

Sensorium™ Sensor Node — BLE Smart Sensor Node Platform

Datasheet · [sensorium-sensor-node-datasheet](#) · Revision Draft (Preliminary) · 2026-07-18

PRELIMINARY — PROPOSED VALUES. Values marked ‡ are proposed, industry-typical figures for this product class, provided so no specification is left blank. They are **not measured and not final**, and no value in this document is a certification claim. Engineering must confirm every ‡ value before this datasheet is released as final. The node is a configurable sensing carrier: the sensing figures in §4 are representative per-variant values and must be confirmed per build. See §12 for change control.



BLE node

SENSORIUM™

Sensorium™ Sensor Node

Industrial Hero Render.

Figure FIG-001 — Sensorium™ Sensor Node, the low-power Sense layer of the Sensorium™ family.

1. At a glance

The **Sensorium™ Sensor Node** is the *Sense* platform of the 5Tech Sensorium™ family: a small, low-power, battery-powered wireless sensor node built on **Bluetooth Low Energy (BLE)**. It hosts a configurable set of sensing elements and reports their readings over BLE to a nearby Sensorium™ Gateway, which relays the data over **MQTT over TLS** to the **5Tech Platform** (dashboard, cloud, and edge pipeline).

Sold two ways, one platform. The Sensor Node is offered directly as **Base** and **Developer** nodes (this datasheet) *and* is the internal platform that underlies the **SmartBolt** (fastener load/vibration sensing) and **Zone Awareness** (proximity/zone sensing) products. Those products are ordered under their own identities; a generic node is ordered here. Because they share this platform, the Sensorium™ Gateway aggregates SmartBolt, Zone Awareness, **and** generic Sensor Nodes on one BLE downlink — the family is one radio and one data path.

Product	Sensorium™ Sensor Node (BLE Smart Sensor Node Platform)
Family / role	Sensorium™ · Sense
Function	Field sensing and wireless (BLE) reporting to the Sensorium™ Gateway
Sold as	Base node · Developer/evaluation node (this datasheet)
Also the platform behind	SmartBolt and Zone Awareness (ordered under their own identities)
Sensing	Configurable carrier — vibration, temperature, motion/tilt, proximity, load/strain, environmental (representative per-variant values in §4)
Wireless	Bluetooth Low Energy 5.2‡ only — no cellular / satellite / Wi-Fi on the node
Nodes per Gateway	Up to 50‡ (BLE 5.x central capacity of the Sensorium™ Gateway)
Power	AA-size Li-SOCl ₂ primary cell, 3.6 V / 2400 mAh‡ (rechargeable Li-ion option); ≥ 5 yr‡ typical life
Enclosure	Glass-fibre-reinforced polyamide; IP67‡ (IEC 60529)
Operating temperature	−40 °C to +85 °C‡ (primary-cell variant; see §8)

Key features

- Small, low-power, **battery-powered** BLE wireless sensor node, **≥ 5 yr** typical life on a primary cell (see §6.2 for the full basis).
- **Base sensing platform** for the Sensorium™ family — sold as Base/Developer nodes and used internally by **SmartBolt** and **Zone Awareness**.
- **Configurable sensing carrier**: vibration, temperature, motion/tilt, proximity, load/strain, and environmental conditions — representative per-variant ranges and accuracies in §4.
- Reports over **Bluetooth Low Energy 5.2** to the Sensorium™ Gateway — no cellular, satellite, or Wi-Fi radio on the node itself.
- **Up to 50** nodes aggregate to a single Sensorium™ Gateway (BLE central capacity), reconciling with the Gateway datasheet and the SmartBolt bolts-per-Gateway figure.
- Contributes to the **node** → **Gateway** → **MQTT/TLS** → **5Tech Platform** data path.

Typical applications

- Wireless condition monitoring of assets, structures, and equipment near a Gateway.
- Retrofit sensing where wired instrumentation is impractical.
- The sensing basis for fastener monitoring (SmartBolt) and worksite proximity/zone alerting (Zone Awareness).

Not a safety-rated device. The node is a sensing and alerting platform, not a certified safety controller. It does not by itself stop machinery or form a certified protective zone.

2. System context

The Sensor Node is the **Sense** origin of the chain. Readings flow up over BLE through the Gateway to the 5Tech Platform; configuration and rule-based automation flow back down.

