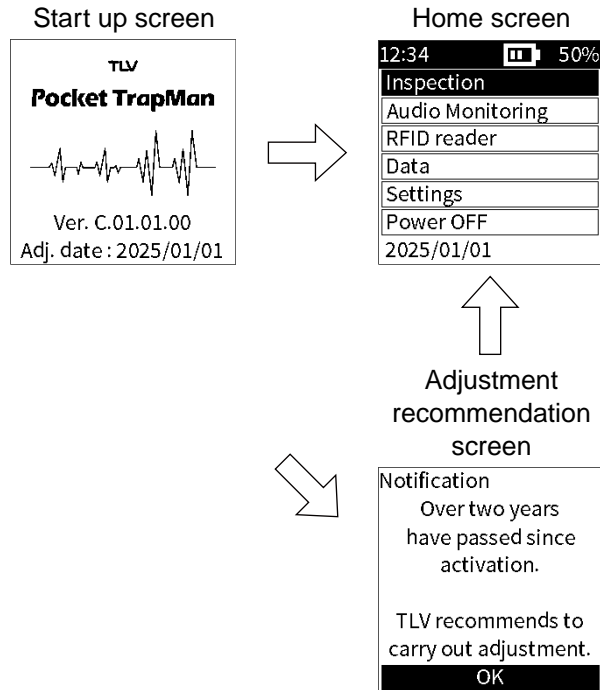
Turning the device on

Press and hold the [ENT] button for 3 seconds to turn on the power. (Front light turns on.) After the start up screen is displayed, the display moves to the home screen.



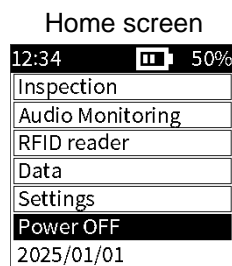
Note

When two years have passed since the activation date, a recommendation to carry out adjustment will appear. If this screen appears, please refer to the "Adjustment" section.



Turning the device off

Select [Power OFF] on the home screen and press the [ENT] button to turn the power off. Additionally, pressing and holding the [ENT] button for 3 seconds on each screen will switch off the device.



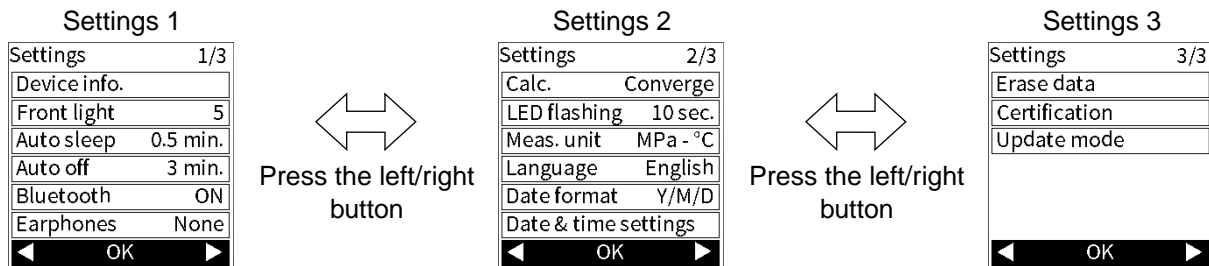
Note

On the measurement screen or settings screen, pressing and holding the [ENT] button for 3 seconds will not turn switch off the device.

Settings

1. Select [Settings] on the home screen and press the [ENT] button.
2. Various parameters can be set on screens 'Setting 1', 'Setting 2' and 'Setting 3'. Refer to the "Setting Details" section. The directional buttons (left/right) switch between the settings screens.

- To configure each parameter, select the parameter with the directional buttons (up/down).
- Select [OK] and press the [ENT] button to save settings.



Setting details

Device information

Shows the device information, version of each function, and various information.

Device info.	
a	Serial No. HW00001
b	Prog. ID C.01.01.01
c	Probe count 12345
d	Adj. date 2025/01/01
OK	

a	Serial number
b	Firmware version
c	Number of measurements
d	Adjustment date

Front light

Adjust the brightness of the screen front light to OFF, 1 to 5 with the left/right button. When the device is off, the front light is turned off.



Note

Operating the device with the front light on consumes a lot of power and shortens the battery life. Power consumption increases with a higher brightness setting.

Auto sleep

When inactive for a defined period of time after being switched on, the device will automatically enter sleep mode. The time period until the device enters sleep mode can be set to: Disable, 0.5, 1, 2 or 3 minutes. Use directional buttons (left/right) to change the value. The standby mode is disabled when the sleep mode is set to [Disable]. During standby mode, the screen display and front light are turned off to reduce battery consumption, and the LED flashes blue. A display of the battery charging status will be prioritized when the USB is connected to the device.

Auto off time

When the device remains in automatic sleep mode for a defined period of time, the device will automatically turn off. The time until the device shuts down can be set to: Disable, 5, 10, 20 or 30 minutes. Use directional buttons (left/right) to change the value. The automatic power off function is disabled when the time period is set to [Disable]. While the device is turned off, the screen, front light, CPU, and Bluetooth communications will be turned off to reduce battery power consumption.



Note

The automatic power off function is disabled while USB power is supplied. This item cannot be selected when automatic sleep is set to [Disable], and the automatic power-off setting will be changed to [Disable].

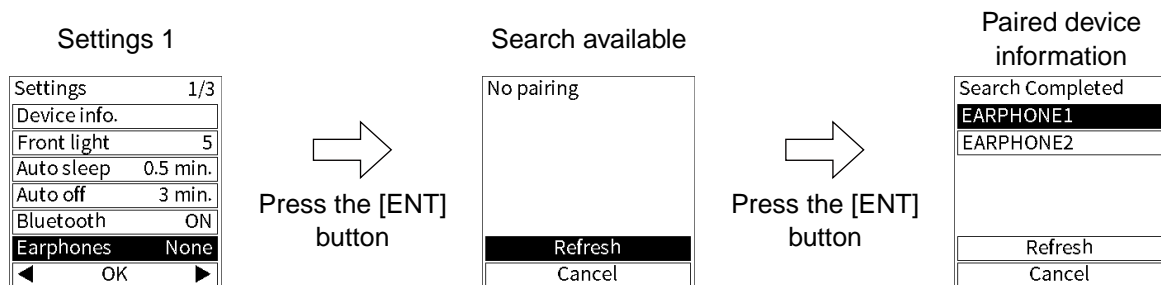
Bluetooth

Enables/disables Bluetooth communication of the device. [ON] (communication enabled) or [OFF] (communication disabled) can be selected by pressing left/right buttons. Button control is not available while [ON→OFF] or [OFF→ON] is displayed.

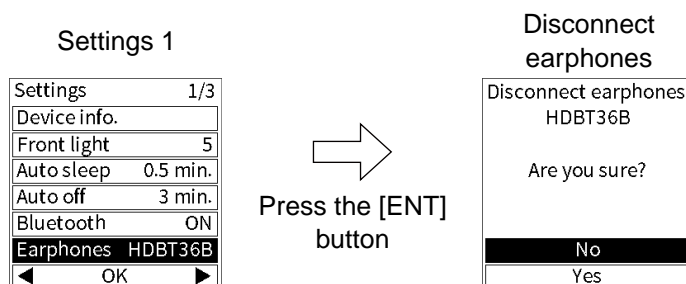
Earphones

Pairs Bluetooth earphones with the device. Bluetooth earphones can be used for trap inspection, valve inspection, and audio monitoring.

1. Select [Earphones] and press the [ENT] button and the device search screen will appear.
2. To search for available Bluetooth earphones, select [Refresh] and press the [ENT] button.
3. To complete pairing, select the earphones you wish to pair with and press the [ENT] button. When Bluetooth earphones are not listed even if [Search completed] is displayed on the device, select [Refresh] once again and press the [ENT] button.
4. If earphone connection fails, [Pairing failed] is displayed. In that case, try to connect the earphone again.



5. If Bluetooth earphones are paired, the earphone name will be displayed in the [Earphones] section of the 'Settings 1' screen. To disconnect, select [Earphones], press the [ENT] button to move to the disconnect earphones screen, and then select [Yes] and press the [ENT] button.



Note

- Earphones cannot be selected when Bluetooth is off.
- Volume should be controlled on the earphones. There is no volume control on this device.
- Earphones without volume adjustment function are not supported.
- Some earphones may not be compatible with Bluetooth connections. Please check the connection before use.

Calculating displayed value (for bearing inspection mode and user-defined mode only)

Set the calculation method for vibration values during bearing inspection and user-defined mode by pressing the left/right buttons.

Converge:

The average measured value from all intervals is displayed. The value converges with time as instantaneous measurements vary.



Note

The current value is always displayed for temperature.

Interval:

The value from the current measurement interval is displayed. This is useful to visualize instantaneous variations.

LED flashing conditions (for bearing inspection mode/user-defined mode only)

Press the left/right button or the [ENT] button to select the condition for switching the LED flashing during bearing inspection and user-defined mode.

10 seconds: 10 seconds after measurement begins, the green LED flashes.

Vibration: When the acceleration level stabilizes, the green LED flashes.

Temperature: When the measured surface temperature stabilizes, the green LED flashes.

