172-65809M-00 (Pocket TrapMan PT3) 10 November 2023

ISO 9001
ISO14001

Manufacturer
TLV CO., LTD.
Kakogawa, Japan

Instruction Manual

Pocket TrapMan®
PT3

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Introduction

Thank you for purchasing the TLV Pocket TrapMan PT3.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary.

The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to use, maintenance contain significant.

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 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 manual or product is strictly prohibited.

1. Read carefully before use

1.1 Precautions before use

Read this section 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).

1.2 Safety considerations

Cautionary items and definitions

⚠	**Indicates a DANGER, WARNING or CAUTION item.**
⚠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

Safety considerations for the product

Charging Precautions

⚠WARNING	**DO NOT charge the battery pack with anything other than the device.** Failure to observe this precaution could result in excessive heat generation or fire.
	After charging is complete, disconnect the USB cable from the device. Failure to observe this precaution could result in excessive heat generation or fire.
	DO NOT connect or disconnect the USB cable with wet hands. Failure to observe this precaution could result in electrocution.
	DO NOT charge the battery pack in hazardous areas. Failure to observe this warning may result in explosion, fire or injury.

Other precautions

⚠ DANGER	**DO NOT disassemble or modify the device or the battery pack.** 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 the body or gets into the eyes, immediately rinse any battery fluid off with clean water and see the doctor.
	Whether the battery pack or the device is new or used, do NOT dispose of them by throwing them into a fire. Both are very dangerous and could result in rupture or ignition.
	Do not immerse or let the device become immersed in water or other liquids. If the device is submerged, immediately stop using it and return it to TLV. Failure to observe this warning may result in heat generation, rupture or ignition.

Battery Pack Precautions

⚠ WARNING	**If irregularities such as fluid leakage, an unusual smell, unusual heat generation, discoloration or deformation are noticed, cease use of the unit immediately.** Failure to observe these precautions may result in damage to the device, fire or burns.
	If battery fluid leaks and comes into contact with your body or gets into your eyes, immediately rinse the affected area with clean water. There is danger of resultant damage to the skin. Immediately rinse the affected area with clean water and see a doctor.
⚠ DANGER	**DO NOT replace the battery pack in explosion-proof areas.** Failure to observe this precaution could result in explosion, fire or injury.
	DO NOT or other disassemble the battery pack. 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.
	DO NOT throw the battery pack into a fire or heat under any circumstances. Doing so is very dangerous and could result in rupture or ignition. Make sure the battery temperature is kept 40 °C or less while charging or 50 °C when in use.
	DO NOT let the battery pack become immersed in water. Failure to observe this precaution could result in leakage of the battery fluid, battery pack overheating, rupture or ignition.
	DO NOT use the damaged the measured battery pack. Do not use the battery pack in the case of any abnormalities such as heating of the battery pack, unusual odors, discoloration or deformation, etc. Battery pack damage could result in overheating, expansion, leakage, smoke, ignition or explosion.
	DO NOT incinerate the battery pack. Failure to observe this precaution may result in fire or explosion.
	DO NOT use any battery pack other than that specified. When replacing the battery pack, use only the SEnergy Corporation model P11-22050 battery pack. Failure to observe this precaution may result in fire or injury.

⚠DANGER	**DO NOT use or leave the device in areas that become very hot.** Do not leave unit 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, excessive heat generation, rupture or Damage.
	Keep the device out of reach of children. Failure to observe this precaution could result in injuries, overheating, smoke, ignition or explosion.
⚠CAUTION	**Be sure to charge the battery pack regularly.** If the device is not used for a long time with the battery pack installed, fully charge the battery pack once a month. The battery will deteriorate and become unusable.
	DO NOT remove the battery pack from the device except when replacement is required. Water resistance may be impaired.
	DO NOT dispose of the battery pack with normal garbage. If at any time the batteries become unusable, observe your company regulations for proper disposal in accordance with local laws. If proper disposal is impossible, insulate the contact terminals by covering them with tape and return them to a TLV office.

