JUMBO BLOCK® Dashboard

User Manual

Operating the Start, Control, Admin and Setup Center

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For operators, control rooms and administrators of a JUMBO BLOCK® plant

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About this manual

The JUMBO BLOCK® Dashboard monitors an underground rainwater retention system built from JUMBO BLOCK® modules. It shows water level and fill level, assesses the situation with a water level indicator and an alert level, records all readings and operator actions in an audit chain and regularly anchors this chain tamper-evidently on the IOTA blockchain.

This manual describes operation. Architecture, interfaces, data formats and system operation are described in the technical reference manual.

Terms used in this manual

Term	Meaning
Plant	The monitored rainwater retention system. One dashboard monitors exactly one plant.
Plant ID (JBA-…)	Random, non-descriptive identifier of the plant, e.g. `JBA-7Q2M-4KXT-9PRD-3HVA`. It reveals neither location nor operator.
Sensor ID (JBS-…)	Random identifier per sensor, e.g. `JBS-NEBD-TR0S-BXDR-7MBP`. Only this identifier is displayed.
Uplink	A reading a sensor sends via LoRaWAN through The Things Network (TTN).
Anchor	An entry on the IOTA blockchain that immutably records the state of the audit chain and the readings of a 30-minute period.
Operator	Person in the control room or operations who watches the situation and confirms alert levels.
Administrator	Person who sets up, maintains and configures the dashboard.

> **Note:** The screenshots in this manual show a sample plant with example data. Identifiers, readings and location are fictitious.

Overview

The four areas

The dashboard consists of four areas reachable from the header bar. The Setup Center is in the “More” menu.

Area	Purpose	Access
Start Center	Public live view: water level, indicator, anchoring, weather, sensor overview.	open
Control Center	Situation picture for the control room, alert level, confirmation of the situation with names.	operator password
Admin Center	System, services, balance, maintenance, alarm, weather location, sensors, backups.	admin password
Setup Center	Setup, audit export and verification, credentials, plant model, indicator design, decommissioning.	admin session

Header bar, language and theme

- **Start, Admin, Control, More:** switch between areas. “More” contains the Setup Center, “Security & KRITIS”, “Accessibility” and the legal notice.
- **DE / EN:** switches the language. The choice applies to all areas and is stored in the browser.
- **Sun / moon:** light or dark theme.

Screen sizes

On screens 1200 pixels wide or more the dashboard arranges the cards in two columns. On tablets and phones they are stacked. All functions are available in both layouts.

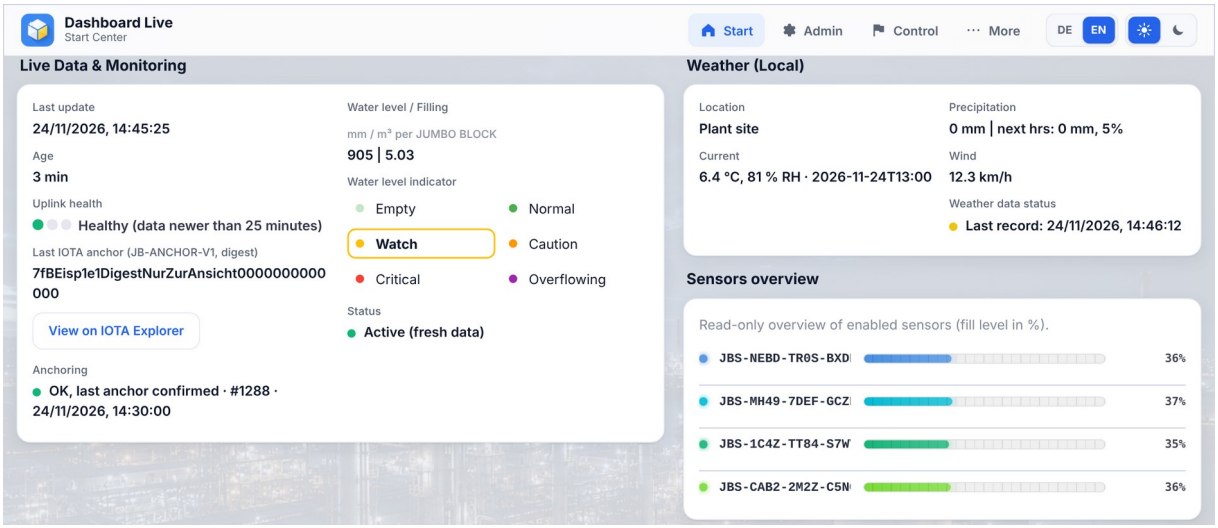
Login and sessions

Role	Login	Validity
Public	none	–
Operator	Operator password in the Control Center	until logout or page reload
Administrator	Admin password in the Admin Center; the session also applies in the Setup Center	logout after 30 minutes without interaction, at the latest after 8 hours

> **Tip:** If a dashboard is opened in the local network via its IP address (http://…), login works just as over HTTPS.

