User MANUAL *MMD Box*

Alpha Teknoloji

January   2026

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1.1 Device Overview

The **Multi Measurement Device (MMD Box)** is a portable industrial measurement system developed by **Alpha Teknoloji** in accordance with **industrial standards** for the geometric analysis of rotating equipment such as **rotary kilns, dryers, mills, and support rollers**.

The device enables accurate and repeatable measurement of critical geometric parameters during operation or maintenance activities. By integrating multiple measurement methods into a single system, the MMD Box allows both contact and non-contact measurements depending on site conditions and application requirements.

The system is capable of measuring:

- Circumference and diameter using a contact encoder wheel
- Radial and axial displacement using non-contact inductive sensors
- Deflection, throw, and positional variation using a laser distance sensor

All measurement data is processed in real time and displayed directly on the device screen, allowing immediate evaluation in the field.

For inductive and laser measurement modes, the MMD Box can be connected to a PC via USB, enabling measurement data to be visualized, recorded, and analyzed using Alpha Teknoloji's dedicated software.

Through the PC software interface, users can monitor live measurement signals, evaluate displacement trends, and perform detailed analysis beyond the on-device display. This approach supports advanced assessment of run-out, deflection, and positional changes during operation or maintenance.

The MMD Box is designed for field use in demanding industrial environments, providing reliable performance under conditions involving dust, vibration, and elevated temperatures. The device is intended to be operated by trained technical personnel.

1.2 Typical Applications

The Multi Measurement Device (MMD Box) is used for inspection, alignment, and condition monitoring of rotating industrial equipment in heavy industrial environments.

The device supports a wide range of on-site measurement tasks, including:

- Circumference and diameter measurement of rotary kilns and rotary dryers
- Run-out and ovality measurement of kiln tyres and girth gears
- Roundness and run-out inspection of support rollers
- Shaft bending and positional movement analysis of rollers and drive components
- Radial and axial displacement measurement using inductive sensors
- Non-contact deflection and throw measurement using laser distance sensing

The MMD Box can be used during operation or planned maintenance, allowing measurements to be performed without disassembly. This enables early detection of wear, misalignment, and abnormal movement, supporting informed maintenance decisions and preventive maintenance strategies.

The flexibility of combining contact and non-contact measurement methods within a single device allows the MMD Box to adapt to varying site conditions and measurement requirements.

1.3 Standards and Compliance

The Multi Measurement Device (MMD Box) has been designed and developed in accordance with applicable industrial and international standards to ensure safe, reliable, and consistent operation in industrial environments.

Compliance with these standards supports environmental durability, electromagnetic compatibility, and enclosure protection requirements relevant to field use.

Standard	Description
TS EN 60529	Degrees of Protection Provided by Enclosures (IP Rating)
TS EN / IEC 60068-2-1	Environmental Testing – Test A: Cold
TS EN / IEC 60068-2-2	Environmental Testing – Test B: Dry Heat
IEC 61000-6-1	EMC – Immunity for residential, commercial
IEC 61000-6-3	EMC – Emission standard for residential

1.4 Technical Data

This section describes the embedded hardware and safety features designed to ensure reliable operation and measurement accuracy in field conditions. The listed components support signal integrity, protect internal electronics, and provide real-time alerts during active measurements, contributing to the robustness of the MMD system.

Parameter	Specification
Device Type	Portable industrial measurement device
Measurement Methods	Contact (encoder wheel), Non-contact (Inductive sensor and Laser sensor)
Encoder Wheel Diameter	160 mm
Encoder Wheel Verification	Measured on CMM and supplied with measurement report
Encoder Resolution	5000 pulses per revolution
Circumferential Resolution	0.032 mm per pulse
Inductive Sensor Input	2 channels
Inductive Sensor Ranges	0–10 mm / 0–20 mm / 0–40 mm/ 2-5mm (sensor dependent)
Laser Measurement	Non-contact distance measurement 60 to 210 mm
Display	4.3" TFT color display
User Interface	Membrane keypad
Data Output	USB
PC Software	Alpha Teknoloji Measurement Software
Power Supply	Rechargeable battery
Battery Configuration	4-cell battery pack
Battery Type	Replaceable battery pack
Battery Handling	Tool-free replacement
Air Transport Compatibility	Suitable for air travel in accordance with applicable battery transport regulations
Charging Method	Charging dock
Operating Temperature	According to environmental test standards
Enclosure	Industrial-grade enclosure
Intended Use	Industrial field measurements

The MMD Box has been evaluated against applicable international standards to confirm mechanical robustness, environmental resilience, and electromagnetic compatibility for industrial use.

1.5 Carrying Case

The MMD Box system is supplied in a dedicated carrying case designed for safe transport and storage of the device and its accessories. The case provides mechanical protection against impact, dust, and handling-related damage during field use and travel.

All system components are stored in designated compartments to ensure organized placement and quick access during setup. The carrying case supports secure handling of the device during on-site measurements and transportation between locations.

Feature	Description
Dimensions	45 × 53 × 28.5 cm
Weight	10 kg (With MMD Set)
Material	High-Strength Polypropylene
Waterproof	Sealed design for full water resistance
Shockproof	Shock-absorbing shell for equipment protection
Surface Finish	Professional-grade hard surface
Mobility	Wheeled base + telescopic handle
Interior	Custom foam cut-outs for MMD components

1.6 Safety Instruction

The MMD Box is designed for use in industrial environments. To ensure safe operation and prevent damage to the device or injury to personnel, the following safety instructions must be observed.

⚠️	Keep hands, cables, and accessories away from rotating equipment during measurement. Contact with moving parts may result in serious personal injury.	
⚠️	Ensure that the device and sensors are securely positioned before starting measurements on rotating equipment. Unsecured components may be caught by moving surfaces.	
⚠️	Do not operate the device if the enclosure, connectors, or cables are damaged. Operating the system in this condition may lead to incorrect measurements or device failure.	⚠️
⚠️	Verify that all sensors and trigger elements are correctly aligned before measurement. Incorrect positioning may cause measurement errors or sensor damage.	
⚠️	Measurements on rotating equipment should be performed by trained technical personnel familiar with site safety procedures and operating conditions.	

⚠️	Do not disassemble, puncture, or short-circuit the battery pack. Improper handling may result in personal injury or battery damage.	
⚠️	Do not expose the battery pack to excessive heat or open flame. Improper use may result in fire or explosion.	
⚠️	Use only an approved and compatible 4-cell battery pack with the device. Use of non-approved batteries may cause device damage.	⚠️
⚠️	Charge the battery pack only using the supplied charging dock.	
Note	The battery pack is designed to be user-replaceable without tools. If the device will not be used for an extended period, removal of the battery pack from the device is recommended.	

