



AUTOMATED ENVIRONMENTAL MONITORING NETWORKS

User Manual

Aquatos nano

Compact Submersible Mini-Logger · Pressure and Temperature Measurement

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Issue: April 2026 · Document No. TT-ANL-ANA-001

Table of Contents

I Disclaimer

II Safety Instructions

III Specific Safety Instructions

Part 1 Scope of Delivery

Part 2 Introduction

- 2.1 Area of Application
- 2.2 Intended Use
- 2.3 Features and Unique Selling Points

Part 3 Installation

- 3.1 Mechanics and Housing
- 3.2 Inserting Batteries
- 3.3 Installation in the Measurement Pipe / Gauge Point
- 3.4 Initial Commissioning

Part 4 Configuration

- 4.1 Establishing Bluetooth Connection (Bluetooth app)
- 4.2 Setting Measurement Interval and Parameters
- 4.3 Configuration with BlueShell (PC)

Part 5 Operation

- 5.1 Starting and Monitoring Measurements
- 5.2 Reading Measurement Data via BLE
- 5.3 Data Export to Sensor Manager

Part 6 Maintenance

- 6.1 Cleaning the Measurement Probe
- 6.2 Replacing Batteries

Part 7 Troubleshooting

Part 8 Repair and Return

Part 9 Technical Data

- 9.1 Mechanics
- 9.2 Electrical / Power Supply
- 9.3 Measurement
- 9.4 Communication
- 9.5 Environmental Conditions

Part 10 Operator Obligations and Disposal

Contact

I Disclaimer

The information contained in this manual corresponded to the state of the art at the time of publication. Subsequent updates are possible. This manual does not cover all details of the construction, production or variants of the device and does not cover every possible situation that may arise during installation, operation or maintenance.

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II Safety Instructions

Read the user manual including all operating instructions completely before installing, connecting and commissioning the AquatOS nano. The manual describes the intended operation of the product. It is intended for qualified technical personnel who are familiar with and trained in the installation, assembly, commissioning and operation of such measuring instruments.

Note: Keep this manual for the entire service life of the device. Pass on the device only together with this manual.

Safety Symbols in this Manual

Warning: Indicates a potentially hazardous situation which, if not observed, may result in property damage or malfunction.

Note: Useful information for operating or protecting the device.

General Safety Rules

- Use the device only as intended.
- Check the device for external damage before installation. Do not commission a damaged device.
- Have repairs carried out exclusively by TerraTransfer or authorised specialist personnel.
- Unauthorised modifications to the device void the warranty.

III Specific Safety Instructions

Batteries

Warning: Incorrectly inserted batteries can damage the device. Use only lithium batteries of the recommended type. Do not short-circuit, throw into fire or mechanically damage batteries.

- Remove depleted batteries immediately to prevent leakage.
- Dispose of batteries properly in accordance with local regulations (not in household waste).

Pressure and Waterproofness

Warning: Do not exceed the maximum measuring pressure (nominal measuring range). Overpressure can permanently damage the pressure diaphragm.

- Do not use the device in media that exceed the nominal measuring range.
- After a fall or mechanical impact, check for tightness before submerging the device again.

ESD — Electrostatic Discharge

Note: The device contains sensitive electronic components. When opening the battery cover, ensure an ESD-safe working environment.

Chemical Resistance

The measuring probe is designed for use in clean groundwater, surface water and slightly contaminated water bodies. Highly aggressive media (acids, alkalis, solvents) can attack the housing and pressure diaphragm.

Part 1 Scope of Delivery

Standard Scope of Delivery

- Aquatots nano — submersible mini-logger (1" version)
- Cable with end cap (length as ordered)
- Lithium battery (inserted or enclosed depending on shipping regulations)
- Quick-start guide (printed)

Optional Accessories

- Extension cables in customer-specific lengths
- Protective cage for the pressure diaphragm
- Mounting clip and cable tie set for installation pipes

Note: Check the scope of delivery immediately upon receipt for completeness and integrity. Report damage immediately to the carrier and TerraTransfer.

Part 2 Introduction



Figure 1: Aquatots nano — compact 1" submersible probe with integrated sensor, data logger and BLE radio.

2.1 Area of Application

The Aquatots nano is a compact submersible mini-logger for the continuous measurement of water level (pressure) and water temperature. Typical areas of application include:

- Groundwater monitoring in observation wells and gauges
- Water level measurement at rivers and lakes
- Flood early warning systems
- Temporary measurement campaigns and scientific studies

2.2 Intended Use

The Aquatots nano is intended exclusively for use in aqueous media within the specified measuring pressure range and temperature range. Any other use is considered unintended. TerraTransfer accepts no liability for damage resulting from unintended use.

Warning: Do not use the Aquatots nano for safety-relevant applications that cannot tolerate device failure without compensatory measures.