Usage/Storage Precautions

⚠WARNING	**DO NOT operate the device with wet hands.** Failure to observe this precaution could result in electrocution.
⚠CAUTION	**PT3 is explosion-proof certified. The explosion-proof marking is indicated on the product nameplate.** The device should be used by trained personnel with knowledge of the hazardous locations/classifications.
	DO NOT allow any foreign matter to enter the unit. In areas with small foreign matter such as metal dust, use the product after taking measures to prevent foreign matter entering the unit. Failure to observe this precaution could result in fire or malfunction.
	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.
	DO NOT drop the device or otherwise subject it to strong impacts. Doing so may cause damage, malfunction, or battery pack ignition.
	DO NOT 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. This may cause the device to malfunction or fail.
	DO NOT use sharp objects such as pens to operate the buttons. This may damage the buttons.
	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.
	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.
	DO NOT leave the device in places subject to excessive exposure to 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.
	DO NOT dispose of the battery pack with normal garbage. If at any time the battery pack becomes unusable, observe your company regulations for proper disposal in accordance with local laws. If proper disposal is impossible, return them to a TLV office.

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 unit while walking.** Failure to observe this precaution could lead to accidents such as tripping or collisions.
	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.
	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 the earphone in places where there is loud noise or vibrations may result in hearing loss.

2. PT3 Standard set

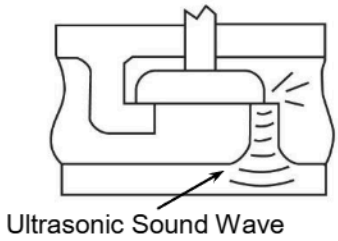


1	Instruction manual (this manual)	3	PT3 device
2	Explosion-proof requirements	4	Cap

3. Principles of operation

Generation of ultrasonic sound (trap and valve)

When fluid leaks through the seat in a steam trap (hereinafter referred to as "trap") or valve, it emits ultrasonic sound. (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.

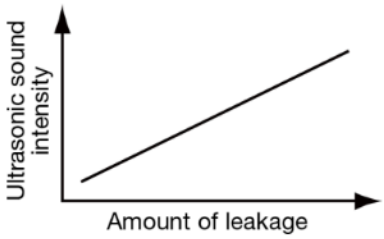


Note:

- Valve inspections for PT3 should only be only available for valves installed on steam or air piping.
- Trap inspections for PT3 should only be only available for traps installed on steam piping.

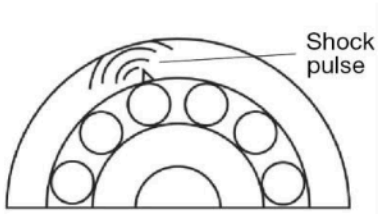
Ultrasonic intensity and steam leakage correlation

There is a correlation between the intensity of the ultrasonic sound generated by a leak and the amount of steam leakage.
Pocket TrapMan PT3 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.



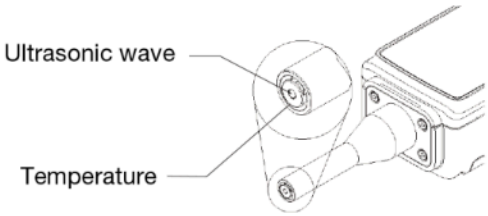
Ultrasonic shock pulse generation (bearing)

Shock pulses 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 (trap, valve, bearing)

Pocket TrapMan PT3 can measure surface temperature and ultrasonic sound simultaneously. Temperature data can be used to detect blockage in steam traps and can be utilized to help determine the condition of bearings.



4. Functions and features

Trap inspection

PT3 automatically inspects the steam trap and makes a judgement estimate regarding the basic operational condition (Good/Caution/Leak/Blocked/Fail adj.-H/Fail adj.-L).
Note: Automatic inspection for Fail adj.-H/Fail adj.-L are only available for temperature control traps.
Ideal for systems where detailed steam trap management is not implemented, or for daily inspections of critical systems between annual steam trap surveys. Using PT3 for a daily inspection is an effective way to determine whether maintenance is required or not.

