Sensorium™ Sensor Node — BLE Smart Sensor Node Platform — User & Operation Manual

Operation, BLE pairing, configuration, and battery maintenance of the BLE Smart Sensor Node Platform.

`sensorium-sensor-node` · Revision Draft (Preliminary) · 2026-07-18 · Status: **PRELIMINARY**

PRELIMINARY — PROPOSED VALUES. This manual describes intended operation. Operational values marked ‡ (button timings, indicator patterns, intervals, and defaults) are proposed, industry-typical placeholders provided so no procedure is left blank; they are **not measured and not final** and must be confirmed against the production unit and firmware before being relied on for commissioning, safety, or service. Specifications are **not** repeated here — see the datasheet. Always follow the documentation shipped with your unit.

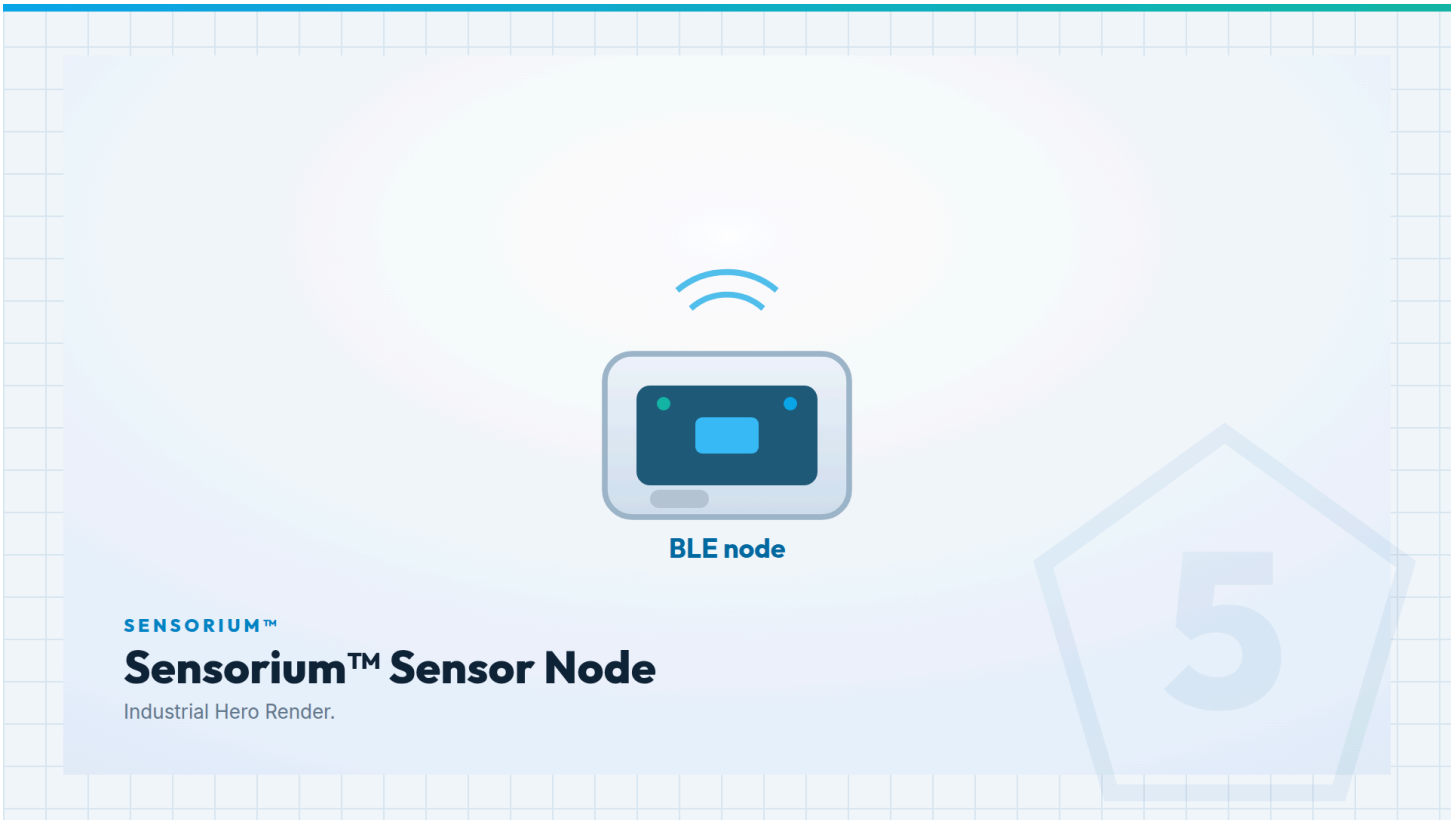

Figure FIG-001 — Sensorium™ Sensor Node, the low-power Sense layer that measures field signals

and reports them over BLE to the Sensorium™ Gateway.

1. Safety

Read this chapter in full before you install, operate, or service the Sensorium™ Sensor Node. Keep this manual with the equipment for the life of the product.

