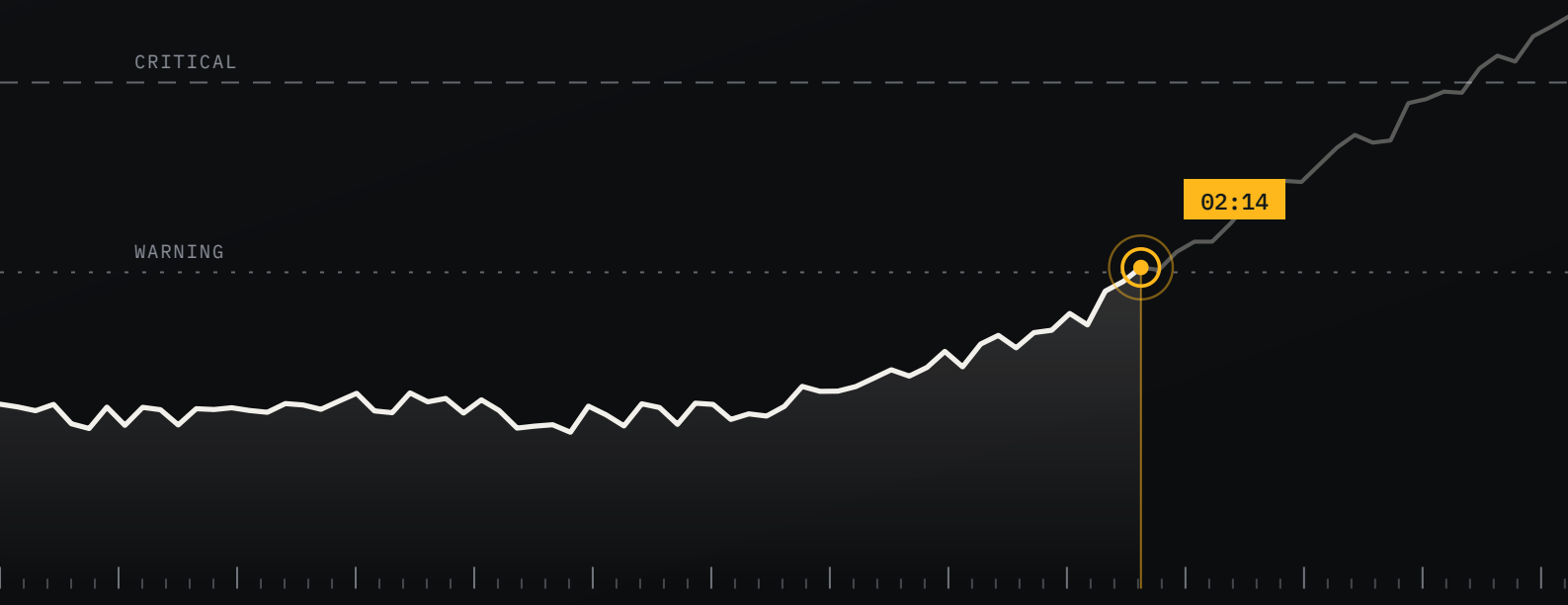
HS-IIoT
Industrial monitoring, made intelligent

Engineering catalog

Power monitoring
Installation, operation and maintenance

The three-phase measuring node and the site gateway: specifications, wiring, pairing and calibration.



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Document control

Rev.	Date	Description	Approved by
1.0	2026-08	Initial release (industrial specification).	HS Team
2.0	2026-10	Redesigned in the HS-IIoT visual identity. Gateway 2.3.0 and node 1.1.0; alarms and troubleshooting added.	HS Team
3.0	2026-11	New visual identity. Gateway 2.7.0 and node 1.1.0: the gateway’s local interface and its remote update from the dashboard.	HS Team

01 Safety and compliance

This document contains safety instructions that must be followed during installation, operation and maintenance of the HS-IIoT system. Only qualified electrical personnel may carry out the installation.