Start Center

The Start Center is the public view. It requires no login and only shows values that may be public: no location, no TTN device identifiers and no credentials.



Start Center with live data, water level indicator, weather and sensor overview

Live Data & Monitoring

Display	Meaning
Last update, Age	Time of the last reading and how long ago it was.
Uplink health	Green: data newer than 25 minutes. Yellow: last uplink 25–45 minutes ago. Red: older than 45 minutes.
Last IOTA anchor	Identifier (digest) of the last confirmed anchoring. “View on IOTA Explorer” shows the transaction publicly in the IOTA Explorer.
Anchoring	“OK, last anchor confirmed · #number · time”: anchoring is running. Yellow: an anchor is pending. Red: anchor service unreachable.
Water level / Filling	Water level in millimetres above the base and water volume per JUMBO BLOCK in m³ (example: `905 | 5.03`).
Water level indicator	Current stage, highlighted with a frame. See next section.
Status	“Active (fresh data)” if the last reading is newer than 15 minutes; otherwise “Stale, but data available”.

The water level indicator

The indicator classifies the water level in six stages. The three lower limits are fixed; the upper ones result from the design of the respective plant (Setup Center, section “Water level indicator”).

Stage	Water level	Meaning
Empty	below 50 mm	Plant practically empty.
Normal	50 to 550 mm	Normal operation.
Watch	550 to 1050 mm	Raised water level, follow the trend.
Caution	1050 mm up to start of “Critical”	High water level.
Critical	from the calculated limit up to	The free space up to overflow is no longer sufficient for a

Stage	Water level	Meaning
	overflow	15-minute design rainfall. Also if the level rises so fast that overflow would be reached in less than 15 minutes.
Overflowing	from overflow height (emergency overflow)	The emergency overflow has been reached.

Note: The plant indicator shows the highest stage of all sensors with current readings. To keep the display from flickering at a limit, it only switches back once the level is 30 mm away from the limit.

Weather (Local)

Current temperature, humidity, wind and precipitation as well as the expected precipitation for the next hours. Publicly the location only reads “Plant site”; the actual location is visible only when logged in.

Sensors overview

One bar per active sensor showing the fill level as a percentage of the block height (2500 mm). A ★ marks the main sensor whose values appear above under “Live Data”.

If a sensor delivers no data, the dashboard estimates its value from the neighbouring sensors. An estimated value is marked with “~” and shown in yellow.

Alarm banner

When an administrator triggers a manual alarm, a prominent alarm banner appears in the Start Center until the alarm is reset.

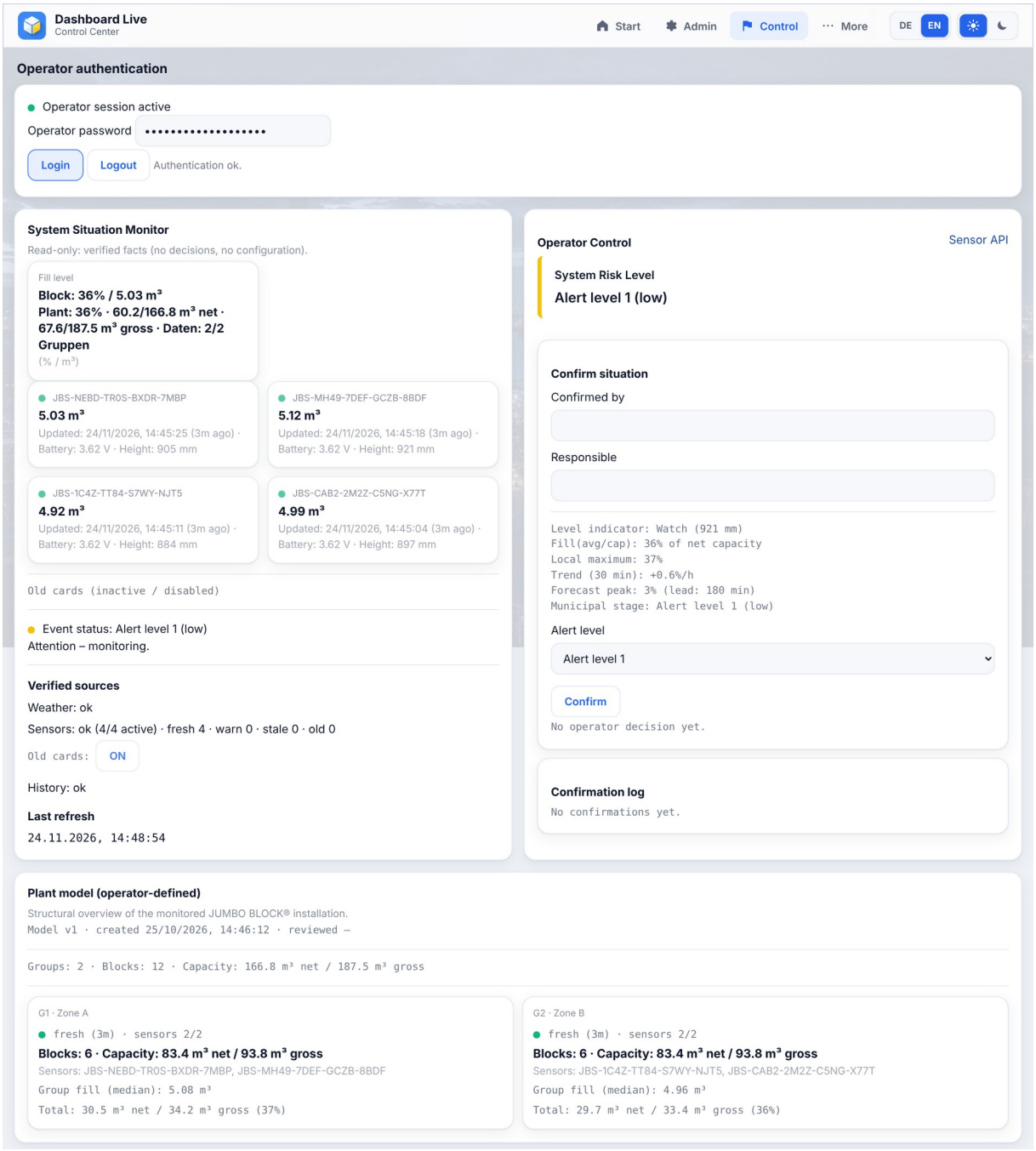
Control Center (operator)