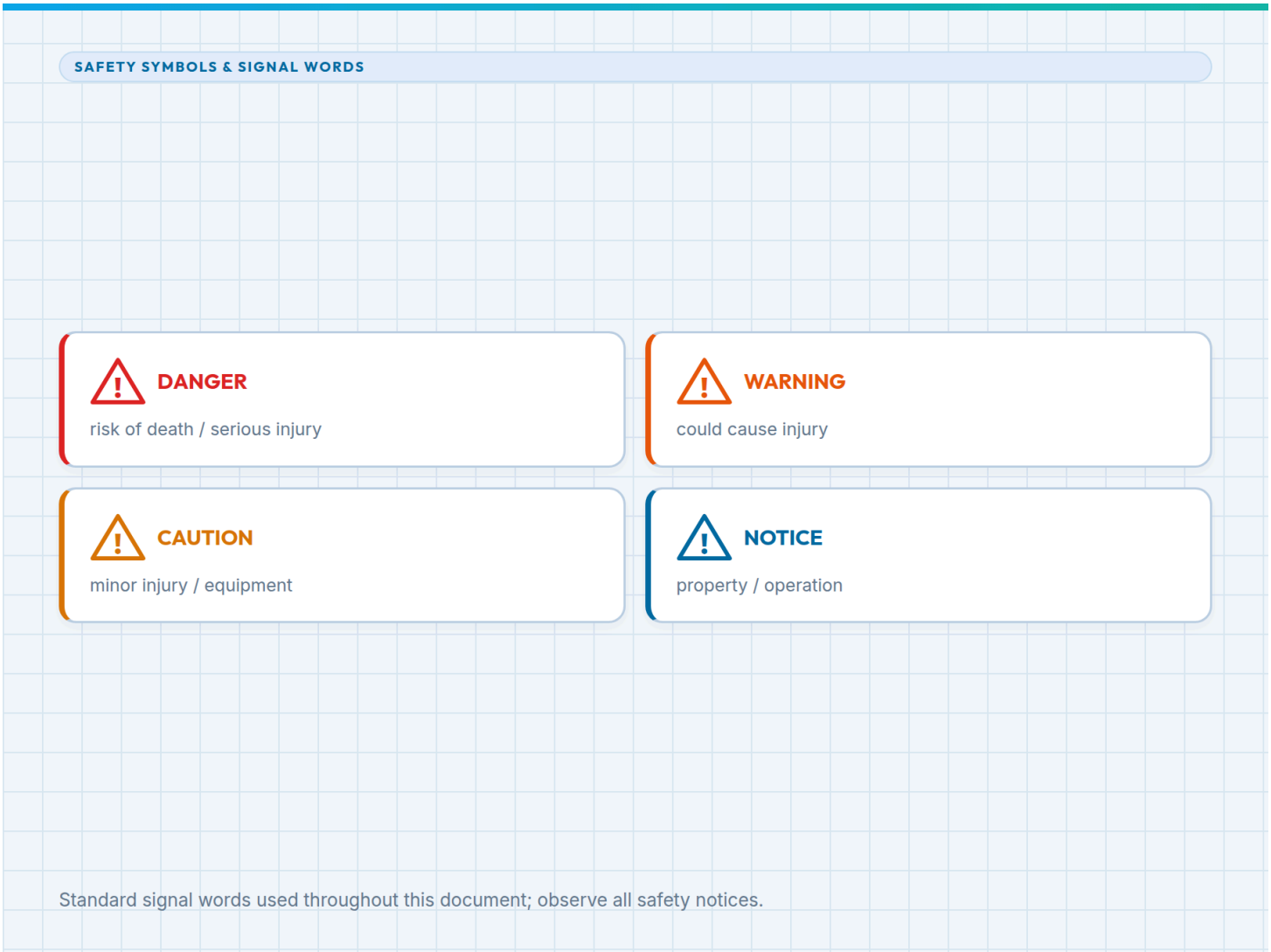

Figure FIG-002 — Signal words (DANGER · WARNING · CAUTION · NOTICE) and the hazard pictograms used in this manual.

1.1 Signal words

This manual uses four signal words. Each is paired with the pictograms in Figure FIG-002.

SIGNAL WORD	MEANING
DANGER	Hazard that **will** cause death or serious injury if not avoided.
WARNING	Hazard that **could** cause death or serious injury if not avoided.
CAUTION	Hazard that could cause minor or moderate injury if not avoided.
NOTICE	Practice that could cause property or equipment damage, but not injury.

1.2 Qualified personnel

Installation, sensor integration, and battery service should be performed by competent personnel who have read and understood this manual and the installation guide, and who follow the site's safety rules. The node is a low-voltage, battery-powered device; the primary hazards relate to the **battery** (§1.4) and to **misuse as a safety device** (§1.3).