Valve seal inspection

PT3 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). PT3 is effective for determining whether a valve is properly closed.

Bearing deterioration inspection

PT3 is effective for collecting the data regarding a bearing's operational characteristic. Bearing deterioration (lack of lubricant, ball wear, etc.) can be determined based on the collected data.
Note: PT3 cannot detect structural or configuration problems (such as misalignment, being unbalanced, etc.) in rotating equipment.

Surface temperature measurement

The device can be used as a surface thermometer.

Measurements begins and stops automatically

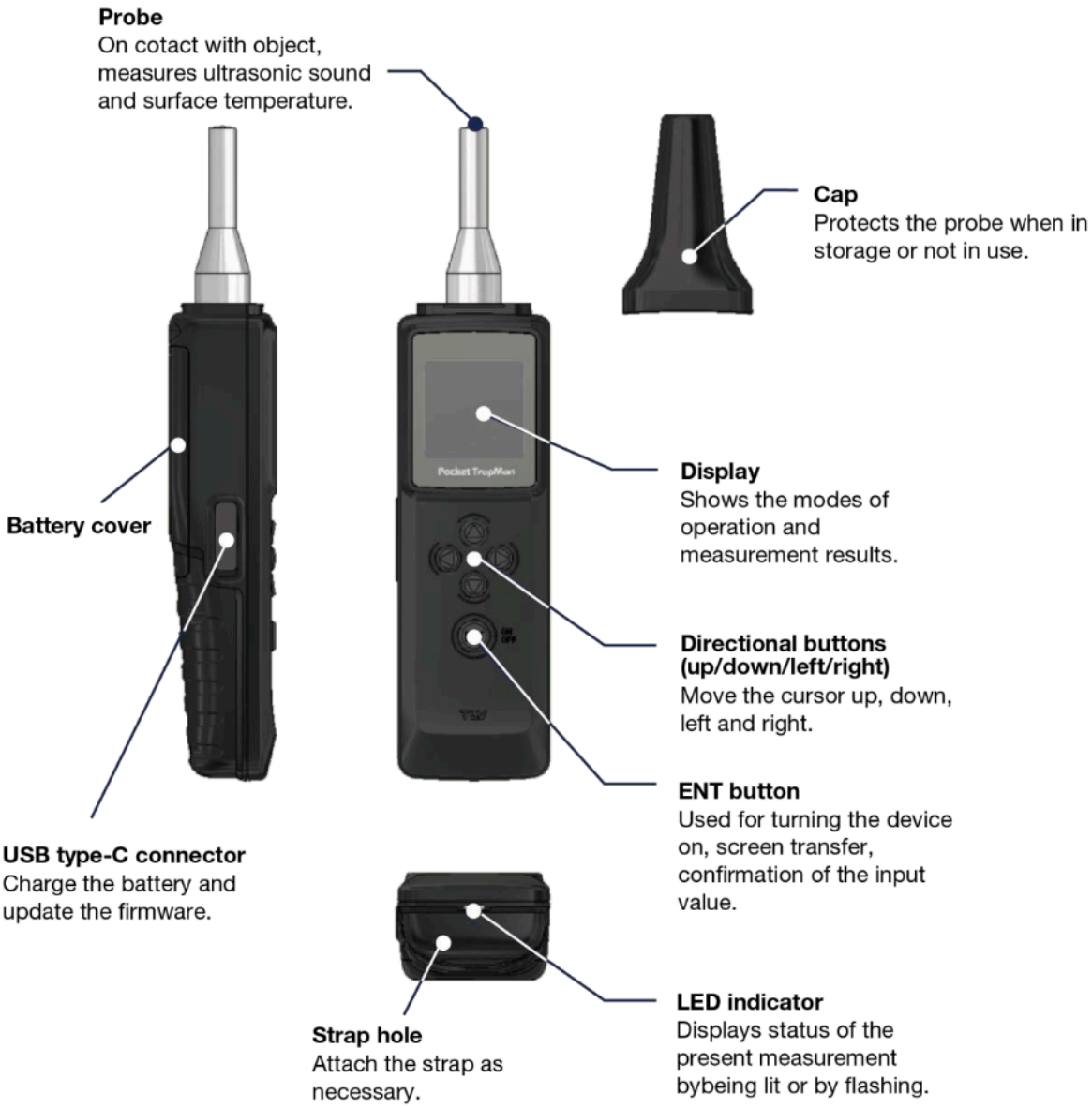
Measurements begin automatically when the probe is set on the measurement location. Measurements stop after a certain amount of time has elapsed ("Trap", "Valve" and "Bearing" mode), or after the probe is removed from the measurement location ("Bearing" mode only).