1.7 Environmental Conditions

The MMD Box shall be operated within the environmental conditions specified in the technical data. Exposure to excessive moisture, mechanical shock, or condensation may affect measurement accuracy or cause device damage.

2.1 Supplied Parts and Accessories

1	Measuring Wheel	**7**	Inductive Sensor 0...10mm
2	Distometer	**8**	MMD BOX
3	Small Silicon Magnet	**9**	Inductive Sensor 2...5mm
4	Silicon Magnet	**10**	Battery Pack
5	Inductive Sensor 0...40mm	**11**	Battery Charger
6	Inductive Sensor 0...20mm	**12**	Trigger Sensor

Note: All necessary cables and magnetic holders required for sensor operation are included in the package.

2.2 Device User Interface

The MMD device is equipped with a Lexan membrane control panel featuring four buttons designed for reliable and intuitive operation in field conditions. The button layout provides full access to the device menu, enabling users to configure settings, navigate functions, and manage measurement tasks efficiently.
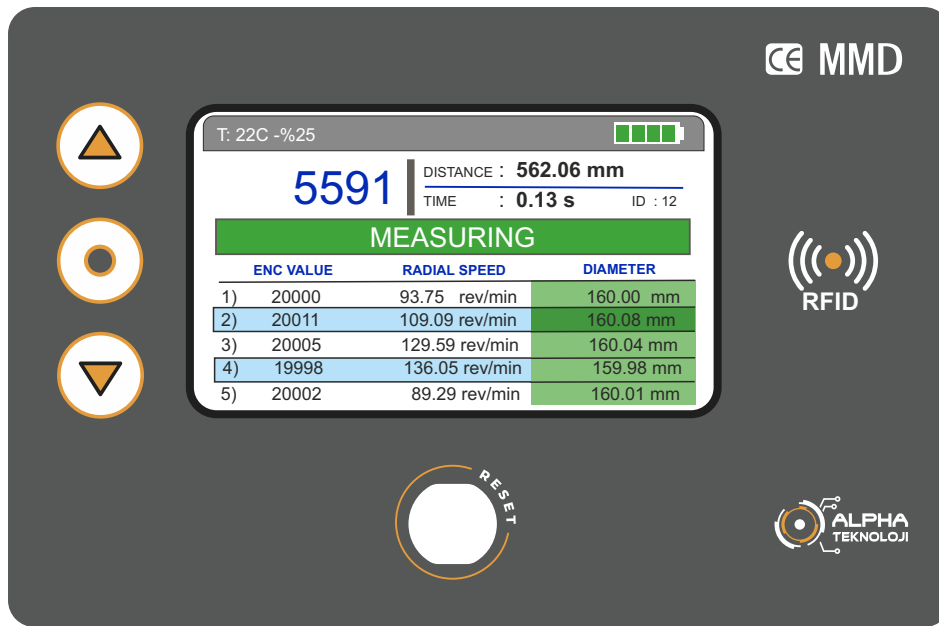
Up Button
Used to navigate upward through the menu options.

Select Button
Used to confirm selections and enter submenus. This button is essential for activating features and starting measurement processes.

Down Button
Used to navigate downward through the menu options.
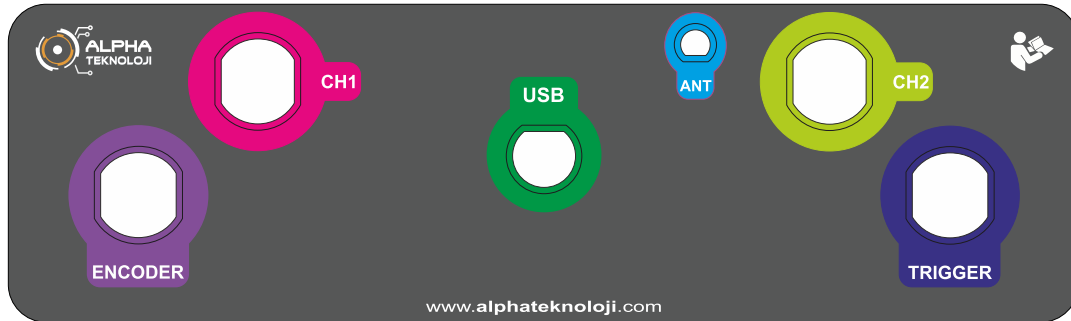
Power Button
This is a dual-function mechanical button:
Press and hold to power the device ON or OFF.
Short press during measurement to reset the current measurement values.
During each trigger event, the power button indicator light flashes, providing visual feedback that the trigger signal has been detected.

2.3 Connectors

The MMD device is equipped with dedicated connectors to support sensor inputs, triggering, charging, and PC communication. All connectors are positioned for ease of access and designed for reliable operation in industrial field conditions.

🟣	**Encoder Connector** Used to connect the encoder wheel for contact-based circumference and diameter measurements.
🔵	**Magnetic trigger** input used to start and stop the measurement cycle. **without delay.**
🔴🟢	**Ch1 / CH2** Channels for inductive sensors, laser sensors, or deflection measurement sensors. These inputs allow simultaneous radial and axial measurement of metal surfaces, depending on the measurement configuration.
🟢	**USB** USB port used for device communication, data transfer, firmware updates, and PC connectivity.
🔵	**ANT** Reserved connector for optional wireless communication modules

2.4 Measuring Principle

The MMD Box is a multi-mode, high-precision measurement system designed for circumferential, structural, and axial analysis of rotary equipment such as kilns, dryers, and mills. The system operates based on three core measurement principles: circumferential measurement, inductive sensor-based measurement, and laser distance measurement.

Circumferential Measurement :

This measurement mode is used to determine the circumferential distance traveled by a rotating surface during one full rev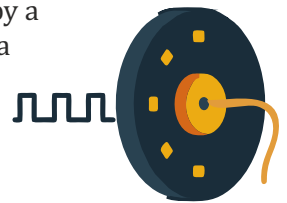olution. The MMD Box performs this measurement using a measuring wheel that is in contact with the surface and mechanically coupled to an encoder.

Wheel travel per revolution: 160 mm
Encoder resolution: 5,000 pulses per revolution
Measurement resolution: 0.032 mm/pulse (160 mm / 5,000 pulses)

Encoder Disk

The start and end points of the measurement cycle are defined by a magnet mounted on the rotating body. A magnetic trigger sensor detects the magnet reliably and without delay. The encoder pulse count recorded over one full revolution is used to calculate the circumference.

All measurement results are displayed on the MMD screen for direct comparison. Based on this data, variations in diameter, ovality, and surface wear can be identified.

Magnetic Trigger

Inductive Sensor Measurement

The MMD Box features two independent inductive sensor channels used to measure positional changes in radial or axial directions. These non-contact sensors provide high-resolution analog output signals and are suitable for displacement measurements on metallic surfaces.