1.3 Intended use

The Sensorium™ Sensor Node is intended to measure physical signals (such as vibration, temperature, motion/tilt, proximity, load/strain, or environmental conditions — the sensing element is configurable per variant; see datasheet §4) and report them over Bluetooth Low Energy to a Sensorium™ Gateway, within its rated environmental limits (see datasheet §8).

Any other use is considered misuse. In particular:

> **WARNING — Not a safety device.** The Sensor Node — including when it underpins the **Zone Awareness** product — is a **sensing and alerting** device. It does **not** stop machinery, form a certified protective zone, or provide a functional-safety / safety-rated function. Do not use it as the sole means of protecting personnel or as a substitute for a certified machine-safety system.

The node is also **not** a certified structural-health inspection instrument. Data from the node (and from SmartBolt products built on it) supports monitoring; it does not replace qualified inspection.

1.4 Battery safety

> **WARNING — Battery hazards.** Use only the battery type specified for the unit (Li-$SOCl_2$ primary cell, or the Li-ion cell of the `-R` variant — see datasheet §6.2 and the rating

label). Do not short-circuit, crush, puncture, disassemble, reverse, heat, or incinerate the battery. A damaged or wrong-type battery can leak, overheat, vent, or rupture.

- Observe polarity when fitting a battery. Do not mix used and new cells or different chemistries.
- Store and operate the battery within its rated temperature range (see datasheet §8).
- If the battery leaks, swells, or overheats, remove it from service using appropriate protection and dispose of it per local regulations. Do not put it back into use.
- Dispose of / recycle batteries according to local regulations; do not discard in general waste.

CAUTION — Charging the rechargeable variant. On the `-R` (Li-ion) variant, charge only within **0 °C…+45 °C‡** and only with the specified method (datasheet §6.2). Charging a Li-ion cell below 0 °C can plate lithium and cause an internal short. Primary (Li-$SOCl_2$) cells are **not** rechargeable — never attempt to charge them.

1.5 Radio-frequency (RF) safety

The node communicates over **Bluetooth Low Energy (BLE)** in the 2.4 GHz band. BLE is a low-power radio; radiated power is low (+8 dBm‡ maximum — see datasheet §7).

- Radio type-approvals and permitted operation are region-specific and pending type-approval (see datasheet §9). Operate the node only where its radio is approved.
- Do not modify the antenna or enclosure in a way that alters the radio; doing so can void radio type-approval.

1.6 Environmental and handling

- Operate the unit only within its rated environmental limits (see the datasheet). Any ingress rating is valid only when the enclosure, battery door, and seals are intact and closed.
- Do not open, drill, or modify the enclosure except as directed for battery replacement (§7).
- Handle the node and its sensing element with care; a damaged sensing element can give false readings.

1.7 Residual risks

Even when used as intended, the following residual risks remain: battery hazards from misuse or a damaged cell (§1.4); reliance on the node as if it were a safety device when it is not (§1.3); and **loss or delay of data** if the node moves out of BLE range of the Gateway, the battery is

depleted, or the Gateway is offline. Alerts derived from node data are not guaranteed to be real-time or delivered; do not rely on them for life-safety decisions.

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2. About this manual

Scope. This manual covers day-to-day operation, BLE pairing, configuration, battery maintenance, and troubleshooting of the Sensorium™ Sensor Node. It does **not** cover physical mounting and first power-up — see the installation guide.

Audience. Competent installers, maintenance technicians, and integrators as described in §1.2.

Conventions.

- Safety notices use the signal words defined in §1.1 and appear **before** the step they apply to.
- Procedures are numbered, one action per step, in the imperative voice. The expected result follows the action where useful.
- **‡** marks a proposed, industry-typical operational value (e.g. a button timing, indicator pattern, interval, or default) provided so no procedure is left blank; it is not measured or final and must be confirmed against the production unit and firmware.
- `[TBD]` marks a value or detail still genuinely pending. Never substitute a guessed value for a `[TBD]`; where a credible proposed value can be given it is shown with **‡** instead.
- `Monospace` denotes labels, order codes, indicator names, and UI text.

Related documents.

DOCUMENT	LOCATION	USE
Datasheet	`datasheets/sensorium-sensor-node-datasheet/`	Full specifications, wireless (BLE), ratings
Installation guide	`installation/sensorium-sensor-node-installation/`	Mounting, power, pairing, commissioning
Sensorium™ Gateway manual	`manuals/sensorium-gateway-manual/`	The Gateway this node reports through
5Tech Platform overview	Platform documentation	The dashboard / MQTT / edge destination

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3. Product overview & theory of operation

