



# MANUAL VERIFICATION KIT

## USER MANUAL

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## SAFETY PRECAUTIONS

The Innovatest Manual Verification Kit has been designed and manufactured to provide safe and dependable performance. Nevertheless, incorrect handling or operation may result in electrical shock, personal injury, equipment damage, or loss of data. To ensure proper use and long-term reliability, all users must follow the safety requirements described in this section during installation, operation, transportation, and maintenance of the device.

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### On Safety

Use only the original charging equipment and cables supplied with the unit. If a replacement cable is required, ensure it meets applicable national safety standards. If the charging cable or any part of the power system appears damaged, discontinue use immediately and contact the manufacturer or an authorized Innovatest service provider.

The USB-C charging connector functions as the primary disconnection point for the device. Ensure that the charger and the wall outlet are easy to reach and remain unobstructed.

Operate the device only within the voltage and power limits specified in this manual. If you are uncertain about the conditions of your electrical installation, consult a qualified technician or supervisor.

Do not use overloaded extension cords, uncertified power banks, or visibly damaged charging accessories. Such equipment can cause overheating, electrical shock, or fire.

While the device is connected to a power source, some internal components may remain energized even if the unit itself is switched off. Always unplug the charger before cleaning, transporting, or performing maintenance.

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### Do Not Open the Device

There are no user-serviceable components inside the electronics module. Opening the sealed enclosure will void the IP67 protection rating and may expose the user to hazardous voltages.

High internal voltages may remain present even when the device is turned OFF.

If the unit stops functioning correctly, contact Innovatest service personnel. Do not attempt to open, repair, or modify the internal electronics under any circumstances.

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### To Avoid Personal Injury

- Place the unit only on stable, flat, and vibration-free surfaces. Unstable positioning may cause the device or connected load cell to fall.
  - Transport the system exclusively using the integrated Pelican handle. Never lift the device using cables or connected accessories.
  - Avoid striking, dropping, or applying excessive force to any part of the touchscreen or enclosure, as this may damage internal components.
  - Do not insert objects into any USB port, ventilation opening, or the load cell connector.
  - Keep the equipment away from children and untrained personnel to prevent accidental misuse or injury.
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#### To Prevent Fire, Electrical Shock, or Hazards

- Turn the device OFF and disconnect it from the charger when it will not be used for an extended period.
  - Keep liquids, metal objects, and high-voltage tools away from the M12 load cell connector to avoid electrical short circuits and injury.
  - Do not use or attach accessories that are not approved for this verification kit, as they can compromise electrical safety and sealing integrity.
  - Do not operate the device in environments with open flames, excessive dust, or explosive atmospheres.
  - During thunderstorms or electrical storms, avoid touching the charger, USB cables, or load cell cables.
  - Avoid high-humidity environments. The device is IP67 rated, but improper cable connections may allow moisture to enter.
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#### Battery and Charging Safety

Never attempt to remove, puncture, or replace the internal battery. Doing so may lead to overheating, fire, or chemical leakage.

Charge the device only with certified USB-C power sources.

If unusual heat, odor, noise, or smoke is detected, immediately disconnect all cables and stop using the device.

Do not leave the device charging unattended for extended periods.

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#### Environmental and Handling Precautions

Ensure all ports and connectors are dry and free of contamination before use.

Do not expose the device to temperatures outside the permitted operating range (0–60°C).

Avoid placing heavy items on the case or applying pressure to the touchscreen.

Before transporting the device, ensure all load cells are properly secured in their designated foam compartments.

Do not close the Pelican case while cables are still attached; doing so may damage wiring or connectors.

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## Data Protection Safety

Always use the Safe Eject function before removing the USB stick.

Unplugging the storage device prematurely may result in file corruption.

Verify adequate battery level before starting extended measurement or calibration processes.

Unexpected power loss during calibration may corrupt stored data.

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## INSTALLATION

Correct installation is essential for achieving accurate measurement results and maintaining device safety. Follow the guidelines below when setting up the Innovatest Manual Verification Kit.

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### Placement and Setup

Place the unit on a stable, flat, and vibration-free surface.

Avoid locations near table edges or where the device may be knocked over.

Fully open the Pelican case and ensure that it remains firmly positioned before touching the touchscreen or connecting cables.

Do not place tools, equipment, or load cells on top of the touchscreen or electronics compartment.

Avoid installation sites with prolonged exposure to direct sunlight, which may cause overheating and reduced display visibility.

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### Environmental Considerations

Do not place the device near water sources such as wash stations, coolant tanks, or open containers.

Avoid extremely dusty, dirty, or corrosive environments, as metal dust and chemicals can degrade connectors and seals.

Maintain good ventilation around the system. Excessive heat buildup may affect battery life and electronic stability.

Keep the device away from strong electromagnetic interference (e.g., welding equipment, industrial motors, radio transmitters), as these sources can negatively affect measurement accuracy.

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### Handling the Protective Case

Ensure that the non-slip rubber feet of the case rest securely on the work surface.

Open the case slowly and fully to prevent unnecessary stress on the hinges or accidental displacement of internal components.

Never force the lid closed if any cable is still attached; doing so may damage connectors, load cell ports, or the touchscreen.

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### Cable Routing and Connections

Route the M12 load cell cable in a safe manner that avoids tripping hazards, sharp bending, or pulling.

Strain on the cable can loosen the connector or damage internal wiring.

Use the strain-relief groove near the connector to minimize unwanted motion during operation.

Keep cables away from sharp tools, heavy objects, or rotating machinery in the work area.

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### Battery and Power Installation

When charging the device, place it near an easily accessible electrical outlet. Ensure the USB-C cable is not compressed, stretched, or routed under heavy items.

Avoid installing the unit near heat sources while charging.

Charge the device only within the recommended temperature range (0–60°C).

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### Load Cell Installation

Before connecting a load cell, inspect the M12 connector pins to ensure they are clean, dry, and undamaged.