Measurement resolution ranges from 1 to 10 micrometers, depending on the selected sensor configuration. Sensor data is sampled at high speed and processed in real time by the system.

The measurement logic is defined by the selected software mode, allowing results to be displayed in both numerical and graphical formats within the MMD software.

Inductive Sensor

Laser Distance Measurement

This measurement mode is intended for applications where physical contact is not possible due to high temperature, vibration, or limited accessibility. The system uses a laser displacement sensor to perform non-contact distance measurements by reflecting a focused light beam from the target surface.

The sensor operates within a working range of 60 to 210 mm and provides repeatable measurements with a resolution down to 60 micrometers. This allows reliable detection of fine positional changes in conditions where inductive sensors may not be suitable.
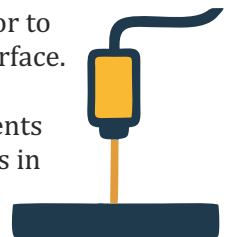
Measurement data is synchronized with the overall system operation and transmitted to the MMD software. Results can be monitored in real time and analyzed through numerical and graphical representations. Graphical results may also be viewed directly on the MMD device, while detailed numerical data is accessed via the software interface.

Laser Distance

2.5 Battery and charging System

The MMD Box is powered by a detachable, high-capacity battery module designed for field operation. The battery can be removed from the device and charged externally using the MMD Box Charging Dock.

The modular battery system provides the following advantages:
The removable design allows the battery to be transported separately during international travel, supporting compliance with air transport regulations.

The battery can be replaced within seconds without the use of tools, minimizing operational downtime.

A spare battery can be charged in parallel using the charging dock, enabling continuous field operation.

The 4-cell battery configuration supports extended operating time and multiple consecutive measurements on a single charge.

⚠️ Use Original Charger OnlyOnly use the official MMD Box charging dock to charge the battery. The use of third-party chargers may cause battery incompatibility, reduced performance, or potential safety hazards.

⚠️ Store Spare Batteries ProperlyStore spare batteries in a cool, dry environment away from direct sunlight and metallic objects. Improper storage conditions may lead to battery degradation or short circuits.

⚠️ Avoid Deep DischargeTo extend battery life, avoid fully depleting the battery. Recharge the battery when a low power warning appears, and do not leave it uncharged for extended periods.

3.1 Turning on the Device

⏻   To power on the MMD Box: Press and hold the power button located on the device for a few seconds.You will hear a beep sound, indicating that the device is starting up.The TFT display will illuminate, and the main screen will appear shortly.

3.2 Selecting the Measurement Type

To select the desired measurement type on the MMD Box:

Use the ▲ (up) and ▼ (down) arrow keys to scroll through the available measurement types. When the desired type is highlighted, press the Select button to confirm.
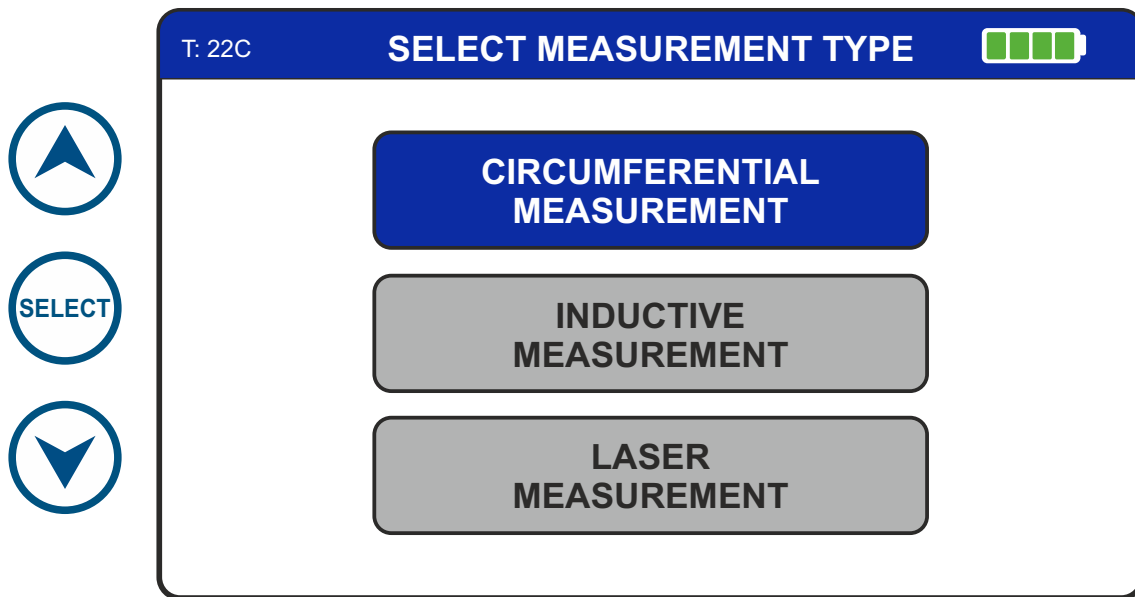
3.3 Circumferential Measurement Type

Before starting a circumferential measurement, ensure that both the encoder wheel and the magnetic trigger are connected to their designated input ports on the MMD Box. Once this type is selected, the system will automatically verify and display the currently calibrated disc ID. This ensures that the correct encoder calibration settings are applied to the measurement process.
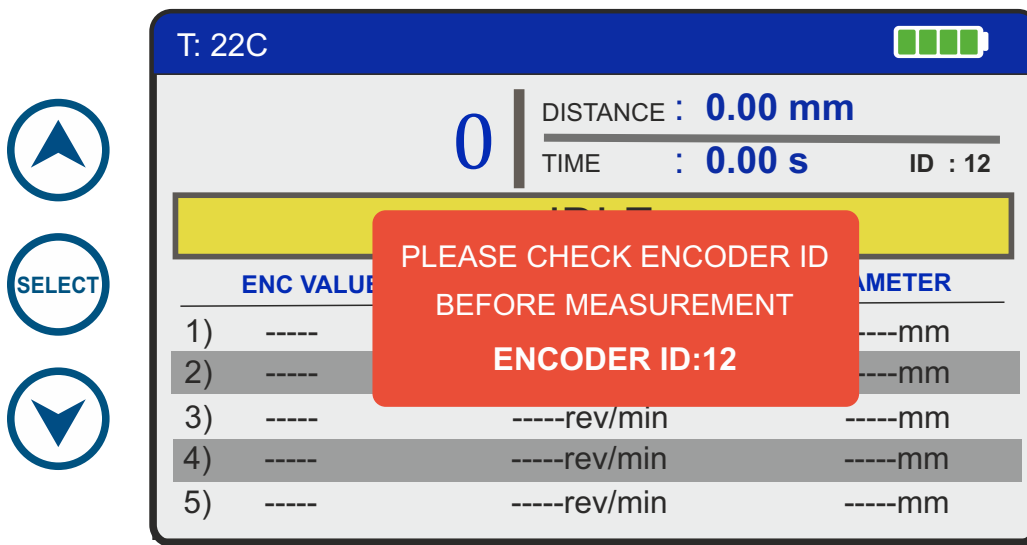
3.3.1 Calibrating The Encoder Disk

You can connect your MMD device to your PC and by using the MMD Measurement Tool, you can calibrate the encoder disc.