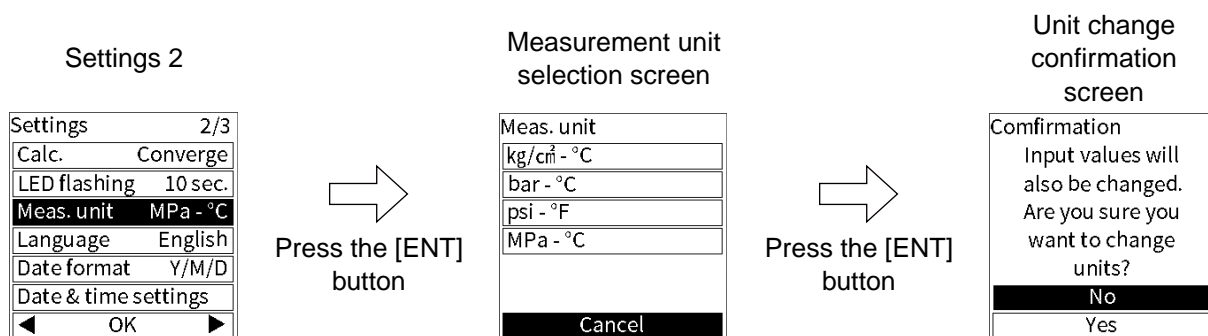


Note

"Vib." will not be displayed when "Interval" is selected for the calculation method.

Measurement units

Selects pressure and temperature units. All pressures are gauge pressures, not absolute pressures. The unit change confirmation screen will be displayed when changing units, but not when setting units for the first time. Select [Yes] and press the [ENT] button.

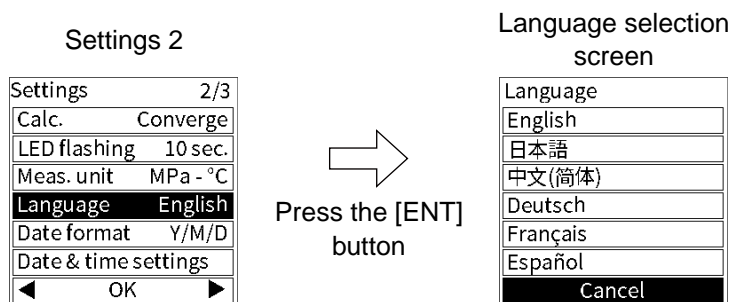


Note

The unit cannot be changed while the device is connected to CMRecorder. Disconnect the app before the unit is changed.

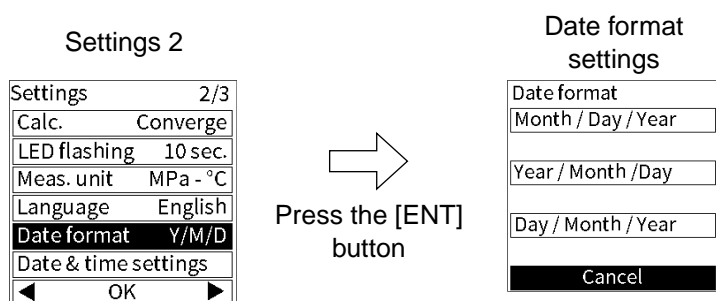
Language

Selects the display language.



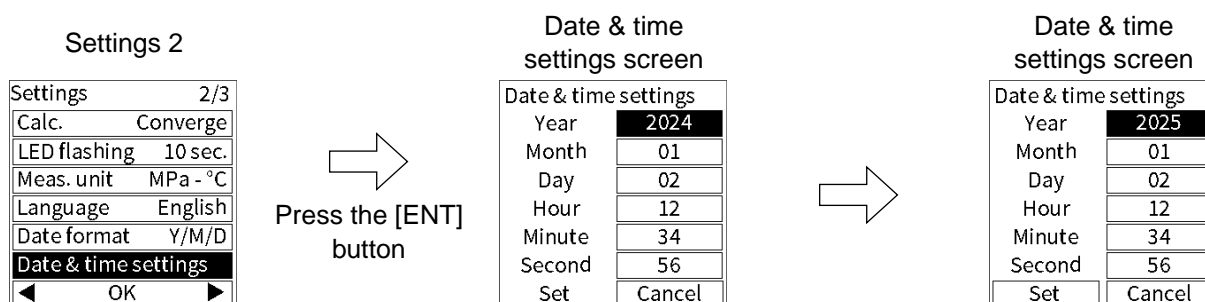
Date format

Selects the date format.



Date & time settings

Sets the date and time for the device. When a valid date and time are selected, complete settings by selecting [Set] and pressing [ENT].



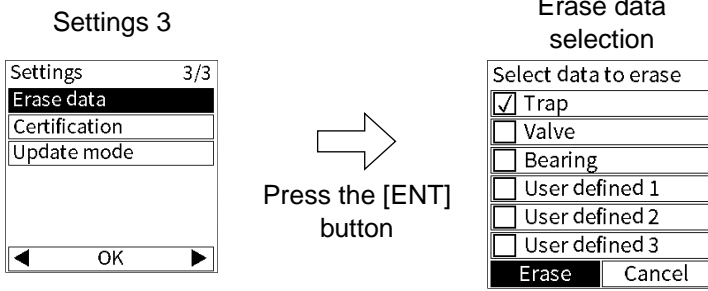
Note

Inspections cannot be performed without setting this item. Performing inspections without setting the date and time will automatically transfer the user to the date and time settings screen. When the device is connected to CMRecorder, the date and time will be set automatically.

Erase data

Erases inspection data stored on the device.

- Check the data type you wish to erase by pressing the [ENT] button.

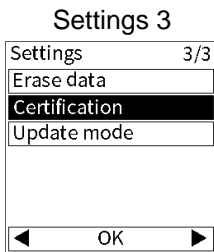


Note

Deleted data can only be restored if it has already been uploaded to CMRecorder.

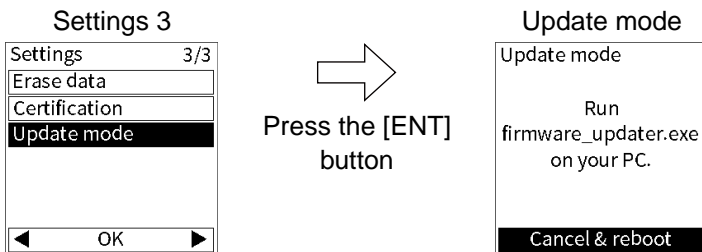
Certification

Displays the information related to the certification of the product.



Update mode

Updates the product firmware.



Note

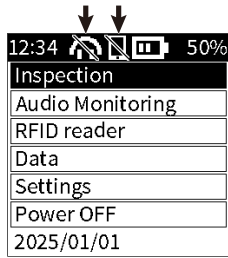
Please download the necessary files for updating from the TLV website. Refer to the TLV website for details.

Connect the device to CMRecorder

1. Communicate with CMRecorder using Bluetooth.
2. Open CMRecorder on your mobile device.

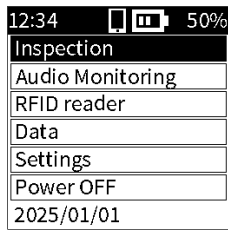
3. Make sure that Bluetooth is enable on the device.

When Bluetooth is disabled



4. Connect to the device from the [Connect] button on CMRecorder. For details, refer to the CMRecorder documentation.
5. When the device is connected to a mobile device with CMRecorder, an icon indicating the connection is displayed on the home screen.

The device connected to CMRecorder



Inspection

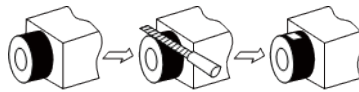
Prepare the measurement surface

Ultrasonic sound and surface temperature cannot be measured accurately if the surface where the measurement is to be taken is curved or a rough finished surface, or if it is coated with paint, dirt, rust or scale. Additionally, if the measuring surface is curved or in a rough-cast state, accurate measurements cannot be obtained. File the measurement location to produce a smooth and flat area of at least $\varnothing 9$ mm.



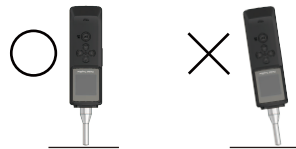
Note

Take measures to prevent getting caught in rotating machinery while performing bearing inspections.



Probe application

If the probe is tilted or applied to the surface at an angle, inconsistent contact with the surface will make it difficult to obtain an accurate measurement. Try to keep the probe as perpendicular and steady as possible during the measurement.



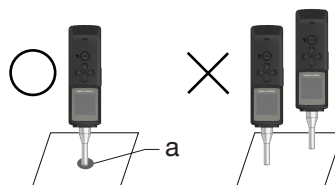
Consistent measurement location

Always take measurements from the same location. If measurement locations are different, the measured data may also differ. Especially, when trying to observe trends in measured values taken over time, it is likely to be more difficult to accurately identify such trends, leading to misjudgement, if the location differs with every measurement. Determine an appropriate measurement location first, and measure at the same location for subsequent measurements. For convenience, mark the measurement location (a).



Note

Avoid scoring the surface or making a small indentation on the surface as this may cause inaccurate measurement.



Surface temperature restriction

The allowable surface temperature range of the object to be measured is -40 to 350 °C. The LED indicator (red) will flash rapidly when the surface temperature exceeds 350 °C, "Over" appears on the display or "Under" when the temperature is below -40 °C.

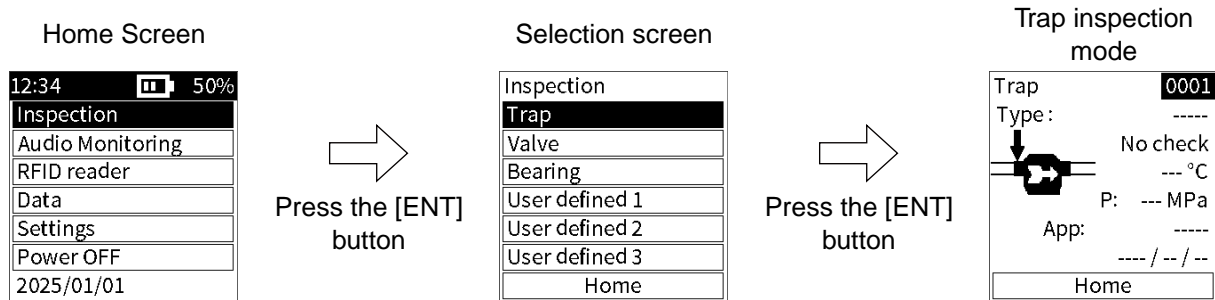
If you observe the indicator flashing in such a rapid manner, quickly remove the probe from the object, cancelling the measurement. Continuing measurement under these conditions could result in damage to the probe.