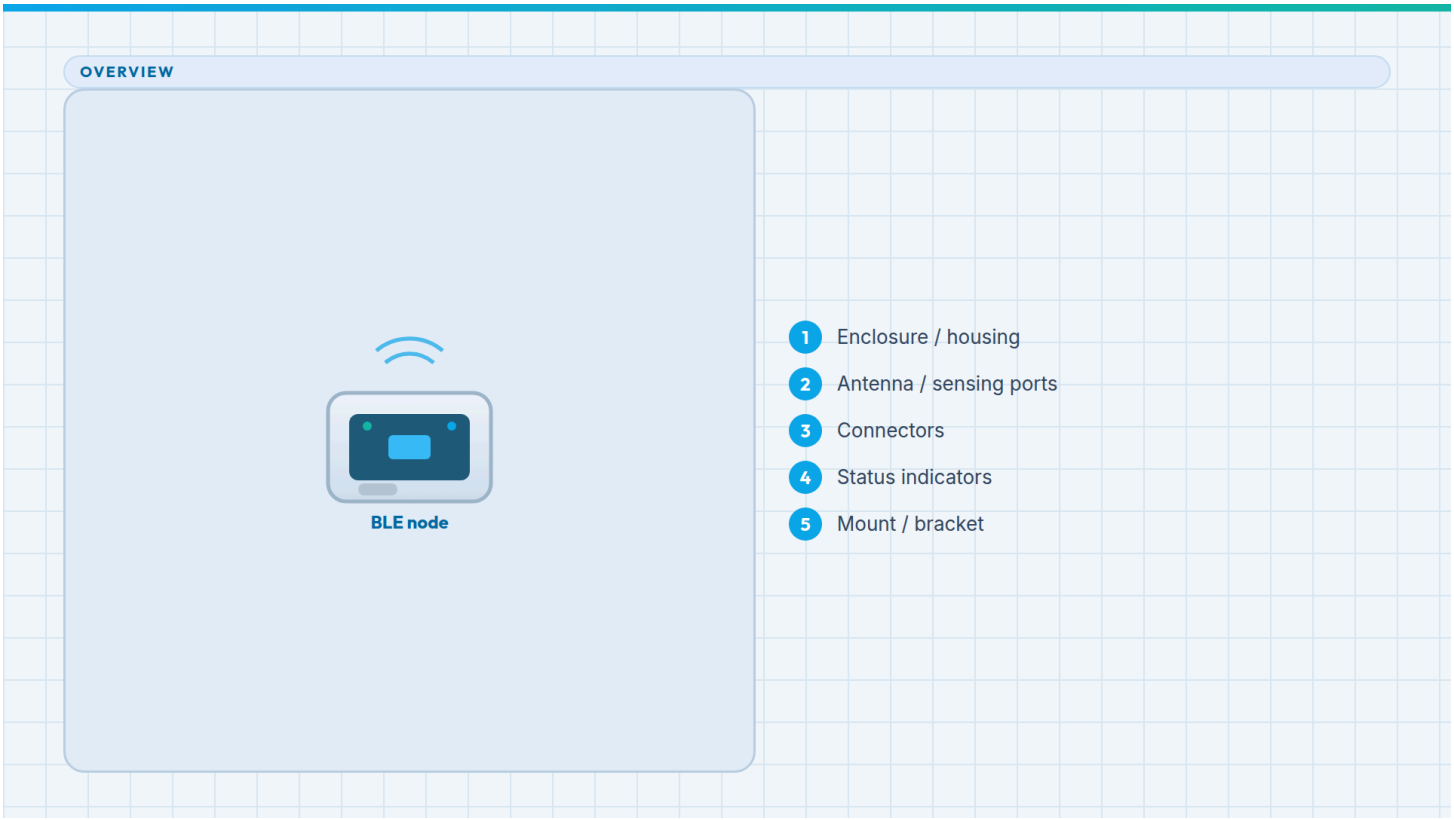

Figure FIG-003 — External features of the Sensorium™ Sensor Node with numbered callouts and legend.

3.1 What it does

The Sensorium™ Sensor Node is the **Sense** platform of the 5Tech Sensorium™ family: a small, low-power, battery-powered wireless node that measures field signals and reports them over Bluetooth Low Energy to a nearby Sensorium™ Gateway. It is sold directly as Base and Developer nodes and is also the base platform behind the **SmartBolt** and **Zone Awareness** products.

3.2 Where it sits — Sense → Connect → Decide

- **Sense** — the **Sensor Node** (and SmartBolt / Zone Awareness products built on it) measures physical signals in the field.
- **Connect** — the **Sensorium™ Gateway** receives node data over BLE and relays it over MQTT/TLS.
- **Decide** — the 5Tech Platform (dashboard, cloud/edge pipeline, and rule-based automation) turns readings into visualization, alerts, and AI-assisted reports (human-in-the-loop).

3.3 Theory of operation (operator depth)

Internally, the node performs four functions:

1. **Sense** — it samples its configured sensing element(s). The sensor set is variant-specific (configurable carrier; see datasheet §4).
2. **Process** — it applies basic on-node processing (e.g. thresholding, event detection, or vibration RMS/FFT features) and duty-cycles between sleep and active states to conserve battery.
3. **Report over BLE** — it transmits readings to the paired Sensorium™ Gateway over Bluetooth Low Energy. There is **no** cellular, satellite, or Wi-Fi uplink on the node.
4. **Power management** — it runs from its battery with low-power sleep management; battery life is ≥ 5 yr‡ typical (datasheet §6.2) and depends on the sensing mode and reporting interval.