- Click on the "Device" button in the MMD Measurement Tool, and select "Connect". A new windowwill appear and you can enter the calibration values provided to you for your encoder disc.

- Click on the "Send Calibration" button and the MMD device will get the calibration values and save it to its non-volatile memory.

3.3.2 Idle Screen

When no measurement activity is detected, the MMD Box enters an idle state. The device will remain idle until motion is detected at the encoder. Alternatively, the user can manually return to the idle screen at any time by pressing the RESET button on the device.

```
T: 22C        DIAMETER MEASUREMENT      [████]

          0 | DISTANCE : 0.00 mm
            | TIME     : 0.00 s        ID : 12

          ┌──────────────────────────────────┐
          │             IDLE                 │
          └──────────────────────────────────┘

            ENC VALUE    RADIAL SPEED    DIAMETER
        1)   -----       -----rev/min    -----mm
        2)   -----       -----rev/min    -----mm
        3)   -----       -----rev/min    -----mm
        4)   -----       -----rev/min    -----mm
        5)   -----       -----rev/min    -----mm
```
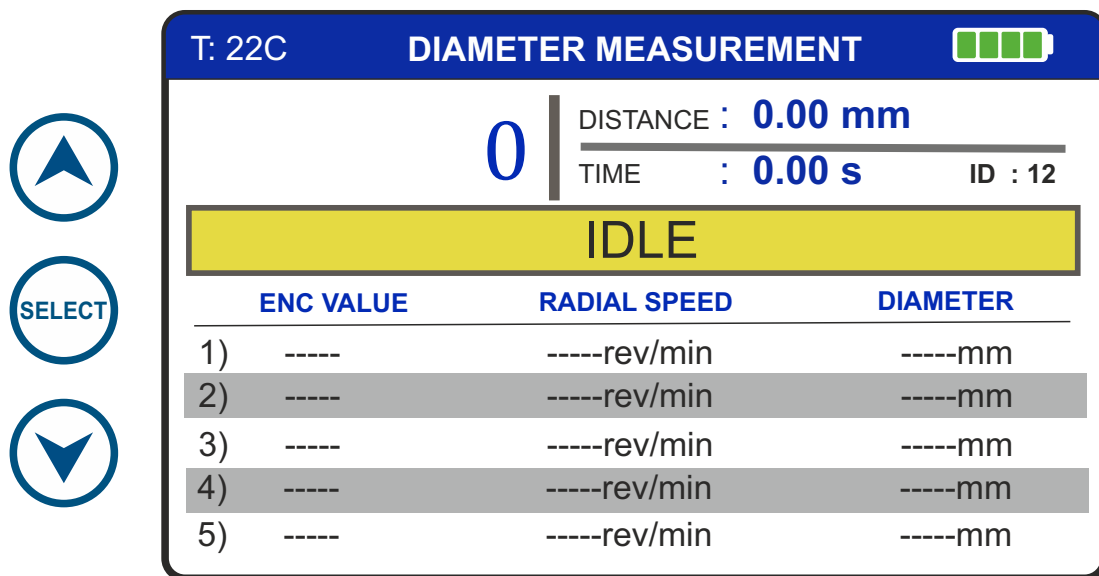
3.3.3 Encoder and Trigger Connection

To begin a circumferential measurement, connect the encoder cable to the ENCODER input port. Mount the trigger sensor on its holder and position the magnetic trigger on the metal surface to be measured axially.

The trigger sensor can detect the magnetic field from a distance of up to 6 cm. For optimal accuracy, the trigger sensor should be placed as close as possible to the magnetic trigger. Then, connect the trigger cable to the TRIGGER input port.

3.3.4 Taking Measurement

Once movement is detected at the encoder, the device begins counting encoder pulses. The measurement cycle starts with the next detected trigger signal.

During operation, the MMD Box displays the results of the last five measurements, updating the values in real time. The device continues measuring automatically until the user presses the **RESET** button.
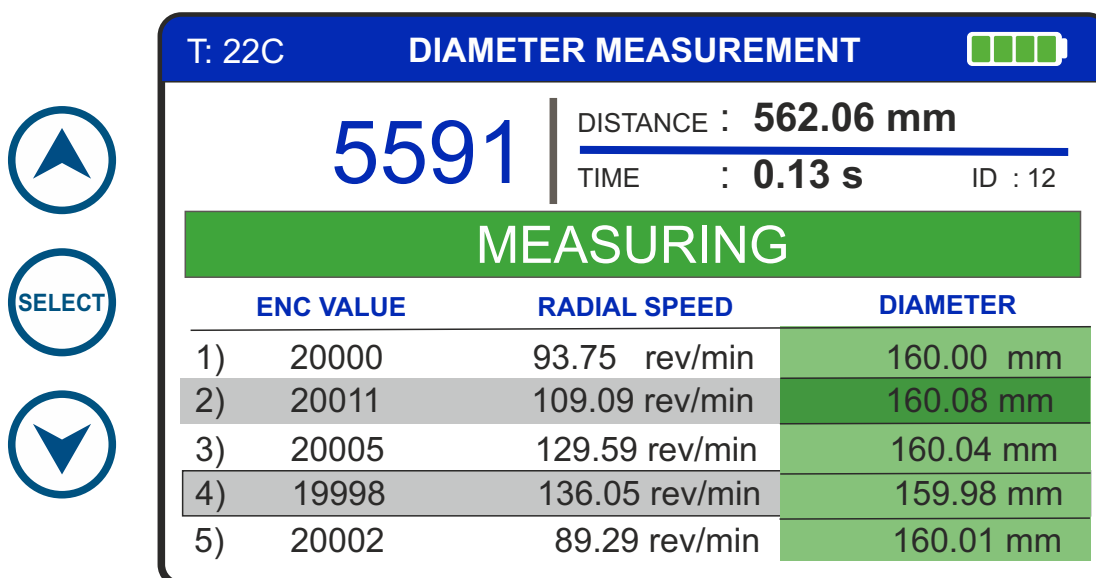
If the variation (error) among the last five measurements remains within 0.1 mm, the result is displayed with a green background. The highest value within this range is highlighted in dark green.

Pressing the **RESET** button at any time stops the measurement and returns the device to the idle screen.

