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PiCUS TreeQinetic

Device and Software Manual

This Manual applies to PiCUS TreeQinetic and the associated software application.

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1. Abbreviations and Agreements

PTQ	PiCUS TreeQinetic = Name of the whole system
IML TreeQinetic	Measurement software available for Windows, Android and iOS
Module/ Measurement device/ Sensor	Part of the PTQ system, it can refer to elastometers, inclinometers, forcemeters, or anemometers
PTQ Com unit/Central unit	Communication unit, the central control unit of the PTQ system, controls the measurement process, connects the modules to a PC or mobile device (data transfer), and serves as a charger for the modules

Inputs and displays in an app on the mobile phone, in software on the PC, or markings on the outside of a device are presented in **bold and in Courier font** in this manual.

This manual is valid for both the **PC Software** and the **Mobile App**. In principle, these software versions are identical, but there may be significant differences in handling due to the hardware typically available and the characteristics of the respective operating system. Where there are significant differences between the two software versions or when referring to only one of the program versions, this is highlighted in colour. When only "software" is mentioned, both variants are meant.

Cross-references to other chapters of this manual or references to external sources are written in italics and underlined.

Important notes on potential errors and sources of danger are highlighted in **bold and italic text**.

General notes are written in *plain italic text*.

Many of the icons and symbols used in IML TreeQinetic and in this manual come from the freely available section of the Font Awesome Library. The relevant licences can be viewed here: <https://fontawesome.com/license/free>.

The English translation of this manual (from its German original) has been assisted with AI tools, namely <https://www.deepl.com/en/translator>.

2. General Information

2.1 Intended Use

PiCUS tree measurement technology provides arborists with comprehensive diagnostic tools for the detection and assessment of defects in trees. The tree static pull test is currently the only method that allows conclusions to be drawn about both uprooting stability and breaking safety. PiCUS TreeQinetic measuring devices are optimized for conducting such pull tests and provide the necessary data foundation for safety calculations.

When using the system, it is important to adhere to the environmental conditions specified in the General Operating Instructions and Technical Information. Otherwise, the error-free operation of the system cannot be guaranteed.

The PiCUS product family represents measuring devices that not only provide precise results but are also designed to accompany users in the field for a long time with reliability. They are built to be correspondingly robust. However, they are highly sensitive electronic measuring instruments. Careful handling that takes this into account reduces failures and maintenance efforts, significantly increasing their lifespan and reliability.

2.2 Intended application

The PiCUS TreeQinetic System is intended for use as measurement technology in tree static pull tests. In a pull test, the tree under examination is subjected to a controlled load using a measured force, while the reaction of the trunk and roots to this load is recorded. The tree's response to the known load is compared to the expected wind load during a storm, and this ratio expresses its stability or break safety. The TreeQinetic system provides the user with the data needed to make calculations regarding tree statics.

The Forcemeter is used to record the force introduced into the tree and should be installed between the tree and the entire pulling apparatus. It is designed for loads of up to 60 kN (approximately 6 tons). The Forcemeter should only be attached using the shackles provided with it or those approved by the manufacturer.

The Elastometers measure the change in length between the two measurement points. They are attached to the provided needles, which are driven into the measuring body with the gauge. Elastometers are designed to measure elastic deformations or compressions in the range of up to several hundred micrometers.

Inclinometers detect the inclination of the tree part to which they are attached. First, the Inclino bracket is attached, and then the measuring device is mounted and aligned on it.

The radio central unit is intended to allow the reception and recording of measurement data at a safe distance from the tree in case of unforeseen failures.

The overload indicator assists the responsible person in terminating the non-destructive pull test in a timely manner.

In general, all components of the PiCUS TreeQinetic system communicate wirelessly. Should individual or all connections be disrupted or interrupted, replacement cables are included.

All PiCUS TreeQinetic sensor components are designed to measure fine movements and should never be subjected to impacts or falls. Only mount measuring devices when the respective holders are securely in place. Install the measuring equipment after the rope is in place and disassemble the measurement technology first to avoid contamination and damage during other work.

2.3 Disclaimer

The use of the PTQ on objects other than trees is not intended and may result in damage to the measuring devices or the object being measured.

The measurement results always require interpretation by qualified professionals.

Conclusions about the tree's condition derived from the measurement data and analyses generated with the PTQ are the sole responsibility of the person making those conclusions. Neither the manufacturer nor the seller can be held liable for the consequences arising from the use of the PTQ.

Damage to the equipment resulting from improper handling is not covered by the warranty. It is strongly recommended to handle all PTQ components with due care to keep them operational for an extended period.

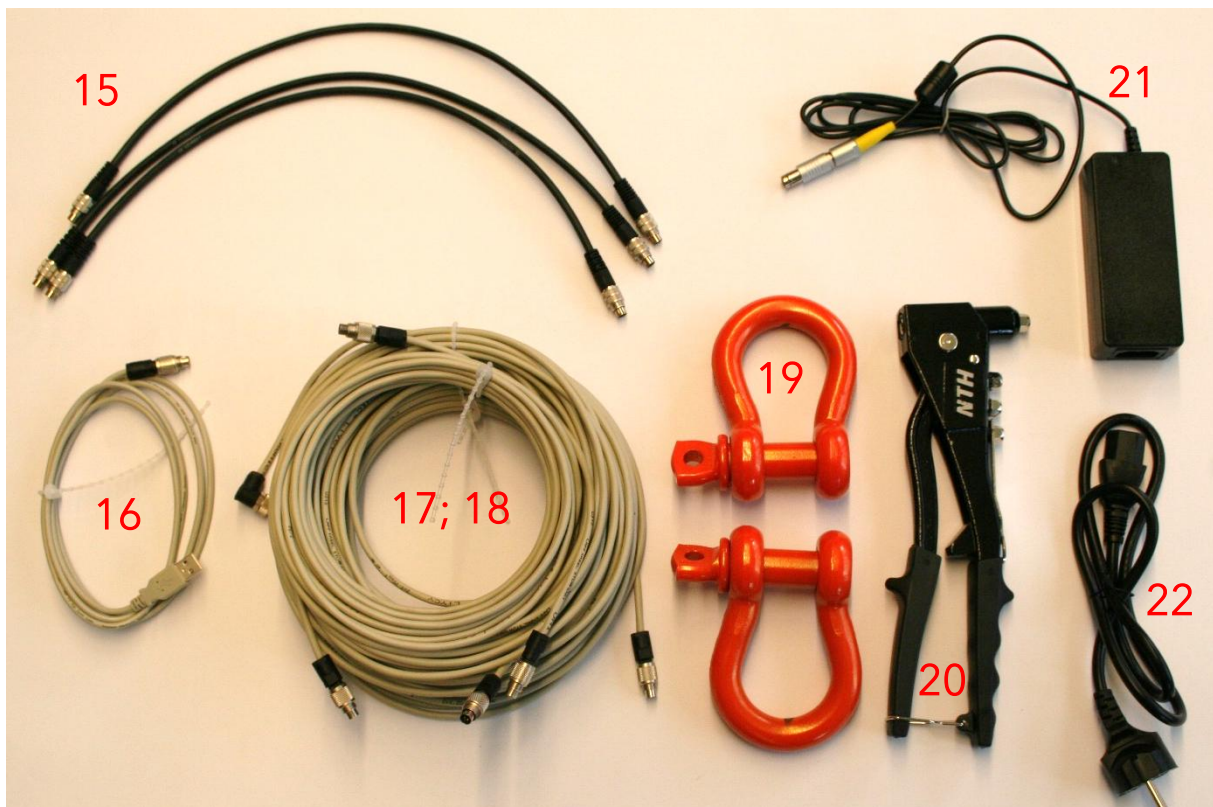
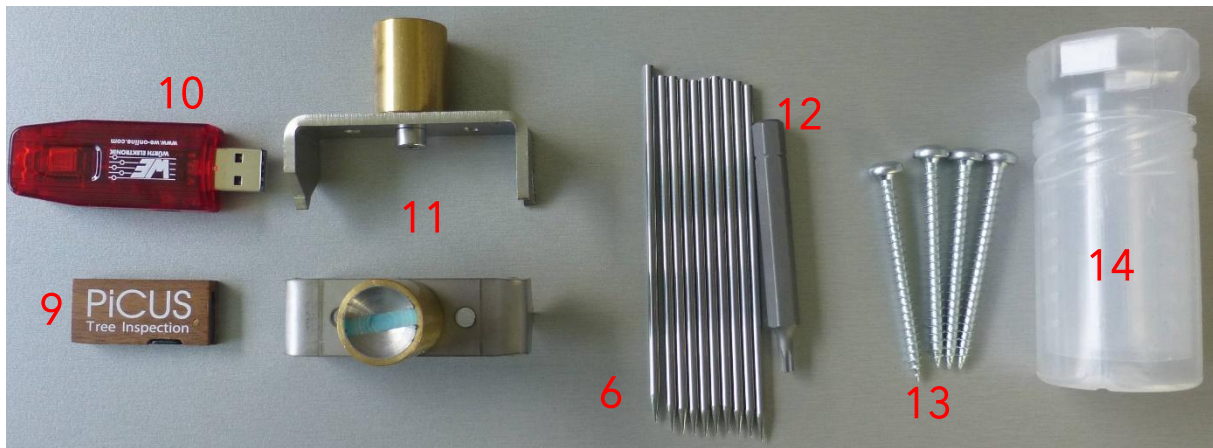
All technical specifications are subject to change without notice.

2.4 Packing list (Starter)



Nbr.	Description	Count
1	Transport case	1
2	Com Unit	1
3	Forcemeter	1
4	Inclinometer	1
5	Elastometer	1
6	Elastometer needles	10
7	Gauge for Elastometer needles	1
8	Overload indicator	1

Table 1: Packing list PTQ Starter Part I



Nbr.	Description	Count
9	Measurement software and digital manual (USB stick)	1
10	Bluetooth 5 - USB-Dongle	1
11	Magnetic holder (inside the lid behind the foam mat)	2
12	Hex bit for Torx screws (T20x70)	1
13	Attachment screws for magnetic holder (with Torx drive)	4
14	Clear plastic box, screwable (for screws, bits, and needles)	1
15	PTQ charge cable	3
16	PTQ USB cable	1
17	Data cable 5 m (not usable for charging)	2
18	Data cable 30 m (Forcemeter, not usable for charging)	1
19	Shackles (Forcemeter)	2
20	Pliers for Elastometer needles (blind rivet pliers)	1
21	Charging adapter	1
22	IEC power cable	1

Table 2: Packing list PTQ Starter Part II

3. Measurement devices

3.1 Description of system components

This chapter provides an overview of the components, structure, and functions of the PiCUS TreeQinetic.

3.1.1 Com Unit

3.1.1.1 Device description

The PTQ Com Unit is the heart of the system. It sends command signals to the sensor modules, receives measurement data from them, and transmits it to the computer or mobile device. Furthermore, the Com Unit also serves as a charging distributor for the starter system.

NOTE:

There are different generations of Com Units. Only the version manufactured from mid-2020 onwards (recognizable by serial numbers ending in -BT5) is capable of communicating with mobile devices! To ensure communication with older computers, USB adapters for BT5 are included with those devices.



Nbr.	Description	Function
1	Charging channel / Data input	During charging, a sensor module can be connected with the charging cable (45 cm). If a cable connection is required during the measurement, a sensor module can be connected using a data cable.
2	DC-IN charge input	Connector for charging adapter
3	USB-connector	Connection for USB cable to the PC
4	ESC or ON/OFF button	Menu control or turning on/off the Com Unit
5	Arrow buttons	Menu control
6	OK button	Menu control
7	Display	Displays the status of the connected sensor modules
8	Radio antenna	Connection to the modules
9	Bluetooth antenna	Wireless connection to the PC

Tabelle 3: PTQ Com Unit: control- and display elements

3.1.1.2 Operation

The PTQ Com Unit is turned on or off by briefly pressing and holding the **ON/OFF** button. The display shows device information and the serial number after startup. After the device search is completed, the connected modules are listed in the display, sorted by device type.

The individual measuring devices (Elastometer, Inclinator, Forcemeter, Anemometer) can be connected to the PTQ Com Unit via a wireless connection or a cable connection. Multiple modules with mixed connections can be used simultaneously.

Connect via radio:

- Turn off module
- Remove cable
- Turn on module

If measuring devices are turned on without a connected cable, they will start immediately in wireless mode.

Connect via cable:

- Turn off module
- Connect cable between module and PC
- Turn on module

The TreeQinetic system can be connected to a PC via Bluetooth or USB through the Com Unit.

Operation via USB

- Turn off Com Unit
- Use USB-cable to connect Com Unit with a USB-port of your PC
- Turn on Com Unit

Launch the measurement software after establishing the connection with the PC.

Operation via Bluetooth:

- Turn off Com Unit
- Remove USB-cable from the Com Unit
- Turn on Com Unit

If the Com Unit is turned on without a connected USB cable, it will start immediately in Bluetooth mode.

3.1.1.3 Wireless range

The range achievable with the Bluetooth connection from the Com Unit to the PC or mobile device is highly dependent on the Bluetooth module used in the respective device. The PTQ Com Unit and the included Bluetooth 5 USB dongle are both Long Range capable, which means that ranges of up to 50 meters can be achieved depending on environmental conditions. If a device is used that is only Short Range capable, the maximum achievable wireless range is 10 meters (strongly dependent on environmental conditions).

The wireless mode is displayed in the screen and the app (see *Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.*). When available, Long Range is automatically selected.



BT5 - Long Range



BT5 - Short Range



BT4.2 - Short Range

3.1.2 Forcemeter

3.1.2.1 Device description

The PTQ Forcemeter is installed in the rope assembly and measures the pulling force applied to the tree.



Nbr.	Description	Function
1	Attachment eyes	Connection point for shackles. Intended for use exclusively with the recommended steel shackles!
2	Display	Menu display
3	ON/OFF button	Turning on / Turning off
4	OK button	Menu control
5	Cable connector	Connection for charging cable or data cable
6	Relief screw	Strain relief for Forcemeter cable (cable channel)

Table 4 - Forcemeter: Control and display elements

3.1.2.2 Operation

The Forcemeter is turned on or off by briefly holding the **ON/OFF** button. The display shows the current measurements for force and rope angle, as well as the battery voltage and the module address.