Data stored in memory

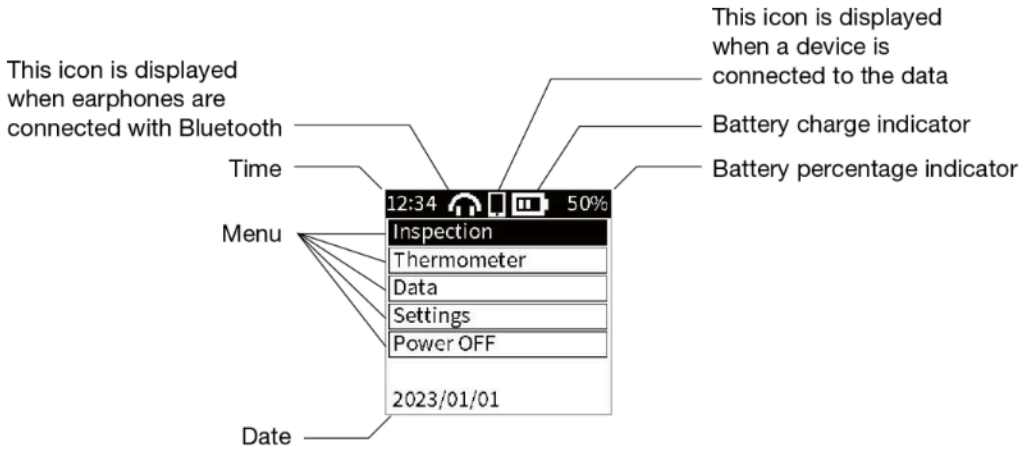
Inspection data is automatically stored in memory after each measurement.
PT3 has three inspection modes, "Trap", "Valve" and "Bearing" mode. Maximum of 3,000 data can be recorded for each mode.

5. Components, features and functions

5.1 Hardware



5.2 Names and functions of icons displayed on the home screen

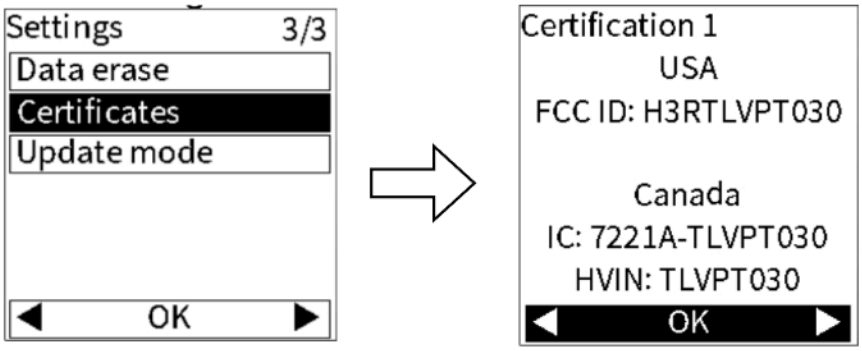


Menu item	Description
Inspection	Used to perform inspections
Thermometer (temperature measurement)	Used to measure the surface temperature
Data	Search and display data stored on the device
Settings	Used to set various items
Power off	Turn off the device