Align the connector properly and twist it gently to lock it in place. Forcing the connector may damage the pins.

Route the load cell cable so it does not interfere with the movement of the hardness tester or surrounding equipment.

Do not install load cells on unstable, contaminated, or obstructed fixtures.

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### Case and Component Protection

The internal foam inserts are designed to secure and protect the load cells. Always place each load cell in its designated compartment before moving or storing the device.

Do not remove or modify foam padding or structural brackets; these components provide shock absorption and help maintain the IP rating.

Avoid operating or storing the device in environments containing oil mist, airborne chemicals, or corrosive vapors, which may degrade seals and enclosure materials.

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### General Precautions During Installation

- Do not drop tools or accessories onto the touchscreen or electronics panel.
- Avoid positioning the device under shelves or locations where objects may fall onto it.
- If the device is installed in a semi-permanent location, ensure that the lid can still open fully to allow access to the USB port, emergency stop, and connectors.
- Before each use, verify that all mechanical buttons (Power, Emergency Stop) move freely and are unobstructed.



## CLEANING

To maintain accuracy and extend the lifespan of the Innovatest Manual Verification Kit, regular cleaning must be performed using the correct methods. Improper cleaning can damage connectors, the touchscreen, or the protective sealing.

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### General Cleaning Rules

- Power off the device and disconnect the USB-C charging cable before cleaning.
  - Never spray liquids directly onto the touchscreen or into any ports.
  - Avoid using chemicals such as alcohol, acetone, solvents, or industrial cleaners, as these may degrade seals and plastic components.
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### Touchscreen Cleaning

- Wipe the touchscreen using a clean, soft, lint-free microfiber cloth.
  - If necessary, lightly dampen the cloth with water (never apply water directly to the screen).
  - Do not apply excessive pressure to the touchscreen.
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### Exterior Case Cleaning

- Clean the Pelican case exterior using a damp cloth; mild soap may be used.
  - Do not use abrasive pads, brushes, or high-pressure water jets, as these may compromise sealing.
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### Connector Cleaning

- Ensure all connectors (USB-A, USB-C, M12 load cell port) are dry before use.
  - Use low-pressure dry compressed air to remove dust.
  - Do not insert metal tools, pins, or sharp objects into connectors.
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### Internal Components

Do not attempt to clean or open the internal electronics module. Opening internal components voids the IP67 rating and warranty.

If internal contamination (dust, liquid, corrosion) is suspected, contact Innovatest service support.

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## Regular Cleaning Frequency

- Daily: Wipe touchscreen, inspect connectors for dust.
- Weekly: Clean exterior case and check seals for debris buildup.
- After harsh environments: Perform a full external cleaning before storing the device.

Proper cleaning maintains measurement accuracy, protects sealing integrity, and extends the service life of the verification kit.



## On Repacking

To ensure safe transport and long-term protection of the Innovatest Mobile Force Verification Kit, the unit must be repacked correctly after each use. Improper repacking may lead to damage of load cells, connectors, or internal electronics. Follow the guidelines below when preparing the system for storage or transport.

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## General Repacking Instructions

- Power OFF the device completely before repacking.
  - Disconnect the USB-C charging cable and ensure all ports are free of moisture and dust.
  - Remove the load cell cable from the M12 connector before placing the kit into storage.
  - Do not store the device while it is still warm from charging or heavy operation; allow it to cool down.
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## Load Cell Repacking

- Place each load cell inside its dedicated foam compartment.  
Each compartment is shaped to match the load cell's geometry; ensure proper alignment to avoid strain on cables or connectors.
  - Do not stack load cells or place them loosely inside the case.  
This may cause internal damage, signal degradation, or calibration drift.
  - Ensure that load cell cables are coiled loosely and placed in the designated accessory area.  
Avoid tight bends or knots that may damage shielding or internal conductors.
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## Cable and Accessory Storage

- Place all cables (USB-C, USB-A sticks, M12 extensions) inside their marked compartments.
  - Do not store cables across the touchscreen or electronics panel.  
This may cause pressure that damages the display or seals.
  - Ensure no small tools or loose objects remain inside the case.  
During transport, movement may cause scratches, dents, or interference with the electronics module.
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## Securing the Electronics Module

- Verify that the electronics panel is seated correctly within the aluminium frame and foam supports.  
There should be no visible gaps or lifted areas.
- Do not apply pressure directly to the screen when closing the case.
- Before closing the lid, ensure that:

- No cable is sticking out
  - Emergency button is unobstructed
  - USB ports are not blocked by objects
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### Closing the Protective Case

- Gently lower the Pelican case lid while ensuring no object protrudes beyond the foam.
  - Lock both latches firmly until they click.  
A partially closed case may compromise the IP67 protection and could open during transport.
  - Inspect the perimeter gasket for dust or debris.  
Clean if necessary to maintain water and dust resistance.
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### Transport Conditions

- Always use the built-in Pelican handle for transport.  
Do not carry the case by any external cables.
  - Avoid exposing the case to severe impacts, crushing loads, or vibration during transport.
  - Do not leave the kit in a hot vehicle or direct sunlight for extended periods.  
Internal temperatures may exceed safe battery limits.
  - If transporting by air, ensure compliance with airline lithium-battery regulations.  
The device should be carried as hand luggage when possible.
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### Long-Term Storage

- Store the kit in a dry, cool environment between –20°C and 60°C.
- Ensure the battery is charged to 40–60% before long-term storage.
- Avoid storing the device in high-humidity environments.
- Inspect the case seals and foam padding periodically for wear.

## PRODUCT OVERVIEW

The Innovatest Mobile Force Verification Kit is a portable, ruggedized measurement system designed to verify forces applied by hardness testing machines in both laboratory and industrial field environments. The system integrates sensing, processing, display, storage, and connectivity functions within a compact IP67-rated

Pelican case. This section provides an overview of the unit's physical layout, components, and essential features.