By pressing the **OK** button once, the Forcemeter enters the offset mode ('zeroing'). A further press of the **OK** button initiates a five-second calibration cycle of the offset value. In most applications, it is recommended to determine the offset value for all modules simultaneously by a command from the Com Unit. This should ideally be done immediately before the actual measurement, and the software can perform this automatically. There should be no load on the Forcemeter when setting the offset value ('zeroing').

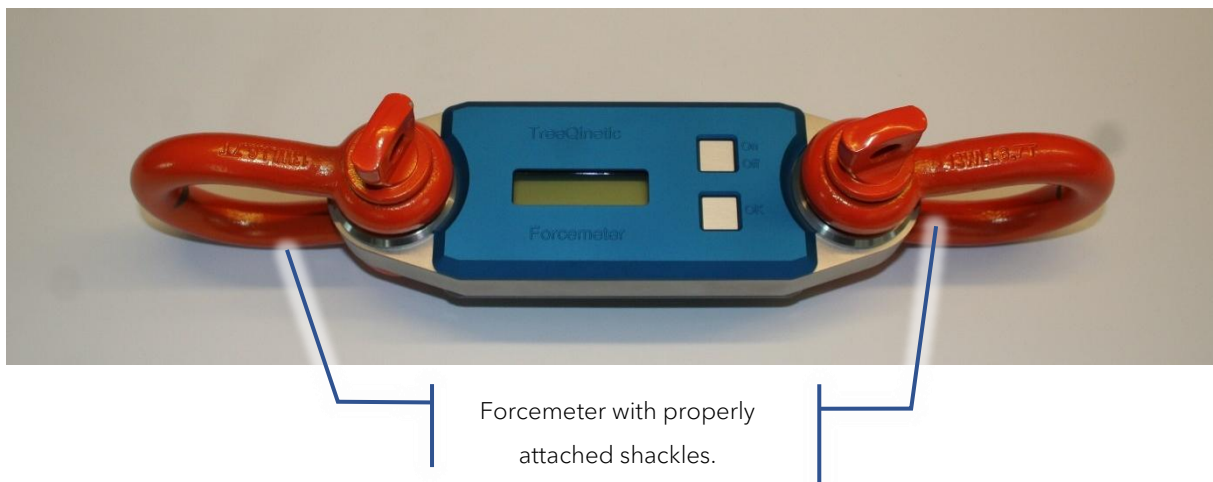
If the **OK** button is held for 3 seconds, the Forcemeter enters the address menu. Here, the module address can be set by pressing the **OK** button. To save the set address, the **OK** button must be held for three seconds.

3.1.2.3 Installation

To attach the Forcemeter, one of the provided steel shackles is attached to each side. The threaded pin goes into the hole in the Forcemeter housing. The attached spacer rings center the Forcemeter; they are not designed to bear loads. The shackles are used to connect the pulling rope on one side and the tree on the other side to the measuring device.

CAUTION!

The Forcemeter is exclusively designed for use with the provided steel shackles! All other attachment tools such as carabiners, ropes, eyelets, hooks, so-called soft shackles, etc., can lead to incorrect measurement results and damage the shackle attachment, especially the fastening of the round spacer rings!



3.1.3 Inclinator

3.1.3.1 Device description

PTQ Inclinatorometers measure the inclination of the tree part to which they are attached, typically at the base of the trunk. The measurement data from an Inclinatorometer can be used to perform calculations related to the tree's uprooting stability.

CAUTION!

Inclinatorometers exhibit a temperature drift, meaning that the displayed value changes with the temperature of the sensor.

It is recommended to allow the Inclinatorometers to acclimate to the local temperature before the measurement. 'Zeroing' should be done immediately before each pull. Protecting the inclinatorometers from direct sunlight during the measurement can help eliminate drift effects.



Nbr.	Description	Function
1	Display	Menu display
2	Direction indicator	Indicates the direction of inclination
3	ON/OFF button	Turning on / Turning off
4	OK button	Menu control
5	Status-LED	Blinks during the measurement
6	Ball magnet	Attachment and alignment on the magnetic holder
7	Cable connector	Connection for charging cable or data cable
8	Antenna	Wireless connection

Tabelle 5 - Inclinometer: Control and display elements

3.1.3.2 Operation

The Inclinometer is turned on or off by briefly holding the **ON/OFF** button. The display shows the current measurement value, as well as the battery voltage and the module address. After turning it on, the firmware version, module address, and the individual serial number of the respective measuring device are temporarily displayed.

Pressing the **OK** button once activates the direction indicator for aligning the Inclinometer. **Adjust** is displayed on the screen. The inclinometer must now be horizontally aligned so that the direction indicator blinks continuously in green at a fast rate. If any of the LEDs on the direction indicator are red, the device is tilted too much in that direction.

Another press of the **OK** button initiates a five-second calibration cycle ('zeroing') of the offset value. In most applications, it is recommended to determine the offset value for all modules simultaneously by a command from the central control unit. This should ideally be done immediately before the actual measurement, and the software can perform this automatically.

If the **OK** button is held for 3 seconds, the inclinometer enters the address menu. Here, the module address can be set by pressing the **OK** button. To save the set address, the **OK** button must be held for three seconds.

3.1.3.3 Installation

Inclinometers are connected with the ball on the back to a magnetic holder. The continuously adjustable guidance of the ball allows the inclinometer to be precisely aligned before the measurement. This means that the front side with the display is level, and the measurement values in the X and Y directions show zero with small decimal values.

The attachment of the holder must be completed before connecting the sensitive measuring device to it. The Inclinometer is removed before dismantling the holder.

Mechanical loads, such as those occurring during the attachment or removal of the magnetic holder, must not be applied to the measuring device!

There are two different versions of these magnetic holders. The newer design is pressed against the desired location on the bark and secured with a countersunk screw. Tightening the screw pulls the three tips against the surface, preventing slipping and twisting. The type of screw used should be adapted to the tree species and the intended use.



New magnetic holder, secured with a countersunk screw.

The older design is driven into the tree with two pointed spikes. It must be ensured that the holder, and thus the measuring device, is securely attached. The spikes are pulled out by gently levering under the base plate. Excessive tilting should be avoided, as it may cause the spikes to bend.

CAUTION!

Permanent magnets are very brittle and can be easily damaged by mechanical stress! Magnets should never be directly struck with a hammer; instead, the provided plastic protective cover should be used.



Attaching the Inclinometer holder:
Before driving it in, place the protective
cap over the magnet.



Remove the magnetic holder by gently levering it
off. It is recommended to alternate between both
sides while levering.

3.1.4 Elastometer

3.1.4.1 Device description

The PTQ Elastometer measures the change in the length of the wood fibres to which it is connected. This change in length can be both positive (extension) and negative (compression).



Nbr.	Description	Function
1	Display	Menu display
2	Locking button	Physical lock that secures the mechanical components during transportation and assembly
3	ON/OFF button	Turning on / Turning off
4	OK button	Menu control
5	Status-LED	Blinks during the measurement
6	Upper needle clamping bracket	Attachment to the upper needle
7	lower needle clamping bracket	Attachment to the lower needle
8	Cable connector	Connection for charging cable or data cable
9	Antenna	Wireless connection

Table 6 – Elastometer: Control and display elements

3.1.4.2 Operation

The Elastometer is turned on or off by briefly holding the **ON/OFF** button. The display shows the current measurement value, as well as the battery voltage and the module address. After turning it on, the firmware version, module address, and the individual serial number of the respective measuring device are temporarily displayed.

Pressing the **OK** button once switches the Elastometer to the offset mode ('zeroing'). Another press of the **OK** button initiates a five-second calibration cycle of the offset value. In most applications, it is recommended to determine the offset value for all modules simultaneously by a command from the central control unit. This should ideally be done immediately before the actual measurement, and the software can perform this automatically.

If the **OK** button is held for 3 seconds, the Elastometer switches to the address menu. Here, the module address can be set by pressing the **OK** button. To save the set address, the **OK** button must be held for three seconds.

Elastometers feature a mechanical locking mechanism for the actual measuring apparatus. When the **locking button** on the back (the side opposite the display) protrudes, the mechanism is locked. When the **locking button** protrudes on the display side, the mechanism is free and ready for measurement.

3.1.4.3 Installation

To attach an Elastometer to a tree, a pair of Elastometer needles, a needle gauge, and a hammer are needed. The needles are inserted into the gauge so that the tips point away from the handle and towards the tree. The gauge is positioned where the Elastometer is to be attached, and then the needles are driven in at the specified distance provided by the gauge. The needles must be securely attached to the wood (xylem) to ensure the transfer of fibre length change to the measuring device. The gauge is then carefully removed.

CAUTION!

The needles must not be further driven in while the sensitive Elastometer is connected to them!

The locked Elastometer is placed on the lower needle using the lower needle holder (movable side of the mechanism) and initially held slightly tilted to the right. The underside of the display faces the tree. A slight tilting movement brings the upper needle holder closer to the upper needle. If the distance between the needles is correct, the holder aligns precisely. The Elastometer is positioned so that the holders come as close to the tree as possible without the device touching the tree.

The lower and upper knurled screws are tightened by hand to secure the measuring device. After tightening, the locking can be released. This should be done without significant resistance or tension.



Drive in the needles



Attach the Elastometer



Release the locking

The first measurement value of the Elastometer (before zeroing) should be in the range of at most a few hundred μm . If the value is above 1000 μm , the device has not been attached with sufficient precision.



To remove the needles without causing damage, blind rivet pliers (3.1 mm) should be used.

3.1.5 Overload-Indicator

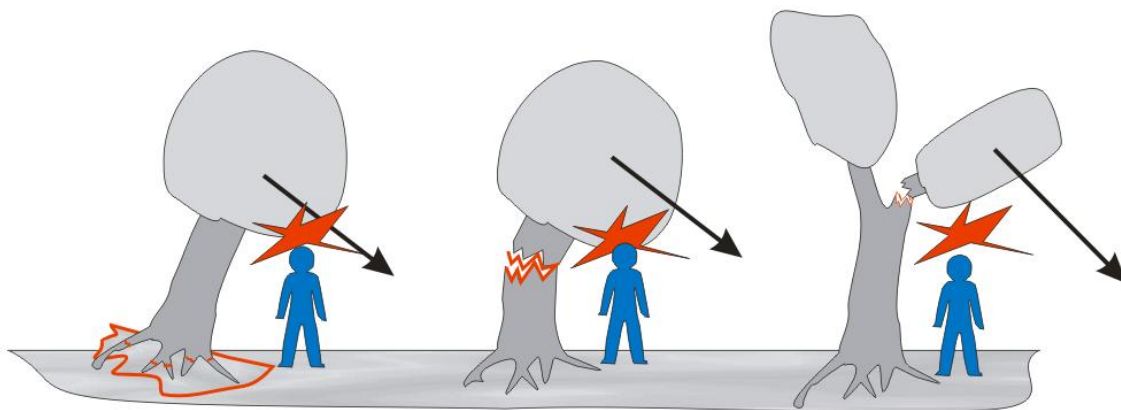
3.1.5.1 Safety first!

The static tree pulling test is an established method for assessing the stability and break safety of trees. However, conducting such a test requires a high level of expertise, experience, and care.

When applying large forces to the tree, extreme caution must be exercised because sudden and unexpected structural failure of the tree could result in it falling, in whole or in part, onto nearby individuals or infrastructure (vehicles, buildings, etc.).

Severe injuries or death can result from individuals being struck by parts of a falling tree!

In addition to personal injuries, incorrect application of the pull test can also cause irreparable damage to the tree itself. The tree could be uprooted, the trunk could break, or branches could be torn off.



Therefore, make absolutely sure that there are no individuals in the immediate danger zone during the execution of a pull test.

Always be sure to use the PTQ overload indicator when conducting tree pulling tests with the PiCUS TreeQinetic measuring system.

*Due to its nature, the PTQ overload warning device **cannot prevent** sudden structural failure of the tree.*

However, it can assist by providing audible and visual warnings to the winch operator, who typically cannot continuously monitor the measurement values, to prematurely and immediately abort the pull test when exceeding adjustable warning thresholds.

3.1.5.2 Device description

The PTQ overload indicator provides clear visual and audible signals when the upper limits of the allowable measurement values in the pull test are reached and exceeded by the other modules.

Nbr.	Description	Function
1	Flashlights	Optical warning
2	Status-LED	Status display
3	ON/OFF Taste	Turning on / Turning off
4	Ball magnet	Attachment and alignment on the magnetic holder (on the back side)
5	Speaker	Acoustic warning
6	Cable connector	Connection for charging cable or data cable
7	Antenna	Wireless connection

Table 7 - Overload indicator: Control and display elements



3.1.5.3 Operation

WARNING!

Do not look directly at the flashing lights during startup!

The overload indicator is turned on or off by briefly holding the ON/OFF button.

The flashing lights also indicate the measurement status.

- Blue blinking indicates the standby mode, where the device is not receiving data.
- Green light means that the indicator is connected to the system, and no measurement value exceeds the set limit.
- Red flashing, along with the alarm sound, signals that one or more measurement values exceed the set limits.

The limits are managed in the measurement software of the connected computer or the app on the mobile device.

NOTE: In older systems, overload indicators are not displayed in the list of connected devices. If the indicator displays green at the beginning of the test, it is properly connected.

A red status LED indicates a weak battery.

3.1.5.4 Installation

Overload indicators are attached to the tree using magnetic holders. However, since the overload indicators do not record any measurements themselves, other mounting locations are also possible.