> ⚠ **Danger: high voltage**
> Installation involves mains voltage that can be lethal. Isolate and lock out (LOTO) the main breaker before opening any panel. Fit a miniature breaker or fuse on every voltage-measuring line.

> ⚠ **Caution: current transformers (CT)**
> Never leave the secondary of a CT open while the primary is energised. It produces dangerous voltage spikes that can destroy the node. Short the CT terminals before disconnecting any wire.

> ⓘ **Note: radio interference**
> The nodes reach the gateway by radio. Mount the units away from large metal enclosures so the signal travels well.

Before you start

Step	Required
Isolate	Switch off and lock out the source, then prove the circuit dead.
Cables	Voltage lines 1.5 mm², CT pair twisted 2.5 mm².
Protection	2 A breaker on each voltage line.
Supply	12 V DC adapter for the node.

02 System overview

HS-IIoT is a scalable industrial monitoring platform: measuring nodes on site, one gateway per site that collects, filters and forwards their readings, and a platform that stores, evaluates and shows them on screen and phone.

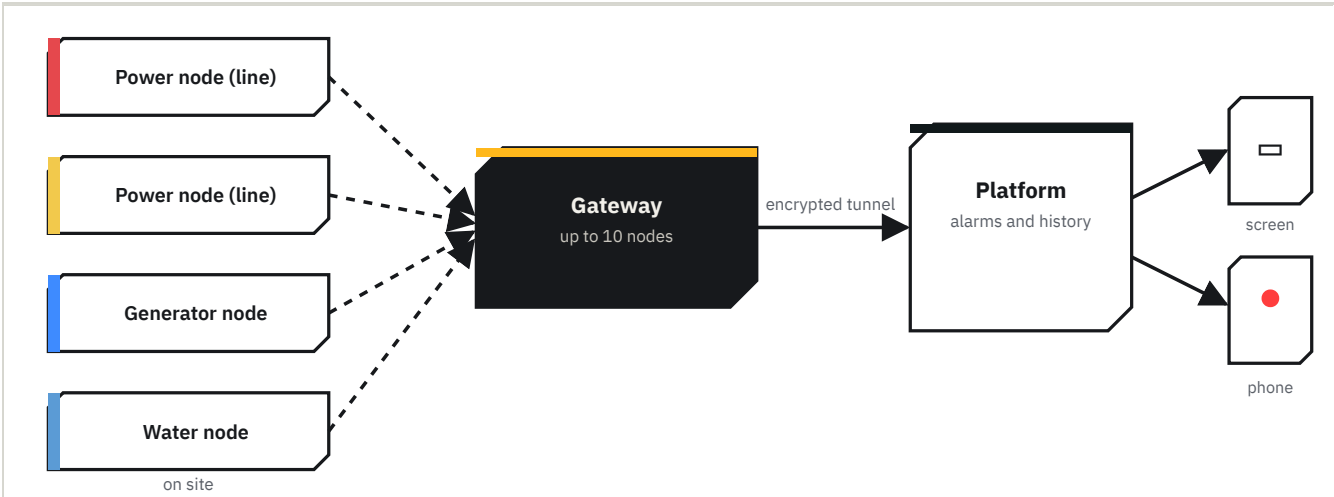


Figure 2.1: The system from the site to the user.

The wireless link between nodes and gateway

Nodes talk to the gateway directly over the system's own wireless link, with no router in between. This gives very low latency and lets overload alarms travel within fractions of a second. The gateway accepts data from the nodes paired to it only.

- **Capacity:** up to 10 nodes per gateway (power and water, in any mix).
- **Range (guidance):** 20-50 m indoors, 100-200 m outdoors, 400-1000 m with a directional antenna.
- **Deadband filtering:** a reading is sent on a meaningful change, an alarm change or when the report interval passes, so small fluctuations do not flood the link.