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## Front Panel Components

### Touchscreen Display

The device features a 10-inch resistive touchscreen centered on the front panel. It supports operation with gloves and remains visible under a wide range of lighting conditions. The display serves as the primary interface for calibration, measurement, data logging, and system navigation.

### Power Button

The power button is positioned above the touchscreen, centered horizontally on the front panel. It provides clear tactile feedback and allows the user to turn the system ON or OFF safely.

### Emergency Stop Button

The emergency stop button is located on the right side of the front panel, clearly separated from the touchscreen and power button to prevent accidental activation. It allows the user to immediately stop any ongoing measurement or calibration process.

## Status LED Indicator

The status LED is positioned directly next to the emergency stop button on the right side of the front panel. The multi-color indicator provides visual feedback on system status, including power state, active measurements, busy conditions, errors, and battery warnings.

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## Side and External Panel Components

### Side Panel (I/O Ports)

All external connectors of the Innovatest Mobile Force Verification Kit are located on the right side panel of the electronics module. This single I/O zone contains:

### USB-A Data Export Port

Positioned on the right side of the electronics panel. Used for exporting measurement logs and calibration files.

## USB-C Charging Port

Located directly next to the USB-A port on the same right side panel. Serves as the primary charging interface for the internal Li-ion battery.

## M12 5-Pin Load Cell Connector

Mounted on the right side panel, grouped with the USB ports. Supports differential signal lines, excitation voltage, and the load-cell identification resistor. The threaded locking mechanism ensures secure attachment during operation.

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## Internal Components

### Battery Module

A high-capacity Li-ion battery pack ( $\approx$ 5000 mAh) provides 8–10 hours of operation. The module is mounted inside the sealed electronics enclosure to maintain IP protection.

### Main PCB Assembly

The PCB contains:

- Microcontroller
- 24-bit ADC
- Instrumentation amplifier
- Passive low-pass filters
- Power regulation circuits
- Memory module for data storage

The electronics are mounted on vibration-damped supports to ensure accuracy and reliability in harsh environments.

### Aluminium Support Frame

A rigid internal frame holds the electronics panel securely inside the Pelican case. It provides:

- Structural reinforcement
- Shock absorption
- Thermal separation between battery and PCB

### Foam Compartments

Precision-cut foam sections store load cells and protect them during transport. Dedicated slots prevent cable strain, connector bending, or contact damage.

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## Carrying Case (Pelican 1500)

The entire system is integrated into a Pelican 1500 IP67-rated protective case, offering:

- Dust and water ingress protection
- Impact resistance
- Stable handling
- Secure latches and ergonomic carrying handle

The case is designed to keep the device operational even in demanding industrial environments.



## SYSTEM LAYOUT

The Innovatest Mobile Force Verification Kit integrates its electronics, connectors, user interface, and power system into a compact, rugged IP67-rated enclosure. This section provides an overview of the physical layout, component arrangement, and functional zones inside and outside the device.

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### Front Panel Layout

#### Touchscreen Display

A 10-inch resistive touchscreen centered on the front panel.

#### Power Button

Positioned directly above the touchscreen, centered horizontally.

#### Emergency Stop Button

Located on the right side of the front panel, separated from frequently used controls to prevent accidental activation.

#### Status LED Indicator

Placed immediately next to the emergency stop button on the right side. Provides visual feedback on power state, system activity, errors, and battery warnings.

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### Side and Rear Layout

#### USB-A Data Port

Located on the side panel of the electronics module, the USB-A port allows the export of calibration data and measurement logs to external storage devices.

#### USB-C Charging Port

Positioned near the USB-A port, the USB-C connector is the primary charging interface for the internal Li-ion battery. Its recessed placement protects against accidental impact.

### M12 5-Pin Load Cell Port

This connector is used to interface with Innovatest load cells. The port supports:

- Signal+
- Signal-
- Excitation supply
- Ground
- Identification resistor for automatic load-cell recognition

The threaded design ensures secure locking during testing.

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### Internal Layout

Inside the Pelican case, the system is divided into functional zones:

#### Electronics Module

A sealed aluminium-mounted module contains:

- Main PCB
- ADC and amplification stages
- Power regulation circuitry
- Internal memory
- Battery pack

This module maintains an IP67 rating, protecting the electronics against dust and moisture.

#### Battery Compartment

The Li-ion battery is mounted within the electronics enclosure and isolated thermally from the rest of the components. Safety circuitry regulates charging and protects the battery from overcurrent or overvoltage conditions.

#### Load Cell Storage Area

Precision-cut foam compartments store Innovatest-approved load cells securely during transport. Each load cell has a dedicated slot to prevent connector strain or mechanical stress.

#### Accessory Storage Zone

Additional compartments hold:

- USB cables
  - M12 adapters
  - USB sticks
  - Documentation
- These areas keep accessories organized and reduce clutter during field operations.
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## Pelican Case Layout

The device is housed in a Pelican 1500 IP67-rated case designed for industrial transport and field operations.

Its structural components include:

- Dual-latch locking mechanism
- Pressure-equalizing valve
- Rubber perimeter sealing gasket
- Shock-absorbing foam inserts
- Reinforced carry handle

The case protects the device from:

- Vibration
  - Impact
  - Water spray or immersion
  - Dust and airborne contaminants
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## Functional Zones Overview

The overall system layout is divided into:

### User Interaction Zone

Touchscreen, LED indicator, and primary buttons.

### Input/Output Zone

USB-A, USB-C, and M12 load cell connector.

### Processing Zone

Main PCB and signal conditioning circuitry.

### Power Zone

Battery pack and protective power management circuits.

## Storage Zone

Foam compartments for load cells and accessories.

This layout ensures easy operation, safe cable routing, and fast access during calibration or verification procedures.



## MOVING AND HANDLING THE KIT

The Innovatest Mobile Force Verification Kit has been designed for portability and safe transportation in demanding environments. To prevent physical injury and protect the internal electronics from damage, follow the guidelines below whenever moving, lifting, or transporting the unit.