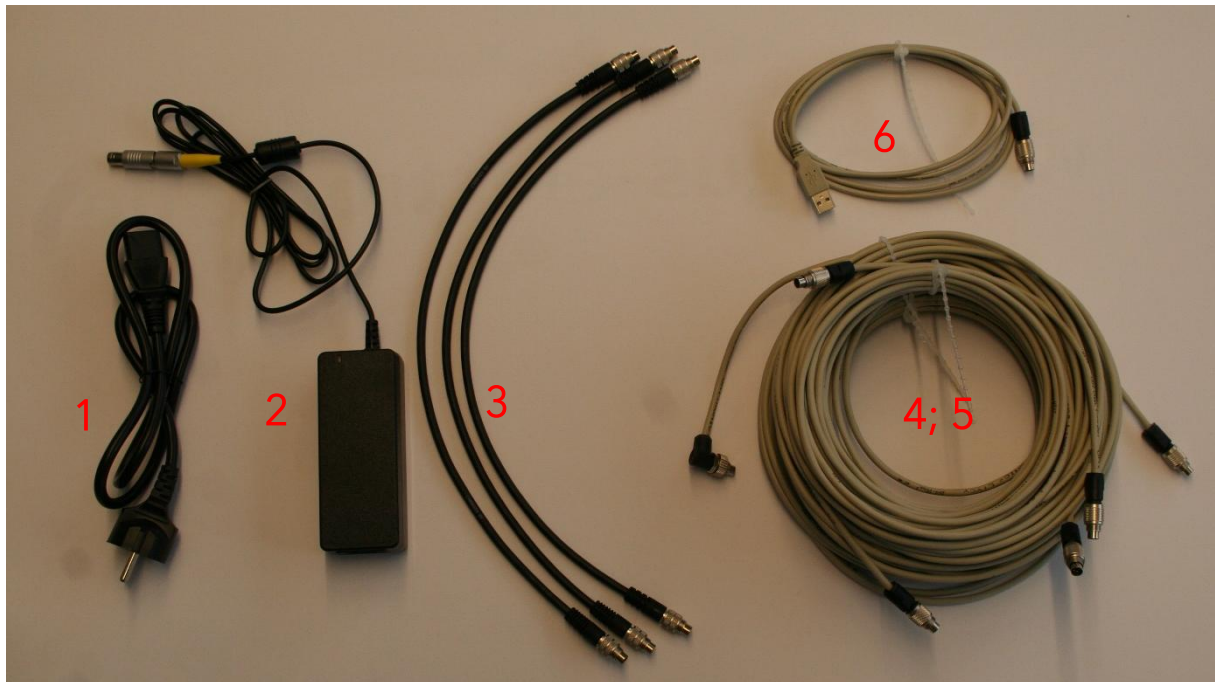
They should always be positioned with a clear line of sight to the winch operator.

The magnetic holder must be attached before connecting the overload indicator. Before removing the magnetic holder, the overload indicator should be removed.

Mechanical stress that occurs during the attachment or removal of the magnetic holders should not affect the overload indicator!

3.1.6 Cables

3.1.6.1 Device description



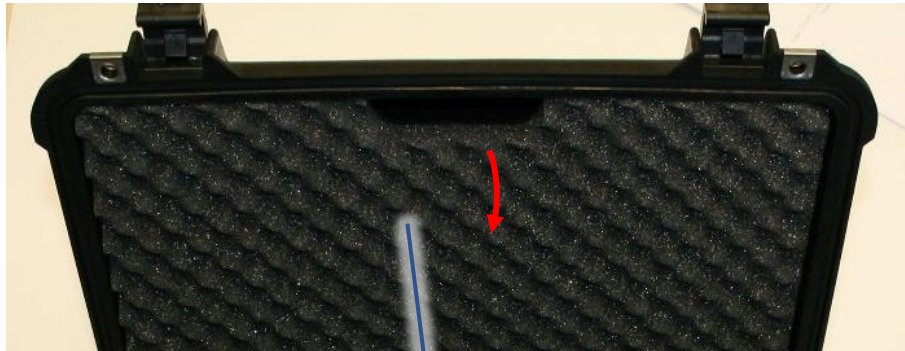
Nbr.	Description	Function
1	IEC power cable	Connects the tabletop power supply to the power source
2	Tabletop power supply	Provides power to the central unit or the PTQ Hub
3	Charging cable	Connects the modules to the central unit or the PTQ Hub
4	Data cable (5 m)	Connects the Elastometer or Inclinator to the Com Unit for data transmission. Do not use for charging!
5	Data cable (30 m)	Connects the Forcemeter to the Com Unit for data transmission. Do not use for charging!
6	USB cable	Data backup for transferring data from the central unit to the PC (no charging!)

Tabelle 8 – Supplied Cables and their use

We offer additional charging and data cables as well as desktop power supplies as optional accessories to provide maximum convenience and reliability for your customized device setup, both for charging (see also [3.1.8 TreeQinetic-Hub \(Optional\)](#) and [3.2.4 Charging](#)) and field use.

3.1.7 Transport case

The PTQ is delivered in a convenient equipment case, which includes suitable holders for all sensitive components. The inclinometer holders can be stored in the lid.



Additional components are stored behind the foam mat in the lid.

The upper edge can be folded forward.

The equipment case is lightweight, very sturdy, and waterproof. It's equipped with a pressure relief valve, making it suitable for air travel, and it has two metal eyelets for securing it with locks to prevent unauthorized access.

3.1.8 TreeQinetic-Hub (Optional)

3.1.8.1 Device description

Optional accessories for extended TreeQinetic systems include the TreeQinetic Hub. Its primary purpose is to charge up to eight PTQ modules simultaneously. However, this device can also serve as a data cable distributor during measurements, allowing you to connect more than three modules to the central unit.



Nbr.	Description	Function
1	Power input connector	Connects to the desktop power supply
2	Module connectors	connect the modules using the charging cables
3	Data cable connector	Used for a data connection to the Com Unit

Table 9 - PTQ Hub: connectors



In older systems, data cable distributors are sometimes used. Unlike the TreeQinetic Hubs, data cable distributors **CANNOT** be used for charging the modules.

3.1.8.2 Operation

To charge up to eight modules, connect the desktop power supply to the DC-IN socket. The modules to be charged are connected to the eight sockets using the short charging cables. The communication unit is still charged directly with the desktop power supply.

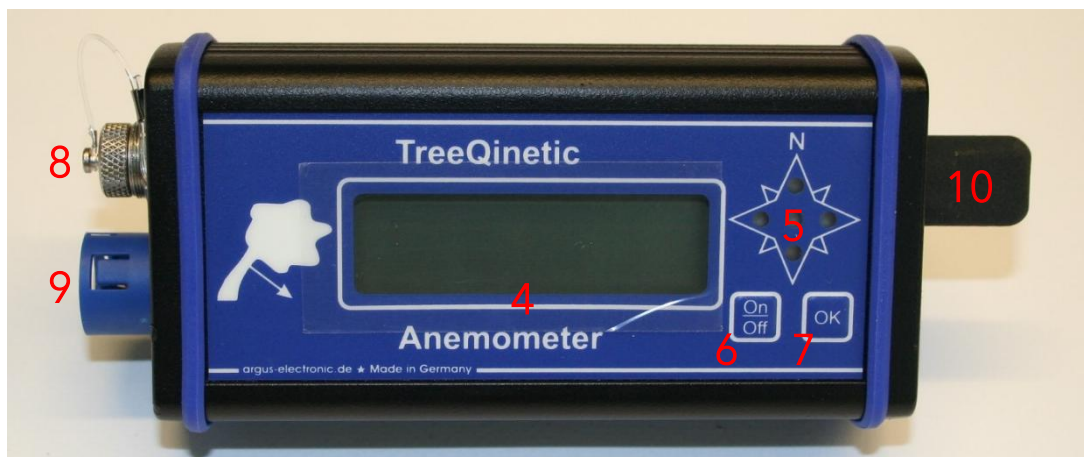
For data transfer, connect the modules to the eight sockets using the long data cables. Connect the eight-fold charger to one of the data inputs of the communication unit with a data cable at the COM socket.

The tabletop power supply is not necessary for data transfer.

3.1.9 Anemometer Version 1 (Optional)

3.1.9.1 Device description

Wind measuring device for use with the PiCUS TreeQinetic. If, instead of the usual pull test, the effect of the wind on the tree is to be investigated, this anemometer is used to record wind parameters while Inclinometers and Elastometers record the tree's response. The wind measuring device is set up near the tree and transmits the current local wind speed for recording on the end device during the measurement.



Nbr.	Description	Function
Measurement unit (without picture)		
1	Anemometer	Cup anemometer for measuring wind speed
2	Wind Vane	Detects wind direction
3	Traverse	Mounting unit for attaching the measurement device to a mast
Transmission unit		
4	Display	Menu display
5	Direction indicator	Shows current wind direction
6	ON/OFF button	Turning on / Turning off
7	OK button	Menu control
8	Data Cable Connection	Connects the data cable for data transmission to the Com Unit (optional).
9	Measurement Unit Connection	Connects the cable of the measurement unit (mandatory)
10	Antenna	Used for wireless communication

Table 10 - Anemometer: Control and display elements

3.1.9.2 Operation

The anemometer is turned on or off by briefly holding the **ON/OFF** button. The display shows the current measurement value, battery voltage, and module address.

If you hold the **OK** button for 3 seconds, the anemometer enters the address menu. Here, you can set the module address by pressing the **OK** button. To save the configured address, hold the **OK** button for three seconds.

3.1.9.3 Installation

The actual measuring unit is typically attached to the optionally available 10-meter telescopic mast. The north marking must be observed and aligned to North. The pictured transmission unit can be attached to the mast near the ground for easier operation. Both components are connected using the cable of the sensor unit.

3.1.10 Anemometer Version 2 (Optional)



A newer version of the anemometer has been available since 2021. It is more compact and user-friendly. However, the basic function remains the same.

This device comes with a separate manual for instructions.

3.2 General operating instructions

3.2.1 Environmental Conditions

The PiCUS TreeQinetic System is designed for measurements under field conditions. However, it is essential to consider environmental conditions when using these highly sensitive instruments.

The recommended temperature range is 0 - 40 °C.

Attention:

Wood properties are influenced by various factors, with temperature being a crucial one. If the temperature falls below 0°C (32°F, 273 K) for an extended period, wood properties can change significantly. Therefore, measurements cannot be conducted during or immediately after periods of severe frost!

The TreeQinetic components do not have an IP rating, meaning they are not considered waterproof. While they may withstand light rain over the usual duration of a measurement, it is essential to ensure that water does not enter the housing.

Particularly, the Elastometers have necessary openings for the mechanical components that need to be protected from the ingress of dirt and water.

CAUTION!

If water enters the housings, it can cause severe damage to the electronics!

Direct sunlight on the sensors causes heating of the components and a minimal, material-specific change in size of the components. Data recorded during temperature changes can exhibit a phenomenon called temperature drift. The Inclinator sensors are particularly affected by this. Make sure to calibrate the devices immediately before taking measurements, so that no further displacement occurs before collecting the data. If necessary, provide shade for Inclinator during the test.

Protect the devices from avoidable contamination, moisture, and mechanical stress whenever possible. The waterproof case can be useful in this regard. Also, protect the instruments from falls and impacts during transportation and while they are inside the equipment case.

3.2.2 Modul addresses

Each sensor module has a unique address for identification in the measurement software and data storage. Each address is unique within a measurement system and consists of a device type (**X**) and module number (**Y**), preceded by a hash symbol: **#XY**.

*Each address is associated with a colour based on its second digit (**Y**), which typically corresponds to the colour of the seals on the housing. Therefore, it is not recommended to change the address.*

The colour assignment is as follows:

#X0 blue	#X5 blue
#X1 yellow	#X6 yellow
#X2 red	#X7 red
#X3 green	#X8 green
#X4 black	#X9 black

To change the address, turn on the device you want to change the address for. Hold down the OK button until **Modul address #XY** is displayed. Each press of the **OK** button increases the address (**Y**) by 1. After 10 steps, it starts counting from the beginning. Hold down the **OK** button again to save the new address.

The first digit (**X** or **XX**) of the module address depends on the device type:

- #8Y**: Inclinator
- #9Y**: Elastometer
- #10Y**: Forcemeter
- #11Y**: Anemometer

For each device type, you can assign 10 addresses (X0 - X9). Overload indicators do not have adjustable module addresses. If an alarm is triggered, all overload indicators are activated simultaneously.

3.2.3 Automatic self-shutdown

The TreeQinetic components have an automatic self-shutdown feature to conserve energy. They will turn off after a certain period of inactivity and lack of communication. For the Central Control Unit and Sensor Modules, this period is 30 minutes, and for the Forcemeter, it's 60 minutes.

To prevent the automatic self-shutdown, you can briefly switch to the measurement mode just before it takes effect. After receiving control commands, the time for the sensor modules will reset, and the shutdown will be postponed.

3.2.4 Charging

The sensor modules must be charged only when they are turned off and at room temperature. The Forcemeter, Inclinator, Elastometer, and Overload Warning Device are charged through the Central Control Unit. To do this, connect the tabletop power supply to the socket using the cold device cable and plug it into the DC-IN socket on the Central Control Unit. Use the short charging cables to connect the modules to the three sockets on the Central Control Unit.

The data cables are not suitable for charging.

While charging, the green LED next to the socket will be lit. When it turns off, the connected device is fully charged.

If a module is powered on after the charging process, it should display a battery voltage of 2.8 V to 3 V. The fully charged battery voltage for the Central Control Unit should be between 5.6 V and 6 V. When empty, the battery voltage is 2.3 V for the modules and 4.5 V for the Central Control Unit.

ATTENTION!

Do not turn on the devices while they are charging! If you need to charge more sensor modules than available charging channels, they must be charged one after the other. Sensor modules should always be connected directly to the Com Unit.

The sensor modules must not be charged using the data cable distributor! See also [3.1.8 TreeQinetic-Hub \(Optional\)](#).

*To switch to a different module for charging, do not remove the power supply plug from the Central Control Unit. This can damage the battery of the Com Unit. Instead, disconnect the plug of the charging cable from the fully charged sensor module and plug it into the next device to be charged. **Remove the power supply plug from the Com Unit only after removing all modules.***

As an alternative to the standard charging method through the Com Unit, you can order the PTQ Hub (see also [3.1.8 TreeQinetic-Hub \(Optional\)](#)). This charger handles the charging function for up to eight modules simultaneously. This charger can be operated using the power supply of the Com Unit, provided the number of pins (two or four) in the DC-IN socket matches.