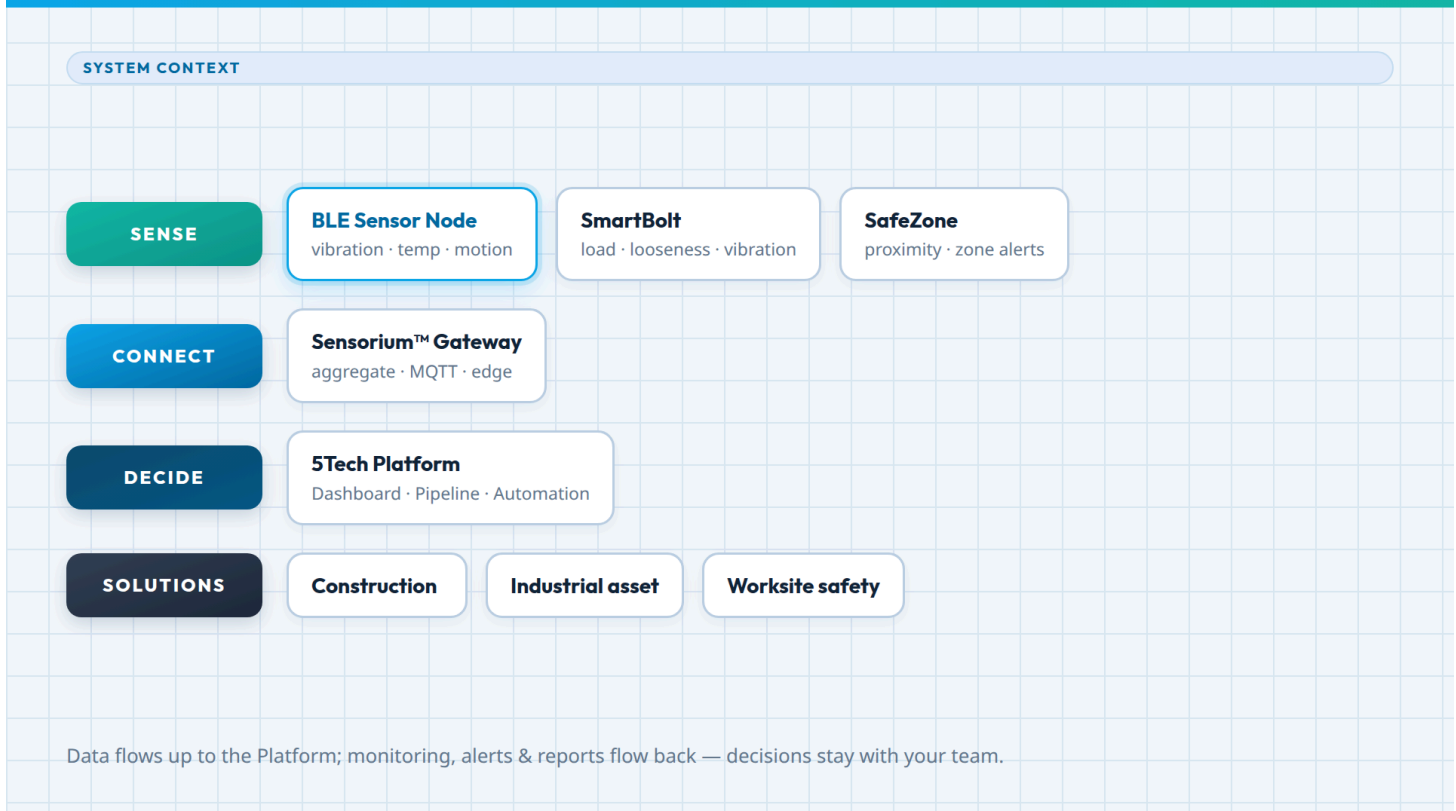


Figure FIG-002 — Sense → Connect → Decide. The Sensor Node reports over BLE to the Gateway.

- **Sense** — the **Sensorium™ Sensor Node** (and the SmartBolt / Zone Awareness products built on it) measures physical signals in the field.
- **Connect** — the **Sensorium™ Gateway** aggregates node data over BLE (up to 50± nodes of any mix — generic, SmartBolt, Zone Awareness) 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. Functional overview