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### Safe Lifting Practices

*(Subtitle — Arial 14 Bold)*

Use the Built-In Carry Handle

Always lift and carry the system using the integrated Pelican handle. This handle is ergonomically designed to provide a secure grip and minimize strain during transport.

#### **Do Not Lift by Cables or Connectors**

Never lift or pull the device using the USB cable, M12 load cell cable, or any attached accessories. Doing so may cause electrical damage, connector deformation, or cable failure.

#### **Keep the Unit Upright**

Transport the case in its upright orientation. Avoid carrying it sideways or upside-down, as internal components and stored load cells may shift and sustain mechanical stress.

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### **Handling While the Case Is Open**

#### **Do Not Attempt to Move the Unit with the Lid Open**

Moving the case while open may cause the lid to slam shut or internal components to shift unexpectedly. Always close and latch the lid before relocation.

#### **Secure Components Before Moving**

Ensure that all load cells, cables, and accessories are properly placed in their foam compartments before attempting to reposition the kit.

#### **Avoid Leaning on the Electronics Panel**

Do not use the touchscreen or internal frame as a gripping point while repositioning the case. These components are not designed to support lifting forces.

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### **Transport on Industrial Floors**

#### **Avoid Dragging the Case**

Dragging the device across factory floors may wear down the protective shell and compromise sealing. Always lift the case or use a transport cart for longer distances.

#### **Watch for Tripping Hazards**

Ensure that cables connected during calibration or measurement are not pulled or stretched when repositioning equipment around the case.

#### **Keep Away From Heavy Machinery Paths**

Avoid placing the kit in areas where forklifts, pallet jacks, or mobile equipment are used, to prevent accidental impact.

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## **Handling During Field Deployment**

### **Protect Against Vibration and Shock**

Although the Pelican case provides significant shock absorption, excessive vibration or sudden impacts should be avoided to protect internal electronics.

### **Avoid Exposure to Extreme Temperatures During Transport**

Do not leave the kit in direct sunlight, inside vehicles during hot weather, or in freezing conditions for extended periods. Temperature extremes may affect battery and sensor performance.

### **Keep the Case Closed in Dusty or Wet Environments**

Only open the Pelican case when necessary. Keeping it closed prevents dust, moisture, and airborne contaminants from entering the system.

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## **Short-Distance Handling**

For short repositioning movements (within the same room):

- Disconnect any cables.
  - Ensure the lid is fully closed.
  - Lift the case using both hands if necessary.
  - Place the case gently on the new surface to avoid shock impact.
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## **Long-Distance Transport**

### **Transport By Vehicle**

Secure the case using straps or place it on a flat, stable surface. Avoid stacking heavy objects on top of it.

### **Transport By Air**

Comply with airline regulations for lithium-ion batteries. In most cases, the device should be transported as carry-on luggage.

### **Shock Labels (Optional)**

For shipment or courier transport, shock indicator labels may be applied to monitor handling conditions.

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## **Inspection After Transport**

After moving the kit over long distances or through rough environments:

- Inspect the case for cracks or latch damage.
- Check the seals for dust or debris.
- Verify that load cells are still properly seated.
- Power on the device to ensure normal operation.

Any abnormalities should be reported to Innovatest support before further use.

## ASSEMBLING AND PREPARING

The Innovatest Mobile Force Verification Kit is designed for quick setup and reliable operation in both laboratory and industrial environments. This section provides detailed instructions for opening the case, preparing the workstation, connecting load cells, and ensuring the system is ready for use.

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### Opening the Case

Before operating the system, ensure the protective Pelican case is placed on a stable, flat surface.

Steps:

1. Release both front latches and gently lift the lid.
2. Fully open the case until it reaches its locked hinge position.
3. Visually inspect the internal compartments to confirm all components are correctly seated in the foam inserts.
4. Ensure no loose objects are resting on the touchscreen or electronics panel before proceeding.

Important Notes:

- Do not force the lid open beyond its hinge limit.
  - Avoid opening the case in environments with high dust, moisture, or airborne contaminants.
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### Workstation Preparation

Before connecting any equipment or powering the system, make sure the environment is suitable for accurate measurement.

Recommended Conditions:

- A clean, vibration-free surface
- Ambient temperature between 0°C and 60°C
- No nearby sources of electromagnetic interference (welders, high-power motors, induction heaters)

- Sufficient clearance to fully open the case and route cables safely

Avoid:

- Direct sunlight on the touchscreen
  - Oily or contaminated surfaces
  - Crowded workspaces where cables may be stepped on or pulled
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## Inspecting the Components

Before use, verify the condition of all essential components.

Inspect:

- Touchscreen surface (no cracks or deep scratches)
- USB-A port (free of dust and debris)
- USB-C charging port (no bent pins or corrosion)
- M12 5-pin load cell connector (threads clean and undamaged)
- Load cells (cable insulation intact, connectors clean)
- Foam inserts (no deformation affecting component seating)

If any item appears damaged, do not proceed. Contact Innovatest service personnel.

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## Connecting the Load Cell

The load cell must be connected before calibration or measurement.

Steps:

1. Align the M12 5-pin connector with the port on the electronics module.
2. Carefully push in and twist to secure using the threaded locking mechanism.
3. Ensure the connector is fully tightened by hand—do not use tools.
4. Verify that the cable is routed so it does not interfere with the hardness tester's moving components.

Warnings:

- Do not force the connector; misalignment can damage pins.
  - Do not connect or disconnect the load cell with wet hands.
  - Avoid sharp bends or crushing of the cable.
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## Preparing the Power System

Before powering the system, ensure sufficient battery life for the intended operation.

#### Check Battery Level:

- Press the power button briefly.
- The LED indicator will display approximate battery status.
- If the battery is low, connect a certified USB-C charger before starting any measurement workflow.

