



Aquatos mini

User Manual

AUTOMATED ENVIRONMENTAL MONITORING NETWORKS

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I Disclaimer

This user manual is part of the product documentation for the AquatOS mini data logger manufactured by TerraTransfer GmbH. All information in this document was prepared with the greatest possible care and reflects the state of knowledge at the time of publication. TerraTransfer GmbH reserves the right to make technical changes without prior notice.

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II General Safety Instructions

Please read all safety instructions before commissioning the device.

- Use the device only for its intended purpose and within the specified operating ranges (see Section 9, Technical Data).
- Installation, maintenance and decommissioning must be carried out by trained and qualified personnel.
- Do not open the hermetically sealed pressure housing. Opening it will void the warranty and can permanently damage the electronic components.
- The device must not be operated in explosive atmospheres (ATEX zones) unless this has been explicitly approved for the respective device variant.
- Protect the device from mechanical impacts, especially on the pressure membrane of the sensor.
- Observe all applicable national and local regulations, particularly with regard to installation in public water bodies.

III Product-specific Safety Instructions

Lithium Battery

Warning: The device is powered by a lithium thionyl chloride (Li-SOCl₂) battery. Lithium batteries must not be short-circuited, thrown into fire, mechanically deformed or opened. Dispose of used batteries in accordance with local regulations — do not dispose of them in household waste. When replacing the battery, use only approved equivalent types (e.g. SAFT LSH 20).

Pressure Housing and Sensors

Warning: Never apply tools directly to the pressure membrane of the sensor. Even slight mechanical damage can lead to complete failure of the sensor element. Do not use aggressive cleaning agents, solvents or high-pressure cleaners.

Stainless Steel Sleeve

The stainless steel sleeve (AISI 316Ti / 1.4571 or 1.4404) is designed for permanent immersion. Inspect the sleeve and cable entry seals at regular intervals for mechanical damage and seal integrity.

1 Scope of Delivery

1.1 Standard Equipment

- AquatOS mini data logger (with integrated pressure sensor, pre-installed battery, Wago terminal connections already wired)
- Stainless steel sleeve 2"
- Sensor cable, pre-fitted (length as ordered)
- Printed quick-start guide
- TerraTransfer Inspection Certificate

1.2 Optional Accessories

- Well cap adapter 2" (for well head mounting)

- Cable strain relief and clamping fitting for sensor cable
- Replacement battery SAFT LSH 20 (Li-SOCl₂, D-size, 3.6 V)
- Additional sensors for SDI-12 bus: pulse counter type 0330, temperature string, Modbus converter type 0210

2 Introduction

2.1 Application Range

The Aquatots mini is a compact, battery-operated data logger for continuous measurement of hydrostatic water levels in groundwater monitoring wells and surface water installations. Due to its hermetically sealed stainless steel housing, it is particularly well suited for long-term measurements under demanding environmental conditions.

Typical application areas include: groundwater monitoring, surface water level measurement, flood forecasting, environmental monitoring and water quality management.

2.2 Product Features

- Compact stainless steel housing for 2" monitoring wells — no external power supply required
- Battery operation with a service life of up to 10 years (1 h measurement interval, 1 channel)
- Storage capacity for up to 250,000 measurement records in flash memory
- Bluetooth Low Energy (BLE) interface for local readout and configuration via BLX.JS browser application or BlueShell desktop software
- SDI-12 bus interface for additional sensors (pressure, temperature string, pulse counter, Modbus)
- Offset compensation (zero-point setting / downdip measurement) directly in the software
- Signed and encrypted firmware updates via BLE (AES-128)
- No mobile network module — offline logger (see Aquatots Web LTX for online connectivity)

2.3 Intended Use

The Aquatots mini is intended exclusively for the continuous measurement of hydrostatic pressure in water bodies and groundwater wells. Any use beyond this — in particular operation in potentially explosive atmospheres, for measuring gases or aggressive media, or for measurements relevant to human safety — is not permitted and will void the warranty.