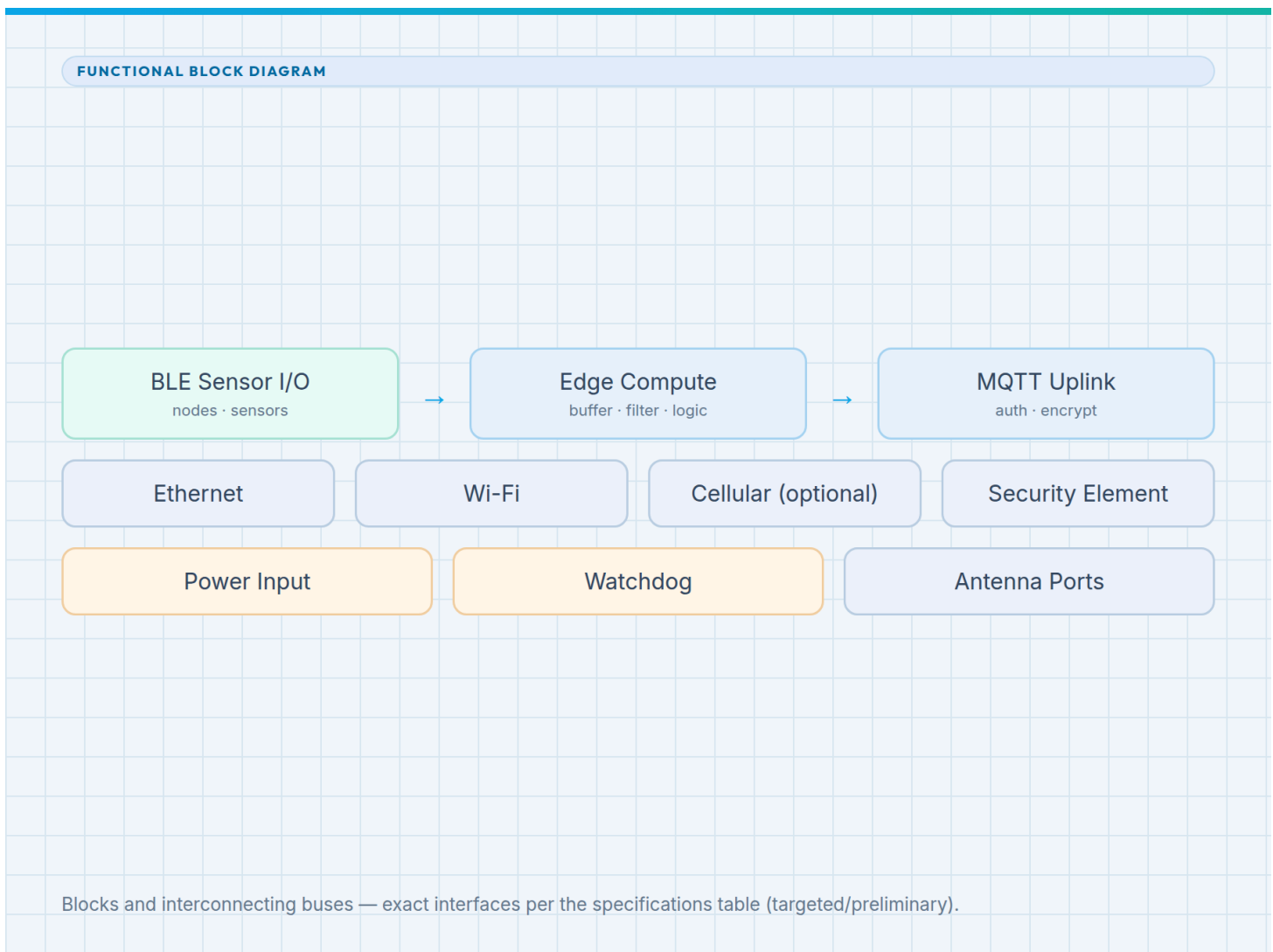


Figure FIG-003 — Functional blocks: sensing front-end, low-power MCU, BLE radio, and battery/power management. Internal detail preliminary.

The node combines four functional groups:

1. **Sensing front-end** — interfaces to the configured sensing element(s) over I²C / SPI / analog / digital channels and conditions their signals. The sensor set is platform-configurable and variant-specific (see §4).
2. **Low-power controller** — samples the sensors, applies basic on-node processing (e.g. thresholding / event detection / RMS-and-FFT vibration features), and manages sleep/wake duty cycling to conserve battery.
3. **BLE radio** — advertises to and exchanges data with the Sensorium™ Gateway over Bluetooth Low Energy 5.2. There is no cellular, satellite, or Wi-Fi uplink on the node.
4. **Power management** — battery supply (primary Li-SOCl₂ cell or rechargeable Li-ion option) with low-power / sleep management; an external-power option is offered on the **-P** variant.

Data path: *sensing element* → *sensing front-end* → *controller (sample / detect)* → *BLE* → *Sensorium™ Gateway* → *MQTT/TLS* → *5Tech Platform*. Configuration flows back to the node over BLE from the Gateway.