#### Charging Notes:

- Charge only within the temperature range 0°C–60°C.
  - Ensure the USB-C port is clean and dry.
  - Do not operate the system during rapid charging if the unit becomes warm.
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### Preparing the Touchscreen Interface

#### Before powering on:

- Remove dust using a microfiber cloth.
  - Ensure no foreign objects are touching the screen.
  - Check that gloves (if used) are clean and dry to ensure proper touchscreen responsiveness.
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### Initial System Power-On

#### Once all components are in place:

1. Press the power button for one second.
2. Wait for the boot sequence to complete.
3. The main menu will appear, displaying access to Calibration, Measurement, Data Logging, Settings, and Peak/Hold functions.

#### If the device fails to start:

- Check battery level.
  - Ensure all connectors are uninterrupted.
  - Inspect the emergency stop button (must be in the unactivated position).
- 

### Ensuring Measurement Readiness

#### Before beginning calibration:

#### Confirm:

- The load cell is securely attached.
- The cable is not twisted or tensioned.
- The hardness tester is properly aligned for applying force to the load cell.
- No vibration sources are present near the workstation.
- The touchscreen is responding correctly to inputs.

Only proceed to the calibration or measurement phase once all these conditions are met.



## OPERATING INSTRUCTIONS

The Innovatest Mobile Force Verification Kit is designed for intuitive operation in both laboratory and field environments. This section explains the essential functions of the user interface, navigation, measurement modes, and system interactions. Follow these instructions to ensure accurate measurements and reliable long-term performance.

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### Powering the Device On and Off

#### Powering On

1. Ensure the load cell is connected and properly seated.
2. Press the Power Button for one second.
3. The system will begin its startup sequence and load the main interface.
4. Once complete, the Main Menu will be displayed.

#### Powering Off

1. Ensure no measurement or calibration is in progress.
2. Press and hold the Power Button for two seconds.
3. Wait until the screen turns completely dark before closing the Pelican case.

If the system does not power on:

- The battery may be depleted—connect the USB-C charger.
  - Verify that the emergency stop button is not locked in the active position.
  - Inspect connectors for contamination or damage.
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### Understanding the Main Menu

After the boot sequence, the Main Menu displays the primary operational functions:

- Calibration
- Measurement
- Peak & Hold
- Data Log
- Settings

A permanent Back button is displayed in the upper-left corner, while the battery indicator is shown on the upper-right side.

## Navigation

- Use the touchscreen to select menu items.
  - Buttons are sized for glove operation.
  - Navigation follows a consistent top-level hierarchy to avoid confusion.
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## Live Measurement Mode

The Measurement screen displays real-time force readings from the connected load cell.

### Displayed Information:

- Current force value
- Unit (N, kN, kgf, gf)
- Live force-versus-time graph
- Load cell identification
- Status messages

### Measurement Controls:

- Start / Stop Measurement
- Zero / Tare
- Peak & Hold (shortcut)
- Return to Main Menu

### Best Practices:

- Ensure the load cell is free from pre-loads or side forces before starting.
  - Keep cables untensioned for accurate readings.
  - Avoid touching the load cell during measurement.
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## Using the Peak & Hold Function

Peak & Hold mode captures the highest recorded force applied during the test.

### How It Works:

1. Select Peak & Hold from the Main Menu (or use the shortcut on the measurement screen).
2. Apply force using the hardness tester.

3. The system captures and holds the maximum measured force.
4. The value remains displayed until the user resets the function.

When to Use:

- Hardness tester verification
  - Mechanical testing
  - Dynamic or impact force monitoring
  - Situations where instantaneous peaks must be recorded
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## Zero and Tare Functions

These functions ensure that measurement starts from a valid baseline.

### Zero

- Removes small offsets from the sensor signal.
- Use Zero when no force is applied to the load cell.

### Tare

- Used when a known pre-load or fixture weight is present.
- Establishes a new reference point while compensating for external forces.

### Warnings:

- Do not press Zero/Tare while the load cell is under significant load.
  - Always verify stability before applying Zero/Tare functions.
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## System Notifications and Status Messages

The device may display the following messages during operation:

- “Load Cell Detected”
- “No Load Cell Connected”
- “Cable Error”
- “Overload”
- “Low Battery”
- “Storage Full”
- “Export Successful”

Always follow the on-screen instructions when a notification appears.

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## Using the Settings Menu

The Settings section allows the user to adjust preferences and system parameters:

### Available Options:

- Measurement units
- Display brightness
- Graph display modes
- Power-saving settings
- System information
- Calibration history
- Factory reset (password protected)

Only authorized personnel should modify advanced system settings.

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## Emergency Stop Function

The emergency button immediately halts measurement, calibration, or data logging.

### When to Use:

- Unexpected force spikes
- Loose fixtures or unstable load conditions
- Hardware malfunction
- Unsafe operator conditions

### After activation:

- The system will freeze all operations.
  - Restore the button to its normal position before continuing.
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## Low Battery Operation

If the battery reaches a critical level:

- A warning will appear on the display.
- Measurement functions may be disabled.
- Calibration should not be performed until the device is recharged.

To preserve battery:

- Lower the screen brightness
  - Close unused menus
  - Disconnect the charger once fully charged
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## Shutting Down After Use

Before closing the case:

1. Stop all measurements.
2. Turn off the device.
3. Disconnect the load cell if transporting.
4. Coil cables loosely.
5. Inspect the interior for loose items.
6. Close and latch the Pelican case securely.

Following these steps ensures safe long-term operation and maintains environmental sealing.

## CALIBRATION PROCEDURE

Calibration ensures that the load cell readings are accurate and traceable. The Innovatest Mobile Force Verification Kit supports multi-point calibration procedures designed for hardness tester verification. Follow the steps below before performing any critical measurements.

---

### Before You Begin

Ensure the following conditions are met:

- The load cell is properly connected and identified by the system
- The device is on a stable, level surface
- No external forces are applied to the load cell
- The battery is sufficiently charged

These steps prevent calibration drift and ensure repeatability.

