



User Guide

Your Smart
Environment,
Smarter Than Ever.
Monitor.
Automate.
Protect.



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benolitech.com/sensoblock

Partner/Reseller

Table of Contents

1. Introduction	3
1.1 Overview	3
1.2 Before you begin	3
2. Package contents	3
3. Safety & Compliance	4
4. Hardware overview	4
5. Sensor descriptions	6
6. Installation	6
6.1 Mounting	6
6.2 Powering the device	6
6.3 Network connection	6
6.4 Connecting sensors	6
6.5 Quick Start	7
7. Device configuration	7
7.1 Configure a Standalone (No CAN Chain) SensoBlock	9
7.2 Configure a Chained Gateway (Head of the Chain)	10
7.3 Configure a Chained Reader (Satellite Node)	12
7.4 Network settings information	13
7.5 SensoBlock state after configuration	13
8. Modbus status register	14
9. Calibrating the sensors	16
10. LED status meanings	18
11. Technical Specifications & Known limitations	19
12. Reset & Recovery	20
13. Device disposal	20
14. Support & Contact	20

1. Introduction

1.1 Overview

SensoBlock is a secure and versatile IoT gateway designed to collect and transmit data from multiple sensors. It enables real-time monitoring and analytics across environments such as industrial systems, smart buildings, agriculture, and energy infrastructure.

SensoBlock CR01CT01 comprises:

- **Hardware version:** 1.0.1
- **Software version:** 4.2.0

1.2 Before you begin

Ensure the following before installation:

- A 12–24V DC power source
- A computer with a web browser
- Connect the SensoBlock to the same network as your PC, either through a router or directly to the PC via an Ethernet cable¹

2. Package contents

The package includes:

- 1 × SensoBlock device
- 1 × Ethernet cable (1m)
- Schematic for connecting the sensors
- HW ID

Optional (depending on configuration):

- Sensors
- Sensor port extender

Not included:

- Power supply (sold separately)

¹ Go to **Control Panel** -> **Network and Internet** -> **Network and Sharing Center** -> **Change adapter settings** (left menu) -> Right click on the **Wi-Fi connection** -> **Properties** -> **Sharing** tab -> Tick **Allow other network users to connect through this computer's Internet connection** -> In the **Home networking connection** field choose the network you want to share

3. Safety & Compliance

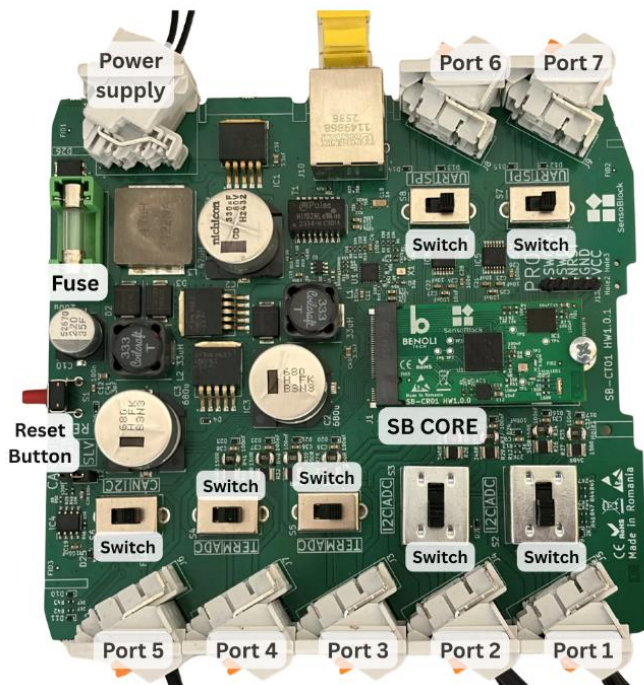
- Use only CE-certified compatible power adapters
- Do not expose the device to moisture, direct sunlight, or extreme temperatures (acc. to Chapter 11 Technical Specifications)
- Ensure proper ventilation during operation
- Do not operate outside specified voltage ranges

The device complies with:

- RED 2014/53/EU
- EMC 2014/30/EU
- LVD 2014/35/EU
- RoHS 2011/65/EU

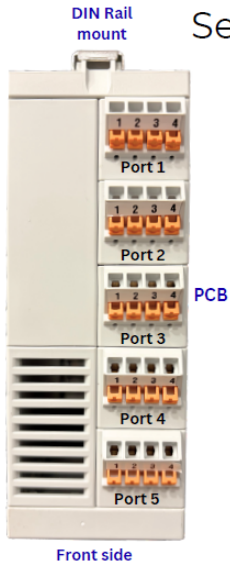
4. Hardware overview

The SensoBlock device includes multiple ports for sensor connectivity and communication protocols. For each port, 2 communication protocols are available, to facilitate the connection of different sensor types. To commute between the two protocols, you need to access the switches, by removing the PCB from its protective case.



The ports arrangement is shown in the images below:

Sensor connection diagram



Port 1 available protocols:

- **4-20mA:** Pin 1 - GND , Pin 2 - 24V, Pin 3 - ADC, Pin 4 - ADC;
- **I2C:** Pin 1 - GND, Pin 2 - 3V3, Pin 3 - I2C_SCL, Pin 4 - I2C_SDA;

Port 2 available protocols:

- **4-20mA:** Pin 1 - GND , Pin 2 - 24V, Pin 3 - ADC, Pin 4 - ADC;
- **I2C:** Pin 1 - GND, Pin 2 - 3V3, Pin 3 - I2C_SCL, Pin 4 - I2C_SDA;

Port 3 available protocols:

- **4-20mA:** Pin 1 - GND , Pin 2 - 24V, Pin 3 - ADC, Pin 4 - ADC;
- **Thermocouple:** Pin 1 - N/A, Pin 2 - N/A, Pin 3 - TERMO_C-, Pin 4 - TERMO_C+;

Port 4 available protocols:

- **4-20mA:** Pin 1 - GND , Pin 2 - 24V, Pin 3 - ADC, Pin 4 - ADC;
- **Thermocouple:** Pin 1 - N/A, Pin 2 - N/A, Pin 3 - TERMO_C-, Pin 4 - TERMO_C+;

Port 5 available protocols:

- **CAN:** Pin 1 - GND, Pin 2 - 24V, Pin 3 - CAN_L, Pin 4 - CAN_H;
- **I2C:** Pin 1 - GND, Pin 2 - 3V3, Pin 3 - I2C_SCL, Pin 4 - I2C_SDA;



Power Supply:

- Pin1 - GND , Pin 2 - GND, Pin 3 - 24V, Pin 4 - 24V

Port Ethernet

Port 6 available protocols:

- **SPI:** Pin 1 - GND, Pin 2 - 5V, Pin 3 - SPI_CLK, Pin 4 - SPI_MOSI
- **UART:** Pin1 - GND, Pin 2 - 5V, Pin 3 - UART_TX, Pin 4 - UART_RX

Port 7 available protocols:

- **SPI:** Pin 1 - GND, Pin 2 - 5V, Pin 3 - SPI_NSS, Pin 4 - SPI_MISO
- **UART:** Pin 1 - GND, Pin 2 - 5V, Pin 3 - UART_TX, Pin 4 - UART_RX

5. Sensor descriptions

Vibration sensor

The vibration sensor compatible with the SensoBlock system is based on **LIS3DH**, a low-power MEMS accelerometer.

It measures acceleration along three orthogonal axes (X, Y, Z). Vibration is not measured directly but **derived from variations in acceleration over time**.

Temperature sensor

The temperature sensor compatible with the SensoBlock system is a **Type J/K thermocouple**, which is a temperature measurement system where the iron–constantan probe generates a micro voltage proportional to temperature, and the MAX31856 chip performs cold-junction compensation, linearization, and high-accuracy conversion to a digital SPI output.