4. Sensing

The Sensor Node is a **configurable sensing carrier**: a given build populates one or more sensing elements onto the common low-power platform. The quantities below are the **supported** measurands; the ranges, accuracies, resolutions, and sample rates are **representative per-variant** figures for typical MEMS/digital sensing elements and **must be confirmed per build** against the element actually fitted and its calibration.

All figures are $\pm$ proposed and stated with their measurement condition. Accuracy is stated after factory calibration unless noted; resolution is the smallest reported step (sensor LSB or reporting quantum), not a guarantee of accuracy.

QUANTITY	REPRESENTATIVE RANGE‡	ACCURACY‡	RESOLUTION‡	SAMPLE RATE‡	CONDITION
Vibration / acceleration	±2 / ±4 / ±8 / ±16 g (selectable)	±3 % of reading	0.98 mg/LSB @ ±2 g	Output data rate up to 6.4 kHz; 0–3.2 kHz usable band	Triaxial MEMS accelerometer, 25 °C; reported as RMS velocity + FFT features
Temperature (process/contact)	–40 to +125 °C	±0.5 °C (0...+65 °C); ±1.0 °C full range	0.0625 °C	Up to 1 Hz	Digital sensor, still air, 25 °C reference
Motion / tilt	±180° (tilt); wake-on-motion	±1° (tilt)	0.1°	Up to 10 Hz; event-driven wake	Derived from the triaxial accelerometer, quasi-static, 25 °C
Proximity / presence	0.05–4 m (time-of-flight); up to 5 m (PIR)	±3 % of reading (ToF)	1 mm (ToF)	Up to 10 Hz	ToF/PIR element, indoor, target reflectivity ≥ 20 %, 25 °C
Load / strain (SmartBolt basis)	0–100 % of rated preload (0–50 kN typical)	±2 % of full scale	0.1 % of full scale	Up to 10 Hz	Strain-gauge/load-cell input, after per-fastener calibration, 25 °C
Environmental — humidity	0–100 % RH	±2 % RH (10...90 % RH)	0.04 % RH	Up to 1 Hz	Digital RH sensor, non-condensing, 25 °C
Environmental — pressure	300–1100 hPa	±1 hPa	0.01 hPa	Up to 1 Hz	Digital barometric sensor, 25 °C

The node reports engineering values and/or on-node features (e.g. vibration RMS velocity and FFT peaks) rather than raw streams, to conserve battery and BLE bandwidth. Which quantities a unit

provides is set by its variant (§5 ordering) and confirmed on its rating label. Values above are illustrative of the sensing class and not measured on a specific unit.

5. Ordering information

Order codes below are the proposed scheme; the base identifier and suffixes are ‡ pending confirmation. Configure = base + sensing option + power option. SmartBolt and Zone Awareness are ordered under their own product identities, not here.

ORDER CODE	CONFIGURATION	NOTES
SEN-SN-100 ‡	Base node	Standard sensing set, Li-SOCl ₂ primary cell
SEN-SN-100-X ‡	Extended-sensor variant	Additional / alternate sensing element (§4)
SEN-SN-100-R ‡	Rechargeable variant	Rechargeable Li-ion cell in place of the primary cell
SEN-SN-100-P ‡	External-power variant	External-power input fitted (§6.2)
SEN-SN-100-DEV ‡	Developer / evaluation node	For sensor integration and bring-up

Accessories and spares: see §10.