3 Installation

3.1 Delivery and Transport Inspection

Check the device for transport damage immediately upon receipt. If any damage is found, document it photographically and notify TerraTransfer GmbH and the shipping company immediately. Do not commission a damaged device.

3.2 Overview: Aquatots mini Housing

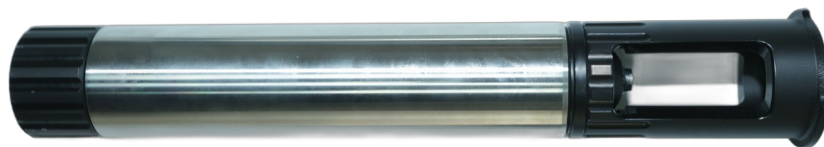


Figure 1: Aquatots mini, stainless steel sleeve with removable suspension cap. The opening in the cap is only used in the absolute pressure variant with barometric option; in the standard relative pressure variant (vented) the capillary tube runs inside the sensor cable to the surface.

3.3 Sensor: Piezo Type 0312

The standard pressure sensor is the piezo-resistive sensor type 0312. It is factory-calibrated and connected to the Aquatots mini via the Wago terminal connections.



Figure 2: Piezo pressure sensor type 0312 with type and serial number engraving. Standard with relative pressure capillary tube and suspension lugs for sensor cable.



Figure 3: Piezo pressure sensor type 0312 — laser-welded stainless steel measuring cell with removable sensor cage. The oil-filled AISI 316Ti pressure cell is visible after removing the cage.

- Sensor type: SDI-12 + BLE, oil-filled, laser-welded AISI 316Ti pressure cell
- Measurement range: 0–5 m or 0–10 m water column (version-dependent)
- Accuracy: ± 0.05 % FS typical
- Temperature compensation: -10 °C to $+40$ °C
- WEEE-compatible: the sensor cage can be removed for recycling

3.4 Battery Installation

The battery is inserted on site. This preserves the battery service life during transport and storage.



Figure 4: Open stainless steel sleeve of the Aquatots mini with a Li-SOCl₂ cell — the epoxy-potted PCB compartment is visible in the right half of the housing.

1. Unscrew the stainless steel sleeve from the sleeve collar (counterclockwise).
2. Pull the POM body including the battery holder out of the sleeve.
3. Insert the Li-SOCl₂ D-size battery (e.g. SAFT LSH 20, 3.6 V) with the correct polarity.
4. Slide the POM body back into the sleeve and screw the sleeve closed (clockwise, hand-tight).

- The logger starts automatically after battery insertion and is ready for configuration.

Warning: Use only approved Li-SOCl₂ D-size batteries (e.g. SAFT LSH 20). Other battery types can damage the electronics. Never mix new and used batteries.

3.5 Mechanical Installation

The Aquatots mini is lowered into the monitoring well on the sensor cable and fixed at the well head with the clamping fitting.

- Check the inner diameter of the monitoring well — 2" sleeve for $\geq 2.5"$ (≈ 63 mm).
- Lower the device carefully into the well on the sensor cable. Do not let the device drop freely.
- Set the installation depth so that the sensor is at least 0.5 m below the lowest expected water level.
- Fix the sensor cable at the well cap using the clamping fitting; ensure the cable is not kinked or abraded at the well tube.
- Seal the well cap to prevent contamination of the groundwater.

Note: Relative pressure variants: make sure the capillary tube inside the sensor cable is not kinked, compressed or flooded. The capillary tube provides the atmospheric reference pressure for the measurement.

4 Commissioning

4.1 Connection via BLX.JS and BlueShell

The Aquatots mini is configured and read out locally via Bluetooth Low Energy (BLE). TerraTransfer provides two applications for this purpose:

- BLX.JS: browser-based Web Bluetooth application, accessible at <https://ltxdata.net/ttblx/> — no installation required, runs on Chrome/Edge (desktop and Android). On iOS the Bluefy browser is required.
- BlueShell: Windows/macOS desktop application, extended functions (firmware update, batch download, scripting).