Pairing and reporting. The node pairs to a Gateway over BLE and thereafter reports on its configured interval. If it moves out of BLE range or the Gateway is offline, on-node buffering during the outage is limited‡ and readings taken while out of range may be lost or delayed until the link is restored.

Battery. The node is battery-powered; battery type, life, and replacement are covered in datasheet §6.2 and in §7 of this manual.

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4. Controls & indicators

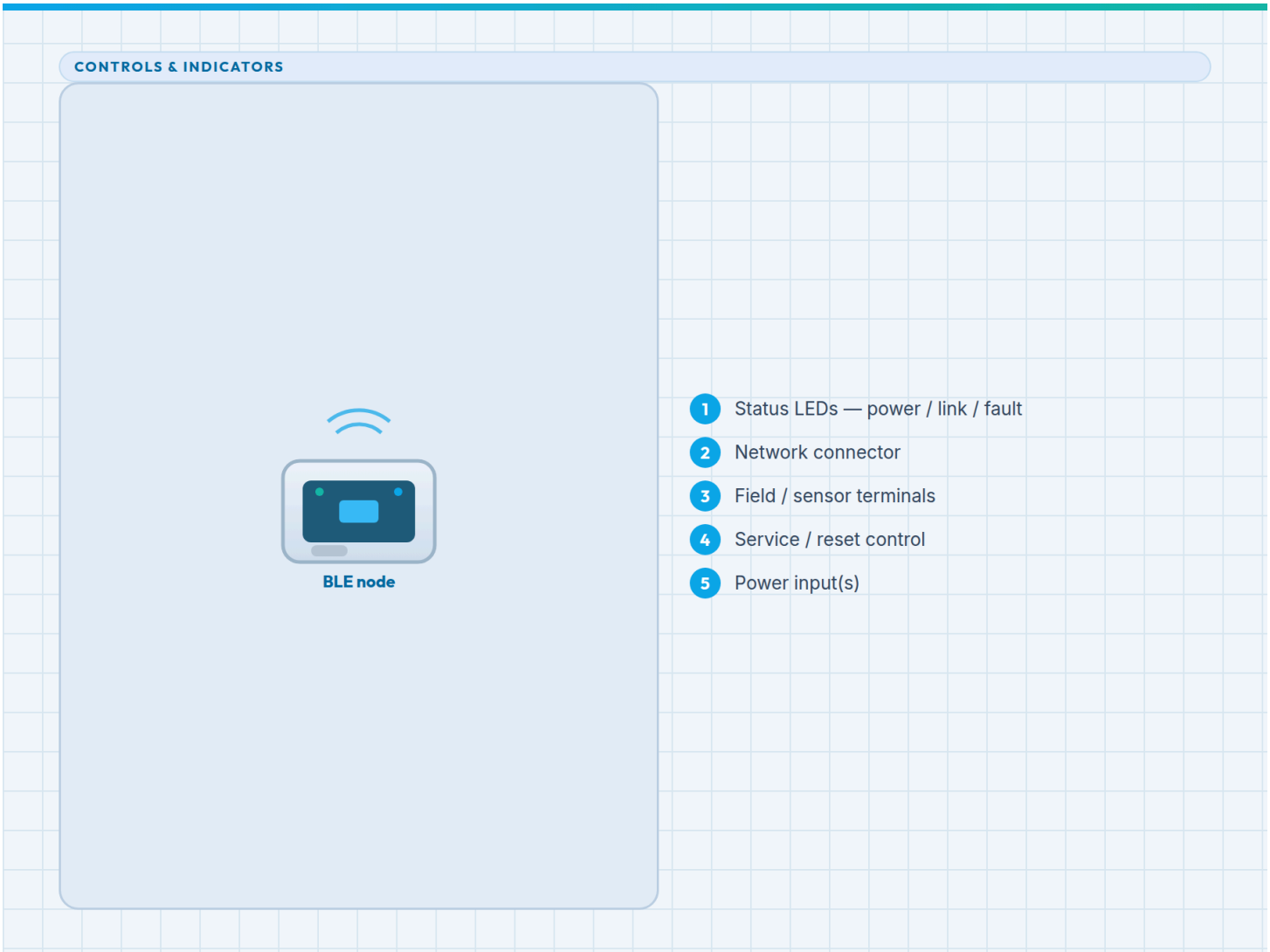

Figure FIG-004 — Controls, ports, and status indicator(s) with a numbered legend.

The table below lists the operator-facing controls and indicators. Indicator colours and blink patterns marked ‡ are proposed and will be confirmed against the production unit; use the legend on your unit and in Figure FIG-004.