6. Mechanical & power specifications

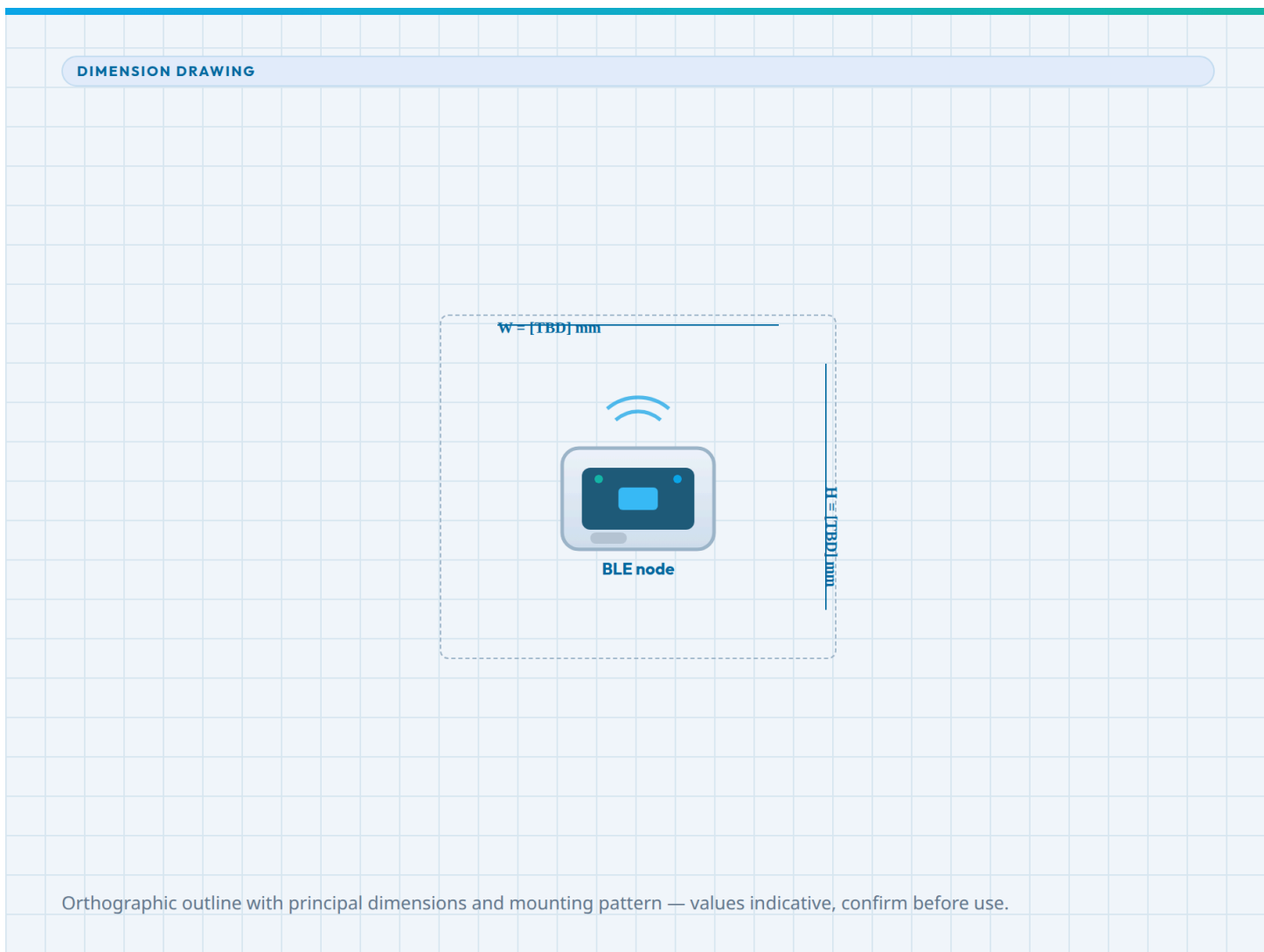


Figure FIG-004 — Overall dimensions and mounting provisions (mm). Values ≠ proposed.

6.1 Mechanical

PARAMETER	VALUE	CONDITION / NOTE
Dimensions (W × H × D)	50 × 50 × 25 mm‡	Base enclosure only; excludes mounting bracket and any external sensor lead; varies by sensing variant
Weight	60 g‡	Base variant, including battery
Mounting	M5 stud, adhesive pad, magnetic base, or bracket‡	Per variant; vibration-qualified per §8
Enclosure material	Glass-fibre-reinforced polyamide (PA6-GF30), UV-stabilised‡	Non-metallic so the internal BLE antenna radiates through the housing
Enclosure colour / finish	Graphite grey, textured‡	
Battery door	Captive-screw sealed door with gasket‡	Retains IP67 when closed and undamaged (§8)
Ingress protection	IP67‡ (IEC 60529)	Battery door and seals closed; see §8

6.2 Power & battery

All power values are ‡ proposed and stated with their measurement condition. The base and extended variants use a primary lithium cell; the -R variant substitutes a rechargeable cell; the -P variant adds an external supply.

PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
Battery chemistry (base)	—	Li-SOCl ₂ primary‡	—	—	AA-size, non-rechargeable; chosen for wide-temperature, long shelf life
Battery voltage (base)	3.0	3.6	3.67	V DC‡	Li-SOCl ₂ nominal 3.6 V, at the cell terminals
Battery capacity (base)	—	2400‡	—	mAh	AA-size Li-SOCl ₂ , 25 °C
Battery chemistry ( -R option)	—	Li-ion rechargeable‡	—	—	3.7 V nominal; do not charge below 0 °C or above +45 °C (§8)
Battery capacity ( -R option)	—	1000‡	—	mAh	Li-ion, 25 °C
Operating voltage (node input)	2.5‡	3.6	3.67‡	V DC	At the node input, from the fitted cell
Active current	—	25‡	40‡	mA	During sample + BLE transmit @ +8 dBm, 3.6 V, 25 °C
Sleep current	—	8‡	—	µA	Between reports, radio idle, 25 °C
Battery life (base)	—	≥ 5‡	—	yr	Li-SOCl ₂ 2400 mAh @ 15-min reporting interval, 20-byte payload, +25 °C; derates at temperature extremes and shorter intervals
External power ( -P option)	5‡	—	30‡	V DC	At the external input; SELV; reverse-polarity protected
Charge temperature ( -R option)	0‡	—	+45‡	°C	Rechargeable variant only; no charging outside this window

Battery life is a proposed target and depends heavily on sensing mode, reporting interval, payload size, and temperature; it is not a measured guarantee. Continuous or high-rate vibration capture reduces life substantially compared with the 15-min interval basis above.

7. Wireless (BLE) & interfaces

The node's only uplink is **Bluetooth Low Energy** to the Sensorium™ Gateway. It has no cellular, satellite, or Wi-Fi radio. A local service/configuration interface is provided for bring-up.

INTERFACE	SPECIFICATION	NOTES
Wireless uplink	Bluetooth Low Energy 5.2‡, 2.4 GHz	To the Sensorium™ Gateway; peripheral role
RF band	2.4 GHz ISM, 2402–2480 MHz‡	Per Bluetooth Core 5.2
TX power	+8 dBm‡ (configurable –20...+8 dBm)	@ antenna port, 3.6 V, 25 °C
Receiver sensitivity	–95 dBm‡	@ 1 Mbps LE, BER 1e-3
Wireless range	30 m‡ line-of-sight	Open field, +8 dBm TX, –95 dBm RX, no obstruction; falls sharply indoors / around metal
Nodes per Gateway	Up to 50‡	BLE central capacity of the Sensorium™ Gateway (mix of generic / SmartBolt / Zone Awareness)
Antenna	Integrated PCB/chip antenna‡	Radiates through the non-metallic enclosure; external-antenna option per variant
Pairing / security	LE Secure Connections (ECDH P-256) + AES-128-CCM‡	Bonded pairing to a claimed Gateway; link encryption; no open pairing in service
Sensor interface(s)	I²C / SPI / analog / digital‡	Internal, to the fitted sensing element(s) — per variant (§4)
Local service interface	BLE service profile (provisioning / firmware)‡	Authenticated; access method confirmed per firmware

Security. Node-to-Gateway pairing uses **LE Secure Connections** (ECDH key agreement) with **AES-128-CCM‡** link-layer encryption, bonded to a specific claimed Gateway. End-to-end transport to the 5Tech Platform (**MQTT over TLS**) is handled by the Gateway, not the node.

Radiated-power and range figures are ‡ proposed and depend on regional radio type-approval and on installation; confirm by test and against the approvals of §9.

8. Environmental & ratings

PARAMETER	VALUE	STANDARD / CONDITION
Operating temperature (base, primary cell)	−40 °C to +85 °C‡	Ambient; battery life derates toward the extremes
Operating temperature (-R rechargeable)	−20 °C to +60 °C‡ (discharge)	Ambient; charge only 0 °C...+45 °C (§6.2)
Storage temperature	−40 °C to +85 °C‡ (primary); −20 °C to +45 °C‡ (-R long-term)	Battery removed for extended storage
Ingress protection	IP67‡	IEC 60529; battery door and seals closed and undamaged
Humidity	5–95 % RH‡	Non-condensing
Altitude	≤ 2000 m‡	Operating
Pollution degree	2‡	IEC 61010-1
Overvoltage category	I‡ (battery/SELV); II‡ for the -P external-power variant	IEC 61010-1
Vibration	10–500 Hz, 5 g‡, 20 sweeps/axis	IEC 60068-2-6, stud/bracket-mounted
Shock	50 g‡, 11 ms half-sine, 3 shocks/axis/direction	IEC 60068-2-27
ESD immunity	±8 kV contact / ±15 kV air‡	IEC 61000-4-2
Radiated RF immunity	10 V/m, 80 MHz–2.7 GHz‡	IEC 61000-4-3
Surge (-P external input)	±1 kV‡ line-to-earth	IEC 61000-4-5 (1.2/50 µs); external-power variant only

All environmental figures are ‡ proposed targets, not yet verified by test. The enclosure is a sensing/alerting device, not a safety-rated barrier; ingress protection is valid only with the battery door, gaskets, and seals intact and closed.