Trigger Setup

Mount the trigger sensor on its holder and position the magnetic trigger on the metal surface to be measured axially. The trigger sensor can detect the magnetic field from a distance of up to 6 cm. For optimal accuracy, the trigger sensor should be placed as close as possible to the magnetic trigger.

Finally, connect the trigger cable to the TRIGGER input port on the MMD Box.

T: 22C	DIAMETER MEASUREMENT	
5591	DISTANCE : **562.06 mm**	
	TIME : **0.13 s**	ID : 12
	MEASURING	

	ENC VALUE	RADIAL SPEED	DIAMETER
1)	20000	93.75 rev/min	160.00 mm
2)	20011	109.09 rev/min	160.08 mm
3)	20005	129.59 rev/min	160.04 mm
4)	19998	136.05 rev/min	159.98 mm
5)	20002	89.29 rev/min	160.01 mm

3.4 Inductive Measurement

When the inductive measurement type is selected, the device displays the real-time status of the two inductive sensors. Each sensor can be in one of the following states:
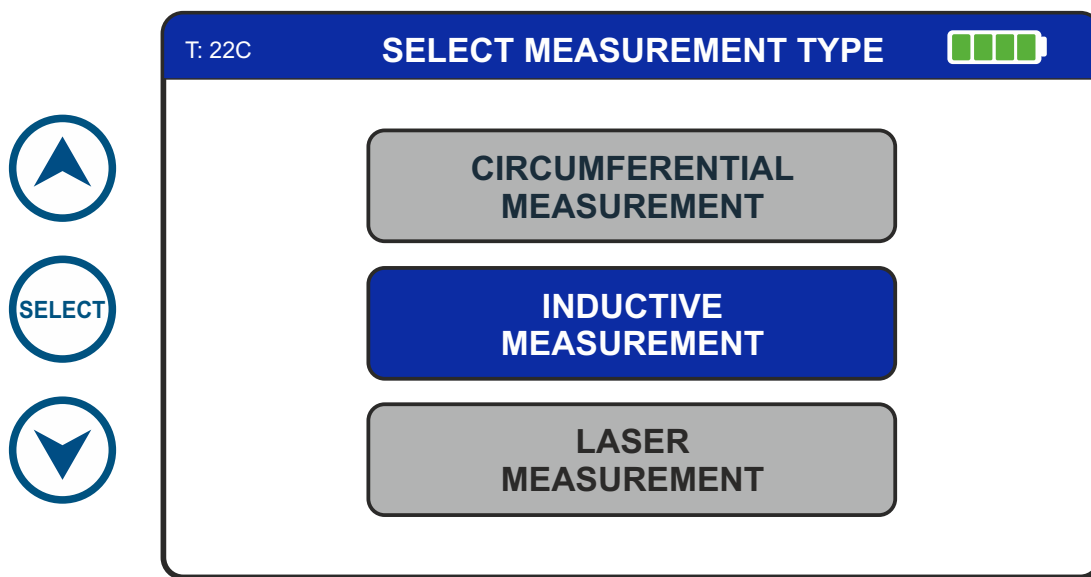
Not Connected
The sensor is not detected by the system.

Out of Range
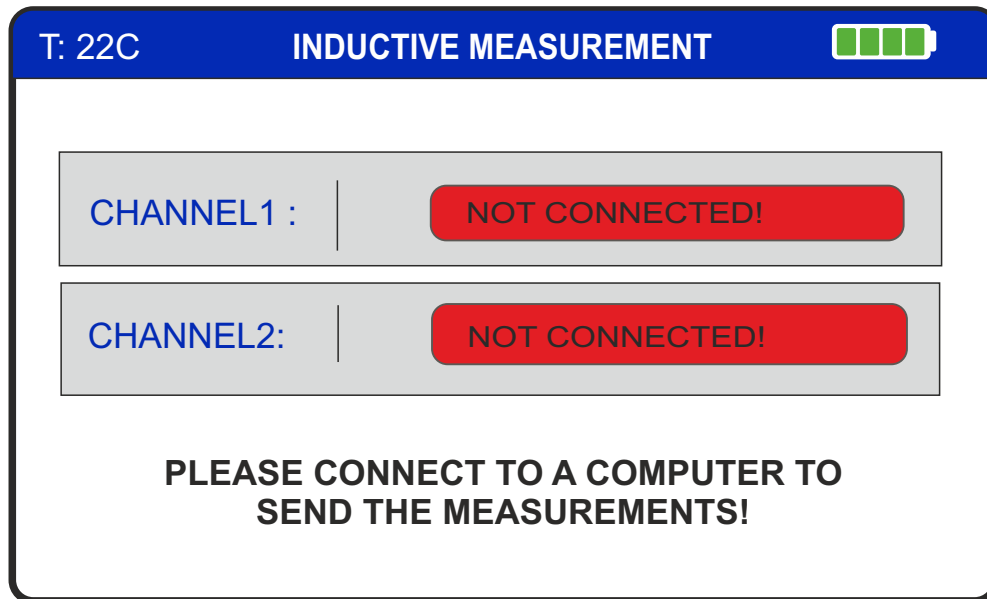The sensor is detected, but the measured surface is outside its effective detection range.

In Range
The sensor is operating correctly, and the target surface is within the measurable distance.

3.4.1 Not Connected

If one or both inductive sensors are not connected to the system, or if a connection fault is detected, the device displays the sensor status as <u>Not Connected.</u>

Before proceeding with the measurement, ensure that the sensor cables are securely connected to the correct input ports and that the sensors are operating properly.

T: 22C	**INDUCTIVE MEASUREMENT**	
CHANNEL1 :		**NOT CONNECTED!**
CHANNEL2:		**NOT CONNECTED!**

PLEASE CONNECT TO A COMPUTER TO SEND THE MEASUREMENTS!

3.4.2 Out of Range

When the sensors are connected, the status bars turn yellow and display Out of Range if the metal surface to be measured is outside the effective detection range of the inductive sensors.