NOTE:

The self-discharge rate of the accumulators is roughly estimated at 1% per day. Periodically check the condition of stored devices and recharge them at intervals of a few months.

NOTE:

If the charging LED turns off unusually quickly, premature shutdown has occurred. Check the device's temperature in this case. If it is higher than the ambient temperature, the full battery cannot absorb the energy and is already converting it into heat. In this case, further charging may damage the battery. Otherwise, the device should be disconnected and reconnected. The causes of premature shutdown can be deeply discharged batteries or significant differences between battery temperature and ambient temperature.

3.2.5 Maintenance

Maintenance work must be exclusively carried out by the IML Electronic GmbH workshop at the company's headquarters. Opening the devices leads to the loss of warranty claims and can result in damage to the respective devices.

Before each commissioning, a simple visual inspection by the user is recommended to ensure that all components are ready for use. Some things to consider include the smooth operation of the Elastometer mechanics, the ability to turn on all devices, their sufficient energy levels, and the output of plausible values.

With proper use and careful handling, the devices can be used for many years without the need for maintenance or repairs.

3.2.6 Spread of Infections

Theoretically, it cannot be ruled out that pathogens may be transported by the repeated use of fasteners on different trees. To prevent this, it is advisable to replace the fasteners or disinfect them before using them again.

You can consider the following methods:

- Heating (> 150°C for longer than 15 minutes; ***not suitable for magnets!***)
- High-percentage alcohol (with an exposure time of several hours)
- Using disinfectant for tree care tools (according to the instructions)
- Boiling water for at least 15 minutes (***not suitable for magnets!***)

3.3 Calibration

All PTQ modules are factory calibrated. This calibration does not deteriorate significantly over time due to use, so from a technical point of view a new calibration is not mandatory.

After damage or opening a measuring device, a new calibration may be necessary.

If you require certificates of the proper functioning of your measurement devices, you can send them back to the manufacturer for certification.

4. Software

4.1 General Notes

The software for controlling and configuring the PTQ measurement system, as well as recording and saving measurement data, is available for all common operating systems:

- **Android**
- **iOS**
- **Windows PC**

These programs are similar in their structure, using the same symbols and pictograms. The workflow remains consistent across all versions. All program versions produce identical measurement files (compatible with Arbostat). Therefore, transitioning between the programs is seamless and does not require significant relearning.

The software is explained here exclusively using the Android app as an example. Platform-specific peculiarities will be highlighted separately and marked in colour.

4.1.1 Installation

The app is available for free on the Windows Store, Google Play Store (for Android) and the Apple Store (for iOS).

Simply search:  **IML TreeQinetic**

Or use the following QR-Codes:

		
Google Playstore	Apple Store	Microsoft Store

4.1.2 App-Start

Upon installation, launch the IML TreeQinetic App by tapping the icon in the app list on your mobile device. After starting, you will initially land on the **Control** tab on the **Com Unit** page.

4.1.2.1 Permissions

Upon the first launch, the **app** will request up to 3 permissions when required (depending on your device type and operating system):

- **Location** (optional): When entering data for a tree pulling test, the app provides the option to determine the position of the tree under investigation via your **mobile device's GPS**. Your permission to use the location system is required for this purpose.
- **Camera** (optional): For data collection during a tree pulling test, it is essential to take a crown projection photo of the tree under investigation. Additionally, it is recommended to document the measurement setup with images. The **app** offers you the option to take these photos directly and add them automatically to the project data. Your permission to use the **camera** is required for this purpose.
- **Internal Storage** (mandatory): Both the project data manually entered by you and the recorded data during a tree pulling test need to be stored on your mobile device's **internal storage**. Your permission to use the storage for reading and writing is required for this purpose. Denying this permission will render the app inoperative, and it will automatically terminate.

4.1.2.2 Special features for Android and Windows

If you have denied one or more of these permissions and wish to change them afterward, there are 2 options for Android users:

- Through the app itself
 - If you have denied access to storage, the app will request permission each time it's restarted.
 - To grant permission for the camera or GPS after denial, you simply need to initiate the respective function within the app (take a photo or determine the tree's position), and you'll be prompted for permission again.
- Through your Android settings
 - If you chose **Don't ask again** when denying permissions, you can still modify the permissions afterward by directly accessing your device's system settings:
 - Swipe down from the top of your screen and tap on the gear icon in the upper right corner.
 - Then, select **Apps** and scroll down to find **IML TreeQinetic**. Tap on it.
 - Choose **Permissions**.
 - Now, you'll see all the permissions the app requests. You can manually grant or deny these permissions using the **toggle switches on the right**.

4.1.2.3 Special features for iOS

If you have denied one or more of these permissions and wish to change them afterward, you will need to do this through your device's system settings:

- Tap on the gear icon labelled **Settings** in the app list on your mobile device.
- Scroll down considerably until you find the list of installed apps. Then, select the entry **IML TreeQinetic**.
- Here, you'll see all the permissions requested by the app and can manually grant or deny these permissions by using the **toggle switches on the right**.

4.1.3 Starting the Software

Upon completing the installation, an icon will automatically be added to the desktop or home screen for launching the software.

Additionally, *in Windows* you can find the software in the Start menu under the **PiCUS** folder.

4.2 Differences between PC-Software and App

In principle, the IML TreeQinetic software makes no distinction between different platforms. Any differences in the available functions are always due to the hardware available and inherent limitations of the operating system. Functions that are not available are greyed out in IML TreeQinetic.

For example, while modern mobile devices (phones and tablets) almost always come equipped with a **camera** and **GPS receiver**, this functionality is typically not available on desktop PCs and laptops. The PC software therefore does not offer a **camera function** or **positioning** in most cases. However, exceptions are possible (such as a connected webcam, provided it is recognised by the software).

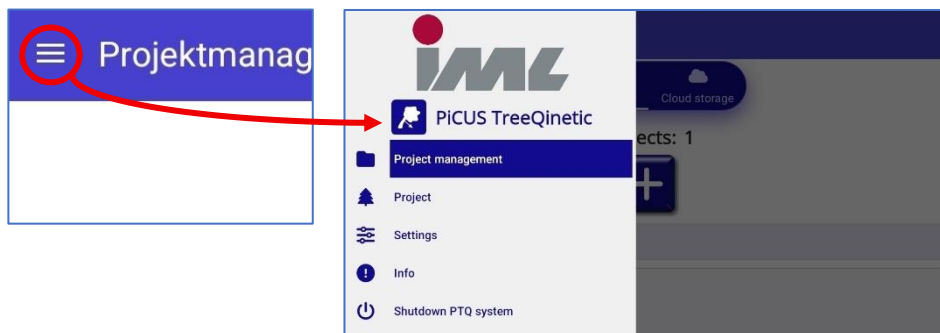
On the PC, photos documenting the tree and measurement setup would then have to be taken using external devices and could only be added to the project at a later stage. Position data to be entered would also have to be determined externally, either using a GPS-capable device or with the aid of a mapping service.

In addition to these hardware-related restrictions, there are also limitations on the operating system side. For example, on iOS devices, communication is always limited to Bluetooth Low Energy. Bluetooth Classic and USB are not permitted. There are also differences between the various mobile platforms and Windows PCs when it comes to accessing the recorded measurement data (see [4.11.2 Data Transfer](#)).

4.3 User Interface Concept

4.3.1 General

To switch between the different parts of the software, you can open the main menu in the top-left corner.



The menu items offer the following functions, which are described in more detail in the following chapters:



Project Management: Create new projects or open existing ones. Upload and download projects to and from the IML Cloud.



Project: The primary workspace where measurements are carried out. If a project is already open, you will return to it, otherwise you can create a new project.



Settings: This is where the general behaviour of the software is configured independently of the project. Communication with the COM Unit is set up here, as is access to the IML Cloud.



Info: General information about the software itself:

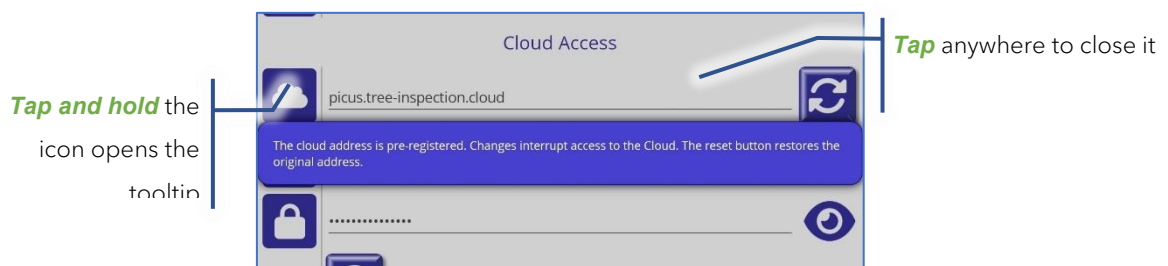
- Version information
- Contact details
- Link to the IML Privacy Policy
- An overview of the software licences used in the programming



Shutdown PTQ system: This command sends a signal to the radio control centre, which first switches off all connected modules and then the radio control centre itself.

The functions of input fields or buttons are indicated by corresponding icons. Buttons can be identified by a 3D effect on the icon. If a particular function is disabled, the icon is greyed out.

Additional information about the fields can be displayed by **tapping the icons**. On a PC, these tooltips appear when you **hover** the mouse pointer briefly over the icon.



Note: When entering numerical values, pay attention to the correct physical unit! This unit is displayed in the placeholder (appearing in empty input fields) and is automatically appended to user inputs.

The app's structure generally follows the typical workflow of a tree pulling test. Accordingly, tabs and their pages are usually worked through from left to right, and the content of each page from top to bottom.

4.3.2 Context menu for list elements

In project management, functions can be selected via the context menu for the relevant project. To do this, follow these steps:



iOS and Android: When you swipe a list item to the right, a context menu appears to the left of the item.



Windows PC software: In the PC software, the context menu options are available by right-clicking on the project.

4.4 Settings

This menu contains options for configuring the app and connecting to the PTQ measurement system and the IML Cloud.

This page is used to configure the app and to enter the information required for its functions.



Automatic zero calibration: When this option is enabled, the zero calibration of all modules is performed automatically when a measurement is started. It is always possible to initiate zero calibration manually, regardless of this function.



Anemometer display unit: If the optional PTQ wind measurement system is used, the display unit can be switched between m/s and km/h here.



Display interval for live measurement: the duration for the live graphical display of sensor readings can be set here (between 1 and 10 minutes). This setting only affects the display. The recording of measurement values happens independently.



File path: The app saves all inputs/measurements for a project in a directory structure on the mobile device's storage. On Android, this line displays the absolute path to this location. (See also [4.11 Data Management](#)) In the PC software, the storage location is not predefined and can



be set or



opened.



The software is capable of uploading your projects directly to the IML Cloud on-site. The web address for the cloud is displayed here. The correct address, **picus.tree-inspection.cloud**, is already pre-filled. No changes are necessary!



To access the cloud, the app requires the account details provided to you with the PTQ system. Enter your **username** here.



Enter your **password** here.



Connection test: This button starts a connection test to check that your internet connection and the account details you have entered are valid.



Under **device settings**, you can search for Com Units. The search can be carried out via both Bluetooth and USB. If you do not wish to search through all possible connections, you can deactivate the search for either



Bluetooth or



USB by tapping the small icons next to the search button.



Use the **Search** button to start the device search.



In the **device list**, the Com Unit can be selected once the search has been successful.



Selecting **Read device information** retrieves and displays the serial number, firmware and hardware version numbers, as well as the currently active Bluetooth standard, if applicable. In addition, the current battery status of the wireless control unit is displayed as a coloured icon



Calibration allows a correction factor to be calculated for the camera so that it can be used to determine tree height and the mounting height of the equipment. The exact calibration procedure is described in the next chapter ([4.5.1 Calibration](#)).



Error reports enable the automatic sending of anonymised error and crash reports to IML Electronic. Clicking the question mark icon displays additional information.

4.5 Utility Tools in the App

4.5.1 Calibration of the Altimeter

To use the altimeter, a correction factor for the camera must first be determined. A known object is measured for this purpose. Door frames have proven to be very suitable calibration objects. Their height can be measured very well, and the distance to the door frame is easily determined during calibration, typically 2 to 5 meters.

To calibrate, follow these steps:

In the **main menu**, select **Settings**



Start the altimeter calibration with the tool button.

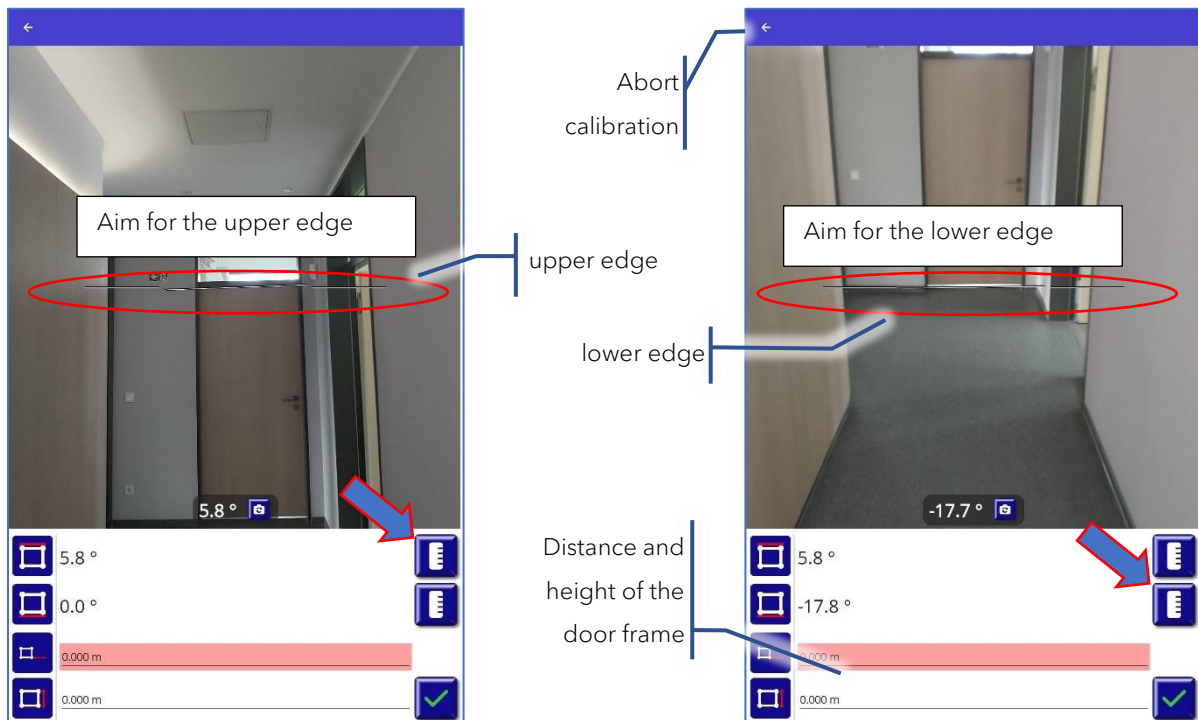
The camera image is displayed with 3 lines. The middle line is parallel to the Earth's surface, and the two outer guiding lines are used to align the camera as straight as possible. Hold the camera during all height measurements so that the 3 lines are aligned as straight as possible.