Trap inspection

The device is equipped with a simple automatic diagnosis function for steam traps. This section explains how to properly operate the device for steam trap inspections.

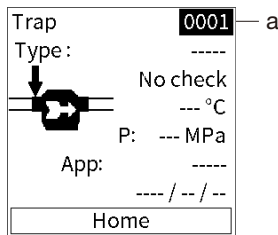
Selecting the trap inspection mode

1. Select [Inspection] on the home screen and press the [ENT] button.
2. Select [Trap] on the selection screen and press the [ENT] button.



Setting the record number

Before measurement is taken, set the record number (a) by pressing the directional button while the record number is selected.



Note

- The record number cannot be changed after the measurement is taken.
- If measurement is started while a record number containing inspection data is selected, the existing inspection data will be overwritten.

1. Pressing either the left or right button once increments/decrements the record number by one.
2. Holding down either the left or right button for more than one second increments or decrements the record number by 10, and holding the button for more than three seconds increments or decrements it by 100.
3. If any inspection data is recorded in the assigned record number, its contents are shown.
4. Record numbers from 0001 to 3000 are available. The data can be saved by skipping record numbers.
5. To return to the home screen, select [Home] and press the [ENT] button.

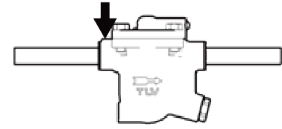
Measurement location

Measurements should be taken at the inlet side of the trap.



Note

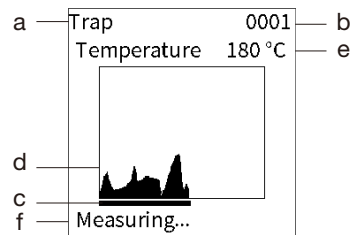
If the measurement is taken at the trap outlet, measurement accuracy cannot be assured. Measurement begins automatically once the probe is pressed against the measurement surface.



Display during measurement

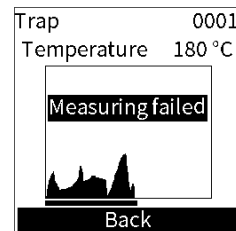
The measurement process takes 15 seconds. Press and hold the probe perpendicularly against the measurement surface.

1. Display during measurement (pressing the probe against the measurement surface)



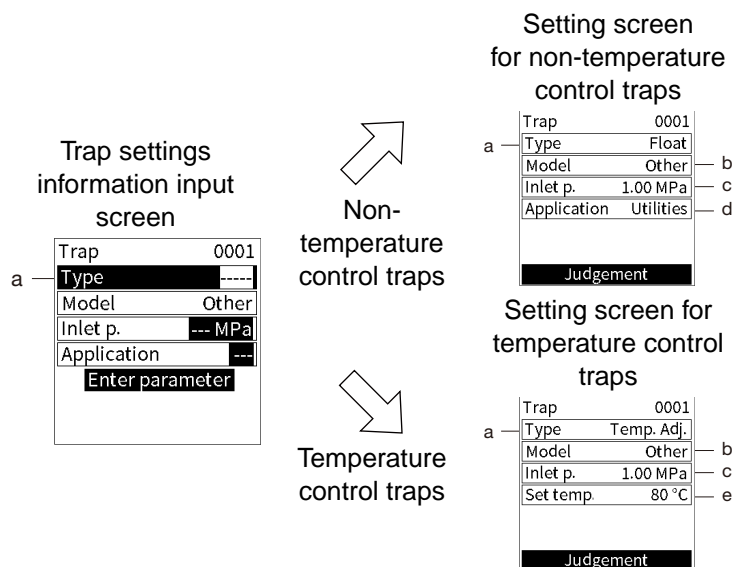
a	Inspection mode	Indicates the current inspection mode (trap inspection mode)
b	Record number	Displays the record number
c	Progress bar	Indicates the progress of the current measurement. When the bar reaches the end of the graph, measurement is complete
d	Ultrasonic waveform graph	Displays the ultrasonic waveform of the measurement in progress
e	Measured temperature	Displays the trap surface temperature being measured
f	Measurement status	Displays the current status

2. The LED lights up green during measurement and flashes green when measurement is complete.
3. If a probe is removed during measurement or is not held perpendicularly against the measurement surface, measurement will stop and the inspection error screen (see the image on the right) will appear. Hold the probe steady and perpendicularly against the measurement surface while measuring. To cancel measurement, press the [ENT] button to return to the trap inspection mode screen. To resume measurement, press the probe against the measurement surface again.



Entering the trap configuration information

Once the 15-second trap measurement is complete, the trap configuration input is displayed. Select the trap configuration information such as the trap type (a), model (b), inlet pressure (c), application (d) or set temperature (e) of the trap to be measured using the directional (left/right) button. If the given information is insufficient, "Enter parameter" will appear on the screen. After all information is input, [Judgement] is displayed. Press [Judgement] and perform the judgement.



Selecting the trap type

Select appropriate trap type from the following:

- Disc:** Disc type
- Float:** Float type
- Bucket:** Bucket type
- Thermo.:** Thermostatic type
- Temp. Adj.:** Temperature control type
- Other:** Unknown

Search and display data stored for the device.

- If data was previously saved under this record number, the previously entered data is displayed.
- If no data was previously saved under this record number, “-----” is displayed.

Selecting the model

The left/right buttons allow the user to select some common TLV models (e.g., SS1 series). More accurate inspection results can be obtained by selecting a model. If the desired model is not listed, select [Other]. The selected model will be displayed on the screen.

- If the model has been entered previously, the corresponding data will be displayed.
- If no model has been entered previously, “-----” will be displayed by default.

Entering the inlet pressure (for all trap types)

1. Enter the pressure information under which the trap to be inspected is operating. All displayed pressures are gauge pressures, not absolute pressures.
 - If data was previously entered, the previously entered pressure value is displayed.
 - If no data was previously saved under this record number, “-----” is displayed.
2. Use the left/right buttons to enter the pressure value.

The pressure will increase or decrease according to the table below.

Press either the left or right button for more than 1 second to increment/decrement the input value quickly.

Display unit	MPa	kg/cm ²	bar	psi
Pressure setting range 1	0.00 to 0.10	0.0 to 1.0	0.0 to 1.0	0 to 10
Increment/decrement value	0.01	0.1	0.1	1
Pressure setting range 2	0.10 to 1.00	1.0 to 10.0	1.0 to 10.0	10 to 100
Increment/decrement value	0.05	0.5	0.5	5
Pressure setting range 3	1.00 to 8.00	10.0 to 82.0	10.0 to 80.0	100 to 1160
Increment/decrement value	0.10	1.0	1	10

Selecting the application (for non-temperature control traps)

- Select the application where the inspected trap is installed: [Main Line], [Tracing], [Heating], or [Other].
 - If no data has been previously saved under the same record number, "---" will be displayed.
 - If data has been previously saved under the same record number, the previously selected application will be displayed.

The selection criteria for applications are as follows. Please consider the application selection as outlined below.

Application	Description	Normal condensate load
Main Line	Trap used for discharging condensate from steam line to steam-using equipment	Low
Tracing	Trap used for discharging condensate from tracing line	Low
Heating	Trap used for discharging condensate from heaters or heat exchangers	High
Other	When the application is neither Main Line, Tracing, nor Heating, or when the application is unknown	Unknown or High



Note

If the condensate load is clearly high, select [Other].

- Use the left and right buttons to select the application.

Entering the temperature setting (for temperature control traps)

Enter the temperature setting for the temperature control type. The set temperature range is 1 to 350 °C. Press either the left or right button for more than 1 second to increment/decrement the input value quickly.

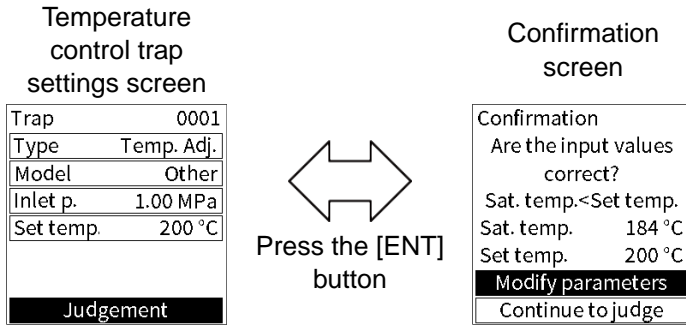
- If no data was previously saved under this record number, "---" is displayed by default.
- If the data was previously saved with the same record number in the past, that set temperature is displayed.

Judgement

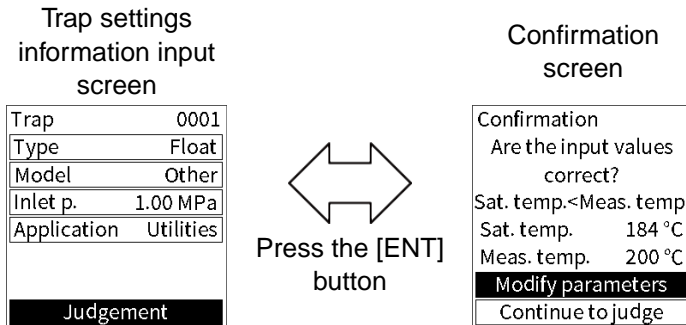
After the settings are completed, select [Judgement] on the measurement screen and press the [ENT] button.