This condition typically indicates one of the following:

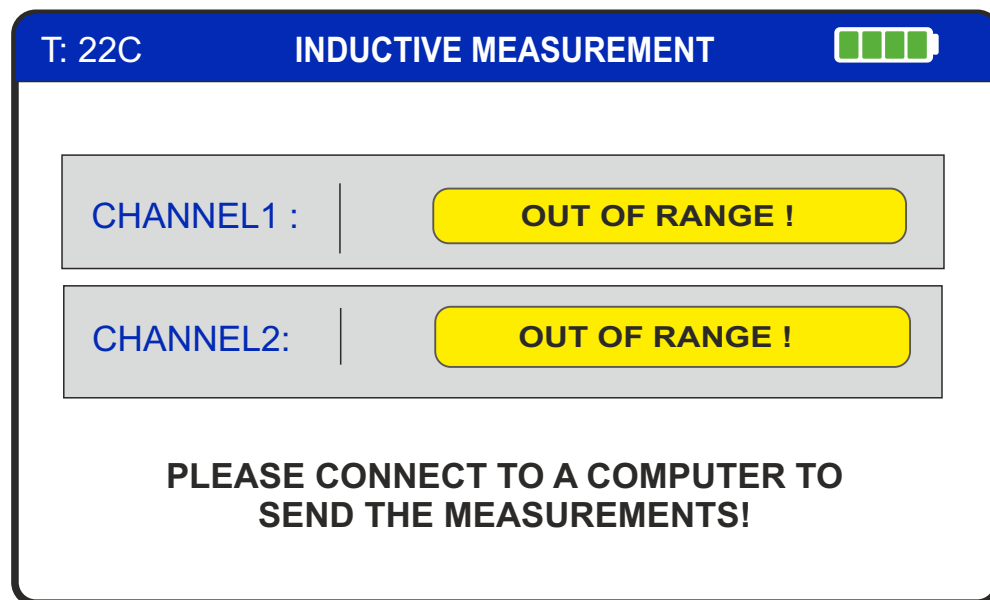The target surface is too far from the sensor,

The sensor is not properly aligned,

The material properties of the surface are not suitable for inductive detection.

To resolve this condition, check the following:

Ensure that the sensor face is directed straight toward the metal surface.

Reposition the sensor or move the target closer until the display changes to In Range, indicating that accurate measurement can resume.

T: 22C	INDUCTIVE MEASUREMENT	
CHANNEL1 :		OUT OF RANGE !
CHANNEL2:		OUT OF RANGE !

PLEASE CONNECT TO A COMPUTER TO SEND THE MEASUREMENTS!

3.4.3 Inductive Measurement

The inductive measurement mode enables accurate distance detection using two proximity sensors. This mode is suitable for monitoring position, alignment, and dimensional verification of metal surfaces during rotary motion.

Sensor Connection:
Connect the inductive sensors to their designated cables, then connect the cables to the device's sensor input ports. The system provides two channels for inductive sensors: CH1 and CH2. Sensors can be connected to either channel.

Channel assignment and configuration can be adjusted later using the PC software, if required.

3.4.4 Taking Measurement

To begin measurement using inductive sensors:

1. Place the sensors securely onto their magnetic stands and align them towards the metal surface to be measured.
2. Ensure the target is within detection range — the bars on the screen will turn green and display **"In Range"**.
3. Once both sensors are in range, the device is ready to start the measurement process.

3.4.5 Starting Digital Measurement

To collect and record measurement values:
1. Connect the device to a computer using the USB cable.
2. Launch the Alpha Teknoloji Measurement Software on the computer.
3. Select the inductive measurement option and start the measurement process via the software interface.
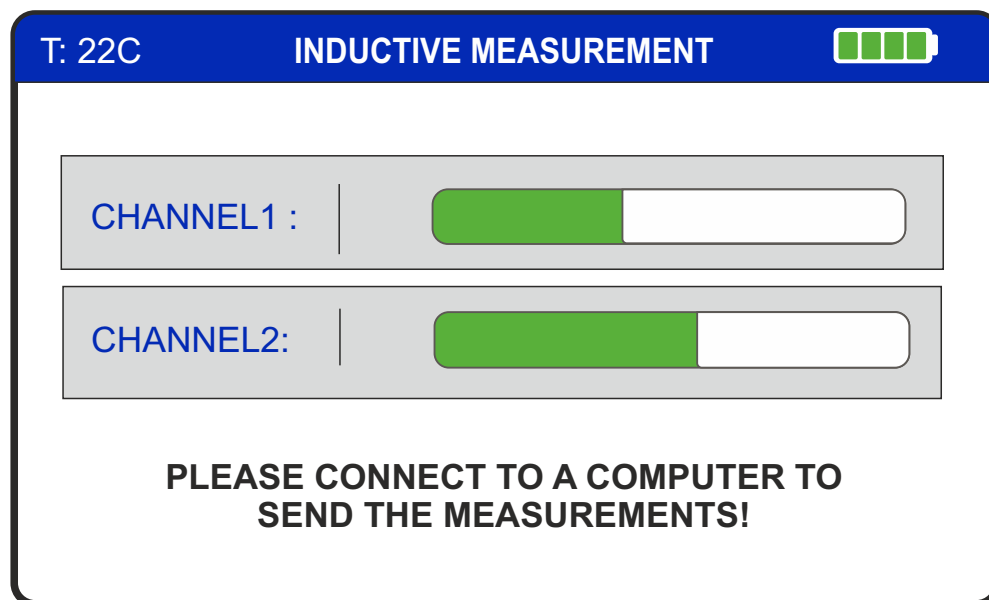
The system will continuously monitor the distance. Any movement of the metal surface within the sensor's range will be detected in real time.

If the target moves **out of range**, the display will automatically update and show ==yellow bars== with the "Out of Range" warning.

3.5 Laser Measurement

When the laser measurement type is selected, the device will display the real-time status of the laser distance sensor.

The sensor can be in one of the following states:
Not Connected – the laser sensor is not detected by the system.
Out of Range – the sensor is active but the target surface is outside the laser's measurable distance.
In Range – the sensor is functioning correctly and the target surface is within detection range.