Aim at the upper edge of the calibration object and take an angle measurement with the upper tool button.



Repeat the process with the lower edge of the object and the lower tool button.



Enter the following values:



Distance from object



Height of the object



Complete the calibration measurement, and the correction factor will be calculated automatically.

4.5.2 Using the Altimeter

This page represents a **tool for measuring object heights** with minimal additional tools. It measures the angular views to the upper and lower edge of the object using the **mobile device** and requires only the horizontal distance to calculate the total object height. In addition to measuring tree height, the altimeter can also be used to measure the mounting heights of the individual sensor modules. The procedure is always the same and is therefore explained here only once.



In all menus where a height measurement is required, it can be entered directly, or the altimeter can be started using the tool button. The height measurement is performed similarly to the calibration measurement.

In the upper half of the screen, you will see a live view from your camera with an artificial horizon projected onto it. Additionally, the current angle of the device is displayed at the bottom of the camera view. Follow these steps:



Aim the artificial horizon at the **upper edge** and tap on the measurement button located in the topmost row to measure the angle to the treetop.



Now, aim the artificial horizon at the **lower edge** and tap the measurement button on the second row to measure the angle to the tree's base.



Next, enter the previously measured **distance** to the object in the input field. The distance should correspond to at least the estimated tree height.



The **calculated object height** will then be displayed in the last row.



The **Confirmation** button saves the determined measurement value and returns to the calling page.

You can repeat these steps in any order and as many times as necessary.

Using the **Back** button (arrow symbol at the top left), you can return to the calling page, without transferring the just-determined measurement result to the input field.

This functionality is typically not available in the PC software.

4.5.3 Compass Measurement Tool

This page represents a tool for measuring the orientation of the sensor modules without additional tools. It measures the **orientation of the mobile device** in relation to the magnetic North Pole using the **integrated magnetic sensor** (if available).

The structure of the page remains consistent, but the specific presentation is adapted to the context from which the tool was called. Here, for instance, the page is described as it would be when measuring the Inclinator orientation.

To correctly measure the orientation of all sensor modules in relation to each other, the upper half of the screen depicts and describes the intended measurement process for each device.

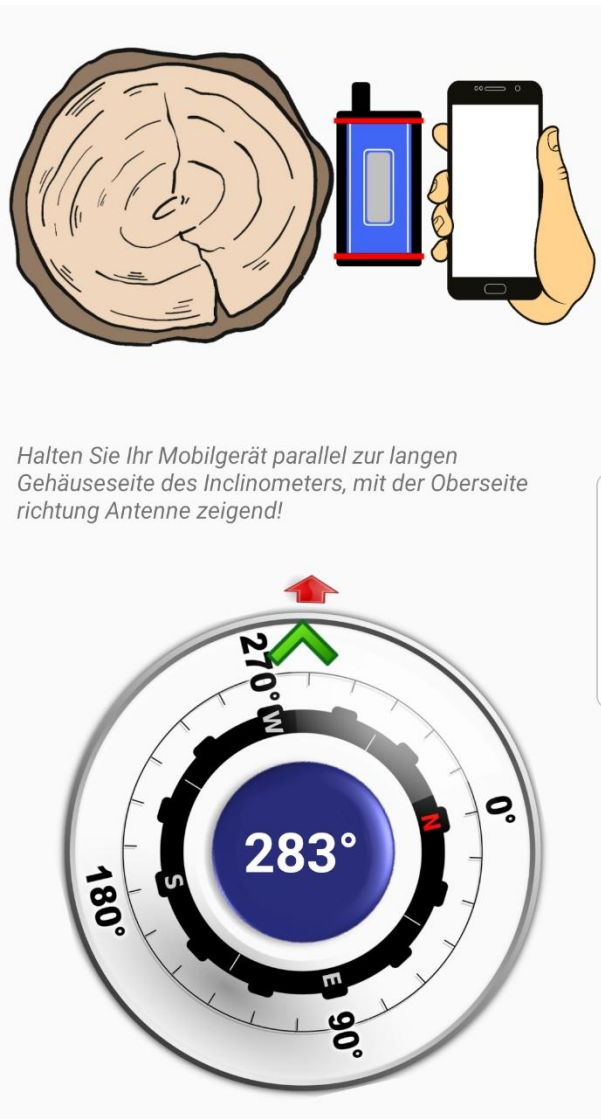
Please follow the instructions.

To perform the measurement, tap on the circular, blue button located at the centre of the compass rose. This action will return the display to the page from which the tool was initiated. The captured measurement will automatically be input into the respective input field on that page.

The compass rose rotates according to the device's orientation. The red N or 0° always indicates the direction of the magnetic North Pole.

The green, triangular marker on the compass rose, along with the number in the centre, indicates the current measurement value of the device's orientation.

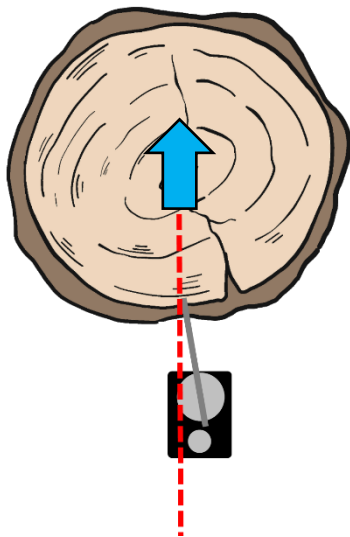
As a special feature when measuring the orientation of inclinometers or elastometers: If the pull direction has already been measured, it is marked by a red arrow at the edge of the compass rose.



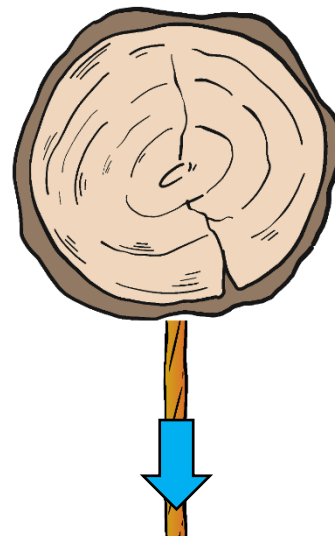
4.5.4 Determining Orientation without Compass Tool

Since not all mobile devices have a built-in magnetic field sensor, the compass tool might not always be available. This function is also not available in the PC software.

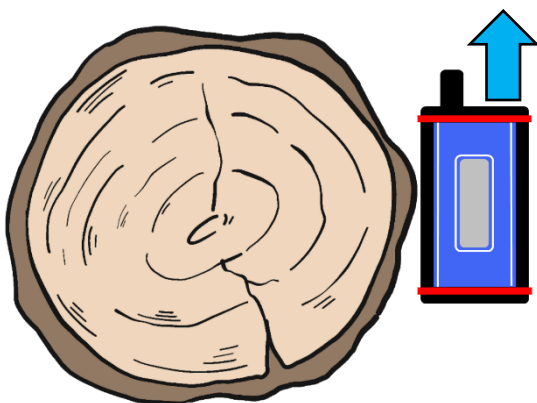
To maintain compatibility between measurements with and without the compass tool, the following details how the orientation is determined for each module. The blue arrow indicates the orientation to be determined.



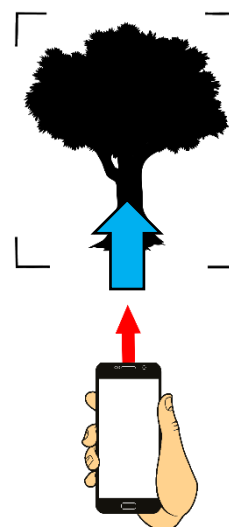
Orientation Elastometer



Orientation pull direction/Forcemeter



Orientation Inclinometer



Orientation gallery photos

4.6 Project Management

On the Project Management main menu page, you can:

- Create new projects
- Select existing projects for editing
- Copy projects between local storage and IML Cloud storage



1. Number of saved projects
2. Create new project
3. List of saved projects
For each saved project, a group of detailed information is displayed:
 - a. Project name
 - b. Tree number
 - c. Number of measurement setups created in the project
 - d. Number of measurements performed in the project
 - e. Project creation date and time
4. Search bar to search for project names
5. Context menu of a project (left: **swipe right** on mobile /right: **right click** on PC)
6. The cloud icon shows the synchronisation status with the IML Cloud.



Create a new project The view will automatically switch to the next page, **Tree Data** (see also [4.7.2 Tree Data](#)).



Open a saved project by double clicking on one of the other list entries or by using the **Open** button in the context menu. The view will automatically switch to the next page, **Tree Data** (see also [4.7.2 Tree Data](#)).



Delete a saved project via the context menu of the relevant list entry. This will permanently delete all measurement set-ups, documentation photos and measurement files. Back up the data if necessary. This action cannot be undone.



Upload/Download: The software also offers the option to copy projects to IML Cloud storage. The procedure is described in chapter [4.11.2.3 Through the IML Cloud](#).

4.7 Project Structure



The structure within a project is organised as a **tree structure**. The tree structure itself can be opened using the button in the app's top bar.



The plus sign can be used to create an additional data node within the tree structure.



Project / Tree: Each project is typically associated with a tree. General data about the tree is documented here, and the tree (as a whole) can be documented with photos in the gallery.



Test setup: Multiple test setups can be created within the project. Each setup corresponds to one pulling test. If the tree is examined by pulling in multiple directions or at different times (e.g. annual inspections), a separate test setup should be created for each new pulling test. The installation of the equipment can be documented in the test setup's gallery.



Measurements: Multiple measurements can be carried out with each test setup. In the measurements, the recorded values can also be viewed retrospectively in a time series. Each measurement is associated with an Arbostat-compatible measurement file. The entries are automatically created in the tree structure when a measurement is completed.

Further details on the project structure can also be found in Chapter [4.11.1 Project Structure](#).

Further functions for editing the project are available within the app's top bar:



Save: saves the current editing status of the presently open data node. Changes are also automatically saved when exiting the project, when closing the IML TreeQinetic software and when switching to another data node (but not when switching to another tab within the data node).



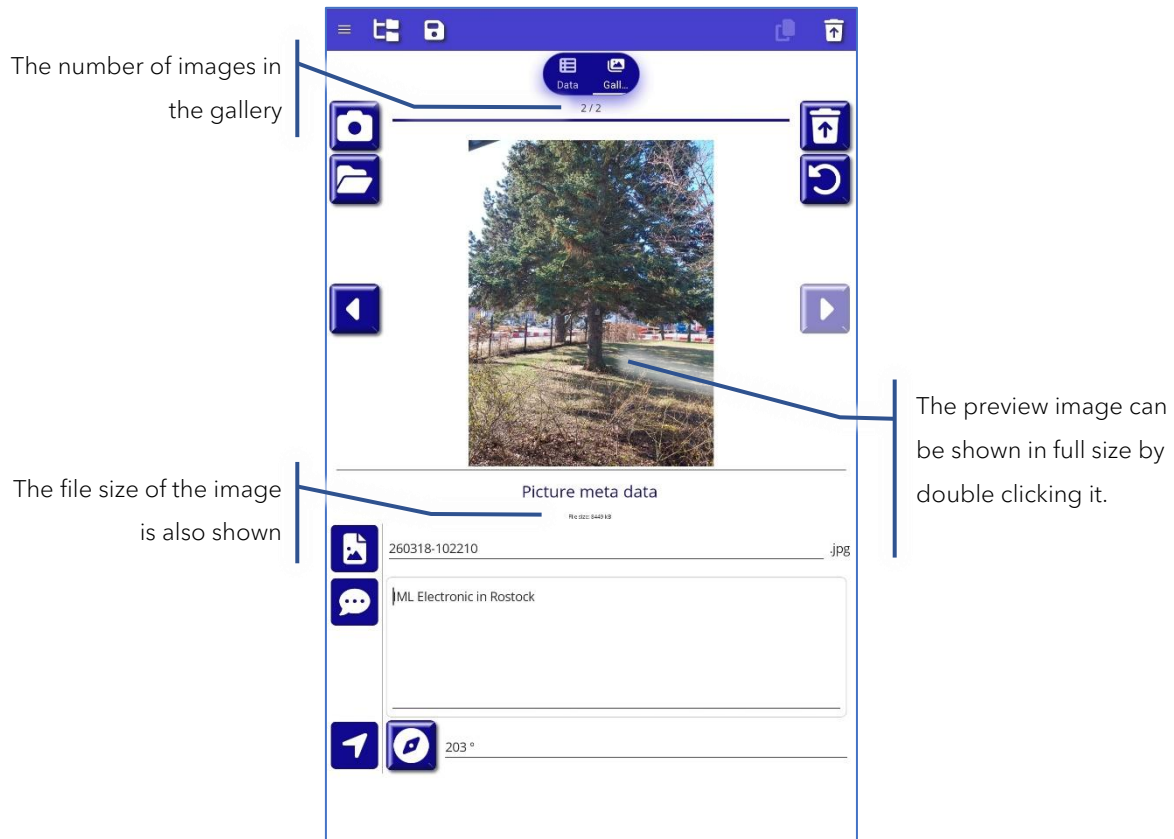
Copy creates another measurement setup using the data from the currently selected node. The alarm limits and all entries within the device list are copied. Only the images in the gallery are not copied, as these would otherwise unnecessarily inflate the project size.