---

### Starting the Calibration Process

1. Power on the device.
2. From the Main Menu, select Calibration.
3. Confirm the detected load cell model and serial number.
4. Choose the number of calibration points (typically 1–5).

The system will prepare the calibration screen, displaying the target force and stability indicators.

---

### Applying Calibration Forces

At each step:

1. Apply force gradually using the hardness tester or reference system.
2. Hold the force steady when the screen indicates “Apply Load.”
3. The LED or on-screen graphic will confirm when stability is achieved.
4. The system automatically records the force at that point.

Important Notes:

- Do not exceed the rated capacity of the load cell.
- Avoid sudden impact forces when collecting calibration points.

- Ensure no cable movement or vibration during measurement.
- 

## Completing All Calibration Points

The system will guide you through each point:

- Move to the next target force when prompted
- Follow the same procedure for stability and acquisition
- If an error or excessive deviation occurs, repeat the step

Once all points are collected, the system calculates the calibration line.

---

## Saving Calibration Data

After the final point:

1. The device displays a summary including linearity and offset.
2. Review the calibration curve for abnormalities.
3. Press Save to store results in system memory.
4. A recommended default filename (timestamp-based) is provided.

Calibration files can later be exported via USB.

---

## Recalibration Recommendations

Perform calibration:

- Whenever the load cell may have been overloaded
- After transportation or shock exposure
- At regular intervals based on organizational quality procedures

Recalibration ensures reliable verification results and maintains traceability.

---

## Short Error Handling

These common issues may occur:

- “Unstable Load” → Reduce vibration, apply force steadily
- “Load Too Low/High” → Adjust applied force closer to target
- “Measurement Noise” → Check cable routing and connector tightness

Most errors resolve by repeating the point under stable conditions.

## DATA LOGGING AND EXPORT

The Innovatest Mobile Force Verification Kit stores measurement and calibration data internally and provides options for reviewing, managing, and exporting records. This section explains how to log new data, access stored files, and transfer information to external devices.

---

### Data Logging Overview

The system can record both continuous force measurements and calibration results. Logged data includes:

- Time-stamped force curves
- Peak values
- Calibration points
- Load cell identification
- Operator notes (if entered)

Logging ensures traceability and supports quality-control procedures.

---

### Starting a New Data Log

1. From the Main Menu, select Data Log.
2. Press Start Logging to begin recording.
3. Apply force or perform the required test.
4. Press Stop Logging when finished.

#### Notes:

- Data is saved automatically after stopping.
- Ensure adequate battery life before long logging sessions.
- Avoid cable movement to maintain clean signal data.

---

### Viewing Logged Data

Stored logs can be accessed from the internal memory.

1. Navigate to Data Log → View Records.
2. Select an entry from the list (sorted by date/time).

3. The system will display:
  - Graph of force vs. time
  - Key measurement statistics
  - Metadata (load cell type, date, etc.)

Short Tip:

Use this review function before exporting to ensure the test captured the desired information.

---

### Deleting Data Logs

To free memory:

1. Select the record you want to delete.
2. Press Delete → confirm when prompted.

Warning:

Deleted files cannot be recovered.

---

### Exporting Data via USB

The system supports exporting stored logs to a USB-stick in a portable data format (typically CSV, TXT, or proprietary structure).

Steps:

1. Insert a USB-stick into the USB-A port.
2. Go to Data Log → Export Data.
3. Choose:
  - Export selected file
  - Export all files
4. Wait for the “Export Successful” message.
5. Use USB Eject before removing the USB-stick.

Important Notes:

- Do not remove the USB device during export.
  - If export fails, check the USB-stick format or free space.
  - Large files may take longer to transfer.
-

## File Naming and Structure

Exported files include:

- Timestamp-based filenames
- Load cell identification tags
- Calibration or measurement labels

This simplifies long-term organization of verification records.

---

## Troubleshooting During Export (Short)

- USB Not Detected: Check the port and try another USB-stick.
- Export Interrupted: Repeat the export and avoid touching cables.
- Corrupted Files: Ensure proper eject procedure and retry.

## TROUBLESHOOTING

This section provides guidance for diagnosing and resolving common issues that may occur during operation of the Innovatest Mobile Force Verification Kit. Most problems can be corrected through simple checks of connectors, cables, or basic system settings. For persistent issues, contact Innovatest support.

---

### Load Cell Detection Issues

#### Load Cell Not Detected

Possible causes:

- M12 connector not fully tightened
- Pins contaminated or misaligned
- Load cell cable damaged

Solutions:

1. Disconnect and reconnect the M12 connector.
  2. Inspect pins for dirt or debris; clean gently if necessary.
  3. Verify that the load cell model is supported.
  4. Try a different load cell cable if available.
- 

### Incorrect or Unstable Load Cell Identification

- Ensure the cable is not under tension.
  - Avoid bending the cable sharply near the connector.
  - Confirm that no electromagnetic noise sources (welders, motors) are nearby.
- 

### Measurement Problems

#### Unstable Readings

Common causes:

- Cable motion
- Vibration on the workstation
- Electromagnetic interference
- Loose connector

Fixes:

- Stabilize the environment.

- Keep cables still and properly routed.
  - Tighten the M12 connector.
- 

#### Force Values Too Low or Too High

- Zero or Tare may have been used incorrectly
- Applied force not centered on the load cell
- Load cell capacity mismatch

Fix:

- Re-zero with no external loads
  - Ensure proper alignment with the hardness tester
- 

#### No Force Displayed

- Load cell disconnected
- Internal protection activated
- System requires restart

Fix:

- Reconnect the load cell
  - Restart the device
  - Inspect the load cell cable
- 

#### Calibration Issues

##### Calibration Step Fails

Occurs when force is unstable or outside expected limits.