These states help the user verify proper laser alignment and working conditions before starting a measurement.
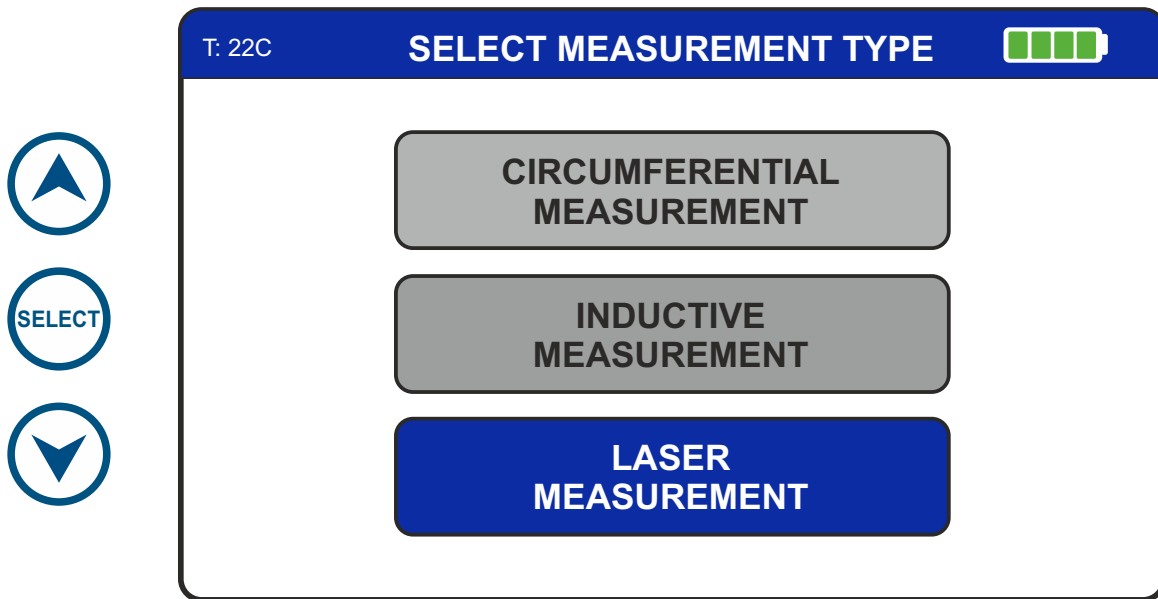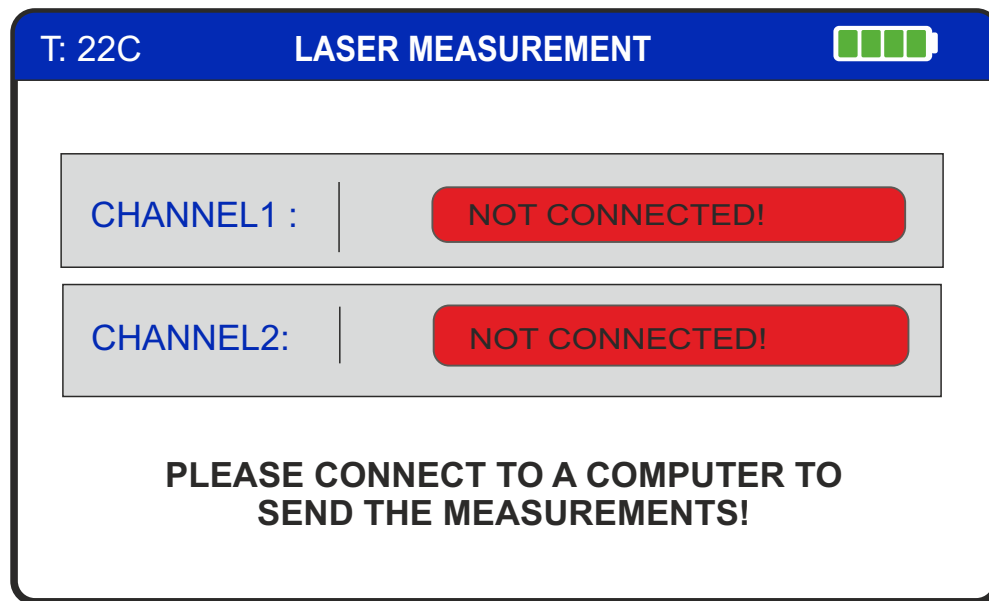
3.5.1 Not Connected

If either of the Laser sensors is not connected to the system or the connection is faulty, the device will display the corresponding sensor status as Not Connected.

Ensure that the sensor cables are securely plugged into the correct input ports and that the sensors are functioning properly before continuing.

3.5.2 Out of Range

If the laser sensor is connected, the bar will turn yellow and display the "Out of Range" label when the target surface is beyond the laser's detection range.

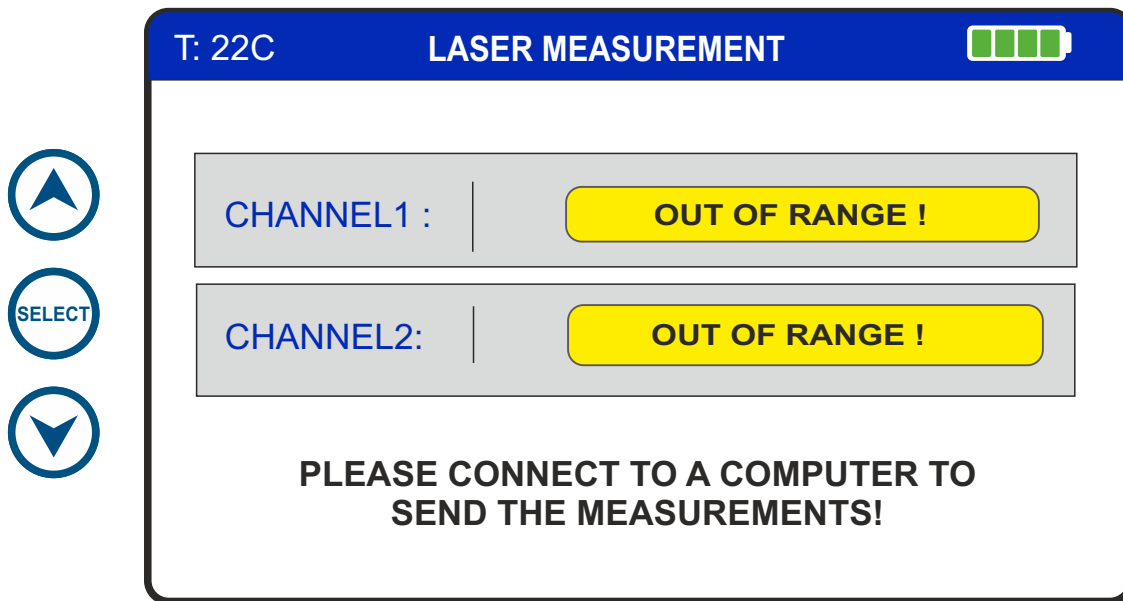This typically indicates: The target surface is too far from the sensor,

The laser is not properly aligned,

Or the surface is not reflective enough for accurate measurement.

To resolve the issue:

Ensure the laser is aimed directly and perpendicularly at the target surface.

Reposition the device or bring the surface closer until the display shows "In Range."

T: 22C	LASER MEASUREMENT	
CHANNEL1 :	OUT OF RANGE !	
CHANNEL2:	OUT OF RANGE !	

PLEASE CONNECT TO A COMPUTER TO SEND THE MEASUREMENTS!

3.5.3 Laser Sensor Connection

The laser measurement mode enables precise distance detection from a single point to a flat metal surface. It is particularly effective for detecting deflection, throw, or position shifts on rotary equipment.

Sensor Connection

Connect the laser distance sensor to its designated cable, and plug the cable into one of the device's sensor input ports.The system supports two input channels: CH1 or CH2.The laser sensor can be connected to either channel — the active channel can be selected later via the PC software.

3.5.4 Taking Measurement

To begin measurement using the laser sensor:

1. Mount the laser sensor securely on its stand and align it perpendicularly to the metal surface.

2. Ensure the surface is within the sensor's detection range — the bar on the screen will turn green and display "In Range."