CONTROL / INDICATOR	FUNCTION	STATES
Status LED	Power / pairing / health	Off = asleep or no power · slow blink ~1 Hz‡ = advertising/pairing · brief flash per report‡ = paired & reporting · rapid blink ~4 Hz‡ = fault
Pairing / function button	Start pairing, wake, or reset	Short press < 1 s‡ = wake · long press ≥ 5 s‡ = enter pairing · very long press ≥ 15 s‡ = factory reset (§5, §6)
Battery compartment / door	Battery access	Closed in service; opened only for replacement (§7)
Sensor port / element	Connection to the sensing element	Per variant (datasheet §4)
Local service interface	Provisioning / firmware	Authenticated BLE service profile‡

NOTICE. Do not press the pairing / function button during normal operation unless directed by a procedure in this manual or by 5Tech support.

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5. Operation

Once installed and paired (installation guide), the node is designed for unattended, low-power operation. Routine operation is limited to confirming it is paired and reporting, and to battery service. Button timings and indicator patterns referenced below are proposed (**‡**) and defined in §4.

5.1 Before you start

1. Confirm the node has been mounted and its battery fitted per the installation guide.
2. Confirm a Sensorium™ Gateway is within BLE range and online.
3. Confirm the enclosure and any battery door/seal are closed and intact.

5.2 Wake / power-on and status check

1. Fit the battery (or apply external power, if fitted) per the installation guide.
2. Wake the node if required (short press the function button, < 1 s‡; §4).

3. Observe the status LED indicate power / advertising (slow blink ~1 Hz‡; §4).
4. Verify the node reaches a healthy state (see §4). If it does not, go to Chapter 8.

5.3 Pairing to the Gateway (over BLE)

The node reports **only** through a Sensorium™ Gateway; it must be paired first. Pairing may also be initiated from the Gateway / 5Tech Platform side.

1. Confirm the target Gateway is online and within BLE range.
2. Put the node into pairing mode (long press the function button ≥ 5 s‡; §4); the status LED indicates advertising (slow blink ~1 Hz‡).
3. From the Gateway or 5Tech Platform, accept / claim the node.
4. Verify the node shows as paired (brief flash per report‡; §4).
5. Confirm the node appears **online** for this site in the 5Tech dashboard, through its Gateway.
6. If pairing does not complete within 2 min‡, go to Chapter 8.

5.4 Confirming telemetry

1. Open the 5Tech dashboard view for this site.
2. Verify the node is online and reporting current readings through its Gateway.
3. Verify the readings are plausible for the sensing element and site conditions.
4. If the node is online but not reporting, verify the sensing element and configuration (§6).

5.5 Standby / storage

1. If storing the node, remove the battery to prevent depletion and leakage (§1.4, §7).
2. Store within the rated storage temperature (datasheet §8).

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6. Configuration

Most configuration is delivered from the 5Tech Platform through the paired Gateway; the node requires little local configuration in normal use. Parameters, ranges, and defaults marked ‡ below are proposed and will be confirmed against the production firmware.

6.1 Configuration methods

METHOD	USE	NOTES
5Tech Platform (via Gateway)	Routine settings, reporting interval, thresholds	Primary method; over BLE through the Gateway
Local service interface	Initial provisioning, recovery	Authenticated BLE service profile‡
Pairing / function button	Pairing and reset actions	Press durations per §4

6.2 Configurable parameters (preliminary)

PARAMETER	PURPOSE	RANGE / DEFAULT‡
Reporting interval	How often the node reports	1 min–24 h‡ (default 15 min‡)
Sampling / sensing mode	How the sensing element is sampled	Per sensing element (datasheet §4)‡
Alert thresholds	On-node event detection limits	Per signal, in engineering units‡
Gateway pairing / identity	Which Gateway the node reports through	Bonded Gateway ID‡
Low-power / sleep settings	Duty cycle vs. battery life	Duty cycle 0.1–100 %‡
Security / device identity	Pairing credentials	LE Secure Connections bond (datasheet §7)

6.3 Applying a configuration change

1. Confirm the change is authorized for this site.
2. Apply the change from the 5Tech Platform (preferred) through the Gateway.
3. Confirm the node acknowledges the change.
4. Verify operation is unaffected (§5.4).
5. Record the change per your site's change-control procedure.

6.4 Firmware updates

> **NOTICE.** Do not remove the battery or power during a firmware update. Interrupting an update can leave the node in a recovery state.

1. Confirm the update is approved for this unit and that the battery is healthy.
2. Initiate the update from the 5Tech Platform (over BLE through the Gateway).
3. Wait for the update to complete without removing power. *Duration: typically < 5 min‡.*
4. Verify the node returns to a healthy state (§5.2) and reports the new version.

6.5 Factory reset / recovery

> **CAUTION.** A factory reset removes local configuration and un-pairs the node; it must be re-paired afterward. Perform only when directed by 5Tech support.

1. Contact 5Tech support and confirm reset is the correct action.
2. Perform the reset with the function button as directed. *Press pattern: very long press ≥ 15 s‡ (§4).*
3. Re-pair the node to its Gateway (§5.3) and re-apply configuration (§6.1–§6.3).