Legal indication

How to confirm identification

Home → Setting → Certification

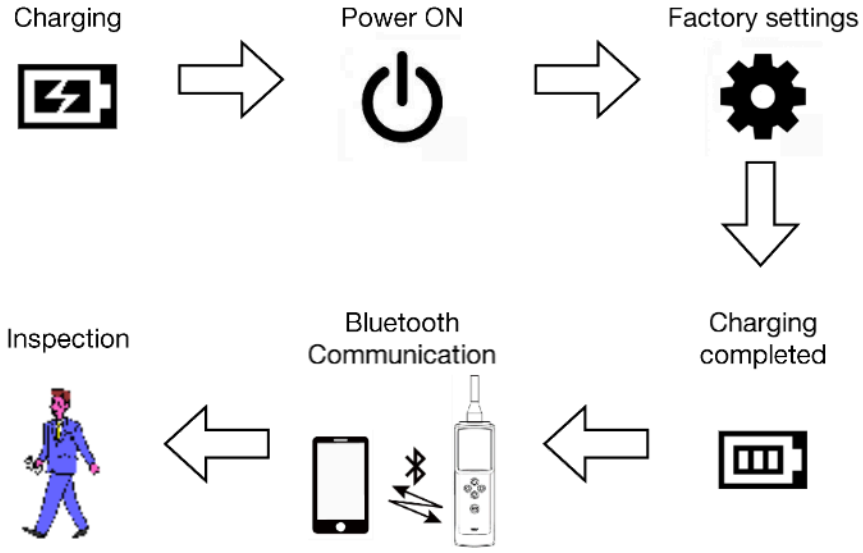


6. Getting started

6.1 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.



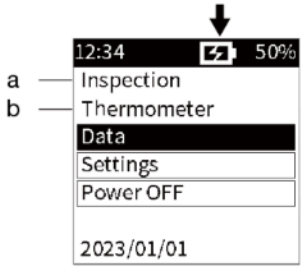
Bluetooth communication is available when the data management app. is used.

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 section 6.6 before use of the device.

6.2 Charging the battery

⚠CAUTION	• The ambient temperature during the charging process should be between 0 to 40 °C (32 to 104 °F). • 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 lamp lights up red while battery is being charged. The LED lamp lights up green when the battery is fully charged.
3. Charging status is displayed on the home screen while charging the battery.

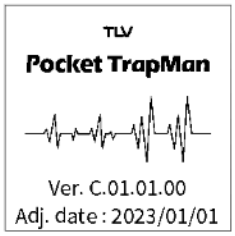


4. After charging is complete, disconnect the USB cable from the device.
5. Items [Inspection] (a) and [Thermometer] (temperature measurement) (b) become unavailable while the battery is charged.
6. If the device is not used for a long time, charge the battery every month to prevent battery degradation.

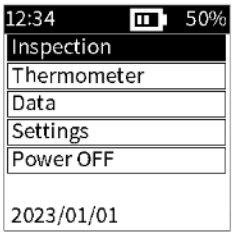
6.3 Turning the device on

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

Start up screen



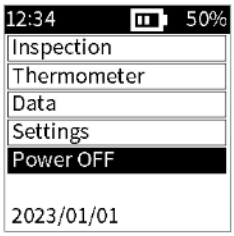
Home screen



6.4 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 allows for the device to turn off.

Home screen



6.5 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'. See 6.6.1 Device information for details. The directional buttons (left/right) switch between the settings screens.
3. To configure each parameter, select the parameter with the directional buttons (up/down).
4. To save settings, select [OK] and press the [ENT] button.