Fix:

- Apply force more gradually
  - Hold force steady until system confirms stability
  - Ensure no vibration or cable strain
- 

##### Calibration Curve Looks Incorrect

- Load cell may not be aligned properly

- Incorrect calibration weights or forces used
- Noise in environment

Fix:

- Repeat calibration in a stable environment
  - Verify load application method
- 

## USB and Data Export Problems

### USB-Stick Not Recognized

- USB format unsupported
- Dust in port
- Faulty drive

Fix:

- Use a FAT32-formatted USB-stick
  - Clean USB-A port with dry air
  - Try another USB device
- 

### Export Fails Mid-Transfer

- USB removed too soon
- Storage full
- Large file size

Fix:

- Retry and wait until “Export Successful”
  - Perform USB Eject before removal
- 

## Display or Interface Issues

### Touchscreen Not Responding

- Gloves too thick
- Moisture or dirt on screen
- Software freeze

Fix:

- Clean the screen
  - Press the Emergency Stop and restart the device
- 

### Screen Too Dim

- Display brightness setting too low
- Strong overhead reflections

Fix:

- Increase brightness in settings
  - Tilt the case or adjust lighting
- 

### Power and Battery Issues

#### Device Does Not Turn On

- Battery fully depleted
- Emergency stop engaged

Fix:

- Charge the device for at least 10 minutes
  - Release emergency stop and retry
- 

#### Rapid Battery Drain

- Heavy measurement usage
- Extreme temperature
- Battery aging

Fix:

- Reduce screen brightness
  - Avoid cold environments
  - Contact service for battery evaluation
- 

### Internal Error Messages (Short Explanation)

- “Overload” → Applied force exceeds load cell capacity
- “No Cell Connected” → M12 cable disconnected

- “Storage Full” → Delete or export data
  - “Sensor Error” → Cable or connector issue
  - “Low Battery” → Recharge immediately
- 

### When to Contact Innovatest Support

Contact authorized service if:

- The load cell fails repeatedly
- The electronics module becomes unusually hot
- Battery performance drops severely
- Internal error messages appear consistently
- The device has been dropped or impacted

Do not attempt repairs yourself, as this voids IP67 protection and warranty.

## TECHNICAL SPECIFICATIONS

The following technical specifications describe the mechanical, electrical, environmental, and performance characteristics of the Innovatest Mobile Force Verification Kit. All values are based on standard operating conditions and may vary slightly depending on load cell model, environment, and usage.

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### Mechanical Specifications

#### Housing and Construction

- Enclosure Type: Pelican 1500
- Rating: IP67 water and dust protected
- Material: High-impact polypropylene case with stainless steel hardware
- Internal Frame: Reinforced aluminium support structure
- Internal Protection: Precision-cut foam inserts for load cells and accessories

#### Dimensions & Weight

- Total Weight: Approx. 5–6 kg (varies based on load cells included)
  - Case Dimensions (L × W × H): Approx. 472 × 362 × 190 mm
  - Electronics Module: Compact sealed assembly mounted inside case
- 

### Display Specifications

#### Touchscreen

- Size: 10-inch diagonal
  - Type: Industrial-grade resistive touchscreen
  - Input Support: Gloves, stylus, bare hand
  - Brightness: Adjustable
  - Operating Feedback: Single-touch command interface
- 

### Electrical Specifications

#### Power System

- Battery Type: Lithium-ion rechargeable pack
- Capacity: Approx. 5000 mAh
- Typical Runtime: 8–10 hours (depending on measurement activity and screen brightness)

- Charging Method: USB-C
- Charging Time: 1–2 hours (with certified charger)
- Protection Circuits: Overcurrent, overvoltage, temperature, short-circuit

## Input/Output Ports

- USB-A: Data export (USB-sticks)
- USB-C: Charging only
- M12 5-Pin Connector (Load cell interface):
  - Excitation Voltage: 5 V or 10 V selectable
  - Signal Input: Differential analog input
  - Identification Pin: Voltage-divider system for load cell recognition

## Electronics

- ADC: 24-bit Delta-Sigma high-resolution ADC
  - Amplifier: Precision instrumentation amplifier
  - Filters: Passive low-pass for noise reduction
  - Memory: Internal non-volatile storage for calibration and measurement logs
  - Processor: Embedded microcontroller (industrial grade)
- 

## Load Cell Compatibility

### Supported Load Cells

- Designed for Innovatest force verification load cells
- Minimum Supported Models: 6 distinct load cell types
- Identification Method: Automatic ID via resistor coding
- Connection: Threaded M12 locking connector

### Measurement Range

- Typical Supported Range: 10 gf to 3000 kgf
  - Overload Protection: Limited by load cell hardware
  - Linearity: Based on load cell characteristics
- 

## Measurement Performance

### Resolution & Accuracy

- Resolution: Dependent on load cell sensitivity (commonly 4 mV/V)
- Measurement Accuracy: Determined by sensor calibration and ADC characteristics
- Data Refresh Rate: Real-time display on measurement screen

## Signal Quality

- Differential input design for noise immunity
  - Shielded cable compatibility
  - Automatic detection of unstable force conditions
- 

## Environmental Specifications

### Operating Conditions

- Temperature: 0°C to 60°C
- Humidity: 10%–90% (non-condensing)
- Vibration: Device should be used on stable surfaces

### Storage Conditions

- Temperature: –20°C to 60°C
  - Humidity: 10%–90% (non-condensing)
  - Long-term battery storage recommended at 40–60% charge
- 

## Software Features

### User Interface

- Icon-based navigation
- Multi-language support (if enabled)
- High-contrast layout for industrial visibility

### Functional Features

- Multi-point calibration
- Live measurement graph
- Peak & Hold mode
- Data logging
- USB export
- Load cell auto-recognition

- Internal file management
- 

## Compliance and Safety

### Certifications

(General template, modify based on final university or project requirements)

- Designed according to common industrial safety guidelines
- RoHS-compliant components (where applicable)
- Internal electrical protections for battery safety

## WARRANTY AND SUPPORT

The Innovatest Mobile Force Verification Kit is engineered to provide reliable performance during force-verification and calibration tasks. This section outlines the warranty terms, service conditions, and recommended procedures for obtaining technical assistance.