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7. Maintenance

The node is a sealed, low-power unit with **no operator-serviceable internal parts** other than the battery (the base and `-R` variants are user-replaceable‡). Maintenance is limited to battery service, external inspection, and keeping the enclosure and seals sound.

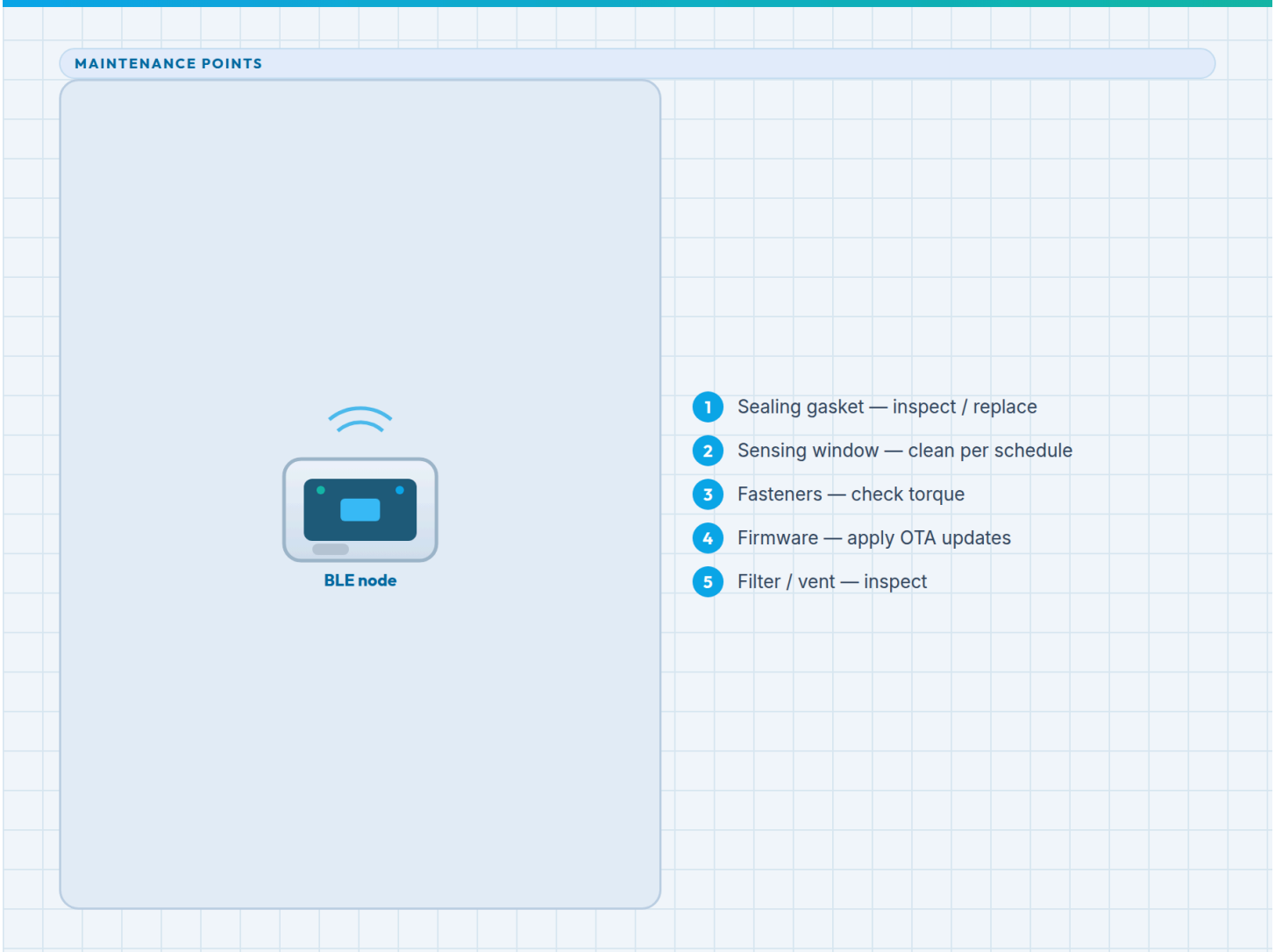

Figure FIG-005 — Battery access and operator-serviceable points of the Sensorium™ Sensor Node.

7.1 Maintenance schedule

Intervals are preliminary; confirm against your site's maintenance policy and the datasheet.

INTERVAL	TASK	NOTES
Monthly‡ (routine)	Confirm the node reports healthy on the 5Tech dashboard	Detects silent faults or dead battery
Quarterly‡ (routine)	Visually inspect the enclosure, battery door, and seals	Preserves ingress protection
Annually‡ (routine)	Check the mounting is secure and the sensing element is sound	Protects reading validity
At low-battery alert / ~5 yr‡ (as needed)	Replace the battery	Use the specified type only (§1.4)
As needed	Replace a damaged seal or door gasket	Restores ingress protection

7.2 Battery replacement

> **WARNING — Battery hazards.** Observe §1.4. Use only the specified battery type; observe polarity; do not short, crush, or heat the battery.