No data is lost

The gateway keeps every reading in a journal on a microSD card before sending it, and deletes it only after the server confirms it is stored. When the internet drops, readings accumulate and are sent afterwards with their original time. An RTC keeps time without a network.

03 Technical specifications

Site gateway

Item	Specification
Microcontroller	Dual-core · 240 MHz

Item	Specification
Network	The site's Wi-Fi (2.4 GHz), with the gateway's own access point for set-up and when no network is saved (HS-AP-XXXX)
Link to the platform	Encrypted VPN tunnel from the gateway to the platform
Nodes	Up to 10 paired nodes (power and water)
Storage	Store-and-forward journal on a microSD card (optional)
Time	Battery-backed real-time clock (RTC), set from network time once online
Security	Remote update from the dashboard with automatic rollback on failure; local web interface with two PIN roles (operator / engineer)
Local address	http://hs-system.local
Local alert	Horn (buzzer) and a status LED

Power monitoring node

Parameter	Range / sensor
Voltage input	80 - 260 V AC per phase to neutral
Current input	0 - 100 A (included CT), up to 5000 A with external x/5 A CTs
Measurements	Per phase: voltage, current, power, energy, frequency, power factor. Derived: VA, VAR, unbalance, neutral current, load factor
Cycle	One phase every ~0.7 s (a full cycle every 2 s); sent on change or every 10-60 s
Climate sensing	-40 … 125 °C · 0 - 100 % RH
Generator role	Virtual controller: run hours, fuel (L/h), stability, engine health, oil and filter intervals
Alarms	Low/high voltage, missing phase, overcurrent, overload, unbalance, panel temperature, power factor (see chapter 6)
Supply	12 V DC from an external adapter

Enclosure and environment

Parameter	Specification
Enclosure material	Industrial-grade ABS / polycarbonate

Parameter	Specification
Mounting	35 mm standard DIN rail
IP rating	IP65 (panel-mount configuration)
Operating temperature	-20 … +70 °C

04 Wiring diagrams

Standard wiring (below 100 A)

For lines below 100 A each phase conductor passes through the standard CT supplied with the node. Voltage is taken after a 2 A breaker on every phase.