Connection procedure in BlueShell:

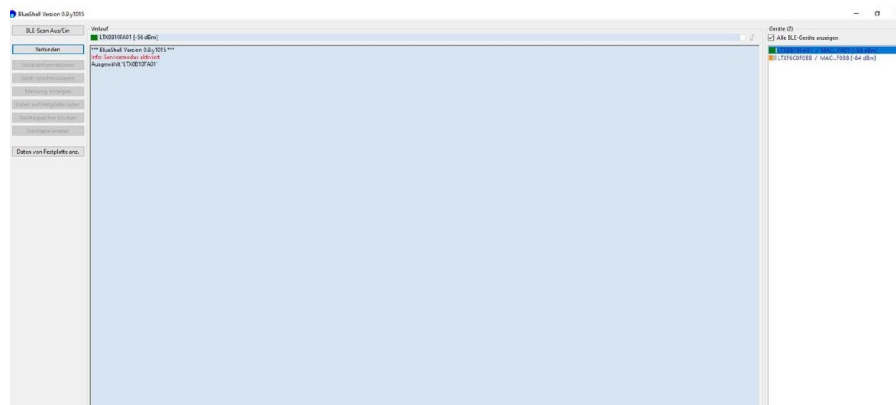


Figure 5: BlueShell after BLE scan — the Aquatots mini appears in the device list on the right-hand side.

- Start BlueShell and click Scan.
- The Aquatots mini appears in the device list with its serial number.
- Click Connect — you will be prompted for the PIN (factory default: 1234).
- After successful authentication, all menu items are active.



Figure 6: Active connection with a TerraTransfer logger in BlueShell. After authentication, all menu items are accessible.

4.2 Device Parameters

The Device parameters dialog (accessible via the toolbar or the main menu) contains all device-level settings:

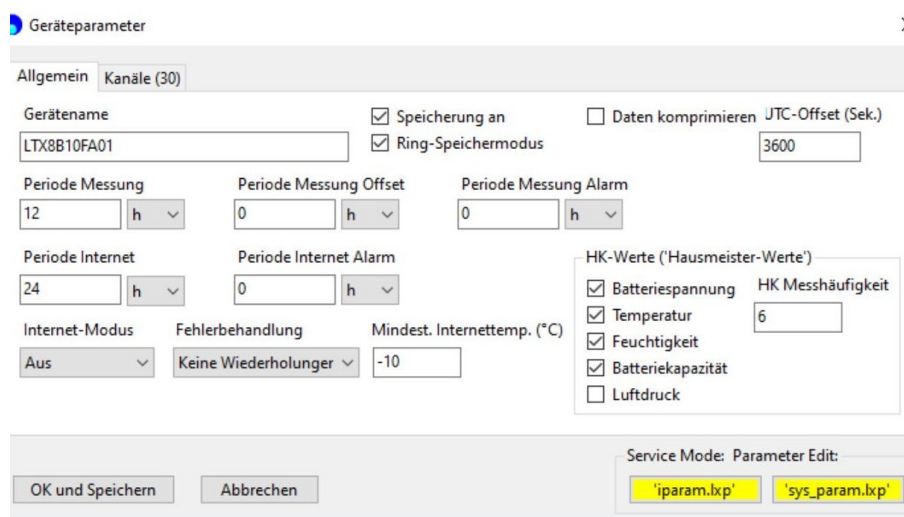


Figure 7: Device parameters dialog — General tab with device name, measurement period and HK values ("housekeeping" live data: battery, temperature, timestamp).

The most important parameters on the General tab:

Device Name	Freely configurable identifier (displayed in BLE scan)
Measurement Period	Measurement interval in seconds (e.g. 3600 = 1 h)
Alarm Period	Shortened measurement interval when an alarm threshold is exceeded (in seconds)
Storage	Activates the internal flash memory (must be enabled)
Ring Mode	Oldest records are overwritten when storage is full
Time	Device time — synchronise with PC time (BLE)

4.3 Configuring Channels

On the Channels tab, the physical inputs are mapped to logical measurement channels. For each channel, the unit, offset, scaling factor, alarm limits and display options can be set.