6. Installation

6.1 Mounting

- Mount the SensoBlock device on a wall or DIN rail

6.2 Powering the device

- Connect SensoBlock's power supply to a 12–24V DC power source

6.3 Network connection

- Connect the Ethernet cable between the router / PC and the SensoBlock device (use the dedicated Ethernet port)

6.4 Connecting sensors

- Connect the sensor(s) to the appropriate ports:
 - Temperature sensor: port 3 or 4; make sure the switches on the PCB are in the correct position (TERM)
 - Vibration sensor: port 1, 2 or 5²; Make sure the switches are in the correct position (I2C) and follow the vibration sensor installation guideline for the correct pinning.
- Ensure correct placement according to hardware specifications (acc. to chapter 4. Hardware Overview)

² Port 5 is available for the vibration sensor only when the SensoBlock is configured as a standalone device. In a chained connection port 5 is always for CAN.

6.5 Quick Start

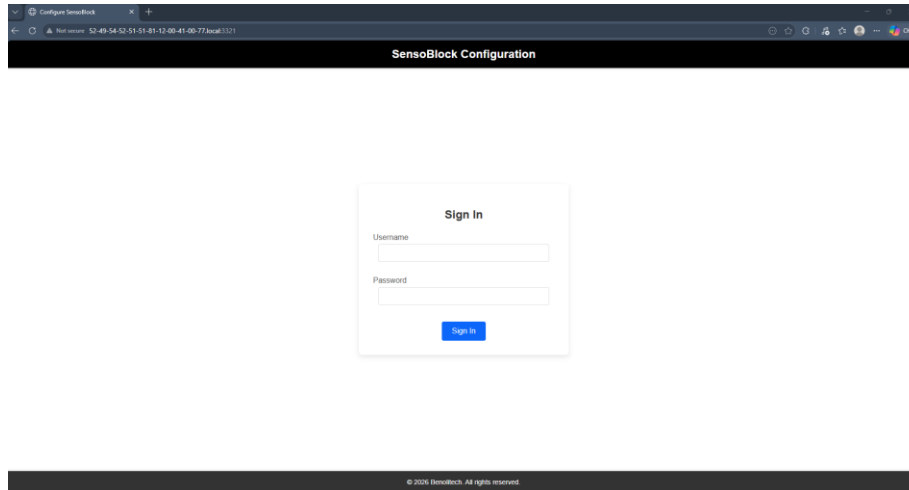
1. Connect the sensors by following the sensor connection diagram (found in the package)
 - Temperature sensor: port 3 or 4; Make sure the switches on the PCB are in the correct position (TERM)
 - Vibration sensor: port 1, 2 or 5 (for chained devices, port 5 is always used by CAN); Make sure the switches are in the correct position (I2C) and follow the vibration sensor installation guideline for the correct pinning.
2. Power the SensoBlock to 12V-24V
3. Connect both the SensoBlock device and the computer to the same network or directly via an Ethernet cable
4. Open a browser and go to: <http://<HW ID>.local:3321/>
5. Log in (Username: admin; password: last 10 digits of the HW ID)
6. Configure the SensoBlock
7. Configure the sensors (detailed steps found in this User Guide, chapter 7)
8. Save the configuration

7. Device configuration

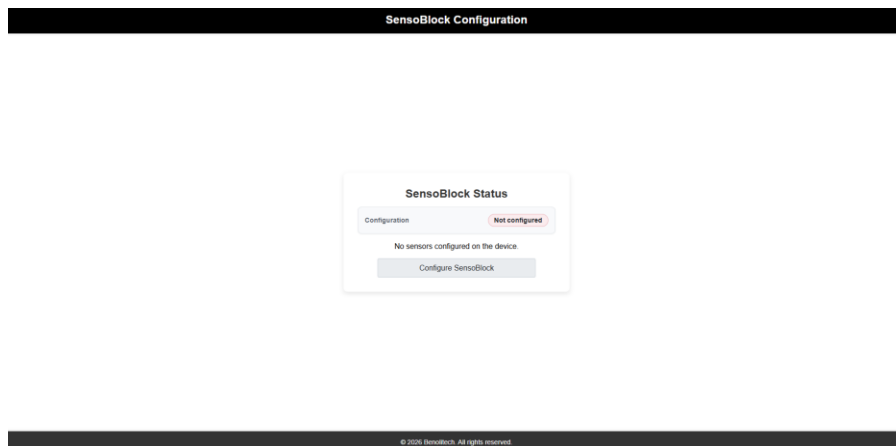
The device can be configured via the local server, by following the steps below:

1. Connect both the SensoBlock device and the computer to the same network or directly via an Ethernet cable
2. Open a browser and navigate to <http://<HW ID>.local:3321/>
3. Log in (Username: admin; password: last 10 digits of the HW ID³)

³ Password example: If HW ID is 52-49-54-52-51-51-81-12-00-40-00-21 then the password is 1200400021.



4. The following page displays after successful sign in. Click on Configure SensoBlock:



5. Enter the required information on the next screen:

Configure SensoBlock

Device on CAN bus:

Standalone

SensoBlock Communication Protocol:

Modbus

Network

IP Address: 5 2 191 185

Subnet Mask: 255 255 255 0

Default Gateway: 0 0 0 0

SensoBlock status register: ☐

Back Next

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7.1 Configure a Standalone (No CAN Chain) SensoBlock

1. Select Standalone from the Device on CAN bus drop-down list.
2. Select Modbus as a communication protocol.
3. Add the required Network information.
4. Select a Modbus register for the SensoBlock status.
5. Click Next.

Configure SensoBlock

Device on CAN bus:

Standalone

SensoBlock Communication Protocol:

Modbus

Network

IP Address: 5 2 191 185

Subnet Mask: 255 255 255 0

Default Gateway: 0 0 0 0

SensoBlock status register: ☒ 8

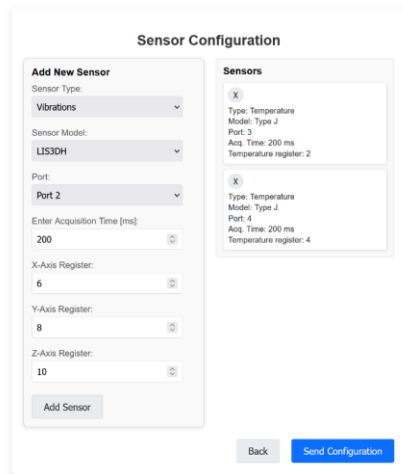
Register 2: read 0 when all sensors are OK. Otherwise: 0: device master, fault, and status 1: disconnected, 2: simulation/failed, 3: read failed, 4: supply too low, 5: supply too high (port 0 => Gateway devices). Do not use this register for measurement data.

Back Next

6. Configure the sensors, keeping in mind the sensor connection diagram (found in the package), their communication protocols and ports:

- Temperature sensor: port 3 or 4; Make sure the switches on the PCB are in the correct position (TERM).
- Vibration sensor: port 1, 2 or 5; Make sure the switches are in the correct position (I2C) and follow the vibration sensor installation guideline for the correct pinning.

7. Choose the sensor type, sensor model, SensoBlock port, data acquisition time and Modbus data register numbers then click on **Add sensor**.



8. Once you are done configuring all the necessary sensors, click on **Send Configuration**.

The device saves, reboots, and enters normal operation.

- **Behavior:** Directly exposes local sensor data to the local network using the Modbus protocol.
- **Network Input Requirements:** Requires manual configuration of local network variables namely IP address, Subnet mask, and Default gateway.
- **Optional Feature:** You can enable a dedicated Modbus status register (consult chapter 8 for further information on this topic) to track local device health diagnostics.