9. Compliance & standards

No certification is currently held. The table lists the intended certification programme; no mark below may be shown on the product, packaging, or marketing until certified with a report on file (recorded in [references.md](#)).

AREA	INTENDED STANDARD	STATUS
Radio / telecom (per region)	FCC Part 15B/C / ISSED RSS-247 / RED (EU) 2014/53/EU‡	Planned — not yet submitted
Bluetooth qualification	Bluetooth SIG QDID declaration‡	Planned — not yet listed
EMC	EN 55032 / EN 55035 / EN 61000-6-2 / -6-4‡	Planned — not yet tested
Electrical safety	IEC/EN 62368-1‡	Planned — not yet tested
Battery cell safety / transport	IEC 62133-2 (cells) / UN 38.3 (transport)‡	Planned — not yet tested
Environmental (materials)	RoHS (EU 2011/65) / REACH‡	Planned — declaration pending

Radio type-approval is required before the product may be sold in any market; it is not yet held. The node is not a safety-rated device and no functional-safety standard (e.g. IEC 61508 / ISO 13849) is claimed or intended.

10. Accessories & related products

ITEM	ORDER CODE	PURPOSE
Replacement battery (Li-SOCl ₂ , AA)	SEN-SN-ACC-BAT ‡	Primary cell per \$6.2
Replacement battery (Li-ion, -R)	SEN-SN-ACC-BATR ‡	Rechargeable cell per \$6.2
Mounting kit (bracket / adhesive / magnet)	SEN-SN-ACC-MNT ‡	Field mounting
External antenna (option)	SEN-SN-ACC-ANT ‡	Extended BLE range
External-power adapter (-P option)	SEN-SN-ACC-PWR ‡	External-power variant
Battery-door seal / gasket kit	SEN-SN-ACC-SEAL ‡	Restores IP67 after service

Related documents

- **Manual:** [manuals/sensorium-sensor-node-manual/](#) — operation, BLE pairing, configuration, battery maintenance.
- **Installation:** [installation/sensorium-sensor-node-installation/](#) — mount, power, pair, verify.
- **Reports to:** Sensorium™ Gateway datasheet ([datasheets/sensorium-gateway-datasheet/](#)).
- **Products built on this platform:** Sensorium™ SmartBolt (fastener sensing), Sensorium™ Zone Awareness (proximity/zone sensing).
- **Works with:** the 5Tech Platform (dashboard · MQTT/TLS cloud pipeline · edge · rule-based automation).