- If the set temperature is higher than the saturated temperature obtained from the previously entered pressure when selecting the temperature control type, a discrepancy confirmation screen is displayed. To change the set temperature or input pressure, select [Modify parameters] on the temperature control trap setting screen and press the [ENT] button to reset the setting.

Select [Continue to judge] to proceed with the selected input values.



- For all trap types, if the measured temperature is higher than the saturated temperature calculated from the previously calculated inlet pressure value input (for all trap types), a confirmation screen is displayed. To change the input pressure, select [Modify parameters], press the [ENT] button, and repeat the "Entering the inlet pressure (for all trap types)" section. Select [Continue to judge] to proceed with the selected input values.

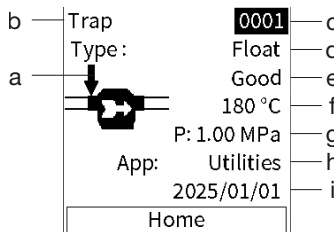


Inspection results

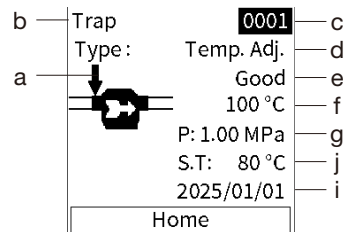
Inspection results are displayed and data is automatically saved.

Trap inspection mode

For non-temperature control type



For temperature control type



a	Measurement location	f	Measured temperature
b	Inspection mode	g	Pressure
c	Record number	h	Application
d	Steam trap type	i	Inspection date & time
e	Inspection result	j	Set temperature

Inspection results are as follows:

Good

The surface temperature is as expected, and there is no detected ultrasonic sound. The steam trap is likely to be in proper operational condition. The LED flashes green and turns off when any button is pressed.

Caution (when [Other] is selected for the model)

The ultrasonic sound level is very low, so it is difficult to determine if the valve seals properly or if there is a very small leak. Continue to observe the valve closely. The LED flashes yellow and turns off when any button is pressed.

Leak (when [Other] is selected for the model)

A large amount of high-intensity ultrasonic sound is detected. There is a high possibility that the trap is leaking steam, and immediate repair or replacement is recommended. The LED flashes red and turns off when any button is pressed.

Leak/L (only applicable when TLV models are selected)

There is a high possibility that a large amount of steam is leaking from the trap. The LED flashes red and turns off when any button is pressed.

Leak/S (only applicable when TLV models are selected)

There is a high possibility that a small amount of steam is leaking from the trap. The LED flashes yellow and turns off when any button is pressed.

Blocked

The surface temperature is lower than 40 °C. The trap is most likely blocked making condensate discharge impossible. Immediate cleaning, repair or replacement is recommended. The LED flashes red and turns off when any button is pressed.

Low temp. (for non-temperature control traps)

There is a high possibility that the surface temperature has dropped due to condensate accumulation, inlet pressure drop, closed inlet valve, or blocked inlet piping. The LED flashes red and turns off when any button is pressed.

Fail adj.-H (for temperature control traps)

The surface temperature is excessively high against the set temperature. The LED flashes red and turns off when any button is pressed.

Fail adj.-L (for temperature control traps)

The surface temperature is excessively low against the set temperature. The LED flashes red and turns off when any button is pressed.

1. When taking measurement again

Press the probe on the trap inlet side to take a measurement again.



Note

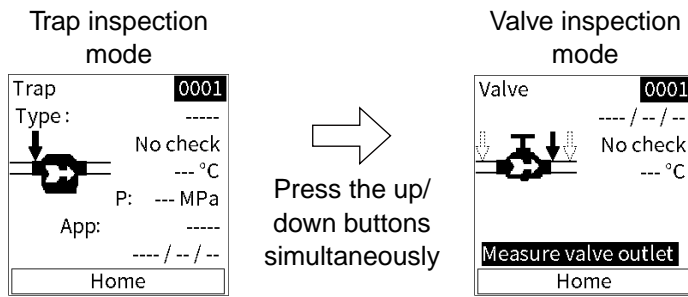
If data is already recorded at the selected data number, taking a measurement will overwrite the data.

2. Inspecting the next trap

Select the record number and press the left/right button to set the record number. After the record number is assigned, repeat procedures from "Set record number" in the "Steam trap inspection" section.

3. Switching the inspection mode to the valve inspection mode

Pressing the up and down buttons simultaneously in the trap inspection mode switches the valve inspection mode in the same record number. Follow the instructions under the "Valves inspection" section.



4. Erasing data

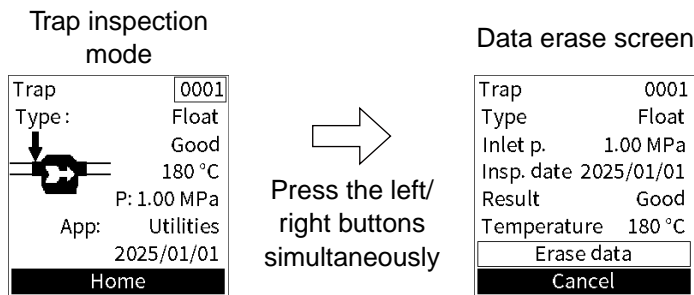
1. Select [Home] and press the left/right buttons simultaneously to move to the data erase screen.



Note

Even the left/right buttons are pressed simultaneously while the record number is selected, the screen will not move on to the data erase screen.

2. Select [Erase data] and press the [ENT] button to return to the trap inspection mode screen and the data in the current record number will be erased. Select [Cancel] and press the [ENT] button to return to the trap inspection mode screen without erasing the data in the current record number.

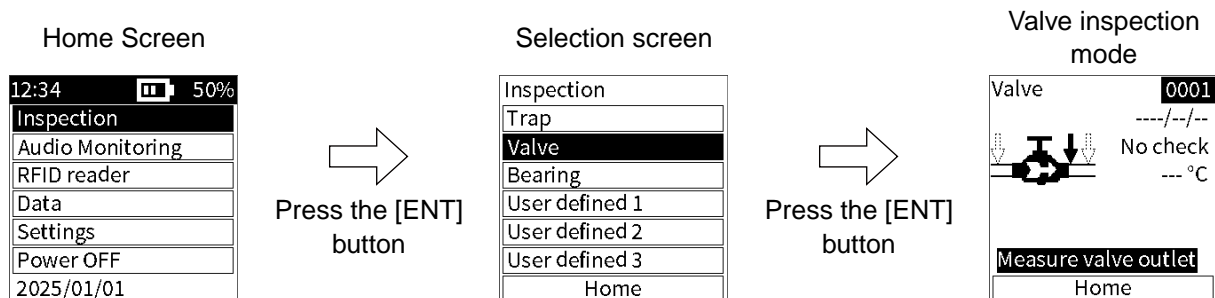


Valve inspection

The device is equipped with a simple automatic diagnosis function for valves installed on piping for applicable fluids such as steam, air and other gases. This section explains how to operate the device for valve inspections properly.

Selecting the valve inspection mode

1. Select [Inspection] on the home screen and press the [ENT] button.
2. Select [Valve] on the selection screen and press the [ENT] button.



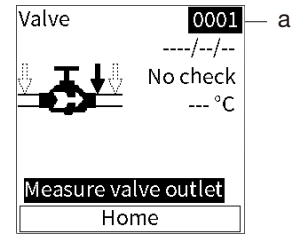
Setting the record number

Select the record number (a) and use the left/right buttons to set the record number.



Note

The record number cannot be changed after the measurement is taken. Set the record number in the same procedures as for the trap inspection. (Refer to the "Setting the record number" in the "Steam trap inspection" section.)



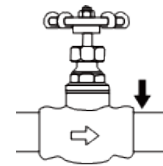
Measurement at the valve outlet

To check for internal valve seat leaks when the valve is closed, make sure the valve is completely closed. If a valve is open, it should only be closed when it is safe to close it for inspection. A maximum of three measurements are required for valve inspection. First, the piping nearest the valve outlet (hereafter referred to as the valve outlet) is measured.



Note

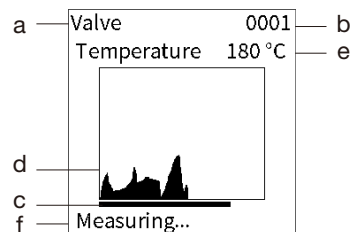
Make sure to take measurements approximately 3 cm from the valve outlet. Do not press the probe against the threaded portion of the pipe as accurate measurement may not be possible. Measurement begins automatically once the probe is pressed against the measurement surface.



Display during measurement

For valves, it takes 10 seconds after placing the probe against the measurement surface to complete measurement. Press and hold the probe against the measurement surface perpendicularly and steady for this entire period.

1. Display during measurement

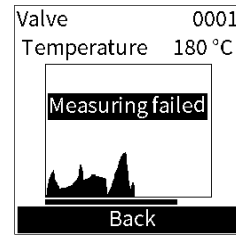


a	Inspection mode	Indicates the current inspection mode (valve inspection mode)
b	Record number	Displays the record number
c	Progress bar	Indicates the progress of the current measurement. When the bar reaches the end of the graph, measurement is complete
d	Ultrasonic waveform graph	Displays the ultrasonic waveform of the measurement in progress
e	Measured temperature	Displays the valve surface temperature being measured
f	Measurement status	Displays the current status

- The LED lights up green during measurement and flashes when measurement is completed. When valve outlet measurement is completed, the LED flash color varies depending on the results. If no ultrasound is detected at the valve outlet, the valve inspection completion screen will appear, displays a "Normal" result and the LED flashes green. If ultrasound is detected at the valve outlet, the valve upstream measurement screen will appear and the LED flashes yellow.