Delete removes the currently selected data node and all subordinate nodes. *This action cannot be undone.*

4.7.1 Gallery

Every project/tree node and every measurement setup has a **Gallery** tab. Here, documentation photos can be taken during the experiment or added later. The structure of the galleries is always the same and is therefore described here only once, independently of the individual data nodes.



Use the **camera** icon to either **capture a new image**



Or use the folder icon to **add an existing image**.



Delete Image removes the photo from the project. Both *.png and *.jpg files can be imported.



In the gallery, you can navigate between all available images using the **arrow keys**. Double-clicking on the thumbnail of the current image opens it.



The **Rotate** button allows you to rotate the image view by 90°.

In the metadata section of the image, additional information is stored for each capture:



Filename: By default, the filename is a timestamp derived from the system time at the moment of capture, with the format YYMMDD-hhmmss. To facilitate easier identification, you can change the name here.



Comments: A free-text field where additional information about the image can be noted.



Image Orientation: To associate the image with a specific position relative to the tree, the viewing direction relative to the north orientation is indicated here. Besides direct input, the *compass* can also be used to determine the orientation (see also [4.5.3 Compass Measurement Tool](#)).

4.7.2 Tree Data

This page contains all relevant data about the project and the tree under examination, which is either entered or displayed upon loading a project.



Project Name: Give your project a name by which you can identify it later.



Tree ID: Enter the identification number of the tree under examination, such as the cadastral ID, tree number, or scan an arbotags barcode using the button.



Genus and Species: In the upper line, select the genus of the tree to be examined from the list. Then, in the lower line, add the species of the tree.



Diameter: Enter the tree diameter in the direction of pull, at a height of 1 meter, in [cm].



Diameter: Enter the tree diameter perpendicular to the pulling direction, at 1 meter height, in [cm].



Bark Thickness: Enter the bark thickness at 1 meter height, in [cm].



Using the **GPS button**, the app determines the tree's position using your mobile device's GPS.



The color of the measured position provides an indication of the measurement's accuracy:

- Accuracy better than 10m
- Accuracy better than 30m
- Accuracy better than 100m
- Accuracy worse than 100m
- Error in position determination

In the PC version, the position cannot be determined directly. It is always possible to enter the position directly, for example, if using an external precision GPS or if the position is already known from a cadastre.



Open Map Service: This button displays the captured position on a map.



Tree Height: Enter the tree height in [m]. You can directly input the value into the provided field or tap on the button to initiate the integrated **tree height measurement tool** (see also [4.5.2 Using the Altimeter](#)).

4.7.3 Test Setup

To thoroughly examine a tree, multiple tree-pulling tests need to be performed, each with different pulling directions and sensor positions. Therefore, the dataset of the measurement setup is subordinate to the project.

On this page, all relevant information about the measurement setup and the utilized sensor modules are entered or displayed after loading a measurement setup.



Name of the Measurement Setup: Provide a name to your measurement setup for future identification.



Force Meter Alarm Limit: Input the threshold value in [kN] at which all force meters used during a measurement should trigger an overload alarm.



Elastometer Alarm Limit: Specify the threshold value in [μm] at which all elastometers used during a measurement should trigger an overload alarm.



Inclinometer Alarm Limit: Set the threshold value in [°] at which all inclinometers used during a measurement should trigger an overload alarm.

The test setup can be documented photographically in the **Gallery** tab.



Device Search: Initiate a search for available sensor modules by tapping this button. The discovered modules will be listed in the subsequent device list.

Below this, you'll find the **Device List:** This list displays the discovered sensor modules sorted by type. Each list entry shows various details about the respective device:

- a. Device type (Text)
- b. Device address
- c. Device colour (Border)
- d. Device type (Icon)
- e. Connection type:



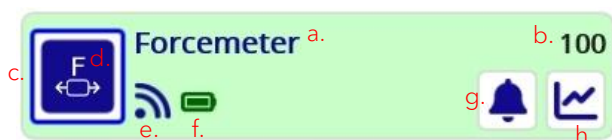
wireless



cable



no longer found after last search



- f. Battery Charge Level
- g. Alarm Switch: Set whether this device is allowed to trigger an overload alarm or not.
- h. Measurement Switch

Specify whether this device's measurements should be recorded or if the device should only appear in the live data display.

When a device is found during a search, the list entry is displayed with a pale green background. If the same device is not found during a subsequent search, the list entry remains but is displayed with a gray background and a **?** icon instead of the connection type.

This can have various reasons, such as:

- Disrupted wireless connection due to repositioning of the sensor module or the wireless central unit
- Sensor module's depleted battery
- Sensor module has turned off due to prolonged inactivity

For device types like Force meter, Elastometer, Inclinator, and Anemometer, additional information is required. The respective input pages are opened by clicking on the respective entry in the device list.

See also [4.9.3 Forcemeter](#), [4.9.4 Elastometer](#), [4.9.5 Inclinator](#) and [4.9.6 Anemometer](#).



On all device input pages, you can either **save** and confirm entries



or you can **abort** the entry and discard all changes.



The Start button begins a new measurement with the current test setup.

4.7.3.1 Forcemeter

This page is for inputting device-specific data for each Forcemeter.



Enter the height of the **rope anchor point** in [m].



Indicate the **pulling direction** by either using the input field or tapping the button to activate the integrated **compass measurement tool** (refer to section [\(4.5.3 Compass Measurement Tool\)](#)).

4.7.3.2 Elastometer

This page is intended for entering device-specific data for each Elastometer.



Enter the **tree diameter** in the pulling direction at the Elastometer height, in [cm].



Enter the **tree diameter** perpendicular to the pulling direction at the Elastometer height, in [cm].



Enter the **bark thickness** at the Elastometer height, in [cm].



Provide the **attachment height** of the Elastometer in [cm].



Specify the **orientation** of the Elastometer in [°]. You can input this directly into the field or use the button to activate the integrated **Compass Measurement Tool** (refer to section [4.5.3 Compass Measurement Tool](#)).



Force Distribution: Input the estimated wind load acting on the tree stem being measured. If measuring the main stem, enter 100%. If two equally strong co-dominant stems with uniform crown structure do not shadow each other in the pulling direction (having the same wind-exposed area for wind loads), and only one stem is measured by the pulling test, you can enter 50%.



Comments: You can input additional documentary details in a free-text field.

4.7.3.3 Inclinator

This page is intended for entering device-specific data for each Inclinator.



Enter the **tree diameter** in the pulling direction at the Inclinator's height in [cm].



Enter the **tree diameter** perpendicular to the pulling direction at the Inclinator's height in [cm].



Provide the **attachment height** of the Inclinator in [cm].



Specify the **orientation** of the Inclinator in [°]. You can input this directly into the field or use the button to activate the integrated **Compass Measurement Tool** (refer to section [4.5.3 Compass Measurement Tool](#)).



Comments: You can input additional documentary details in a free-text field.

4.7.3.4 Anemometer

This page is intended for entering device-specific data for the Anemometer.



Enter the **attachment height** of the Anemometer in [m].



Through this button, the app uses the **GPS module** of your mobile device to determine the **position** of the Anemometer.



The colour of the measured position provides an indication of the measurement's accuracy:

- Accuracy better than 10m
- Accuracy better than 30m
- Accuracy better than 100m
- Accuracy worse than 100m
- Error in position determination

In the PC version, the position cannot be determined directly. However, it's always possible to input the position directly, for instance, if an external precision GPS is used, or if the Anemometer's position is known through other means.



Open Map Service: This button shows the measured position on a map.



Comments: This free-text field allows you to input additional documentary details.

4.8 Measurement

4.8.1 Control

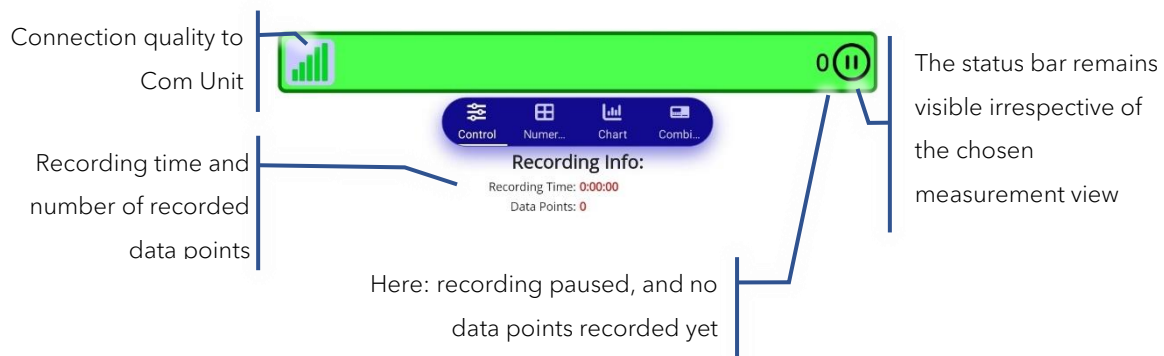
This page controls the data recording of a measurement.

When a measurement is started, the software will automatically switch to this page.



The measurement is initialized by performing the zero calibration (either automatically upon measurement start or on demand) of all sensor modules. During this process, a timer counts down the seconds until the data recording starts. ***The devices should not be touched during and after this calibration process!***

Subsequently, the measurement runs in live mode, meaning the data recording is paused. You can identify this in the status bar at the top, where the number of measurement points remains unchanged, as well as the pause icon in the upper right.



The display and control elements are:

Recording time: Shows the duration for which data has been recorded (live updates during the recording mode).

Data points: Indicates the number of recorded measurement points (live updates during the recording mode). The sampling rate of the PTQ measurement system isn't constant; it depends on the number of modules used and the quality of the wireless connection. Data is collected as fast as the current system configuration allows. In the app, the number of recorded data points is also displayed in the top right, potentially with a pause symbol (blue "2."). This way, it's immediately visible in other tabs if data is currently being recorded.



Zero calibration: Performs a zero calibration of the entire system. *Note: In the app settings, a function can be activated that automatically performs a zero calibration after the start of each measurement (refer to section [4.4 Settings](#)).*



Start / Pause data recording: Switches between modes. In live mode (the initial state of the measurement), the sensor module data is shown exclusively in real-time. In recording mode, the data is continuously collected and stored.



Stop Measurements: The measurement is concluded, and all recorded data is processed for display in the results section.

→ The view automatically switches to the **Results** page on the **Data View** tab (refer to section [4.9.1 Result](#))



Cancel measurement: Ends the measurement and discards all recorded data. The view automatically returns to the **Test Setup** page (see also section [4.7.3 Test Setup](#))

The status bar is always visible, regardless of whether you are on the Control tab or in one of the live measurement data views.

The background colours of the status bar, the numerical measurement displays and the graphs indicate the system's alarm status:

Green: everything OK

Orange: Warning: at least one measurement value is 90% of the alarm limit or higher

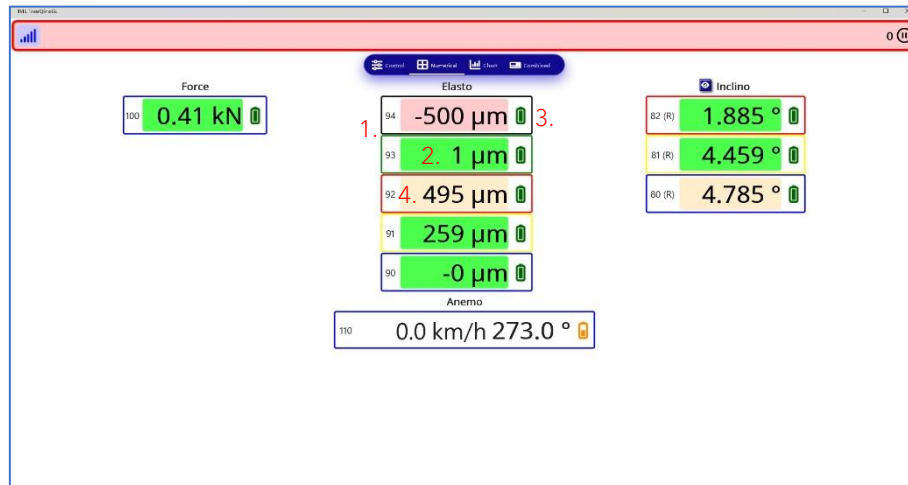
Red: Alarm: at least one measurement value has exceeded its alarm limit.

The alarms can be enabled or disabled separately for each sensor before starting the measurement (see also [4.7.3 Test Setup](#)).

4.8.2 Live Numeric View

This page displays the live measurement data in a numerical format, similar to what is known from the classical TreeQinetic PC software.

The data displays for different types of sensors are organized in columns. For each sensor module found during the device search, a cell is shown with the following information:



1. Device colour (Border)
2. Current measurement value
3. Battery charge level
4. Alarm state (Background colour of the measurement value)

Green: No alarm

Orange: Measurement value is > 90% of the current alarm limit

Red: Overload alarm, measurement value has reached the alarm limit

Grey: The wireless connection to this module is interrupted.

NOTE: Modules for which the alarm has been deactivated will never display yellow or red. See also [4.7.3 Test Setup](#).

After the zero calibration, it can be checked here whether all modules show a value close to zero. The values are never exactly zero but always overlaid with very low basic noise.

4.8.3 Live Chart View

This page displays the live measurement data in clear bar charts.

NOTE: For Inclinator and Forcemeter, only the absolute values of the measured data are displayed. For Forcemeter, it's inherently the tension, while for inclinometers, it's the resulting inclination angle without indicating a directional component.