Settings 1



Press the left/right button

Settings 2



Press the left/right button

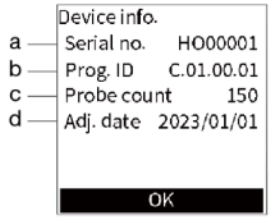
Settings 3



6.6 Setting Details

6.6.1 Device information

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



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

6.6.2 Front light

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

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

6.6.3 Standby time

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]. The screen display and backlight are turned off to reduce battery consumption during standby mode. A display of the battery charging status will be prioritized when the USB is connected to the device.

6.6.4 Auto off time

When inactive for a defined period of time after being switched on, the device will automatically turn off. 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 [none]. 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 when the device is connected via USB. This item cannot be selected when auto sleep is set to [Disable], the setting value of auto power off is also switches to [Disable].

6.6.5 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] [OFF-ON] is displayed.

6.6.6 Earphones

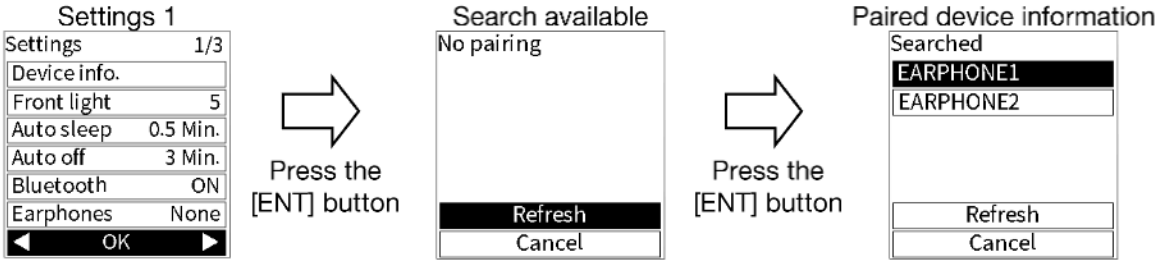
The Bluetooth earphones can be used to listen to the sound of trap and valve operation.

Note: The sound cannot be heard with the Bluetooth earphones when the bearing inspection is performed. Pairing is required when a Bluetooth earphones with is required.

1. To pair Bluetooth earphones with a device, select [Earphones] and press the [ENT] button.
2. To search for available Bluetooth earphones, select [Refresh] and press the [ENT] button.
   To complete pairing the earphone, select the earphone you wish to pair 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.

3. When connecting the earphone is failed, [Pairing failed] is displayed. In that case, try to connect the earphone again.



Note:

- The earphone cannot be selected when Bluetooth is off.
- Volume should be controlled on the earphone. There is no volume control on this device.

6.6.7 Calculating displayed value (for bearing inspection mode)

Set the calculation method of the vibration value during bearing inspection 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.

6.6.8 LED flashing conditions (for bearing inspection mode)

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

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.

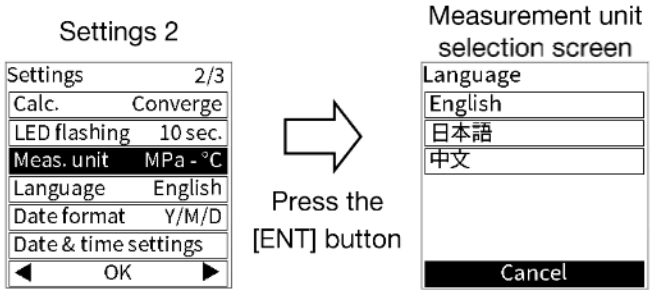
Note: "Vib." will not be displayed when "Interval" is selected for the calculation method.

6.6.9 Measurement units

Selects the unit for pressure and temperature. All pressures are gauge pressures, not absolute pressures.

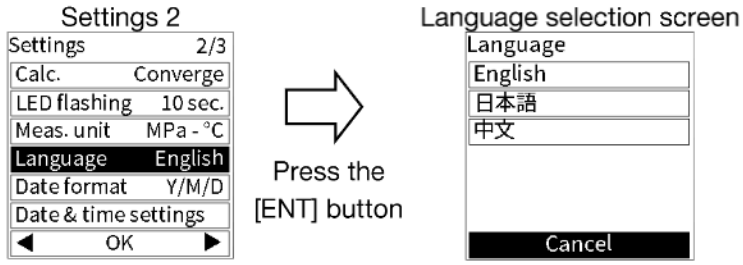
When the unit is changed, measurement units and measured values for all stored data are automatically converted.