The Control Center is meant for the control room. It shows the complete situation picture and documents who confirmed which alert level and when. Without login it shows nothing but the login field.

Logging in

1. Open the Control Center.
2. Enter the operator password and select “Login”.
3. “Authentication ok.” appears next to the buttons and “Operator session active” with a green dot at the top. Situation monitor and plant model are loaded.

“Logout” ends the session and hides the situation picture again. After a typing error simply correct the password and select “Login” again.



Control Center after login: situation monitor, operator control and plant model

System Situation Monitor

- **Fill level:** block (highest single reading) and whole plant in percent and m³, net and gross, with the number of groups delivering readings.
- **Sensor cards:** per sensor water volume, time of reading, battery voltage and water level. Green dot: fresh, yellow: delayed, red: stale. “Old cards” shows or hides disabled sensors.
- **Event status:** the current alert level with its meaning.
- **Verified sources:** whether weather, sensors and history deliver current data.
- **Last refresh:** the monitor refreshes every 30 seconds, situation and alert level every minute.

Alert level

The alert level shown under “System Risk Level” is derived from the water level indicator. Start Center, public interface and Control Center therefore speak the same language.

Water level indicator	Alert level	Meaning	Action
Empty, Normal	Alert start	Observation	none
Watch	Alert level 1 (low)	Attention	Monitoring
Caution	Alert level 2 (medium)	Preparation	Notify staff
Critical	Alert level 3 (high)	Alarm	Prepare response
Overflowing	Alert level 4 (severe)	Critical	Trigger measures

If the weather forecast predicts heavy rain within the next three hours, the dashboard raises the alert level by one stage. If no sensor delivers current readings, the fill ratio of the plant replaces the indicator; the situation summary then points this out.

Confirming the situation

With the confirmation the control room bindingly documents which situation it determined at which time. The confirmation does not control anything at the plant; it is recorded in the audit and anchored on IOTA with the next anchor.

1. Read the situation summary. It starts with the water level indicator and lists fill level, trend of the last 30 minutes, forecast peak and the calculated alert level.
2. Fill in “Confirmed by” and “Responsible” with full names. Both fields are mandatory.
3. Check the alert level. It is pre-filled with the calculated value and can be changed if the assessment differs.
4. Select “Confirm”. “✓ Alert level … confirmed by …” appears below and the confirmation is listed in the confirmation log.

> **Note:** The confirmation log shows the confirmations of the current month, newest first. Older entries are in the audit and can be exported in the Setup Center.