The screenshot shows the 'Kanäle (30)' configuration window. The 'Allgemein' tab is active. Channel #0 is selected. The 'Kanal messen' checkbox is checked. The 'Einheit' is set to 'm', 'Offset' is '-0,001835', and 'Multi' is '10,197442'. The 'Alarm Unten' and 'Alarm Oben' are both set to '0,0'. The 'Phys. Kanal (Bus und Typ)' is 'SDI12 (Bus)'. The 'Quellindex' is '0' and 'Messbits' is '60'. The 'Zahlenformat' is 'Max. Digits'. The 'DB-Index' is '0'. The 'Kanal-Eigensch.' is empty. The 'Zusätzliche Befehle/Bytes' is '*1800 0M'. The 'Service Mode: Parameter Edit' section shows 'iparam.lxp' and 'sys_param.lxp' buttons. The 'OK und Speichern' and 'Abbrechen' buttons are at the bottom.

Figure 8: Channels tab with sample configuration of an SDI-12 pressure sensor on channel 0.

Unit	Physical unit of the measured quantity (m, °C, bar, mS/cm)
Offset / Multi	Linear scaling term: measured value = Multi × raw value + Offset
Alarm Low / High	Threshold values for alarm mode. When exceeded, the shortened measurement interval is activated
Phys. Channel	Assignment to the hardware interface — typically SDI-12 (Bus)
Source Index	Internal indexing with multiple sensors on one bus
Additional Commands	Optional SDI-12 pre-processing (e.g. warm-up time *1800 0M)

4.4 Offset Compensation (Zeroing / Dondip)

For hydrostatic water level measurements, a project-specific zero-point compensation is required. The Aquatos mini supports two modes:

- Tare / Offset: The current measured value is set to a target value (e.g. 0.00 m). The logger calculates the corresponding offset automatically.
- Dondip: The measured dondip (distance from the top of the measurement tube to the water surface) is entered. The logger derives the installation offset and converts all subsequent measurements to water level.

The screenshot shows the 'Offset-Kompensation (Tariere oder Abstich) (mit 1 Punkt) - Kanal #0' dialog box. It has a title bar with a close button. The 'Set (nominal) Y' field is empty. The 'Offset (Original)' field contains '-0,001835'. The 'Multi (Original)' field contains '10,197442'. There is a 'Berechnung' button. A diagram shows a measurement tube with a sensor at the bottom and a water level. Below the diagram are two radio buttons: 'Tara / Offset' (selected) and 'Abstich'. At the bottom are 'Koeffizienten' and 'Abbrechen' buttons. The right side has a 'Messen (tatsächlich) X' field and a 'Messen X' button.

Figure 9: Offset compensation dialog. Left the nominal target value, right the measured value, below the selection between Tare/Offset and Dondip.

15. Install the pressure sensor at the final installation depth.
16. Wait a few minutes after installation for temperature and water pressure to stabilise.
17. In BlueShell or BLX.JS, open the channel of the pressure sensor and click Tare (1P).
18. Select Tare/Offset or Dondip and enter the reference value.
19. Confirm with Calculate — the logger adopts the new coefficients and saves them permanently.

Note: The coefficients can be reset to factory settings at any time with Reset Coefficients.

5 Operation

5.1 Reading Measured Values On-site

The Aquatots mini does not transmit measurement data automatically to an online portal. Data retrieval takes place on-site via Bluetooth using BLX.JS or BlueShell.

20. Open BLX.JS or BlueShell and connect to the device.
21. Click Load data to drive. All measurement values recorded since the last retrieval are transferred as a CSV file to your PC or tablet.
22. Optional: click Show measurement to trigger a live measurement and see the result immediately on screen.
23. The downloaded CSV file can be imported into TerraTransfer Sensormanager, spreadsheets or GIS systems.