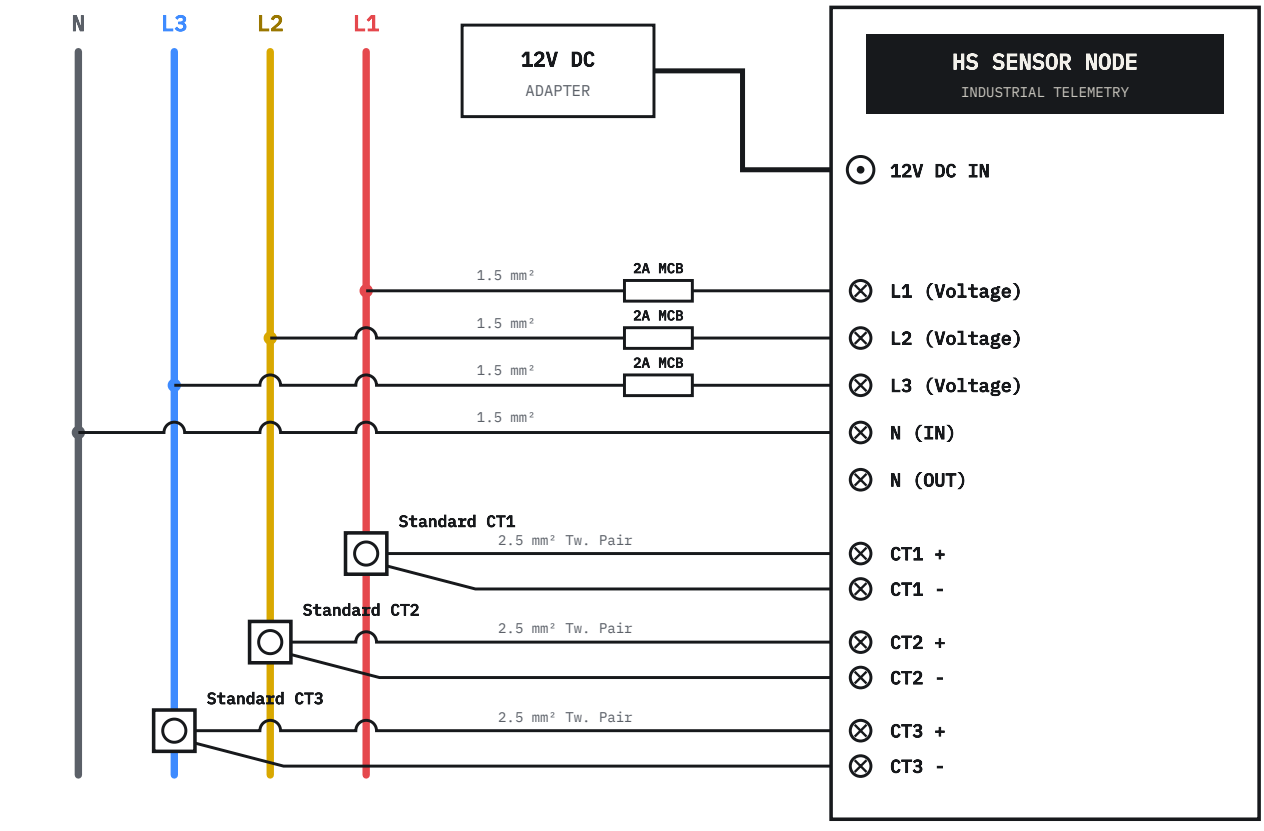


Diagram 4.1: Direct sensing for phases below 100 A.

Heavy industrial loads (above 100 A)

The standard 100 A CT is not enough for heavy loads. Use large industrial CTs (for example 400/5 A) on the main busbars and pass their 5 A output through the node's standard CT. Then set the CT ratio on the gateway (see chapter 5).