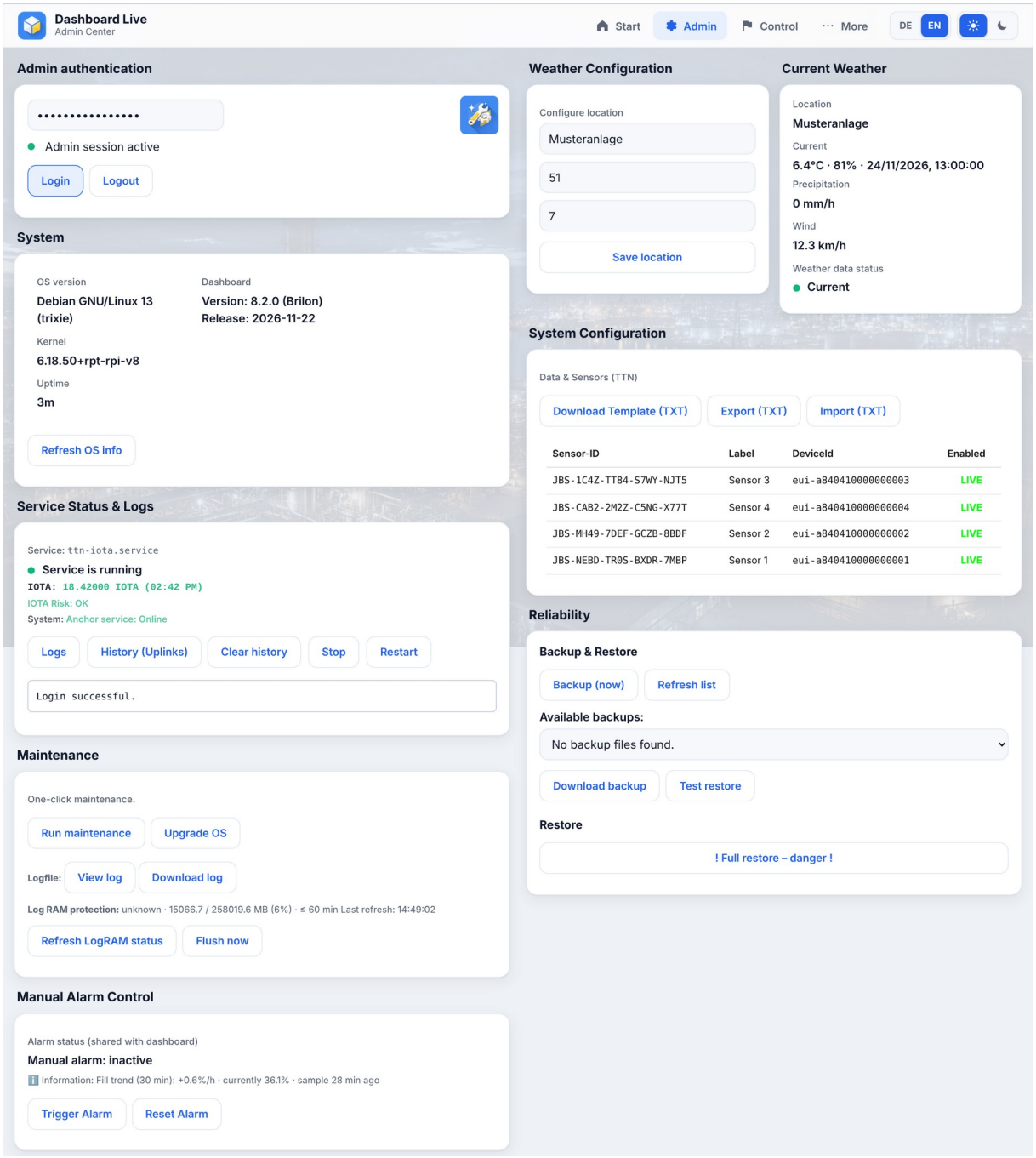
Plant model

Below the situation picture is the plant model: groups (zones) with number of blocks, net and gross capacity, assigned sensors, group fill (median of the sensors) and fill volume per group. The model is maintained in the Setup Center.

The “Sensor API” link opens the public interface with the current values in JSON format.

Admin Center

The Admin Center is where the device is operated and maintained. All buttons become active only after login.



Admin Center after login

Logging in and passwords

Enter the admin password and select “Login”. The display changes to “Admin session active”. The session also applies in the Setup Center. “Logout” ends it; after 30 minutes without interaction it ends automatically.

Changing passwords: with an active session select “Passwords” at the bottom right, choose the target (admin, operator or master) and enter the new password twice (at least 8 characters).

System

Operating system, kernel, uptime since last start and dashboard version. “Refresh OS info” reads the values again.

Service Status & Logs

- **Service is running:** state of the receiving service (TTN bridge) that accepts the uplinks.
- **IOTA:** balance of the anchor wallet with time of the query. The anchor service queries it every 15 minutes.
- **IOTA risk:** OK from 5 IOTA, warning below 5 IOTA, critical below 1 IOTA. On a warning top up the wallet in time; without balance no anchoring is possible.
- **System: anchor service:** “Online” when the anchor service is working.
- **Logs, History (Uplinks):** show the latest messages of the receiving service or the latest uplinks in the output field.
- **Clear history:** clears the uplink history of the display. The audit chain is not affected.
- **Stop, Restart:** stop or restart the receiving service. While it is stopped, readings are lost.

Maintenance

- **Run maintenance:** checks the system (storage, SD card, kernel messages, services) and writes a maintenance log. “View log” and “Download log” open it.
- **Upgrade OS:** installs operating system updates. A restart of the device may be required afterwards.
- **Log RAM protection:** system logs are collected in memory and written to the SD card in batches. This protects the card. “Flush now” writes immediately.

Warnings appear here with a red background:

- **“KRITIS ALERT: Sensor … offline”** – there are no readings for an enabled sensor. Check sensor, battery and radio link.
- **“Configuration changed outside the dashboard”** – a credentials file (.env) was changed without the dashboard. If the change was known and intended, confirm with “Checked”; otherwise inform the administrator. Both are recorded in the audit.