Each device type is represented by a bar chart displaying data for each sensor module found during the device search. The information presented includes:



1. Set alarm threshold for this device type (dotted violet line)
2. Device colour (bar colour)

Note: If the wireless connection to a module is interrupted, the bar colour changes to grey. When the connection is interrupted, the bar length is not meaningful and DOES NOT represent the last received measurement value.

3. Current measurement value (length of the bar) and highest measured value (line on top). The highest measured value can be reset by zero calibrating the sensors in the **Control** tab (see [4.8.1 Control](#)).
4. Alarm state (background colour of the diagram)

Green: No alarm

Orange: Measurement value of at least one of the sensor modules is > 90% of the set alarm threshold

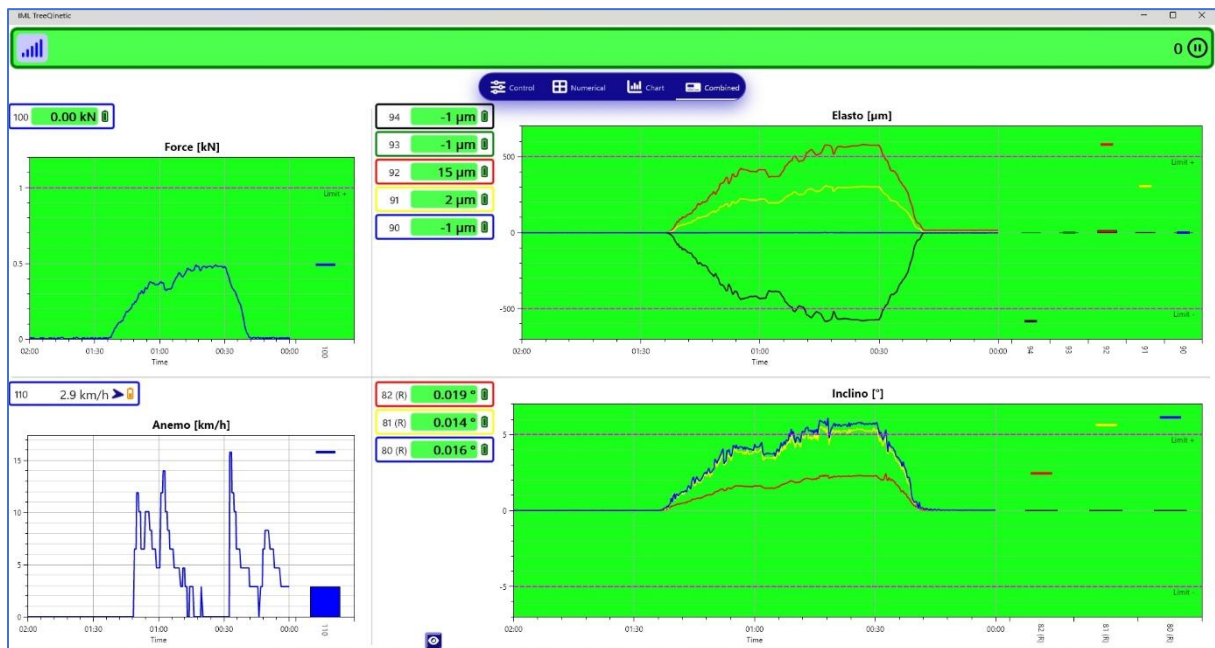
Red: Overload alarm, the measurement value of at least one of the sensor modules has reached the alarm threshold



For the inclinometers, the display of the magnitude of the resulting angle can be switched to show the angle of the X-axis or the angle of the Y-axis.

4.8.4 Live Combined View

The **Combined** view merges the purely numerical displays with the bar charts. In addition, time-series graphs are generated for all active sensors.



The layout of the numerical display is identical to that described in [4.8.2 Live Numeric View](#).

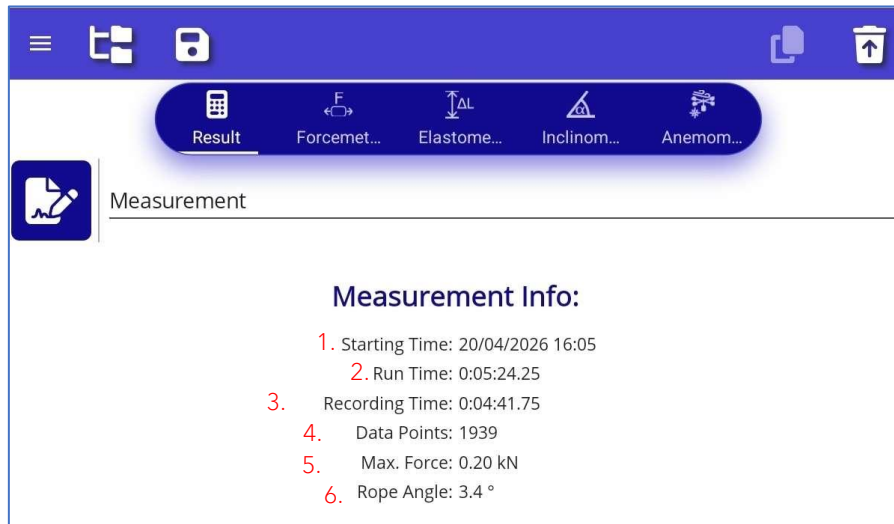
The bar charts behave as described in [4.8.3 Live Chart View](#).

The time-series graphs have a fixed width, which can be adjusted under [4.4 Settings](#). Measurement values older than the specified time window are continuously pushed out of the live display. This setting applies only to the live display. The recording of measurement values continues independently in the background.

4.9 Measurement Data

4.9.1 Result

This page provides a short summary of the measurement you just conducted



1. Start time of the measurement
2. Total duration of the measurement
3. Total time during which data was recorded
4. Number of recorded measurement points
5. Maximum tensile force during the measurement (see for details [4.10.3.1 Max. pulling force](#))
6. Rope angle at maximum tensile force (see for details [4.10.3.2 Rope Angle](#))

The recorded measurement data is automatically saved when the measurement is completed and can be viewed again at any time under the relevant measurement setup.



To make it easier to identify the measurements, you can enter a **name** for the measurement here, which will be displayed in the tree structure.

4.9.2 Chart Control

The chart display in the results section on the following tabs is slightly different in the app and on the PC.

In the app, zooming on both axes can be done by using the common **two-finger pinch gesture**. Apply the gesture either to the chart area to zoom both axes simultaneously or directly on one of the axes to adjust only that axis. Moving the displayed chart area freely can be done with a **one-finger drag**.

In the PC software, the **mouse wheel can be used to zoom**. Similar to the app, use the mouse cursor in the chart area to zoom both axes, or hover over one of the axes to zoom only that specific axis. To freely move the chart view, **press and hold the right mouse button**.

*NOTE The X-axis / time axis is continuous. Therefore, if data recording is paused during the measurement and later resumed, the graphs will have corresponding blank areas. This applies to all charts on the **Data View** tab.*

4.9.3 Forcemeter

This page displays the entire recorded measurement values of all Forcemeters involved in a line chart.

By tapping the buttons below the chart, the data display of each Forcemeter can be adjusted:

- **F & A:** Shows force and rope angle measurement curves in [kN] and [°], along with markings for the determined maximum force and the cable angle averaging window.
- **Force:** Only displays the force measurement curve in [kN], along with the marking for the determined maximum force (see details in [4.10.3.1 Max. pulling force](#))
- **Angle:** Only displays the cable angle measurement curve in [°], along with the marking for the cable angle averaging window (see details in [4.10.3.2 Rope Angle](#))
- **Off:** No measurement curves are displayed.

The **magenta-colored line** represents the set alarm threshold of the Forcemeters.

4.9.4 Elastometer

This page displays in a line chart the entire recorded measurement history of all participating Elastometers in the measurement.

By tapping the buttons below the chart, the data display of each Elastometer can be adjusted:

- **ON:** Displays the curve of length change in [μm]
- **OFF:** Curve measurement is not displayed

The **two magenta-colored lines** represent the set alarm threshold (positive and negative) of the Elastometers.

4.9.5 Inclinator

This page displays in a line chart the entire recorded measurement history of all participating Inclinator in the measurement. By tapping the buttons below the chart, the data display of each Inclinator can be adjusted:

- **X & Y:** Displays the value curve of the calculated resulting inclination angle in [°] (see for details [4.10.3.3 Resulting Angle of Inclination](#))
- **X:** Displays only the X component of the measurement
- **Y:** Displays only the Y component of the measurement
- **OFF:** Data curve is not displayed

Die **Magenta-farbene Linie** stellt die eingestellte Alarmgrenze der Inclinator dar.

4.9.6 Anemometer

This page displays in a line chart the entire recorded measurement history of all participating Anemometers in the measurement.

By tapping the buttons below the chart, the data display of each Anemometer can be adjusted:

- **Speed:** Displays the data curve of the wind speed in [m/s]
- **Direction:** Displays the data curve of the wind direction in [°]
- **OFF:** No data curve will be displayed

4.10 Additional Information / Background processes

4.10.1 Wireless Communication Interruption

The Bluetooth connection between the mobile device or PC and the PTQ radio gateway can be affected by various external factors and, in the worst case, interrupted. This can be recognized by the **signal strength icon** in the header of the app (refer to [4.3.1 General](#)) or by missing measurement data. The reasons for this could be:

- Too much distance between the mobile device and the PTQ Com Unit
- Obstacles between the mobile device and the PTQ Com Unit
- Empty battery of the PTQ Com Unit
- Radio interference caused by external sources
- Standby or Sleep Mode for mobile devices or PC

If the connection is briefly interrupted (for a few seconds), it will automatically be reestablished once the disrupting influence vanishes. In this case, a running measurement will continue, and only a few data points might have been lost.

If the connection is interrupted for a longer time, the app attempts to restore the connection every 10 seconds. However, in this situation, the PTQ Com Unit will have automatically stopped a running measurement. Therefore, it will need to be restarted.

The reasons mentioned above for broken wireless connections also apply to connections between the radio gateway and modules. In the case of an interruption, the modules and the gateway will autonomously try to restore the connection. A running measurement does not terminate; only the data from the disrupted modules will be missing.

To avoid connection problems, the following measures can be taken:

- Fully charge all devices before use
- Keep distances as short as possible
- Place devices relative to each other to avoid radio shadows caused by obstacles (buildings, vehicles, trees)
- Switch to a cable connection between the PTQ Com Unit and the modules
(refer to [3.1.6 Cables](#))
- Switch to a **USB cable** connection between the PTQ Com Unit and the PC
(refer to [3.1.6 Cables](#))
- Deactivate or greatly increase standby times or change energy saving settings of the mobile device or PC

4.10.2 Vibration Alert

During an ongoing measurement, if the reading of any of the sensor modules exceeds the set alarm limit, this event will not only be graphically displayed on the live data pages, but it will also trigger the **vibration alert on the mobile device** (if available).

A disrupted connection to individual sensor modules also triggers the vibration alarm.

4.10.3 Internal Calculations

4.10.3.1 Max. pulling force

The app automatically calculates the maximum applied pulling force during the measurement. The algorithm is designed to detect the typical plateau at the top end of the stress curve and positions the point of maximum force just behind the first peak after reaching the plateau. The result then averages the measured force over a 5-second window around this point.



This means for optimal calculation, the tree pulling test should involve creating such a plateau. To do this, pull the tree to the maximum intended load and maintain the tensile force there for approximately 10 seconds before releasing the tree.

4.10.3.2 Rope Angle

The app automatically calculates the rope angle present during the range of the maximum applied pulling force. The algorithm uses the time frame before the previously determined maximum pulling force and averages the rope angle measurements over a 5-second window around that point.

4.10.3.3 Resulting Angle of Inclination

The inclinometers measure the angle of inclination through the two horizontal, orthogonal vector components. These two measurements are saved in the measurement data files as X and Y values. However, for the sake of simplicity during live measurement display, only the resulting angle of inclination from these two components is shown.

The calculation is performed using the Pythagorean theorem:

$$\alpha = \sqrt{x^2 + y^2}$$

In the results graph, users can switch between the resulting angle of inclination and the individual X and Y components.

Within the resulting measurement data file, the X and Y components of the inclinometer are listed separately. This allows determining the actual direction of inclination relative to the direction of the rope, together with the attachment angle of the inclinometer (refer to section [4.5.3 Compass Measurement Tool](#)).

4.11 Data Management

4.11.1 Project Structure

The software automatically generates an organized project structure, where all components of a project (project data, tree data, measurement setup data, photos, measurement data) are arranged.

This project structure is identical in both the **app** and **PC software**. The only difference lies in the location of the projects depending on the platform used. See the following chapter [4.11.2 Data Transfer](#) for more details.

The main folder in the **app** is always called **PicustQdata**. Within it, a subfolder (the project folder) is created for each project. The structure appears independent of the platform and is as follows:

- **DATE_TIME_PROJECTNAME**
 - The folder name is derived from the creation date (YYMMDD), creation time (HHMMSS), and the entered project name.
 - Within each project folder, additional subfolders and a file are created:
 - **project.json**
 - This file contains all user-input data related to the project and the tree under investigation.
 - **CrownPics**
 - This directory stores all crown images captured with the app.
 - The naming convention for crown images is derived from the date (YYMMDD) and time (HHMMSS) of capture: **Crown_DATE_TIME.png**
- **SETUP-NAME**
 - For each measurement setup created within this project, a subfolder (the setup folder) is established. The folder name is generated from the inputted name.
 - Each setup folder contains another subfolder and various files:
 - **setup.json**
 - This file contains all user-input data related to the measurement setup.
 - **SetupPics**
 - This directory stores all documentation images of the setup captured with the app.
 - The naming convention for setup images is derived from the date (YYMMDD) and time (HHMMSS) of capture: **Setup_DATE_TIME.png**
- **NAME_TIME.txt**
 - For each measurement conducted within this project and with this setup, a measurement data file is generated. This file contains the recorded measurement values.
 - The filename is derived from the measurements name entered in the software and the start time (HHMMSS).
 - This file is compatible with the *Arbostat measurement data file format*.

4.11.2 Data Transfer

The project structure created by the software is designed to consolidate all data related to a project, particularly with an eye toward later evaluation in the context of a tree assessment.