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### Warranty Coverage

The device and its components are covered under standard Innovatest warranty policies. Warranty coverage applies to:

- Manufacturing defects in materials or workmanship
- Electronic component failures not caused by misuse
- Battery defects within the specified aging and cycle limits
- Functional issues arising during normal, intended operation

### Warranty Validity Conditions

The warranty remains valid under the following conditions:

- The device has been used only as intended for force verification
- No unauthorized modifications or repairs have been attempted
- The electronics module has not been opened or tampered with
- The device has not been subjected to impact, liquid intrusion, or extreme environmental abuse
- All components (load cells, cables, accessories) have been handled properly

### Exclusions

Warranty does not cover:

- Damage resulting from misuse, improper operation, or negligence
  - Mechanical damage caused by drops, crushing, or improper transport
  - Battery degradation due to age or prolonged deep discharge
  - Damage caused by using non-approved load cells or accessories
  - Corrosion or contamination from chemical exposure
  - Failures caused by incorrect calibration practices
- 

## Service and Repair Process

If the device requires inspection or repair:

1. Contact Innovatest technical support using the information provided below.
2. Provide the device model, load cell type (if applicable), and serial number.
3. Describe the issue in detail, including when it occurs and any error messages displayed.
4. If requested, ship the device in its original Pelican case to prevent damage during transport.

Important Note:

Do not attempt to open or repair the internal electronics module yourself.  
Unauthorized access voids the warranty and may compromise IP67 protection.

---

## Technical Support Assistance

Innovatest offers support for:

- System setup and configuration
- Load cell compatibility questions
- Calibration procedure guidance
- Data export issues
- Troubleshooting unexpected readings
- Battery or charging concerns

Support personnel can assist via email, telephone, or remote consultation, depending on availability.

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## Required Information for Support Requests

To speed up service processing, prepare the following information:

- Device model and serial number
- Load cell type and serial number
- Firmware or software version
- Description of the issue
- Steps already taken to resolve the problem
- Recent calibration or usage history

Including photos or screenshots of error messages accelerates diagnosis.

---

## Replacement Parts and Accessories

Replacement accessories such as:

- Load cell cables
- USB charging cables
- USB-A export drives
- Foam inserts or protective components
- Pelican case hardware

may be obtained through authorized Innovatest distributors.

Contact service before ordering replacement load cells to ensure compatibility.

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## Returning the Device for Service

If the unit must be shipped:

1. Place the system securely in its foam inserts within the Pelican case.
2. Lock the case and use additional packaging if required by the carrier.
3. Do not ship the device with loose load cells inside the case.
4. Include proof of purchase and a detailed issue report.

Innovatest is not responsible for damage during shipment caused by inadequate packaging.

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## Out-of-Warranty Service

For devices no longer under warranty:

- Paid service and repair options are available

- Replacement batteries may be offered depending on model
- Load cells can often be recalibrated or replaced

The support team will provide a cost estimate before service begins.

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## End of Life and Disposal

When the device reaches end-of-life:

- Dispose of lithium-ion batteries according to local environmental regulations
- Do not incinerate or dispose of the device in general waste
- Contact Innovatest for responsible disposal guidance

## COMPLIANCE AND CERTIFICATIONS

The Innovatest Mobile Force Verification Kit is designed and manufactured according to commonly accepted industry standards for electrical safety, environmental performance, and electromagnetic compatibility. Although certification status may vary based on prototype or production level, the device follows established guidelines to ensure safe and reliable operation.

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### General Safety Compliance

The device is designed in accordance with internationally recognized principles for safe operation of electronic measurement equipment. These design principles include:

- Electrical insulation and grounding practices
- Overcurrent and overvoltage protection for the battery
- Proper separation of high- and low-voltage sections
- Safe mechanical design to prevent user contact with hazardous components
- Use of non-flammable enclosure materials

### Disclaimer

Formal certification (e.g., CE, UL, CSA) may depend on the final production stage and configuration of the device.

Users should follow all safety precautions and operational guidelines provided in this manual.

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### Electromagnetic Compatibility (EMC)

The system is designed to minimize conducted and radiated emissions and to resist interference from external electromagnetic sources.

The device follows the principles of:

- EN 61000 family of EMC standards (general reference)
- Shielded cable design to reduce noise
- Differential measurement inputs for improved immunity
- Passive filtering components on the PCB

User Notes:

- Avoid operating the device near strong electromagnetic sources such as welding equipment, high-frequency motors, or induction heaters.
  - If abnormal measurement noise occurs, inspect cable routing and reduce EMI exposure.
- 

## Environmental Compliance

Where applicable, components used in the system follow environmentally responsible guidelines, including:

- Reduction of hazardous substances in electronics (RoHS-style compliance)
- Use of recyclable materials in the protective case
- Environmentally considerate disposal recommendations

## Disposal Requirements

- Do not dispose of electronic components with general waste.
  - Follow local regulations for electronic waste (WEEE-style guidance).
  - Batteries must be recycled or returned to an appropriate collection facility.
- 

## Battery Safety Compliance

The lithium-ion battery pack includes:

- Overcurrent protection
- Overvoltage protection
- Temperature monitoring
- Short-circuit protection

These safety features follow widely adopted international battery safety practices.

## Important Notice

Do not attempt to open, modify, or replace the battery.  
Incorrect handling may cause fire, chemical leakage, or explosion.

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### Load Cell and Signal Interface Compliance

The load cell interface is designed according to common industrial measurement signal standards:

- 5 V / 10 V excitation supply
- Differential analog sensing
- Noise reduction through shielding and filtering
- Use of industry-standard M12 connectors

These practices ensure compatibility with standard force measurement devices.

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### Prototype and Development Compliance Statement

For university, prototype, or research versions of the device:

- The system is intended for controlled environments
- It should be operated only by trained personnel
- It is not intended for medical or life-support applications
- It must not be used in safety-critical production environments without additional certification