Manual Alarm Control

“Trigger Alarm” sets a manual alarm that is shown in the Start Center and recorded in the audit. “Reset Alarm” clears it. Below, the fill trend of the last 30 minutes is shown for information.

Weather configuration and current weather

Enter name, latitude and longitude of the location for the weather data and select “Save location”. The coordinates remain internal and are not shown publicly. The current weather values are shown on the right.

System Configuration: sensors

The table shows all registered sensors with sensor ID (JBS-…), label, TTN device ID and state (LIVE = enabled). Sensors are managed through a text file:

1. “Export (TXT)” downloads the current list (or “Download Template (TXT)” for an empty template).
2. Edit the file: one line per sensor with devEUI and label. Add new sensors, remove lines no longer needed.
3. Select “Import (TXT)” and upload the file.

New sensors automatically receive a JBS-… identifier; existing ones keep theirs. Removed sensors are disabled, not deleted – their history is kept. Up to 99 sensors are possible.

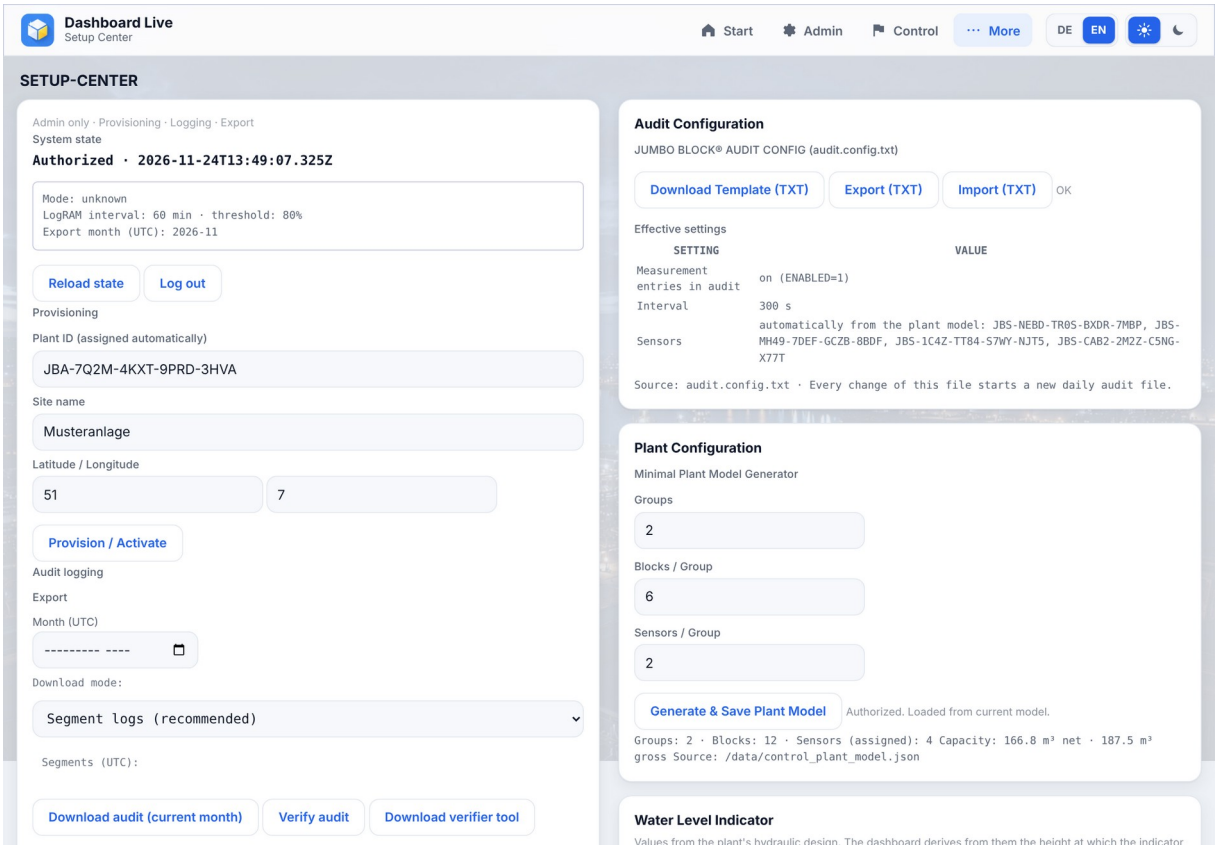
Reliability: backups

- **Backup (now):** immediately creates a backup on the device.
- **Refresh list, Available backups, Download backup:** select backups and download them to the workstation.
- **Test restore:** unpacks the selected backup into a test folder without changing operation. This verifies that a backup is readable.

> **Caution:** “! Full restore – danger !” overwrites the current state of the device with the selected backup. Use only after consulting the administrator and after a successful test restore.

Setup Center

The Setup Center is where the plant is set up. It uses the admin session; without login it shows “Login required”.