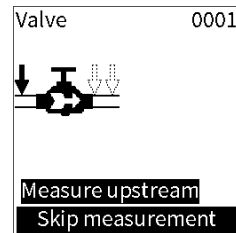
- If the probe moves away from the measurement surface or is extremely tilted, a measurement error is displayed, and the LED will blink red. In this case, perform the measurement again by pressing and hold the probe against the measurement surface. To return to the valve inspection mode is screen, select [Back] and press the [ENT] button.

Measurement error screen



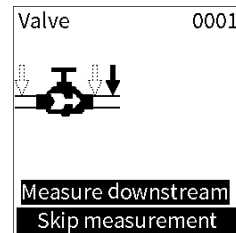
Measuring valve upstream

If ultrasound is detected after a measurement, an instruction to measure upstream of the valve is displayed. Measure about 50 cm further upstream of the valve inlet. After the measurement is complete, the screen switches to the valve downstream measurement screen. If measurement is not possible, select [Skip measurement] and press the [ENT] button to skip the valve upstream measurement and proceed with the valve downstream measurement.



Measuring valve downstream

After the upstream measurement, a third measurement is required about 50 cm downstream of the valve. After measurement is complete, the screen automatically switches to the valve inspection complete screen. If measurement is not possible, select [Skip measurement] and press the [ENT] button to skip the valve downstream measurement and the screen automatically switches to the valve inspection complete screen.



Inspection results

After all the measurements are complete, the valve inspection complete screen will appear automatically. The inspection results are as follows.

Good

No ultrasonic sound was detected, or if detected, it is likely due to external ultrasound, indicating that there is a high possibility that a valve leak is not occurred. The LED flashes green and then turns off once the valve inspection mode screen appears.

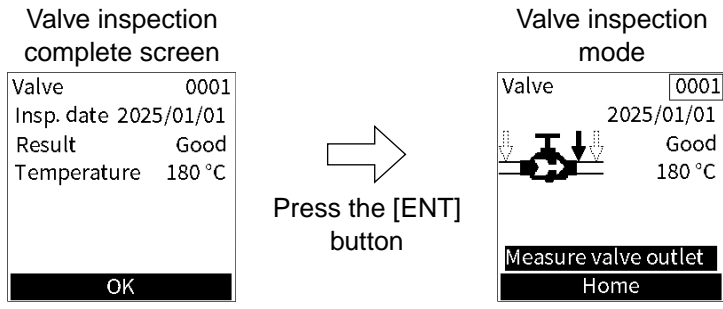
Caution

It is difficult to determine between normal and leaking conditions. Continue to observe the valve closely. The LED flashes yellow and then turns off once the valve inspection mode screen appears.

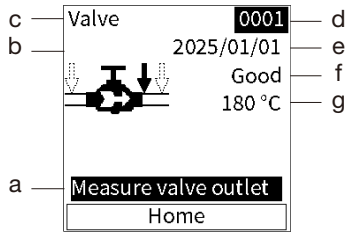
Leak

Strong ultrasound is detected from the valve body, indicating that there is a high possibility that the trap is leaking steam. The LED flashes red and then turns off once the valve inspection mode screen appears.

Select [OK] and press the [ENT] button switches to the valve inspection mode.



Note
 If the valve was opened for inspection, make sure to close the valve after the inspection.

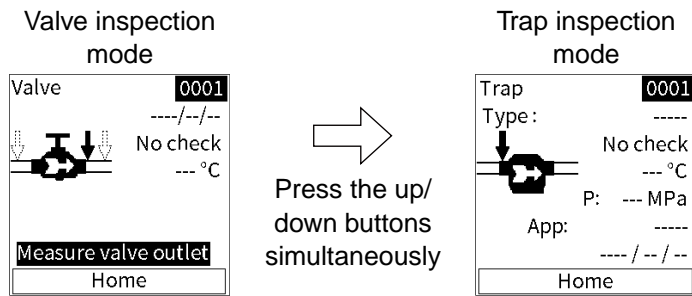


a	Instructions for measurement location	e	Inspection date
b	Measurement location	f	Inspection result
c	Inspection mode	g	Measured temperature
d	Record number		

- When taking measurement again
 Repeat sections from the "Measurement at the valve outlet" to "Inspection Results" in the "Valve inspection" section.

Note
 If data is already recorded at the selected data number, taking a measurement will overwrite the data.

- Inspecting the next valve
 Select the record number and press the left/right button to set the record number. For subsequent operations, repeat sections from the "Setting the record number" to "Inspection Results" in the "Valve inspection" section.
- Switching the inspection mode to the trap inspection mode
 Pressing the up and down buttons simultaneously in the valve inspection mode switches the trap inspection mode in the same record number. Follow the instructions under the "Trap inspection" section.



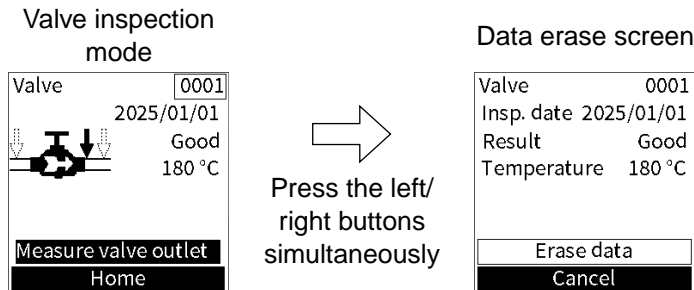
- Erasing data
 - Select [Home] and press the left/right buttons simultaneously to move to the data erase screen.



Note

Even the left/right buttons are pressed simultaneously while the record number is selected, the screen will not move on to the data erase screen.

2. Select [Erase data] and press the [ENT] button to return to the valve inspection mode screen and the data in the current record number will be erased. Select [Cancel] and press the [ENT] button to return to the valve inspection mode screen without erasing the data in the current record number.



Bearing inspection

This section describes how to operate and measure the device when inspecting bearings.

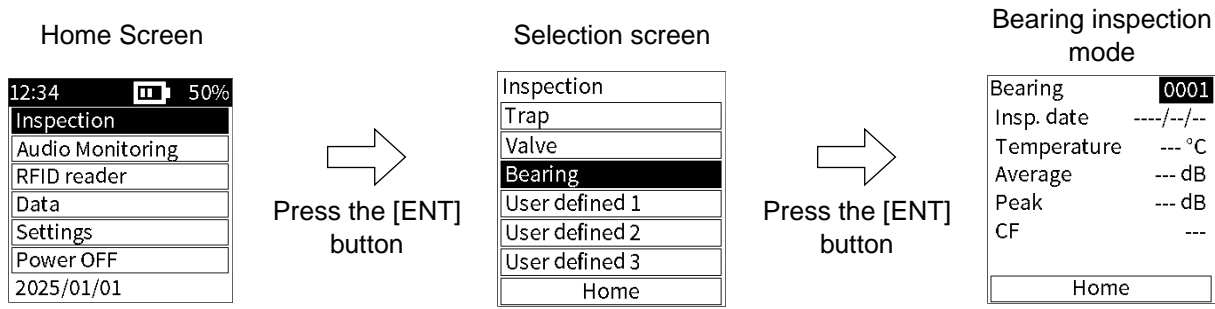
Use the average acceleration level (dB) to assess whether the bearing is in a normal or abnormal condition through trend monitoring or comparison with similar equipment (relative assessment). If an abnormal condition is detected, use the CF value to estimate whether the cause is damage due to a defect or insufficient lubrication.

Bearing inspection

- The device can measure and display vibration acceleration levels (dB), average values, peak values, and surface temperature.
The crest factor (CF) can be also calculated automatically and displayed.
- CF is the ratio of the peak value to the average value; a large CF value indicates possible damage due to scratches, while a small CF value indicates possible lubrication failure.
- Obtains the average values of up to 9 sets of inspection data for each record number and the average value can be saved. Refer to the "Inspection results" section for operations for the operation.
- One of two different calculation methods can be selected. Refer to the "Calculating displayed value (for bearing inspections mode)" section for settings.
- The progress of measurement can be checked by setting the LED flashing condition. Refer to the "LED flashing conditions (for bearing inspection mode)" for settings.

Selecting the bearing inspection mode

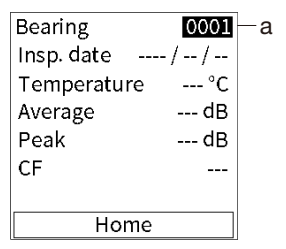
1. Select [Inspection] on the home screen and press the [ENT] button.
2. Select [Bearing] on the selection screen and press the [ENT] button.



Setting the record number

Select the record number (a) and use the left/right buttons to set the record number.

Note
 The record number cannot be changed after the measurement is taken. Set the record number in the same procedures as for the trap inspection. (Refer to the "Setting the record number" in the "Steam trap inspection" section.)



Probe application position

- Determine the measurement location.
 The housing surface closest to the bearings should be selected as the measurement location. One bearing can be inspected by trend management through measurement at one location.

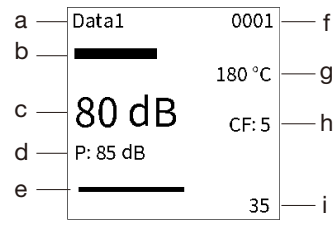
Note
 Avoid taking measurements in dangerous locations or locations in which taking measurements could be dangerous.

- Measurement begin automatically once the probe is pressed against the measurement surface.

Display during measurement

For valves, it takes 10 seconds after placing the probe against the measurement surface for the measurement to be complete. Press and hold the probe against the measurement surface perpendicularly and steady for this entire period.