3. Once the sensor is in range, the device is ready to start the measurement process.

3.5.5 Starting Digital Measurement

To collect and record measurement values:

1. Connect the device to a computer using the USB cable.
2. Launch the Alpha Teknoloji Measurement Software on the computer.
3. Select the inductive measurement option and start the measurement process via the software interface.
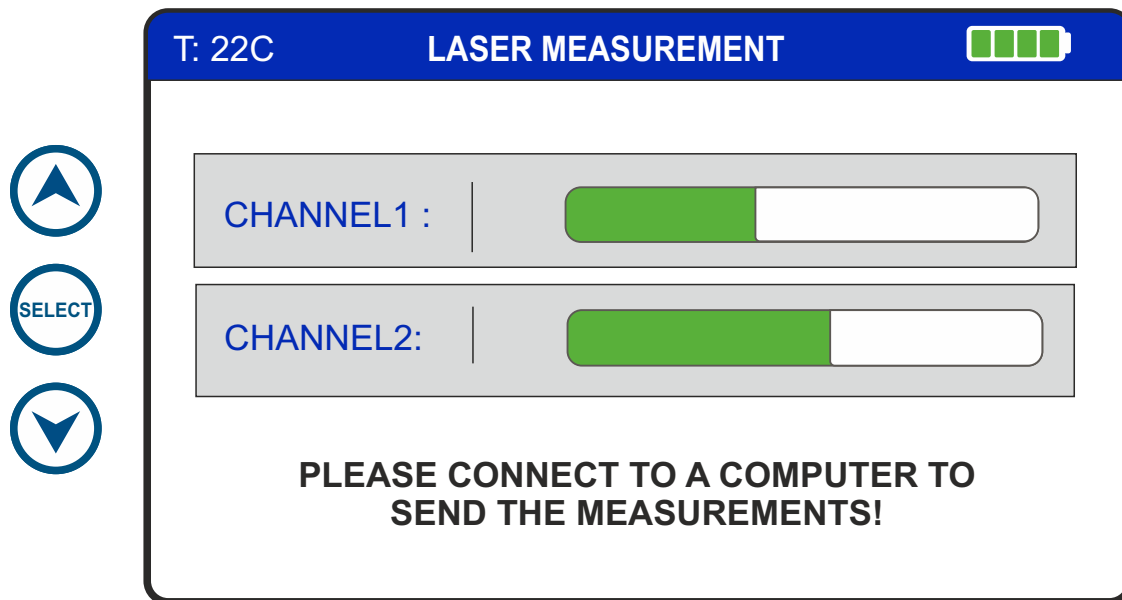
The system will continuously monitor the distance. Any movement of the metal surface within the sensor's range will be detected in real time.
If the target moves **out of range**, the display will automatically update and show **yellow bars** with the "Out of Range" warning.

4. Warning Messages

The device includes built-in safeguards to help ensure reliable and safe operation.If environmental conditions exceed operational limits, the system will notify the user with visual and/or audible alerts.

4.1 High Temperature Warning

The device is equipped with an integrated temperature and humidity sensor.If the ambient temperature exceeds the recommended operating range, the device will:Display a high temperature warning on the screen,Emit an audible alert,And pause or prevent measurements to avoid incorrect data collection.
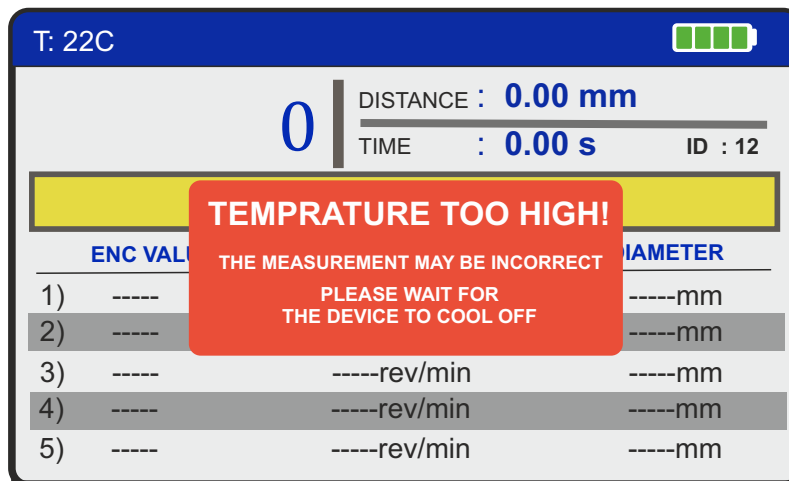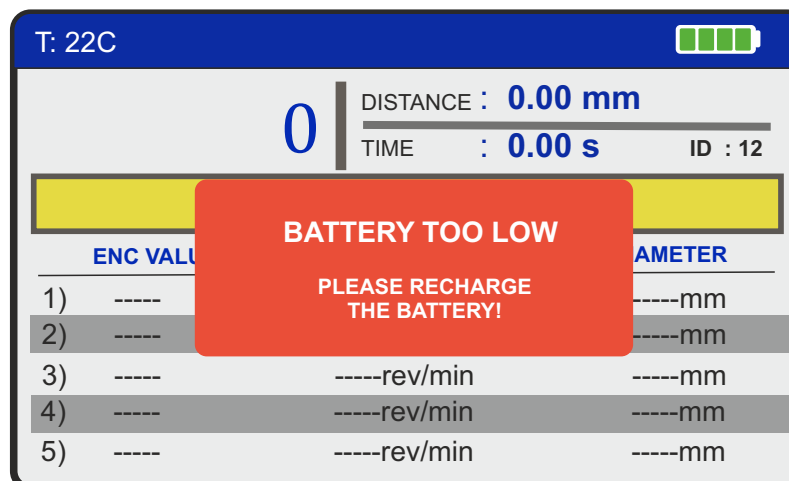

4.2 Low Battery Warning

When battery is low, the device:

Shows a "Low Battery" pop-up on screen, Emits a beep.

Shuts down after 1 minute automatically.

End of Manual

Thank you for choosing the MMD Box.
This manual has been prepared to provide clear and practical guidance for the installation, operation, and measurement processes of the MMD Box and its associated measurement software. All procedures described in this document are intended to support accurate measurements, safe operation, and reliable long-term performance of the device.

It is recommended that this manual be reviewed carefully before operating the device. Proper use in accordance with the instructions herein will help ensure consistent results and protect the equipment from unintended misuse.

For technical support, calibration services, software updates, or additional documentation, please contact the manufacturer.

Manufacturer:
Alpha Teknoloji Electronic & Software

Website:
www.alphateknoloji.com

Document:
MMD Box User Manual

Revision:
Rev. 2026-01