11. Monitored signals & alert behaviour (illustrative)

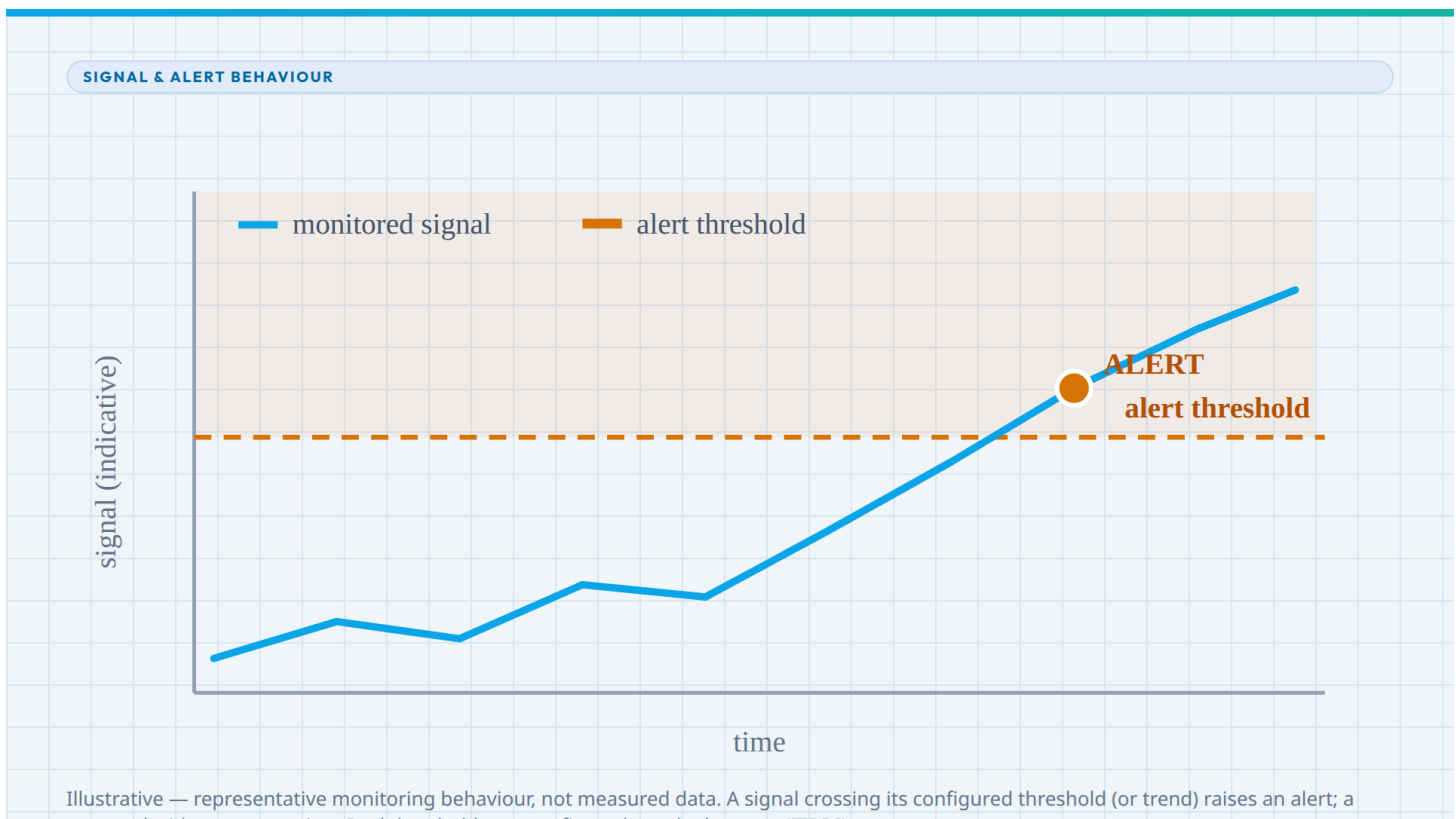


Figure FIG-005 — Illustrative — a monitored signal crossing its configured alert threshold (or an abnormal trend) raises an alert; a person decides on any action. Representative behaviour, not measured data.

The Sensor Node reports its monitored signal over BLE (via the Gateway) to the 5Tech Platform; when the signal crosses a configured threshold or shows an abnormal trend, the Platform raises an **alert** and a person decides on any action. The chart is illustrative; thresholds are configured per deployment.

SIGNAL	EXAMPLE ALERT TRIGGER‡	RESPONSE
Vibration	RMS velocity rises above a configured threshold or trends abnormally‡	Alert + notify (person decides)
Temperature	Temperature crosses a configured limit‡	Alert + notify (person decides)
Reporting / battery	The node stops reporting beyond 3× its interval, or battery falls below 10 %‡	Alert + notify (person decides)

Illustrative — representative, not measured; trigger values ‡ proposed and configurable.

12. Revision & change control

REVISION	DATE	CHANGE	AUTHOR
Draft (Preliminary)	2026-07-08	Initial authored content; values <code>[TBD]</code> .	Documentation
Draft (Preliminary, PROPOSED)	2026-07-18	Industrialization pass: added the Sensing section (§4) with representative per-variant ranges/accuracy/resolution/sample rate and conditions; clarified SKU-vs-platform identity and family framing; added Nodes-per-Gateway capacity (up to 50 $\pm$); selected battery chemistry (Li-SOCl ₂ primary + Li-ion option) with capacity, life basis, and charge limits; filled all electrical/mechanical/wireless/environmental specs with conditioned $\pm$ proposed values and specific test standards; rewrote Compliance to an intended-programme table (no held mark); renamed Safety Zone → Zone Awareness in text; added this revision block.	Documentation

Full change history: `revision.md`. Sources and cited standards: `references.md`.

Figures

ID	TITLE	FILE	ASPECT	PURPOSE
FIG-001	Industrial Hero Render	renders/hero_sensor-node.png	16:9	Cover / hero image
FIG-002	System Context	diagrams/system_context.png	16:9	Where the node sits in the Sense → Connect → Decide chain
FIG-003	Functional Block Diagram	diagrams/block_diagram.png	4:3	Internal functional architecture
FIG-004	Dimension Drawing	cad/dimensions.png	4:3	Mechanical dimensions for specification & mounting
FIG-005	Signal & Alert Behaviour (illustrative)	diagrams/signal_threshold_chart.png	16:9	How a monitored signal crossing a threshold raises an alert (illustrative, not measured data)

Specifications are preliminary; ‡ values are proposed and subject to engineering confirmation and 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: </documents/datasheets/sensor-node/>.