2.3 Features and Unique Selling Points

All-in-one design: Sensor, data logger and Bluetooth communication in a compact 1" submersible probe — no external logger housing required.

Wireless readout: Measurement data is transferred via Bluetooth Low Energy (BLE) to smartphone, tablet or PC. No opening, no cable.

Long service life: Optimised ultra-low-power operation with standby current $<10 \mu\text{A}$ — years of runtime with a single lithium battery.

Browser-based configuration: The Bluetooth app runs directly in the browser (Chrome, Edge) — no app download required.

Robust construction: Stainless steel housing, IP68, suitable for permanent submersion.

Part 3 Installation

3.1 Mechanics and Housing

The Aquatots nano consists of a one-piece 1" stainless steel sleeve. The pressure diaphragm is located at the probe tip. The cable is permanently connected to the probe and also serves as strain relief during installation.

Note: The cable must not be used as the sole load-bearing element if the weight of the device plus cable exceeds the specified tensile strength. For long cables, use a separate suspension (e.g. stainless steel wire rope).

3.2 Inserting Batteries

The Aquatots nano is supplied with a pre-installed or enclosed lithium battery. Batteries are inserted on site due to transport regulations.

1. Unscrew the battery cover at the upper end of the probe with the enclosed tool.
2. Insert the battery into the battery compartment. Observe correct polarity (marking in the housing).
3. Check the sealing ring: clean, undamaged, correctly seated.
4. Screw the cover on firmly until it is flush. Do not overtighten.
5. Hold the device briefly near a BLE receiver — the logger announces itself automatically after inserting the battery.

Warning: Use only lithium batteries of the type recommended by the manufacturer. Incorrect battery types can damage the logger or negate the IP68 protection rating.

3.3 Installation in the Measurement Pipe / Gauge Point



Figure 2: Installation of the Aquatots nano in a groundwater observation pipe — cable remains slack, probe is lowered slowly.

The Aquatots nano is suitable for installation in observation pipes with an inner diameter $\geq 1\frac{1}{4}$ inch (32 mm). Recommended procedure:

6. Cut the cable to the desired immersion depth plus safety reserve (≥ 0.5 m) or order from the factory in the correct length.
7. Lower the probe slowly into the pipe. Ensure that the cable is not twisted.
8. Secure the cable at the pipe end (cable tie, clamp) and protect it from mechanical stress.
9. Record the immersion depth. It is needed for pressure correction and zero point setting.

Note: The probe diaphragm is pressure-sensitive. Do not strike or knock the probe tip during installation.

3.4 Initial Commissioning

After inserting the battery, the Aquatots nano starts automatically. It is visible in BLE advertising mode and can be connected immediately via the Bluetooth app. A zero-point calibration is recommended for relative pressure sensors after installation.

Part 4 Configuration

4.1 Establishing Bluetooth Connection (Bluetooth app)

The Bluetooth app is the recommended configuration and readout method for the AquatOS nano. It runs directly in the browser — no download or installation required.

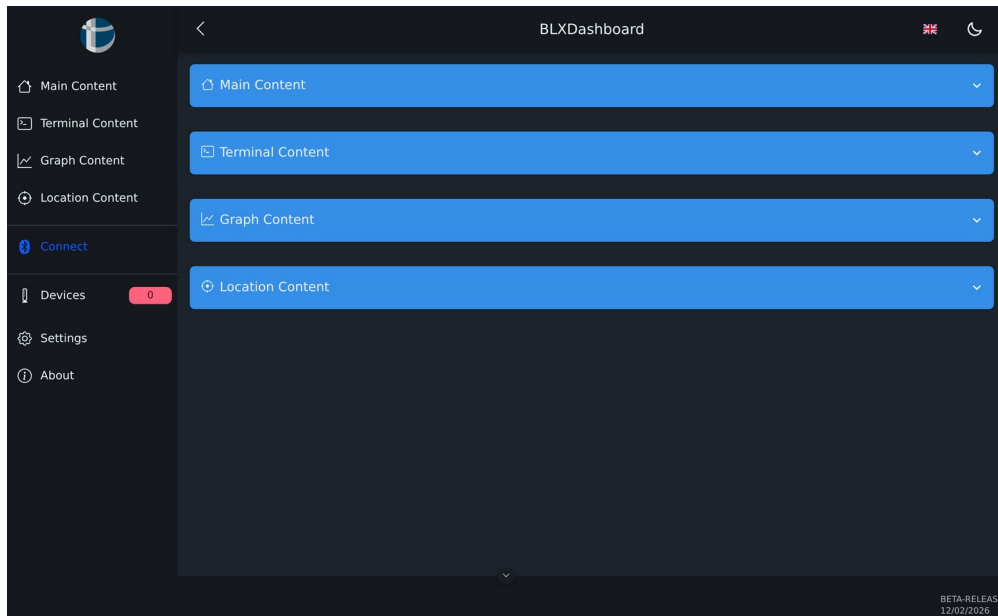


Figure 3: Bluetooth app home view in browser — navigation on the left, "Connect" button and content areas.