1. If required by site policy, note the node's status before service.
2. Open the battery door (observe ESD and sealing precautions).
3. Remove the depleted battery; dispose of / recycle it per local regulations.
4. Fit a new battery of the specified type (Li-$SOCl_2$ AA, or the Li-ion cell of the `-R` variant; datasheet §6.2), observing polarity.
5. Inspect the door seal for damage; replace if damaged.
6. Close and secure the door until the seal is fully seated.
7. Verify the node wakes, pairs, and reports (§5.2–§5.4).

7.3 What not to do

- Do not fit a non-specified battery, or reverse, short, crush, or incinerate a battery.
- Do not open, drill, or modify the enclosure beyond the battery door.
- Do not return a unit to service with a damaged seal — ingress protection would be lost.

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8. Troubleshooting

Use this table for first-line diagnosis. If a fault persists after the listed action, contact 5Tech support (§10). Indicator patterns are defined in §4 (proposed ‡); interpret them against the legend on your unit.

SYMPTOM	POSSIBLE CAUSE	ACTION
No LED / node dead	Battery depleted, missing, or reversed	Fit / replace a specified battery, correct polarity (§7.2)
Node will not enter pairing	Wrong button action or already paired	Confirm pairing procedure (§5.3); factory-reset if needed (§6.5)
Node will not pair to Gateway	Out of BLE range, Gateway offline, or identity issue	Move within range; confirm Gateway online; re-attempt claim (§5.3)
Paired but not reporting	Sensing element or configuration issue	Check sensing element / config (§6.2); wake the node (§5.2)
Node offline on dashboard	Out of range, dead battery, or Gateway down	Confirm range and battery; confirm Gateway online; check platform status
Implausible / no readings	Sensing element fault or misconfiguration	Verify sensing element and sampling mode (§6.2); inspect element (§7.1)
Short battery life	Reporting interval too aggressive or cold ambient	Review reporting/sleep settings (§6.2); confirm ambient within limits
Battery leaked / swollen	Damaged or wrong-type battery	Remove from service safely; do not reuse; replace with specified type (§1.4, §7.2)
Ingress concern after service	Seal not seated or damaged	Re-inspect and reseat the door seal (§7.2); replace if damaged

If a fault cannot be resolved, record the node serial number, the indicator states, and the dashboard status, then contact 5Tech support before taking further action.

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9. Specifications

This manual does **not** duplicate specification values. All sensing, electrical, wireless (BLE), mechanical, environmental, battery, and compliance specifications are maintained in the datasheet; only operational values (shown here with ‡) live in this manual:

- **Datasheet:** `datasheets/sensorium-sensor-node-datasheet/document.md`

AREA	WHERE TO FIND IT
Sensing (quantities, ranges, accuracy, sample rate)	Datasheet §4
Mechanical (dimensions, weight, mounting)	Datasheet §6.1
Electrical & power (battery, voltage, current, life)	Datasheet §6.2
Wireless (BLE) & interfaces	Datasheet §7
Environmental & ratings	Datasheet §8
Compliance & standards	Datasheet §9
Accessories & spares	Datasheet §10

Confirmed at operator level in this manual: the node is a low-power, battery-powered BLE sensor node that pairs to and reports through a Sensorium™ Gateway; it has **no** cellular or satellite radio; and it is a sensing / alerting device, **not** a certified safety controller. All numeric specification values remain in the datasheet.

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10. Warranty & support

Warranty. Warranty terms are 12 months‡ from delivery (to be confirmed) and are provided with the product or on request; the shipped warranty statement governs. The warranty is void if the enclosure is modified beyond battery service, if a non-specified battery is fitted, or if the unit is operated outside its rated limits.

Support and service. For technical support, RMA, or service:

- 5Tech — Vancouver, BC, Canada
- Email: `info@5tech.ca`
- Web: `https://5tech.ca`

When contacting support, have ready: the node serial number, firmware version, indicator states, the 5Tech dashboard status for the site, and a description of the symptom and any actions taken.

Figures

ID	TITLE	FILE	ASPECT	PURPOSE
FIG-001	Industrial Hero Render	`renders/hero_sensor-node.png`	16:9	Manual cover / hero
FIG-002	Safety Symbols & Signal Words	`figures/safety_symbols.png`	4:3	Signal words and hazard pictograms for the safety chapter
FIG-003	Product Overview — External Features	`figures/overview.png`	16:9	Orient the operator to external features
FIG-004	Controls & Indicators	`figures/controls_indicators.png`	4:3	Identify controls, ports, and status indicators
FIG-005	Maintenance Points	`figures/maintenance_points.png`	4:3	Locate the battery and operator-serviceable points

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This manual is preliminary and subject to change. Figure source of truth: `figures.json`. See `revision.md` for change control, `references.md` for sources, and `image_prompts.md` for the figure/prompt index. Web publication target: `/resources/manuals/sensor-node`.