Setup Center: system state, provisioning, audit configuration and plant configuration

System state and provisioning

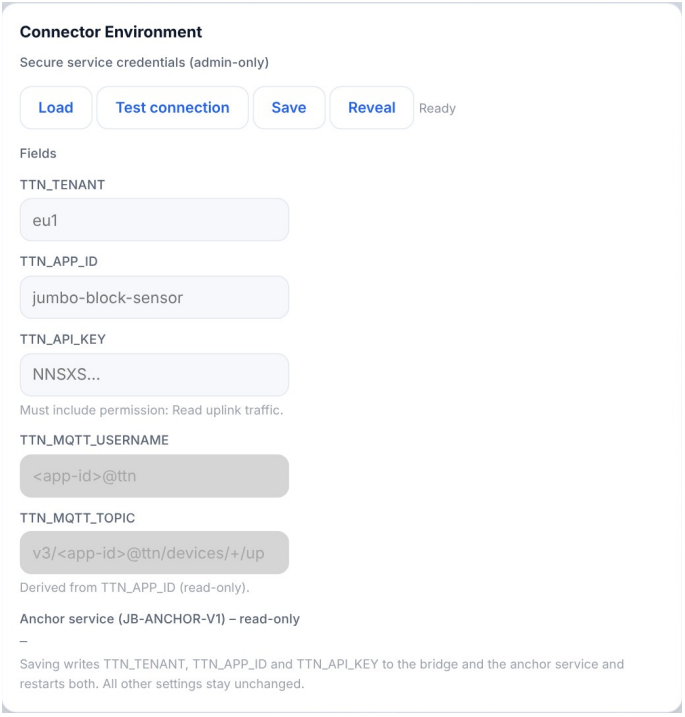
At the top it shows whether the session is authorised. Under “Provisioning” the site name and coordinates of the plant are maintained and saved with “Provision / Activate”. The plant ID JBA-… is assigned by the system; it cannot be changed by hand.

Audit logging: export and verification

All readings, operator actions and configuration changes are in the audit chain. It is organised in daily files; every entry is chained to the previous one, so any subsequent change becomes evident.

1. Choose the month (or leave empty for the current month) and keep the download mode “Segment logs (recommended)”.
2. “Download audit” downloads the daily files. “Verify audit” checks the chain directly on the device.
3. “Download verifier tool” provides the verification tool for an independent check on one's own computer (chapter “Verification tool”).

Connector environment



Connector environment: TTN access for receiving service and anchor service

This holds the access data for The Things Network: TTN_TENANT (e.g. eu1), TTN_APP_ID and TTN_API_KEY. In TTN the API key needs the permission “Read uplink traffic”.

1. “Load” reads the current values. The key appears masked; “Show” displays it briefly.
2. Change the values and select “Test connection”. The dashboard tests the login at TTN without saving anything.
3. “Save” writes the values to the receiving service and the anchor service and restarts both. The change is recorded in the audit without the key.

> **Note:** MQTT user and topic are derived from the app ID and only displayed. Under “Anchor service” plant ID, network and wallet address of the anchor service are shown for checking.

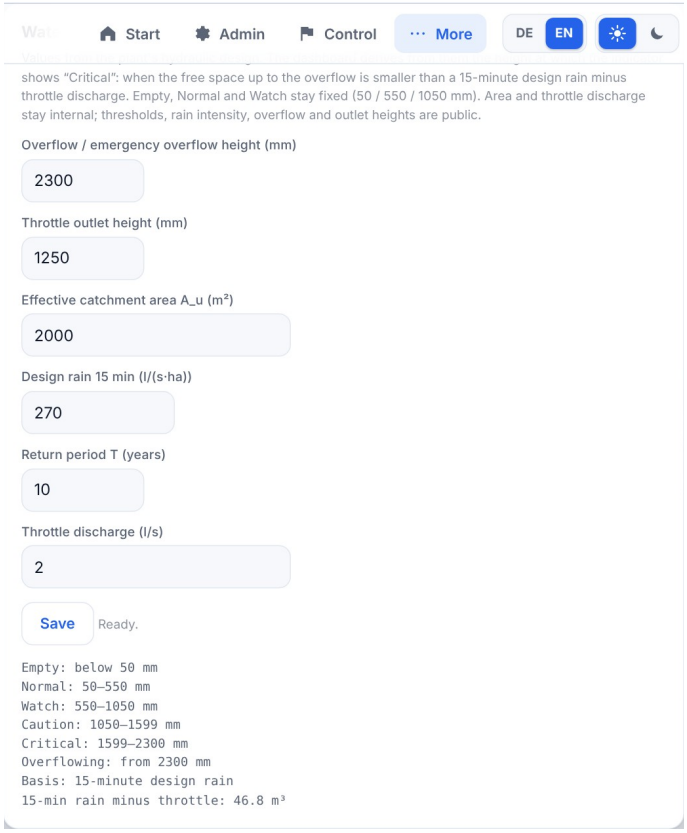
Audit configuration

Shows the effective settings of reading logging: whether reading entries in the audit are on, the interval (default 300 seconds) and which sensors are recorded (automatically from the plant model). The settings can be exported as a text file, changed and imported again. Every change starts a new daily file in the audit.