URL: <https://ltxdata.net/ttblx/>

Supported browsers: Google Chrome and Microsoft Edge (desktop and Android). On iOS, the Bluefy browser is required.

10. Open the Bluetooth app in the browser.
11. Click "Connect device" and select the AquatOS nano from the displayed device list.
12. Confirm the BLE PIN (factory default: stated on the enclosed data sheet).
13. After a successful connection, the app displays the current measurement value, battery status and logger configuration.

Note: For the BLE connection, Bluetooth must be enabled on the end device and the browser must have been granted Bluetooth access. On Android, location permission may be required.

4.2 Setting Measurement Interval and Parameters

The following parameters can be configured via the Bluetooth app:

- Measurement interval (1 minute to 24 hours, freely selectable)
- Device name and location designation
- Pressure unit (mbar, mH₂O, hPa)

- Zero-point correction (offset for water level calculation)
- BLE PIN (6–16 digits, freely definable)

Note: Shorter measurement intervals increase data density but reduce battery life. For long-term groundwater monitoring, we recommend 15–60 minutes.

4.3 Configuration with BlueShell (PC)

BlueShell is a Windows desktop application for advanced BLE configuration, firmware updates and diagnostics. It can be used as an alternative to the Bluetooth app and provides terminal access to the device console.

BlueShell is available on request from TerraTransfer (free, Windows 10/11).

After connecting to the device, all configuration parameters are available in the terminal window via command line. Detailed commands can be found in the BlueShell help (command: "?").

Part 5 Operation

5.1 Starting and Monitoring Measurements

The Aquatots nano starts measurements automatically after inserting the battery according to the configured measurement interval. A manual start is not required. The LEDs on the housing signal the operating status (details see Troubleshooting).

Measurement values are recorded in the internal memory of the logger. The memory holds several hundred thousand measurement series. When the memory is completely full, the oldest entries are overwritten (ring buffer).

5.2 Reading Measurement Data via BLE

Reading the stored measurement data is done exclusively via Bluetooth — the device has no cable connection for data communication.

14. Approach the probe to within a few metres with the smartphone or laptop (BLE range typically 10–30 m in open field, less in narrow pipes).
15. Connect the Bluetooth app to the device (see Part 4.1).
16. Select "Download data". The app transfers all new measurement values since the last readout.
17. The data is available in the app for viewing and CSV export.

Note: For deep wells (> 30 m), the BLE range of the cable cannot be used as an antenna extension. In this case, we recommend temporarily raising the probe to a readable depth for readout or using an external BLE relay station.

5.3 Data Export to Sensor Manager

The Sensor Manager is the TerraTransfer web portal for centralised data management, visualisation and archiving. For the Aquatots nano (offline logger), data import is done manually via CSV upload or via direct Bluetooth app synchronisation.

- CSV export from Bluetooth app → import into Sensor Manager via "Upload file"
- Alternative: automated import via FTP (configuration by TerraTransfer on request)

Access: www.terratransfer.de/sensormanager (access credentials provided by TerraTransfer)

Part 6 Maintenance

6.1 Cleaning the Measurement Probe

The AquatOS nano requires little maintenance. However, regular inspection and cleaning improves measurement accuracy, particularly when the pressure diaphragm becomes silted up.

18. Remove the probe from the installation location.
19. Clean the exterior with clean water and a soft brush.
20. Rinse the pressure diaphragm at the probe tip only with water — no cleaning agents, no sharp objects.
21. Take this opportunity to check the sealing ring on the battery cover and re-grease with silicone grease if necessary.

Warning: Do not use high-pressure cleaners or solvents. The pressure diaphragm can be permanently damaged by mechanical pressure and aggressive chemicals.

6.2 Replacing Batteries

The recommended battery replacement interval is 5–10 years depending on the measurement interval and ambient temperature. The Bluetooth app shows the current battery status (voltage and remaining capacity as a percentage).

22. Remove the probe from the installation location.
23. Unscrew the battery cover.
24. Remove the depleted battery and dispose of it properly.
25. Insert a new lithium battery (observe polarity).
26. Clean and inspect the sealing ring. Replace if worn (spare part available from TerraTransfer).
27. Screw the cover on firmly. Then check for tightness (brief immersion test in clean water).

Note: Record the date of battery replacement in the device master data of the Sensor Manager or in a maintenance log.