Note: The unit cannot be changed while the device is connected to a data management app. Disconnect the data management app before the unit is changed.



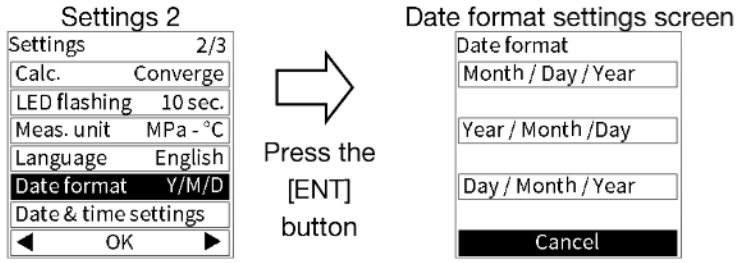
6.6.10 Language

Select the language displayed on the screen.



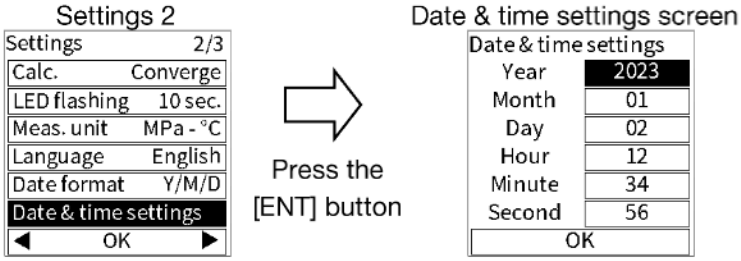
6.6.11 Date format

Select the date format used on the screen.



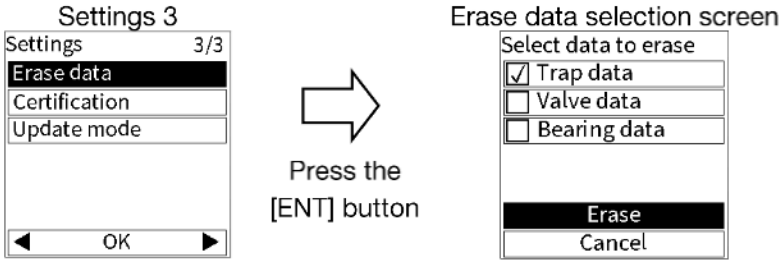
6.6.12 Date & time settings

Sets the date and time for the device.



6.6.13 Erase data

Erases inspection data stored on the device.



1. Check the data type you wish to erase by pressing the [ENT] button.
2. Select [Erase] and press the [ENT] button to erase all selected data.

6.6.14 Certification

Displays the information related to the certification of the product.

Settings 3



6.6.15 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.

Settings 3



Press the [ENT] button

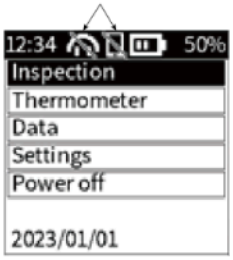
Update mode screen



6.6.16 Connect the device to data management apps

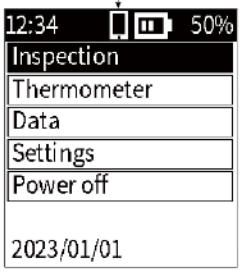
1. Communicate with the data management application using Bluetooth Low Energy (BLE). Open the data management app on your tablet or smart phone.
2. Make sure that Bluetooth is enable on the device.