Plant configuration

Generates the plant model from three inputs: number of groups (zones), blocks per group and sensors per group. “Generate & save plant model” assigns the enabled sensors to the groups in order. Below, the summary with net and gross capacity is shown.

Water level indicator



Design values of the water level indicator with the limits calculated from them

Enter the values from the design of the plant here. From these the dashboard calculates the limits for “Caution”, “Critical” and “Overflowing”:

Field	Meaning
Overflow height / emergency overflow (mm)	Water level from which the plant overflows. Start of the stage “Overflowing”.
Throttle outlet height (mm)	Height of the throttled outlet.
Effective drainage area A_u (m²)	Connected effective drainage area.
Rainfall intensity 15 min (l/(s·ha))	Design rainfall for 15 minutes.
Return period T (years)	Return period of the design rainfall (for documentation).
Throttle discharge (l/s)	Discharge via the throttle.

“Critical” starts where the free space up to overflow is smaller than the water volume of a 15-minute design rainfall minus throttle discharge. After “Save” the list below shows all limits. Area and throttle discharge remain internal; limits, rainfall intensity, overflow and throttle outlet heights are public.

Decommissioning and factory reset

When a plant is decommissioned or the device is prepared for another plant or customer, it is reset to factory settings. All plant data, the audit chain, anchor data, measurement history, backups, passwords, the TTN access and the wallet key are deleted. The software remains.

> **Caution:** The reset cannot be undone. Before it, the chain is anchored a final time, the remaining balance is transferred and a closing archive is downloaded. Each step unlocks only once the previous one is complete.



Card “Decommissioning & factory reset” in the Setup Center

Procedure

1. **Announce decommissioning.** Writes the event “PLANT_DECOMMISSIONED” to the audit chain.
2. **Final anchor.** Wait until the anchor service has anchored the chain including the announcement (within 30 minutes). The page checks this by itself and shows “Confirmed with anchor #…”.

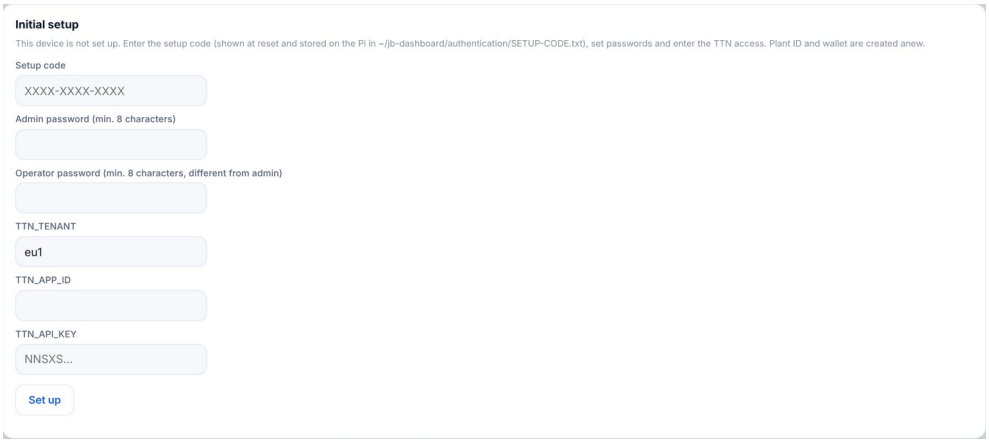
3. **Empty wallet.** Enter the target address (e.g. the customer's or company's wallet); “Dry run” shows balance, fee and amount. Select “Transfer” and enter the confirmation word (TRANSFER or ÜBERTRAGEN). The dashboard then checks the balance on IOTA.
4. **Closing archive.** “Create archive”, then “Download archive”. The browser verifies the SHA-256 checksum. The archive contains audit chain, anchor proofs, measurement history, registry, plant model and the verification tool, but no passwords or keys. Keep the archive or hand it over to the customer.
5. **Reset.** Enter the admin password and the plant ID (JBA-…) for confirmation and select “Reset to factory settings”. The displayed **setup code** is needed for the initial setup – write it down.

“Cancel decommissioning” is possible until the reset. A wallet transfer already made remains; without balance the plant can no longer anchor until the wallet is topped up again.

> **Note:** If the helper script for the reset is not yet installed on the device, the card points this out. The one-time installation is described in the technical reference manual.

Initial setup

A reset or newly installed device is “not set up”. The Setup Center then shows only the initial setup; no login is needed for it.