- Display during measurement (pressing the probe against the valve)



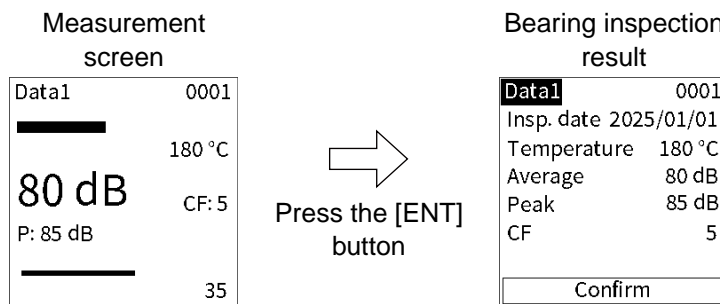
a	Data number	Displays the current data No.
b	Acceleration level indicator	The average value of the measured acceleration level measured values are displayed in a bar graph.
c	Average value	The average value of the measured acceleration level made to-date.

d	Peak value	The peak value of the measured acceleration level made to-date.
e	Progress bar	Indicates the progress of the current measurement. When the bar reaches the end of the graph, measurement is complete.
f	Record number	Displays record number that is currently assigned (to a result).
g	Surface temperature	Displays surface temperature.
h	CF value	The CF value of the measured acceleration level made to-date
i	Timer	The cumulative measurement time to date.

- When the measured surface temperature and the acceleration level are higher than their respective measurable ranges, "OVER" is displayed. If they are lower than their respective measurable ranges, "UNDER" is displayed.
- The maximum measurement time for bearing inspection is 60 seconds. Finish automatically once the probe is applied to the measurement location.

Inspection results

After all the measurements are complete, the bearing inspection complete screen will appear automatically.



- When measurements are taken multiple times at the same location and the average value is saved
 - Select the data number and press the left/right buttons to set the data number.
 - The data number is a single digit number from 1 to 9. If any data is recorded at the selected record number, detailed information is displayed.



Note

If data is already recorded at the selected record number, the data will be overwritten by taking a measurement.

- Once the data number is selected, press the probe against the measurement surface.
- When redoing the measurement for the same data number
Press and hold the probe against the measurement surface without changing the data number. Repeat the procedures described under "Display during and after measurement" in the "Bearing inspection" section.
- Saving measurement results
To save the result, select [Confirm] and press the [ENT] button. When multiple measurements (with multiple data numbers) are taken, only the average value will be saved.
- Inspecting the next bearing
Repeat the procedures in the "Setting a record number" section.

4. Erasing data

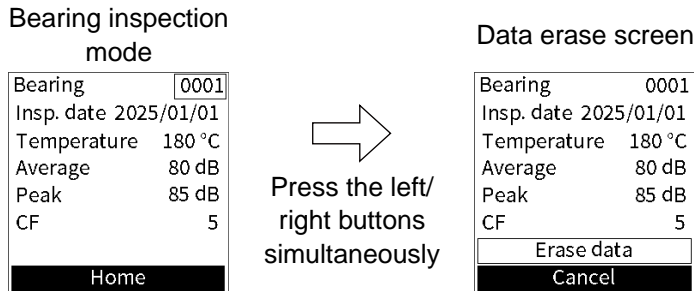
1. Select [Home] and press the left/right buttons simultaneously to move to the data erase screen.



Note

Even the left/right buttons are pressed simultaneously while the record number is selected, the screen will not move on to the data erase screen.

2. Select [Erase data] and press the [ENT] button to return to the bearing inspection mode screen and the data in the current record number will be erased. Select [Cancel] and press the [ENT] button to return to the bearing inspection mode screen without erasing the data in the current record number.



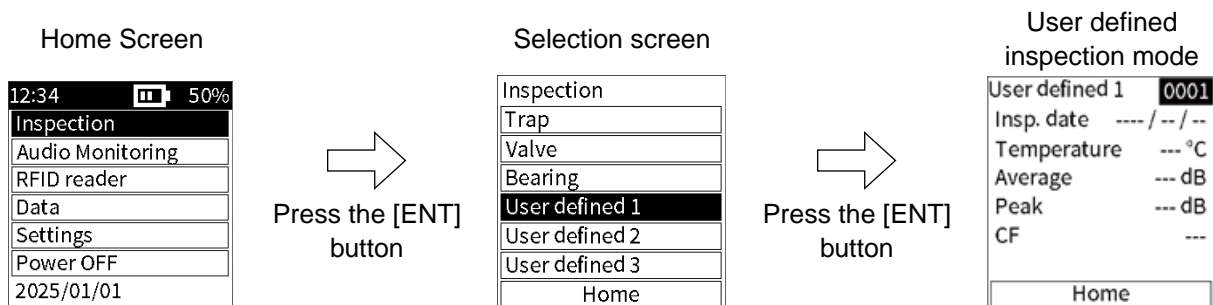
User-defined inspection

The user-defined inspection function is used to record acceleration levels or surface temperatures of inspection points other than traps, valves, and bearings. This section explains how to operate the user-defined inspection mode and its measurement functions.

Selecting the user-defined inspection mode

The following explains the operation procedure using [User defined 1] as an example.

1. Select [Inspection] on the home screen and press the [ENT] button.
2. Select [User defined 1], [User defined 2], or [User defined 3] on the selection screen and press the [ENT] button.



Note

[User defined 1], [User defined 2], and [User defined 3] can be renamed using CMRecorder. For details, refer to the CMRecorder user guide.

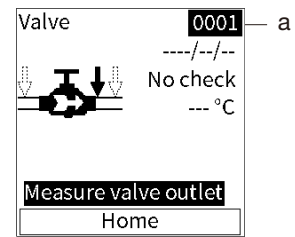
Setting the record number

Select the record number (a) and use the left/right buttons to set the record number.



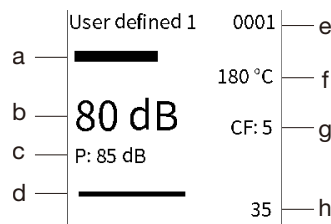
Note

The record number cannot be changed after the measurement is taken. Set the record number in the same procedures as for the trap inspection. (Refer to the "Setting the record number" in the "Steam trap inspection" section.)



Display during measurement

1. Display during measurement

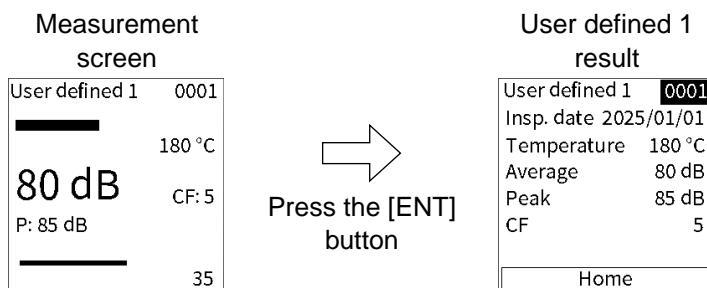


a	Acceleration level indicator	The average value of the measured acceleration level measured values are displayed in a bar graph
b	Average value	The average value of the measured acceleration level made to-date
c	Peak value	The peak value of the measured acceleration level made to-date
d	Progress bar	Indicates the progress of the current measurement. When the bar reaches the end of the graph, measurement is complete
e	Record number	Displays record number that is currently assigned (to a result)
f	Surface temperature	Displays surface temperature
g	CF value	The CF value of the measured acceleration level made to-date
h	Timer	The cumulative measurement time to date

- If the measured surface temperature or acceleration level exceeds the measurable range, "OVER" will be displayed. If it is below the measurable range, "UNDER" will be displayed.
- Measurement will be conducted for up to 60 seconds. Even if the measurement is less than 60 seconds, it will automatically end when the probe is removed. Inspection data will be saved immediately upon measurement completion.

Inspection results

After all the measurements are complete, the User defined 1 screen will appear automatically.



- When re-measuring, press and hold the probe against the measurement location again.

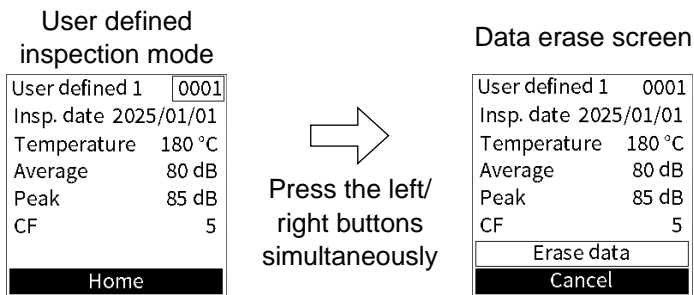
2. For the next [User defined 1] inspection, repeat the procedures described under "Setting record number" in the "User defined inspection" section.
3. Erasing data
 1. Select [Home] and press the left/right buttons simultaneously to move to the data erase screen.



Note

Even the left/right buttons are pressed simultaneously while the record number is selected, the screen will not move on to the data erase screen.

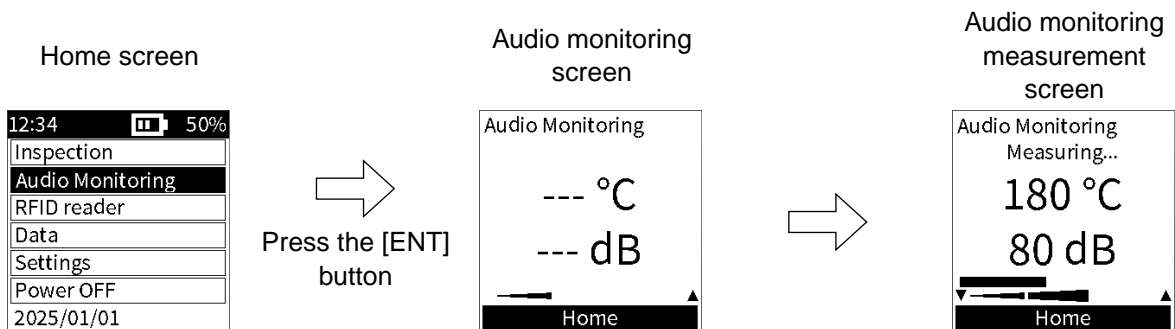
2. Select [Erase data] and press the [ENT] button to return to the user-defined 1 mode screen and the data in the current record number will be erased. Select [Cancel] and press the [ENT] button to return to the User defined inspection mode screen without erasing the data in the current record number.