Therefore, it's highly recommended that when copying/moving measurement data between a mobile device and a PC or MAC, you should always copy the entire project folder of your project.

When using the IML Cloud, this process occurs automatically.

4.11.2.1 From Android via USB cable to PC

Connect your mobile device to a PC using a USB cable. Pay attention to your mobile device's display; you may need to confirm that data exchange with the PC is allowed. Next, navigate to the data folder of the IML TreeQinetic App on your mobile device in the file browser you're using (e.g., Windows Explorer) on. You can find the path to this folder within the IML TreeQinetic App on the Settings page ([4.4 Settings](#)).

Searching for this path:

- On the device itself:
 - Open the file explorer of your device (on Samsung, for example, use the **My Files** app).
 - Select **Internal Storage**. Then navigate to the shown directory, typically:
**\Internal storage\Android\data\
de.iml_electronic.IMLTreeQinetic\files\Documents\Projects**
- On Windows, when the device is connected via USB to the PC:
 - Open the File Explorer on your PC.
 - Navigate to your device node and open it
 - It should automatically show the **Internal storage** location.
 - Then navigate to the shown directory, typically:
**\Internal storage\Android\data\
de.iml_electronic.IMLTreeQinetic\files\Documents\Projects**

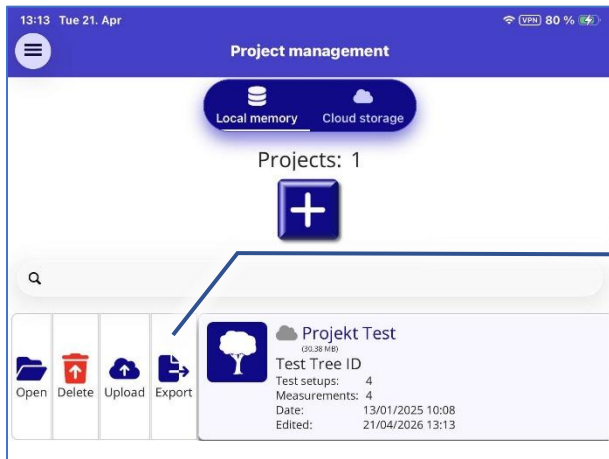
As described in section [4.11.1 Project Structure](#), this folder contains the project folders of all the projects you've created using the IML TreeQinetic App. Now, simply copy or move the project folders of the projects you wish to further process to your PC's hard drive.

NOTE With older versions of Android, it might be necessary to restart the phone for the main folder to become visible on the PC.

4.11.2.2 Transferring from iOS via USB cable to a MAC

On Apple mobile platforms running iOS, the data is initially stored in the app's internal sandbox folder. As a user, you typically do not have access to this sandbox. To make the data available for transfer, it must first be packaged for transmission and exported from the sandbox.

The export is carried out in the project management interface via the context menu of the relevant project.



The entire folder structure of the project is zipped and exported from the sandbox folder.

Then connect your Apple mobile device to a MAC using a USB cable.

Navigate through the file browser you're using (e.g., Finder) to access your mobile device (located under **Locations**). Switch to the **Files** tab where all the apps sharing files are listed. Open the entry for the **IML TreeQinetic** App. Here, you'll find the zip-file named after the project.

4.11.2.3 Through the IML Cloud

The project management section is divided into two areas:

Local Storage: All projects that are stored on the device. All newly created projects are initially local.



New Project creates an empty project

Cloud storage: all online-stored projects in your personal IML Cloud.



The **Refresh** button synchronizes the project overview with the current cloud state, but the projects themselves are *not* downloaded.

Data stored in the cloud must always be downloaded before it can be edited.

To transfer files between the cloud and local storage, first open the project management. Open the context menu of the project you want to upload. In the context menu, select the option **Upload** or **Download**. The entire project will then be transferred to the respective storage location.

For traceability of the editing, in the project list, in addition to the name, the creation date and the last edit date are displayed. Additionally, a small icon indicates the synchronization status between local and cloud storage.



There is also a local copy of the cloud project



There is also a copy of the local project in the cloud

The colour of the icons indicates which project is more recent:

- **Green**: This project is more recent than the copy in the other storage.
- **Orange**: This project is less recent than the copy in the other storage.
- **Blue**: Both projects are identical.
- **No icon**: The project does not exist in the other storage.

Multiple projects with identical names can exist. Internally, these are differentiated by considering the creation date (which is automatically appended to the project folder name).

If a project already present in the other storage is copied again, only the files that are not identical are updated. The modification date is not taken into account. Therefore, it is theoretically possible for an older project version to overwrite a newer one uploaded by another user.

To keep data as consistent as possible, follow these steps:

- If the cloud project is more recent, always create a copy in local storage first.
- Edit the project locally.
- Upload the local project *immediately* after editing.

4.11.2.4 File Storage on the PC

Within the PC software, you have the freedom to choose the location where projects are stored. The default storage path is:

C:\Users\USERNAME\Documents\PicusTQdata

The project storage path can be changed under **Settings** (refer to section [4.4 Settings](#)).

4.11.3 Compatibility with Arbostat

The classic PC software for analysing tree pulling test data captured with the PiCUS TreeQinetic measurement system is Arbostat. The measurement data files generated by IML TreeQinetic conform to the format expected by Arbostat and are therefore completely compatible.

The only difference is that now, the data from all tree pulling tests performed with the new software is already organized in a well-structured, convenient project format. Thus, it's no longer necessary to manually compile and sort the measurement data from a laptop, documentary photos from a camera, and any handwritten notes.

So, if you want to process a measurement from one of your projects in Arbostat, navigate to the respective project folder for importing measurement data and then to the subfolder of the setup you used for that measurement. There, you'll find the saved measurement data files, which you can import into Arbostat as usual (see also [4.11.1 Project Structure](#)). Additionally, all captured crown photos are available in the project folder, within the **CrownPics** subfolder.

5. Technical Information

5.1 PTQ Com Unit

Property	Value
general	
Weight	690 g
Dimensions	240 mm x 110 mm x 35 mm
Battery	
Type	Nickel-metal hydride batteries (Ni-Mh)
Capacity	2000 mAh/ 1,2 V (2,4 Wh)
Brand	Panasonic Eneloop BK-3MCCF
Quantity / total Capacity	4 pcs a 2,4 Wh (sum: 9,6 Wh)
Operation time (Average under typical operation conditions)	Approx. 10 hours
Max. charge current	800 mA
Charge duration	Approx. 2,5 h
Recommended charging temperature	5 - 35 °C (ambient temperature)
Max. charging temperature	0 - 40 °C (ambient temperature)
Communication	
To the mobile device	Bluetooth 5.0 (in limited fashion also 4.2) Long-Range-Mode dependant on mobile device
To the PC	USB 2.0 / Bluetooth 5 - USB-Dongle or internal BT-module
range	With free line of sight Long Range up to 50m Short Range up to 10m
Charging channels	
3 charging channels for external modules	800 mA each

5.2 PTQ Forcemeter

Property	Value
general	
Weight	1970 g
Dimensions	235 mm x 75 mm x 60 mm
Battery	
Type	Nickel-metal hydride batteries (Ni-Mh)
Capacity	2000 mAh/ 1,2 V (2,4 Wh)
Brand	Panasonic Eneloop BK-3MCCF
Quantity / total Capacity	2 pcs a 2,4 Wh (sum: 4,8 Wh)
Operation time (Average under typical operation conditions)	Approx. 15 h
Charging	Through PTQ Com unit or PTQ Hub
Max. charge current	800 mA
Charge duration	Approx. 2,5 h
Recommended charging temperature	5 - 35 °C (ambient temperature)
Max. charging temperature	0 - 40 °C (ambient temperature)
Measurement	
Accuracy pulling force	0,3 kN
Resolution pulling force	0,01 kN
Measurement range pulling force	0 - 60 kN
Accuracy rope angle	1° (in range of 0 - 30°)
Resolution rope angle	0,1°
Measurement range rope angle	0 - 90°
Operating temperature	-20 - +50 °C
Accuracy voltage measurement	0,01 V
Communication	
Wireless connection to PTQ Com Unit	868 MHz, 14 dBm, 115,2 kbps Range with free line of sight > 150 m

5.3 PTQ Inclinometer

Property	Value
general	
Weight	280 g
Dimensions	140 mm x 60 mm x 55 mm
Battery	
Type	Nickel-metal hydride batteries (Ni-Mh)
Capacity	2000 mAh/ 1,2 V (2,4 Wh)
Brand	Panasonic Eneloop BK-3MCCF
Quantity / total Capacity	2 pcs a 2,4 Wh (sum: 4,8 Wh)
Operation time (Average under typical operation conditions)	Approx. 15 h
Charging	Through PTQ Com unit or PTQ Hub
Max. charge current	800 mA
Charge duration	Approx. 2,5 h
Recommended charging temperature	5 - 35 °C (ambient temperature)
Max. charging temperature	0 - 40 °C (ambient temperature)
Measurement	
Accuracy angle measurement	0,005°
Resolution angle measurement	0,002°
Measurement range angle measurement	+/- 30°
Operating temperature	-20 - +50 °C
Accuracy voltage measurement	0,01 V
Communication	
Wireless connection to PTQ Com Unit	868 MHz, 14 dBm, 115,2 kbps Range with free line of sight > 150 m

5.4 PTQ Elastometer

Property	Value
general	
Weight	590 g
Dimensions	220 mm x 60 mm x 38 mm
Distance between Elastometer needles	200 mm
Battery	
Type	Nickel-metal hydride batteries (Ni-Mh)
Capacity	2000 mAh/ 1,2 V (2,4 Wh)
Brand	Panasonic Eneloop BK-3MCCF
Quantity / total Capacity	2 pcs a 2,4 Wh (sum: 4,8 Wh)
Operation time (Average under typical operation conditions)	Approx. 15 h
Charging	Through PTQ Com unit or PTQ Hub
Max. charge current	800 mA
Charge duration	Approx. 2,5 h
Recommended charging temperature	5 - 35 °C (ambient temperature)
Max. charging temperature	0 - 40 °C (ambient temperature)
Measurement	
Accuracy distance measurement	1 µm
Resolution distance measurement	0,1 µm
Measurement range distance measurement	+/- 2000 µm (= +/- 2 mm)
Operating temperature	-20 - +50 °C
Accuracy voltage measurement	0,01 V
Communication	
Wireless connection to PTQ Com Unit	868 MHz, 14 dBm, 115,2 kbps Range with free line of sight > 150 m

5.5 PTQ Overload indicator

Property	Value
general	
Weight	280 g
Dimensions	140 mm x 60 mm x 55 mm
Battery	
Type	Nickel-metal hydride batteries (Ni-Mh)
Capacity	2000 mAh/ 1,2 V (2,4 Wh)
Brand	Panasonic Eneloop BK-3MCCF
Quantity / total Capacity	2 pcs a 2,4 Wh (sum: 4,8 Wh)
Operation time (Average under typical operation conditions)	Approx. 20 h
Charging	Through PTQ Com unit or PTQ Hub
Max. charge current	800 mA
Charge duration	Approx. 2,5 h
Recommended charging temperature	5 - 35 °C (ambient temperature)
Max. charging temperature	0 - 40 °C (ambient temperature)
Communication	
Wireless connection to PTQ Com Unit	868 MHz, 14 dBm, 115,2 kbps Range with free line of sight > 150 m

5.6 Bluetooth 5 - USB-Dongle

Property	Value
Dimensions	68 mm x 25 mm x 10mm
Wireless standard	Bluetooth 5
compatibility PTQ Com Unit	Only PTQ Com Units with serial numbers ending on -BT5
Drivers	FTDI-USB-driver (on the Software Stick) manual installation might be necessary under Windows 7

5.7 PTQ case

Property	Value
dimensions	Ca. 500 mm x 400 mm x 200 mm
Weight, empty	Ca. 2,7 kg
Weight, with full Starter-Kit	Ca. 11 kg

5.8 Requirements mobile devices

Platform	Android - devices	Apple - devices
Operating system	Android 8 or newer	iOS 12.2 or newer
Hardware	Bluetooth 5.0 for maximum Range (Long-Range-Modus up to 50 m) Bluetooth 4.2 (minimum requirement, up to 10 m range) GPS recommended Camera recommended	
Free disk space	100 MB	100MB

5.9 Requirements PC

Operating system	Windows 10 (Version 2004), Windows 11
Hardware	Processor 1GHz (Intel recommended / x86 Processor architecture) minimum 1GB RAM (8 GB recommended) USB 2.0 or newer
Free disk space	100 MB (potentially more for .net 4.7.2 Runtime)
Registration	Internet connection recommended After registration fully usable offline



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DATE: 02.01.2025

Tel.: +49 381 49681440

CE-Declaration of Conformity for PiCUS Measurement Instruments

contact@iml-electronic.de
www.iml-electronic.de

Datum: 02.01.2025

Product: PiCUS Sonic Tomograph

PiCUS TreeMotion Sensor Online
PiCUS TreeQinetic
PiCUS Calliper
PiCUS TreeMotion Sensor
PiCUS TreeTronic
PiCUS Tension

PiCUS Tension Automatic Watering
PiCUS Wind Measurement System

We declare under our sole responsibility that these products to which this declaration relates is in conformity with the standards

EN 61000-6-3
EN 55014-1
EN 55014-2
EN 55032 VDE 0878-32
EN 300220-1
IEC 61010-1 (2010)

following the provisions of:

Directives Electromagnetic compatibility 2014/30 EU
Radio equipment 2014/53/EU
Low Voltage Directive 2014/35 EU

Fabian Hunger

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DATE: 02.01.2025

Tel.: +49 6222 6797-17

Date
02. Januar 2025

UKCA-Declaration of Conformity for PiCUS Measurement Instruments

Product: PiCUS Sonic Tomograph
PiCUS TreeMotion Sensor Online
PiCUS TreeQinetic
PiCUS Calliper
PiCUS TreeMotion Sensor
PiCUS TreeTronic
PiCUS Tension
PiCUS Tension Automatic Watering
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Directives Electromagnetic compatibility 2014/30 EU
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Low Voltage Directive 2014/35 EU

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With Passion and Precision

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