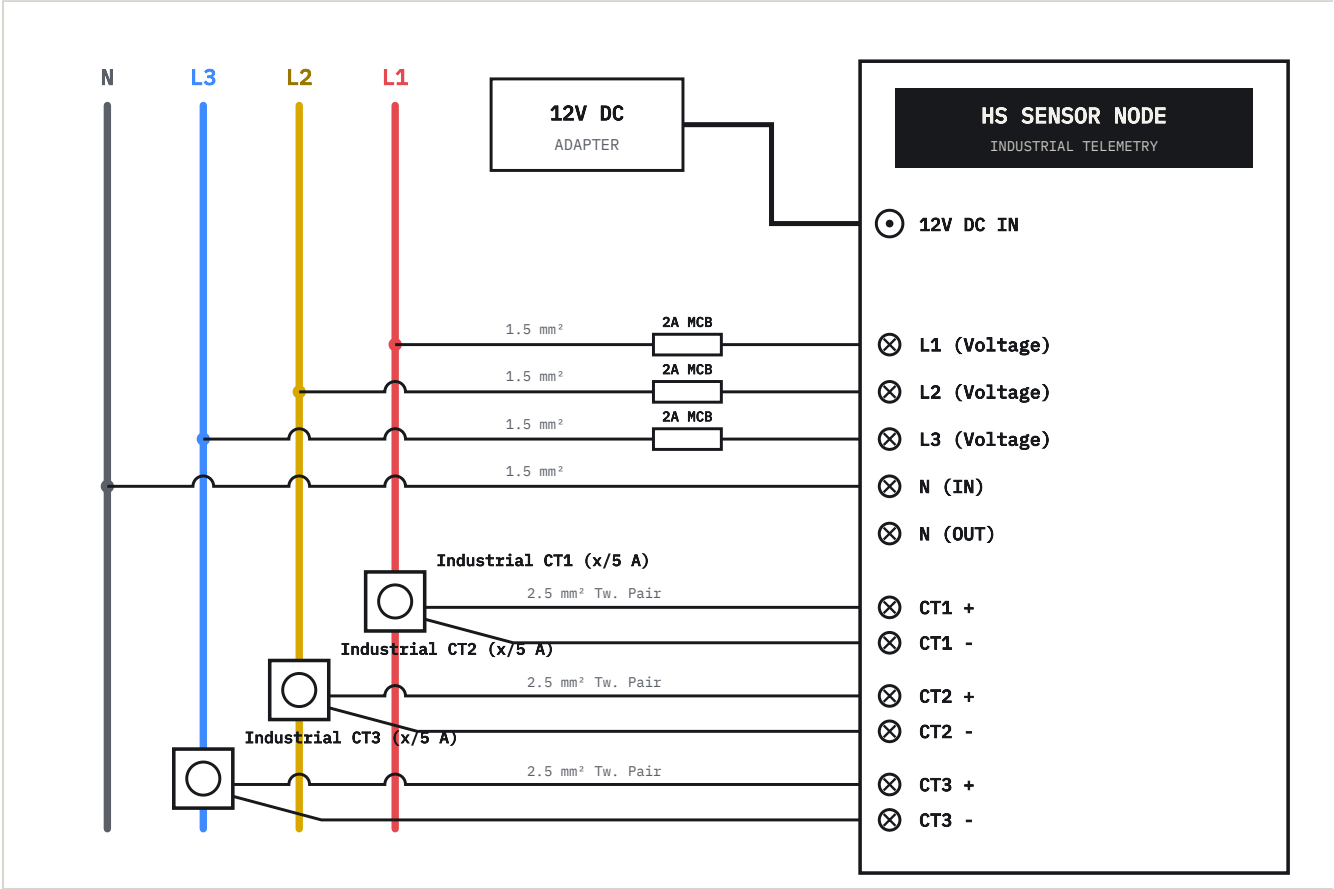


Diagram 4.2: Cascaded sensing for heavy loads (above 100 A).

> ⚠ **Reminder**
> Short the terminals of an industrial CT before changing any of its wiring (see the safety chapter).

05 Commissioning

Pairing a node with the gateway

The gateway never registers a device by itself: a new node pairs only from the gateway's local web page, with the engineer role.

1. Power the node. Its LED blinks every 200 ms while it is unpaired and searching for a gateway.

2. On the gateway open the **Devices** page and press **Pair new device** (a 60-second window).
3. The node appears as a pairing request. Give it a clear name and press **Accept**.
4. The node stores the pairing, receives its settings from the gateway, and flashes briefly with every message it sends.

> **Resetting a node**
> Hold `BOOT` (or the external button) for **3 seconds**: the LED flashes 10 times, the pairing and settings are erased and the node restarts. Use it when the gateway is replaced by a new unit.

CT ratio calibration

With industrial CTs stepped down to 5 A, the node reads a small current. Set the **CT ratio** of each phase in the node's settings on the gateway (or from the dashboard) so the real value shows: ratio = primary current ÷ 5.

Industrial CT rating	Secondary output	Multiplier value
200 A	5 A	40
400 A	5 A	80
800 A	5 A	160
1000 A	5 A	200

Example: with a 400/5 A CT and the multiplier set to 80, a 2.5 A reading at the node is shown as 200 A on the dashboard.

Handover checklist

Check	Criterion
Node visible	Shows under the right name on the dashboard and updates within the report interval.
Voltage	Matches a reference meter within 2 % on every phase.
Current	Matches a clamp meter under a known load, with the right CT ratio.
CT direction	Power is positive under normal supply (CT arrow pointing to the load).
Alarms	No unexplained active alarm at handover.

06 Alarms and troubleshooting

Alarms and what to do

Alarms are evaluated in one place on the platform to ISA-18.2: a source with no voltage on any phase (grid outage, generator stopped) is a *state*, not a fault, so it raises no electrical alarms.