Note: The internal memory of the Aquatots mini holds up to 250,000 measurement records. At a measurement interval of 1 hour, this corresponds to more than 28 years of autonomous recording. Nevertheless, plan readout cycles at least every 2 years to check battery status and sensor function.

5.2 Counter and Temperature String Connection

Via the SDI-12 interface, additional TerraTransfer sensors can be connected alongside the pressure sensor. Each additional sensor receives its own SDI-12 address (0–9) and is configured as its own measurement channel in the Channels tab.

- Frequency/pulse counter type 0330 as rainfall adapter (tipping bucket) or water meter adapter.
- Temperature string (thermistor string) with up to 30 nodes, resolution 0.01 °C.
- Modbus converter type 0210 for connecting Modbus RS-485 sensors to the SDI-12 bus.

5.3 Setting Alarm Limits Locally

Since the Aquatots mini has no direct internet connection, alarms operate exclusively locally: when an alarm limit is exceeded, the logger switches to the shortened measurement interval. The alarm data are transferred during the next readout.

24. Open the relevant channel in the Channels tab.
25. Activate the Check Alarms checkbox.
26. Enter the lower and upper threshold values in the Alarm Low and Alarm High fields.
27. Confirm with OK and Save. Alarm monitoring is active from the next measurement.

6 Maintenance

6.1 Cleaning

Clean the housing of the Aquatots mini with a soft, damp cloth. No mechanical tools must come into contact with the pressure membrane of the sensor.

Warning: Do not use aggressive cleaning agents, solvents or high-pressure cleaners. These can damage the seals, the pressure membrane and the capillary tube.

6.2 Battery Replacement Interval

The battery replacement interval depends on the measurement period, the number of channels and the ambient temperature. Typical values:

1 h interval, 1 channel	≈ 10 years at standard temperature (+10 °C to +25 °C)
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15 min interval, 1 channel	≈ 6 years at standard temperature
1 h interval, 3 channels	≈ 7 years at standard temperature
Continuous operation below -20 °C	Service life reduced by up to 40 %

Note: Battery status is recorded at each measurement and can be read in BlueShell via the HK_BatC (battery capacity) value. Plan a replacement when HK_BatC falls below 15 %.

6.3 Visual and Leak Inspection

Inspect the Aquatots mini at every site visit for the following:

- External integrity of the stainless steel sleeve (no dents, no signs of corrosion).
- Condition of the sleeve sealing ring and the cable gland (sealing, tight fit).
- Absolute pressure variant with barometric option only: cleanliness of the barometer opening in the upper end cap — a blocked opening can falsify the air pressure reference.
- Condition of the sensor cable (no kinks, no abrasion at the measurement tube).

7 Troubleshooting

The following table lists typical symptoms, probable causes and recommended actions. If a problem cannot be resolved locally, contact TerraTransfer support (Section 8).

Device not in BLE list	Battery discharged or logger outside BLE range (typ. 10 m). Reduce distance, check battery, reset battery capacity.
PIN not accepted	Factory PIN has been changed. Look up the project-specific PIN in the TerraTransfer documentation or have the logger reset via service reset.
Measured values missing	Storage under Device Parameters is disabled. Enable and check measurement period.
Pressure sensor reads 0.0	SDI-12 connector not properly engaged, channel not activated or wrong unit. Check connector, check channel in Channels tab.
Level deviates from downdip	Offset not compensated. Perform downdip zeroing according to Section 4.4.
Battery status drops quickly	Low ambient temperatures or short measurement interval. Adjust measurement interval or replace battery.
Data download aborts	BLE connection disturbed. Reduce distance, disable other BLE sources, restart download.

Note: The firmware of the Aquatots mini can be updated via BLX.JS or BlueShell. Updates are exclusively signed and verified by the logger — unsigned files are rejected.

8 Repair and Return

Repairs to the Aquatots mini are carried out exclusively at the TerraTransfer GmbH factory. Opening the hermetically sealed pressure housing by the user voids the warranty and can permanently damage the electronic components.