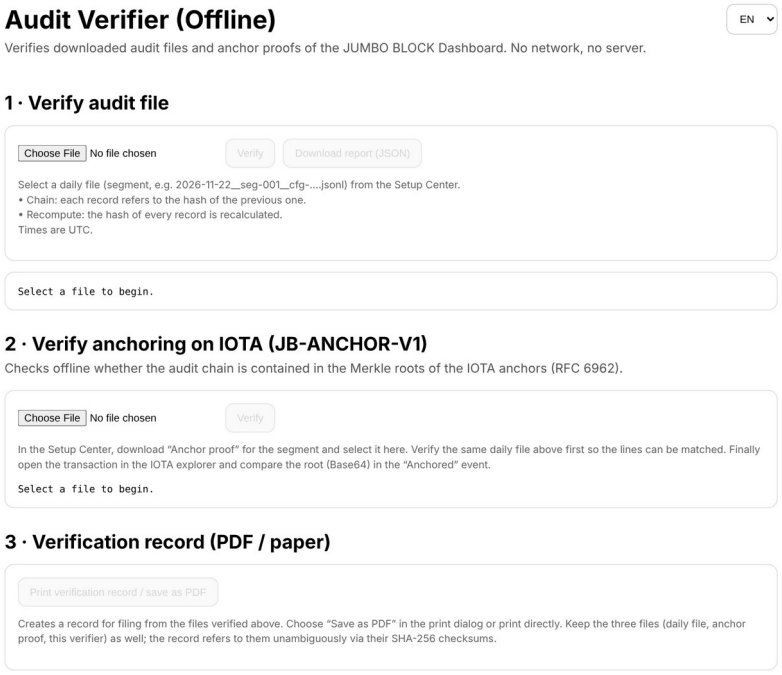
Initial setup of a device that is not set up

1. Enter the **setup code**. It was shown at the reset. A new device creates it itself at first start; it is stored on the device in `~/jb-dashboard/authentication/SETUP-CODE.txt`.
2. Set the **admin and operator password** (each at least 8 characters, different from each other).
3. Enter the **TTN access**: TTN_TENANT, TTN_APP_ID, TTN_API_KEY.
4. Select “Set up”. The dashboard creates a new plant ID and a new wallet and shows the wallet address.
5. Top up the wallet with IOTA. Only then can the anchor service anchor. Then log in to the Admin Center and set up location, sensors, plant model and indicator design.

> **Note:** The setup code is valid once. After five wrong entries the form is locked for 15 minutes.

Verification tool verify-audit.html

With the verification tool anyone – including an auditor without access to the dashboard – can independently check a daily file of the audit chain and its anchoring. It is a single HTML file that runs offline in the browser and sends no data.



Verification tool in the browser

1. Load a daily file (.jsonl) from the audit export. The tool checks every entry: hash and chaining to the predecessor.
2. Load the anchor proofs (from the Setup Center or the closing archive). The tool shows which sections of the file are proven by which anchor on IOTA.
3. Create the verification record and print it as PDF. It is suitable for filing.
4. Under “Content” the daily file can be displayed in readable form and exported as PDF or CSV.

> **Tip:** The anchors are permanently and publicly stored on IOTA. Verification therefore remains possible even if the dashboard no longer exists – for example with the closing archive of a decommissioned plant.

Troubleshooting and FAQ

Observation	Cause and remedy
Uplink health yellow or red, status “Stale”	No reading for more than 25 or 45 minutes. Check sensor, battery, radio coverage and TTN; look at “Logs” in the Admin Center.
Anchoring yellow “Anchor pending”	An anchor was formed but not yet confirmed. Usually resolves by itself. If it persists: check balance and anchor service in the Admin Center.
Anchoring red “Anchor service unreachable”	Anchor service is not running. Inform the administrator.
IOTA risk “Warning” or “Critical”	Balance below 5 or 1 IOTA. Top up the wallet.
Control Center shows “Visible after operator login.”	Intended: the situation picture is visible only when logged in. Log in with the operator password.
Admin Center reports “Device not set up”	The device was reset or newly installed. Perform the initial setup in the Setup Center.
Notice “Configuration changed outside the dashboard”	A credentials file was changed directly on the device. Clarify with the administrator, then confirm with “Checked”.
Logged out without action	After 30 minutes without interaction or after 8 hours the admin session ends. Log in again.

Glossary

Term	Explanation
Audit chain	Continuous, chained log of all events. Each entry contains the hash of the previous one.
devEUI	Globally unique hardware identifier of a LoRaWAN sensor. Kept internal.
Digest	Identifier of a transaction on IOTA; it allows finding an anchor in the IOTA Explorer.
Throttle	Limits the discharge from the plant to a defined value.
JB-ANCHOR-V1	Method by which the dashboard anchors readings and audit chain on IOTA every 30 minutes.
KRITIS	Critical infrastructure. The dashboard is designed for KRITIS requirements: publicly no link between identifier and location, access only with login, complete logging.
LoRaWAN, TTN	Radio standard of the sensors and the network (The Things Network) through which their readings reach the dashboard.
Alert level	Five-level situation classification for the control room, derived from the water level indicator.
Wallet	IOTA account of the anchor service from which the anchoring fees are paid.