Bluetooth disabled



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

Connected to data management app

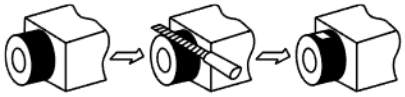


7. Inspection

Prepare the measurement surface

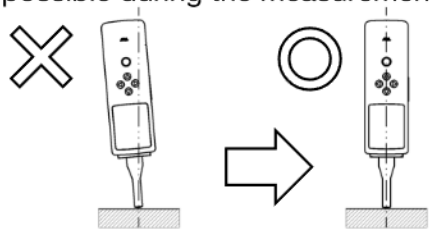
Ultrasonic sound and surface temperature cannot be measured accurately if the surface where the measurement is to be taken is curved or a rough finished surface, or if it is coated with paint, dirt, rust or scale. Additionally, if the measuring surface is curved or in a rough-cast state, accurate measurements cannot be obtained. File the measurement location to produce a smooth and flat area of at least ø9 mm (ø$^{3}/_{8}$ in).

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.

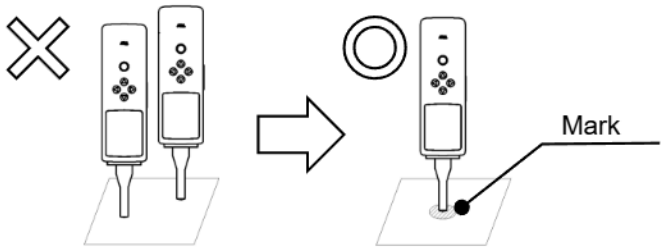


Consistent measurement location

Always take measurements from the same location. If measurement location 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.

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



Surface temperature restriction

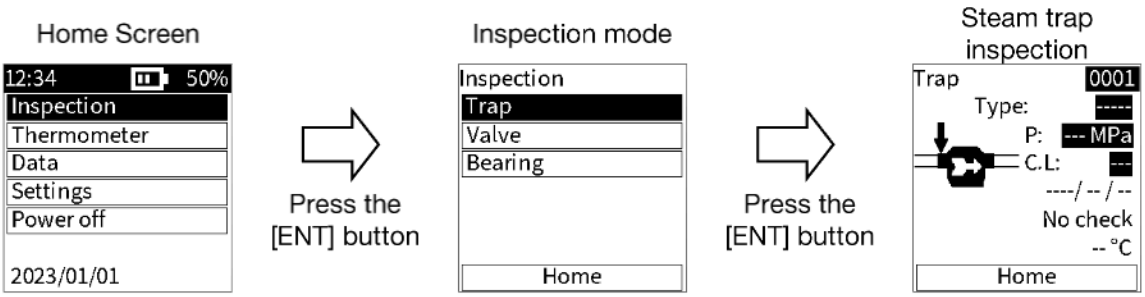
The allowable surface temperature range of the object to be measured is -40 to 350 °C. The LED indicator (red) will flash rapidly when the surface temperature exceeds 350 °C, "Over" appears on the display or "Under" when the temperature is below -40 °C.

If you observe the indicator flashing in such a rapid manner, quickly remove the probe from the object, cancelling the measurement. Continuing measurement under conditions that exceed maximum allowable surface temperature (350 °C) could result in temperature sensor damage.

7.1 Steam trap inspection

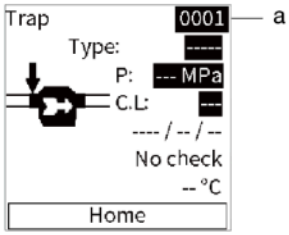
The PT3 is equipped with a simple automatic diagnosis function for steam traps.
This section explains how to properly operate the device for steam trap inspections.

7.1.1 Setting the steam 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.

7.1.2 Set 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.
- The inspection data will be over written when the measurement starts while a record number with inspection data is selected, the inspection data will be overwritten.

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

7.1.3 Measurement location

Measurements should be taken from the inlet side of the trap.
Note: If the measurement location is at the outlet, measurement accuracy cannot be assured. Measurement begins automatically once the probe is pressed against the measurement location.