RMA Process

28. Contact TerraTransfer support by email at info@terratransfer.de or by phone at +49 2327 83 44 85-1.
29. Describe the fault and provide the serial number of the device.
30. You will receive an RMA number and a return form.
31. Send the device carefully packaged, with the RMA number clearly visible on the parcel, to the service address of TerraTransfer GmbH.
32. After inspection you will receive a cost estimate (for non-warranty cases) or a direct repair confirmation.

Warning: Return damaged devices with leaking batteries in a separately labelled dangerous goods shipment. Remove the batteries if it is safe to do so and include them in the parcel separately.

9 Technical Data

9.1 Mechanical and Housing

Housing material	Stainless steel 1.4571 / 1.4404, tool-free opening
Housing diameter	2" (≈ 50 mm)
Housing length	≈ 220 mm (incl. end cap)
Inner body	POM (polyoxymethylene) with separate PCB compartment
Electronics protection	PCB compartment fully potted in epoxy resin
Weight	≈ 900 g
Protection class	IP68 (permanent immersion)
Sensor connection	Wago terminals inside housing
Mounting	Well cap 2", clamping fitting for sensor cable

9.2 Electrical and Storage

Power supply	1 × lithium thionyl chloride battery Li-SOCl ₂ , size D, 3.6 V (e.g. SAFT LSH 20)
Nominal capacity	≈ 13 Ah
Service life	up to 10 years, typical measurement 1 h, one channel
Storage technology	Flash memory, selectable linear or ring mode
Storage capacity	250,000 measurement records
Real-time clock	RTC with ±30 ppm, synchronisable via BLE
Firmware update	Via BLE, signed and encrypted (AES-128)

9.3 Communication and Sensor

Local interface	Bluetooth Low Energy 5 (BLE), authentication via challenge-response
BLE range	≈ 10 m outdoors, reduced at well cap
Pressure measurement standard	Relative pressure sensor with capillary air compensation
Pressure measurement option	Absolute pressure sensor with optional internal barometric sensor (not potted, cannot be retrofitted)
Sensor wiring	Wago terminals, colour-coded, inside housing
Mobile network	Not present — reserved for Aquatots Web LTX

9.4 Environmental Conditions

Operating temperature	–25 °C to +70 °C
Storage temperature	–30 °C to +70 °C (store battery separately)
Protection class	IP68 — electronics additionally protected by epoxy full potting
Internal humidity	No humidity sensor installed (full potting of PCB)
Barometric reference	Only for absolute pressure variant with barometric option, 300–1,100 hPa
Installation depth	Depends on connected pressure sensor (see sensor datasheet)

10 Operator Obligations and Disposal

10.1 Operator Obligations

The operator undertakes to use the Aquatots mini exclusively within the intended operating framework. The operator ensures that installation, maintenance and decommissioning are carried out by qualified personnel. The relevant national regulations on occupational safety, environmental protection and data protection must be observed.

10.2 Decommissioning and Dismantling

33. Disconnect the BLE connection and record the last measured value and the battery status.

34. Remove the Aquatots mini from the measurement tube. Pull the pressure sensor out slowly so that the cable does not abrade on the tube.
35. Clean the sensor and housing with a soft, damp cloth.
36. Store the device dry at room temperature. Remove the battery for long-term storage (> 6 months).

10.3 Disposal

In accordance with the EU WEEE Directive (2012/19/EU), end-of-life equipment must be disposed of separately from household waste. Hand in old devices at municipal collection points or return them to TerraTransfer GmbH for proper disposal.

Lithium batteries are hazardous waste and must be disposed of in the designated collection containers. TerraTransfer GmbH takes back used batteries from TerraTransfer products free of charge.

Note: The WEEE registration number of TerraTransfer GmbH can be found on our website at www.terratransfer.de under Imprint and Sustainability.

Contact

For questions regarding installation, operation or the selection of suitable sensors, we are happy to help.

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