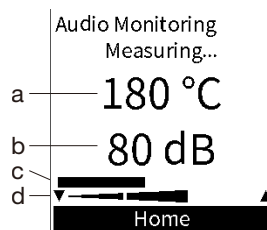
Audio monitoring

This function is used to listen to the sound from the measured object. In addition, the surface temperature and the average acceleration level can also be checked simultaneously.

1. Select [Audio monitoring] on the home screen and press the [ENT] button.
2. While the audio monitoring screen is displayed, you can monitor the sound through Bluetooth earphones by pressing the probe against the measurement surface, and the surface temperature and average acceleration level will be displayed.
3. When the probe is removed from the location, the measured value at that moment will be displayed.



4. Display during the measurement



a	Surface temperature	Displays surface temperature
b	Average value	The average value of the measured acceleration level measured values are displayed in a bar graph
c	Acceleration level indicator	The average value of the measured acceleration level made to-date
d	Sensitivity level	Displays the current digital sensitivity level. The sensitivity can be adjusted in three levels, and the level indicator increases or decreases accordingly. Use the up/down buttons to adjust the sensitivity. Changing the sensitivity level will also switch the measurement range of the acceleration level.

5. Press the [ENT] button to return to the home screen. The results cannot be stored.



Note

When using Bluetooth earphones, make sure that the volume is set to a safe level that will not affect your hearing. During re-measurement, there is a possibility that a loud sound may be output depending on the measurement object and settings. It is recommended to set the sensitivity to the minimum level and also set the earphone volume to the lowest available level.

Scanning RFID tags

The RFID reader scans an RFID tag and transmits the information to CMRecorder.



Note

For proper operation, make sure the device is connected to CMRecorder before using the RFID reader. Refer to the CMRecorder user guide for details.

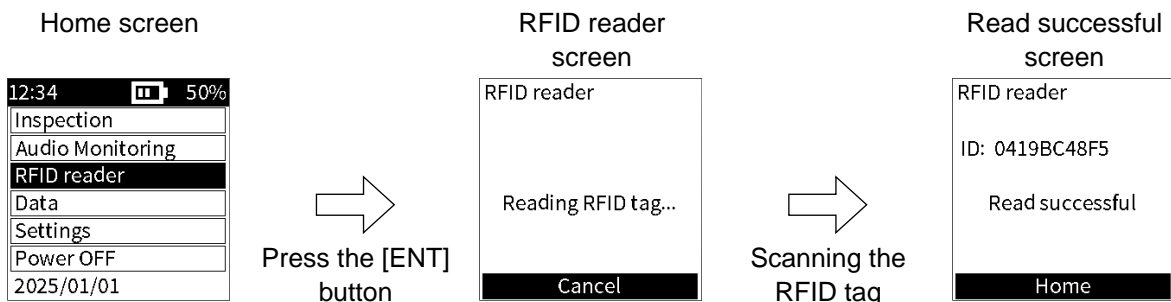
1. To activate the RFID tag reader, select [RFID reader] on the home screen and press the [ENT] button. The RFID reader screen appears and the LED at the bottom of the device lights green. Press the [ENT] button to return to the home screen.



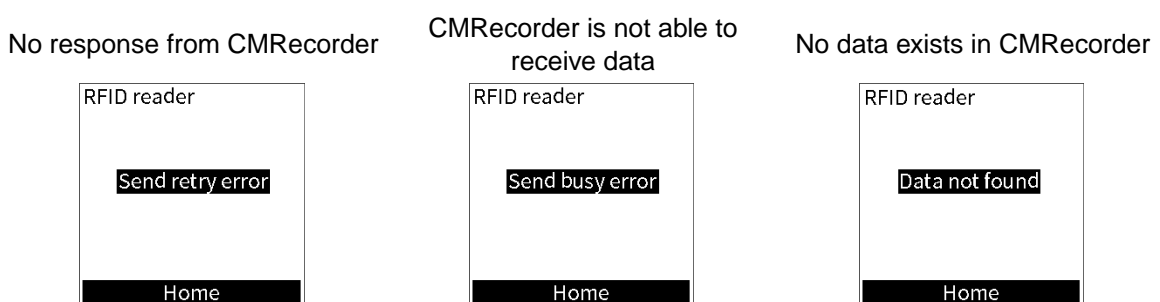
Note

The RFID reader can also be turned ON from CMRecorder. If the device is not connected to CMRecorder, the message "Connect to CMRecorder" is displayed.

2. Hold the RFID reader located at the bottom of the device close to the RFID tag. When the RFID tag is scanned correctly, the message "Read successful" is displayed. The LED turns off, and the RFID tag information is sent to CMRecorder. Press the [ENT] button to return to the home screen.



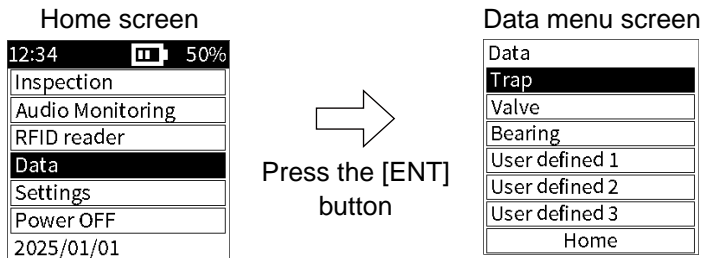
3. If transmission or processing of RFID tag information fails, one of the following error messages will be displayed. Press the [ENT] button on each error screen to return to the home screen.



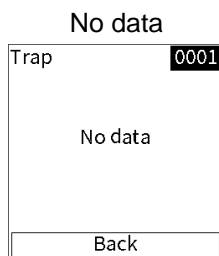
Browsing data

Search and display data stored on the device.

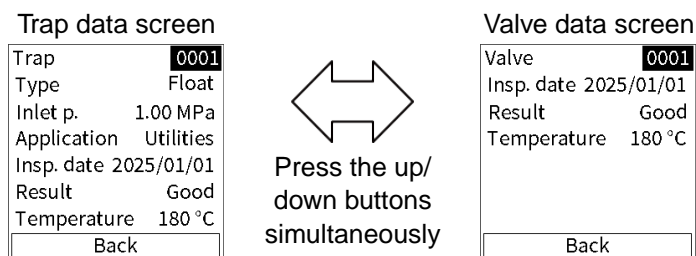
1. Select [Data] on the home screen and press the [ENT] button.
2. Select the item you wish to view on the data menu screen.



3. Select [Trap] and press the [ENT] button to view the stored trap inspection data. Select the record number and use the left/right button to change the record number. Record number that has no inspection data stored will be skipped.
4. If the data does not exist, "No data" is displayed on the screen.



5. Press the up and down buttons simultaneously to review the valve inspection data saved in the same record number. If valve inspection data with the applicable record number does not exist, "No data" is displayed on the screen.

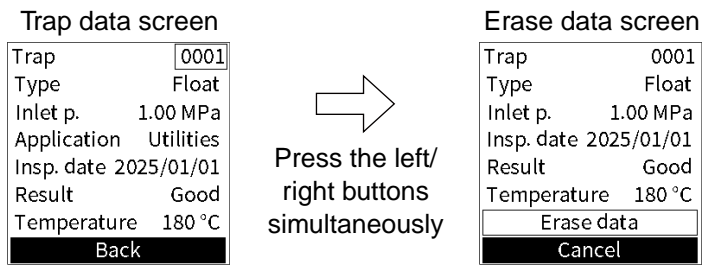


6. When the inspection data exists, select [Back] and press the left/right buttons simultaneously to move to the data erase screen.



Note

Even the left/right buttons are pressed simultaneously while the record number is selected, the screen will not move on to the data erase screen. Select [Erase data] and press the [ENT] button to erase the inspection data for the current record number and "No data" will be displayed. To return to the home screen, select [Cancel] and press the [ENT] button.



7. Data can be browsed in the same way for [Valve], [Bearing], [User defined 1], [User defined 2], or [User defined 3] inspection modes. In [Bearing], [User defined 1], [User defined 2], or [User defined 3] mode, even when pressing the up and down buttons simultaneously, there will be no screen transition.
8. Select [Back] and press the [ENT] button to return to the data menu screen.

Registering inspection records using RFID tags

Inspection records can be registered by scanning an inspection location stored in User defined 1, 2, or 3 and sent to CMRecorder. While the device is connected to CMRecorder, switch to the RFID reader ON screen and scan an RFID tag to easily register inspection records.



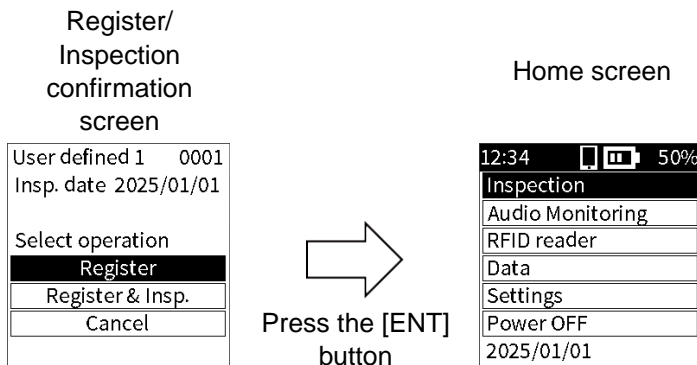
Note

RFID information must be linked in CMRecorder in advance.