Part 7 Troubleshooting

The following table describes common problems and their remedies.

| Problem | Possible cause and action |
|--|---|
| Device not visible in BLE list | Insert / replace battery. Check Bluetooth on the end device. Reduce distance. Check browser permissions. |
| Connection drops | Distance too great (> 10 m in pipes). Other BLE devices nearby may interfere. Reconnect. |
| Incorrect PIN rejected | Take PIN from device documentation. After 3 failed attempts: time lock active. Wait briefly, then try again. |
| Measurement value deviates | Pressure diaphragm dirty → clean. Check zero-point offset. Compare immersion depth with calculation. |
| Bluetooth app does not load | Use Chrome or Edge. JavaScript and Web Bluetooth must be active. Reload the page. |
| Battery depleted after short time | Measurement interval too short (< 5 minutes) or BLE connection permanently open. Increase interval, disconnect after readout. |
| Sealing ring leaks | Cover not tight enough. Sealing ring defective → replace. Send device to TerraTransfer for inspection. |

For problems that cannot be resolved using the above table, please contact TerraTransfer support (contact details on the last page).

Part 8 Repair and Return

Repairs to the Aquatos nano may only be carried out by TerraTransfer or specialist personnel authorised by TerraTransfer. Unauthorised interventions in the interior of the device (beyond battery replacement) void the warranty.

RMA Process (Return Merchandise Authorisation)

28. Contact TerraTransfer (contact details on the last page) and describe the defect.
29. You will receive an RMA number. Mark this clearly on the shipment.
30. Pack the device securely, avoiding impacts to the pressure diaphragm.
31. Send the shipment to TerraTransfer GmbH, Ottostraße 19a, 44867 Bochum, Germany.
32. After diagnosis you will receive a quotation or the repaired device returned.

Note: Always send the device with a brief description of the fault. This significantly speeds up diagnosis.

Part 9 Technical Data

9.1 Mechanics

| Property | Value |
|------------------------|---|
| Form factor | 1" submersible probe (stainless steel) |
| Diameter | 25.4 mm (1 inch) |
| Protection class | IP68 (permanently submersible) |
| Housing material | Stainless steel AISI 316L |
| Cable material | PVC-sheathed, strain-relieved |
| Standard cable lengths | 5 m, 10 m, 20 m, 30 m (custom lengths on request) |
| Weight (without cable) | approx. 130 g |

9.2 Electrical / Power Supply

| Property | Value |
|-------------------------|--|
| Battery | Lithium thionyl chloride (Li-SOCl ₂), 1 cell |
| Battery voltage | 3.6 V |
| Standby current | < 10 µA (ultra-low-power) |
| Operating voltage range | 2.8 V – 3.6 V |
| Service life (typical) | Up to 10 years (at 15-minute measurement interval, +20 °C) |
| Battery replacement | By user, tool enclosed |

9.3 Measurement

| Property | Value |
|-----------------------------|--|
| Measured variables | Relative pressure (water level) and water temperature |
| Pressure measuring range | 0–10 m H ₂ O (standard) · 0–20 m H ₂ O · 0–30 m H ₂ O · 0–100 m H ₂ O (on request) |
| Pressure accuracy | ± 0.15 % FS (Full Scale) |
| Temperature measuring range | –10 °C to +60 °C |
| Temperature accuracy | ± 0.1 °C |
| Measurement interval | 1 minute to 24 hours (freely configurable) |
| Storage capacity | > 200,000 measurement series (internal ring buffer) |

9.4 Communication

| Property | Value |
|---------------------------|--|
| Radio | Bluetooth Low Energy (BLE) 5.0 |
| Range (open field) | Up to 50 m (device and environment dependent) |
| Authentication | PIN protection with PIN (6–16 digits) |
| Encryption | TLS (BSI recommended) |
| Configuration | Bluetooth app (browser) or BlueShell (Windows) |
| Mobile network | Not available (offline logger) |

9.5 Environmental Conditions

| Property | Value |
|------------------------------|--|
| Operating temperature | –10 °C to +60 °C |
| Storage temperature | –20 °C to +70 °C (without battery) |
| Protection class | IP68 |
| Operating medium | Fresh water, slightly contaminated water (not suitable for salt water) |
| Certifications | CE (RED 2014/53/EU, EMC 2014/30/EU) · RoHS-compliant |

Part 10 Operator Obligations and Disposal

Operator Obligations

The operator is obliged to operate the device only as intended, to carry out regular maintenance and to keep a maintenance log. Defective devices must not continue to be operated.

Disposal — EU WEEE Directive

In accordance with the EU WEEE Directive (2012/19/EU), old devices must be disposed of separately from household waste. Return old devices to municipal collection points or to TerraTransfer for proper disposal.

Battery Disposal

Depleted lithium batteries must not be placed in household waste. They must be returned to collection points at retail outlets or municipal collection points. The symbol of the crossed-out wheeled bin on the battery indicates the obligation to return it.

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