Priority	Alarm	Action
High	Missing phase (L1 / L2 / L3)	Disconnect three-phase loads (motors, pumps) at once and check the breaker and fuse of the missing phase.
High	Overcurrent on a phase (L1 / L2 / L3)	Reduce the load on that phase before the breaker trips or the cables overheat.
High	Source overloaded	Reduce the load or start the backup source before the source trips.
High	Grid and generator both on	Check the transfer switch (ATS) at once: feeding both sources together endangers the generator and the grid.
High	Gateway offline	The gateway has sent nothing for 5 minutes: check its power supply and the internet or Wi-Fi.
High	Internet subscription ended	Renew the subscription at once: without internet the gateway delivers no data and no alarms. After renewing, press RENEWED in the settings.
Medium	Low or high voltage	Check the source voltage and disconnect sensitive equipment (air conditioners, motors) if it persists.
Medium	Low or high frequency	Generator: reduce the load and check engine speed and governor. Grid: watch the source and report it.
Medium	Phase meter not responding	The other phases are live: check the wiring and supply of that phase's meter.
Medium	Voltage unbalance between phases (over 5 %)	Check the source connections and spread the loads across the phases.
Medium	Panel overheating (over 65 °C)	Check the ventilation of the panel and look for loose connections.
Medium	A measuring node stopped reporting (over 2 minutes)	Check the node's supply, its distance from the gateway and any large metal obstacle between them.

Priority	Alarm	Action
Medium	Gateway temperature high	Check the ventilation of the gateway box and keep it away from sun and heat sources.
Medium	Internet subscription ends soon	Renew the internet subscription before its last day so the gateway does not drop, then press RENEWED in the settings.
Medium	Gateway dropped unsent data	The gateway's storage filled before the data reached the platform and its oldest part was dropped: check the gateway's internet and fit a larger memory card.
Low	Current unbalance between phases (over 20 %)	Spread single-phase loads evenly across the phases.
Low	Low power factor (below 0.8)	Check the power-factor correction capacitors and inductive loads.
Low	Weak Wi-Fi signal at the gateway	Move the gateway closer to the router or add a signal repeater.
Low	High electromagnetic noise at the gateway	Move the gateway away from cables and motors and check the earthing.
Low	Gateway storage nearly full	Check the gateway's memory card: clear old records or fit a larger card before it fills and data is dropped.

Status indicators

Device	Indicator	Meaning
Node	Blink every 200 ms	Not paired: searching for a gateway
Node	Short flash	Paired: a message was sent
Node	10 flashes after a 3 s hold	Pairing and settings erased; restarting
Gateway	Steady light	Joined to the site's wireless network.
Gateway	Light blinking once a second	Direct mode (no network): it broadcasts its own network for the engineer.
Gateway	Light off	Not connected to the network.
Gateway	Light and buzzer together	An alarm is active at the site.
Gateway	3 short beeps at start-up	The clock module is missing: it waits to set the time from the internet.

The alarm buzzer’s rhythm tells the kind: the faster the pulses, the more serious: high voltage is the fastest, then high current, then frequency, then low voltage, then water level, and the slowest is the gateway’s own alarm.

Common problems

Symptom	Likely cause	Remedy
Node not on the dashboard	Not paired, or too far from the gateway	Pair again; move the node closer or fit a better antenna.
Current reads far too low	CT ratio not set	Set the ratio from the table in chapter 5.
Power negative or weak	CT fitted the wrong way round	Reverse the CT so the arrow points to the load.
Readings stop after an internet drop	Normal: they are kept on the gateway	They appear complete, with their original time, once the link returns.

Contact us

Channel	Details
E-mail	info@hs-iiot.com
Website	https://hs-iiot.com (the request form: we call back within one working day)
The team	Eng. Hussein, Eng. Abdulameer (WhatsApp: the numbers are in the contact section of our website)
When you write, mention	The site name, the device, the time of the event, and the message text or a screenshot.

End of document

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