When registering inspection records, select one of the following two options:

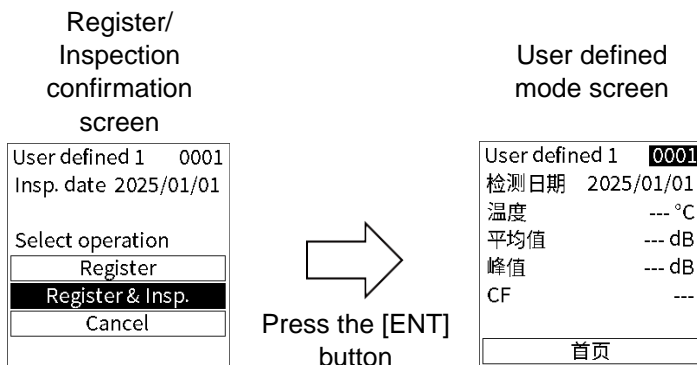
1. Register only inspection date and time

Select [Register] and press the [ENT] button to save only the inspection date and time as User defined 1, 2, or 3 data. After sending the data to CMRecorder, the screen returns to the home screen.



2. Register inspection date and time and measurement data

Select [Register & Insp.] and press the [ENT] button to display the User defined 1, 2, or 3 mode screen. After the measurement is complete, the inspection date and time and measurement data are sent to CMRecorder.



3. Select [Cancel] and press the [ENT] button to return to the Home screen without changing the User defined 1 data.



Note



Inspection records can also be registered from CMRecorder using a QR code.

Troubleshooting

Error codes


Error code(s)	Symptom	Action
E0000, E0001, E0002, E0003, E0006	A program error has occurred.	Press the [ENT] button to cancel the error and return to the home screen. If the measurement was performed immediately before the error code was displayed, perform the measurement again.
F0004, F0005	A program error has occurred.	If the error is displayed on the screen, contact TLV.
E0007	The battery temperature is out of the allowable range.	The device will be turned off 10 seconds after the error code is displayed on the screen. If the error is displayed even when the device is used in ambient temperatures below 40 °C, remove the battery from the device and contact TLV. When a device is used outside the allowable range of the ambient temperature, wait for a while.
E0008	The device temperature is out of the allowable range.	Press the [ENT] button to cancel the error and turn off the device. Make sure to use the device within the ambient temperature range of -10 to 50 °C.
E009	The battery temperature during charging is out of the allowable range.	After an error message is displayed, charging stops automatically. Remove the USB cable, wait for a little while and then charge within the ambient temperature range of 0 to 40 °C.
F0010	The temperature sensor is disconnected.	If the error is not resolved even after the device is rebooted, contact TLV.
E0013	A battery control error has occurred.	The device will be turned off 10 seconds after the error code is displayed on the screen. Insert or remove the battery in non-hazardous areas. If the error is not resolved even after the device is rebooted, contact TLV.
E0014	Bluetooth communication error has occurred.	The device automatically restarts 10 seconds after the error code is displayed on the screen. If the error is not resolved, contact TLV.
F0015, E0019, F0021	A memory error has occurred.	If the error is not resolved, contact TLV.
E0016	An internal clock error has occurred.	Press the [ENT] button and the device will be turned off. Insert or remove the battery in non-hazardous areas. If the error is not resolved even after the device is rebooted, contact TLV.
E0018	An abnormal charging voltage has been detected.	When the USB cable is unplugged, the error is canceled, and the home screen will be displayed. Please check the USB power supply and cable.
E0022	The battery voltage is low.	Connect the USB cable and charge the battery. Continue charging the device if already charging. The device will restart when the battery is charged to its minimum level.
Other	—	If the error is not resolved even after the device is rebooted, contact TLV.

Causes and corrective measures

Cause	Remedy
Nothing appears on the screen even when the [ENT] button (power on) is pressed and held.	The battery may be over-discharged. Charge the battery. When the problem is not resolved after the battery is charged, replace with a new battery.
After pressing and holding the [ENT] button, there is a delay before the device goes on	This is normal. Press and hold the [ENT] button for three 3 seconds to display the start screen.
The temperature display shows a lower temperature than expected	<ul style="list-style-type: none"> • The probe may not be correctly placed against the measurement surface. Hold the device so that the probe is perpendicular to the measurement surface. • Foreign matter may be adhered to the probe. Remove any foreign matter from the tip of the probe. Be careful not to damage or deform the sensor. • The probe maybe damaged or deformed. If deformation or damage is confirmed in the sensor unit, repairs will be necessary. Contact TLV.
Measurement does not begin automatically even when the probe is pressed and hold against the measurement surface	Foreign matter may be adhered to the probe. Remove any foreign matter from the tip of the probe. Be careful not to damage or deform the sensor.
Nothing can be heard from the earphones	<ul style="list-style-type: none"> • If the icon  appears, the Bluetooth function may be disabled. Enable the Bluetooth function in settings. • The earphones may not be connected to the device. If the icon  does not appear, try connecting the earphones again. • The earphones volume may be low. Please adjust the volume with your earphones. • There is no output from the earphones in bearing inspection mode. • The Bluetooth connection may be lost if the earphones are too far from the device. • A physical obstruction may cause the connection between the device and the earphones to be interrupted. • Earphones compatible with Bluetooth 5.4 or later may not output sound. Verify proper operation before use.
The device does not switch off automatically when left for a period of time, even though the automatic power off function enabled. (The LED light does not go off.)	<ul style="list-style-type: none"> • The automatic power-off function does not operate while the battery is being charged. • The device may have frozen. When nothing appears on the screen by pressing buttons, press and hold the left and right buttons simultaneously for 7 seconds to force restart.
Incorrect remaining battery level display.	The remaining battery level is correctly displayed after a learning period. Approx. 3 or 4 charges are necessary for the device to learn after delivery or battery removal.
The battery level does not reach 100% even when charging is complete,	For battery protection, charging stops once it is complete. Therefore, if the device is left connected to USB power, the battery level may decrease over time.
The screen is frozen and the device cannot be operated.	Press and hold the left and right buttons simultaneously for 7 seconds to force restart.
Charging does not start even when a USB Type C cable is plugged in.	Power may not be supplied to the USB cable. Make sure that power is being supplied. If power is being supplied, there is a possibility that the USB cable may be damaged. Try charging with a different cable.

After checking the above items and performing the suggested corrective measures, if the device is still not performing as expected, contact TLV with details regarding the malfunction.

Specifications

Product name	Pocket TrapMan
Model	PT3
Measurement	Measurement items: Ultrasonic sound/vibration acceleration level, surface temperature
Temperature measurement	Allowable measurement temperature range: -40 to 350 °C
Trap measurement	Maximum primary pressure: 0.0 to 8.0 MPaG Maximum condensate flow rate: 0 to 3000 kg/h Applicable fluid: Steam
Valve measurement	Applicable fluids: Steam, air and other gases  Note This product is certified as intrinsically safe. Use only in appropriate hazardous areas in accordance with applicable standards.
Automatic judgement	Steam traps: Good/Caution/Leak/Leak/L/ Leak/S/Blocked/Low temp./Fail adj-H/ Fail adj-L Valves: Good/Caution/Leak
Power source	Battery: Lithium-ion battery (rated voltage: 3.7 V, rated capacity: 1000 mAh)/TLV CO., LTD.: model P11-22050-x (x: alphanumeric character) Continuous operation time: Approx. 24 hours (with front light off), approx. 16 hours (with front light on) Charging time: Approx. 2.5 hours
Allowable temperature range	When in use: -10 to 50 °C (No condensation or freezing) When in stored: -10 to 50 °C (Avoid high temperatures and humidity and fully charge the device once a month) When charging: 0 to 40 °C (No condensation or freezing)
Appearance	Dimensions: 216 mm (L) × 50.5 mm (W) × 35 mm (T) Weight: Approx. 250 g

Adjustment

This device is a precision instrument. The probe sensitivity deteriorates over time, not only if the unit is dropped or knocked, but also as a result of regular wear and use. Therefore, periodic adjustment is required.

- Adjustment should be performed every two years, after 30,000 measurements, or when deformation or damage is observed at the tip of the probe.
- The device will be adjusted using special equipment at TLV. Contact TLV for details.

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Subject to the limitations set forth below, TLV CO., LTD., a Japanese corporation ("**TLV**"), warrants that products which are sold by it, TLV International Inc. ("**TII**") or one of its group companies excluding TLV Corporation (a corporation of the United States of America), (hereinafter the "**Products**") are designed and manufactured by TLV, conform to the specifications published by TLV for the corresponding part numbers (the "**Specifications**") and are free from defective workmanship and materials. The party from whom the Products were purchased shall be known hereinafter as the "**Seller**". With regard to products or components manufactured by unrelated third parties (the "**Components**"), TLV provides no warranty other than the warranty from the third party manufacturer(s), if any.

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This warranty does not cover defects or failures caused by:

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2. dirt, scale or rust, etc.; or
3. improper disassembly and reassembly, or inadequate inspection and maintenance by persons other than TLV or TLV group company personnel, or service representatives authorized by TLV; or
4. disasters or forces of nature or Acts of God; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV, TII or TLV group companies; or
6. improper storage, maintenance or repair; or
7. operation of the Products not in accordance with instructions issued with the Products or with accepted industry practices; or
8. use for a purpose or in a manner for which the Products were not intended; or
9. use of the Products in a manner inconsistent with the Specifications; or
10. use of the Products with Hazardous Fluids (fluids other than steam, air, water, nitrogen, carbon dioxide and inert gases (helium, neon, argon, krypton, xenon and radon)); or
11. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

Duration of Warranty

This warranty is effective for a period of one (1) year after delivery of Products to the first end user. Notwithstanding the foregoing, asserting a claim under this warranty must be brought within three (3) years after the date of delivery to the initial buyer if not sold initially to the first end user.

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