7.2 Configure a Chained Gateway (Head of the Chain)

The configuration of a Chained Gateway device follows the same steps as for a standalone device, the only difference being the role chosen in the Device on CAN bus drop-down list:

Configure SensoBlock

Device on CAN bus:

Chained gateway

SensoBlock Communication Protocol:

Modbus

Network

IP Address:

192 · 168 · 1 · 210

Subnet Mask:

255 · 255 · 255 · 0

Default Gateway:

192 · 168 · 1 · 1

SensoBlock status register: ☒

0

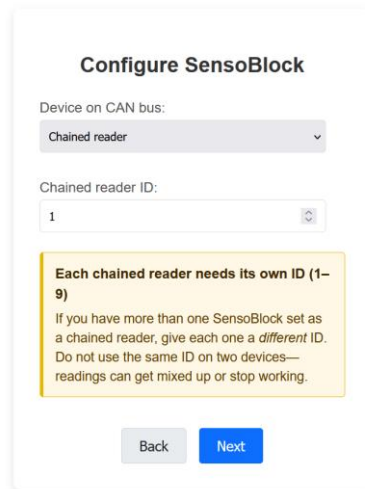
Register 0: read 0 when all sensors are OK. Otherwise decode reader, port, and status: 1 disconnected, 2 setup/calibration failed, 3 read failed, 4 supply too low, 5 supply too high (port 0 = Gateway device). Do not use this register for measurement data.

BackNext

- **Behavior:** Consolidates telemetry data from downstream CAN readers along with inputs from its own local sensors.
- **Network Interface:** Exposes a single unified Modbus TCP interface to the LAN (requires IP, Mask, Gateway). External equipment on the network reads the entire system's map (chain of SensoBlock devices) by polling only this Gateway.
- **Critical Recommendation:** It is highly recommended to assign a Modbus status register on the Gateway to centralize fault streams from all downstream reader nodes. Ensure you

reserve this register address in your Gateway Modbus configuration before setting up downstream readers⁴.

7.3 Configure a Chained Reader (Satellite Node)



- Behavior: Forwards local sensor inputs to the SensoBlock Gateway strictly via the CAN bus protocol. It does NOT expose Modbus directly to the Ethernet network.
- Mandatory Parameter: Requires a Chained Reader ID (unique among all chained readers) assigned strictly between 1 and 9⁵.
- Critical Recommendation: Ensure you reserve the Modbus register addresses for sensor data, such that the same register addresses are not re-used by the Gateway or by another reader.

⁴ Every sensor channel across the entire CAN chain must be assigned a strictly unique, non-overlapping register number within Gateway's global register pool.

- No Overlaps Between Nodes: You must never assign the same Modbus register to different physical Reader IDs.
- No Overlaps on Floats: Because sensor data is stored as a 32-bit Float, each Temperature sensor requires 2 sequential registers, and each Vibration sensor requires 6 sequential registers. The starting register of a new sensor must not intersect the range of an adjacent sensor.
- No Overlaps with Status: The designated Modbus Status Register must not share an address with any configured sensor channel.

⁵ Using the same ID on two distinct devices causes severe data collisions on the CAN bus, mixed or dropped data packets, and total bus instability. Ensure that every satellite reader node on the physical chain is assigned a strictly unique ID (1–9) before moving the system into operational mode.

Commented [DD1]: Inca o poza cu pagina pentru senzor, sa fie clar ce inseamna senzor modbus register. Pentru readeri nu trebuie modbus register

Commented [DD2R1]: Am schimbat cu sensor data

Commented [IM3R1]: Am adaugat poza

Commented [DD4R1]: perfect

Sensor Configuration

Add New Sensor

Sensor Type: Vibrations

Sensor Model: LIS3DH

Port: Port 2

Enter Acquisition Time [ms]: 200

X-Axis Register: 6

Y-Axis Register: 8

Z-Axis Register: 10

Add Sensor

Sensors

✕

Type: Temperature
Model: Type J
Port: 3
Acq. Time: 200 ms
Temperature register: 2

✕

Type: Temperature
Model: Type J
Port: 4
Acq. Time: 200 ms
Temperature register: 4

Back
Send Configuration

7.4 Network settings information

In order to obtain the information required by the SensoBlock configuration page, use ipconfig on the computer used for data reception (this is applicable only if the computer and the SensoBlock are on the same network):

- SensoBlock shall be assigned a free IP address from the same range as the computer's address (if the computer's address is 192.168.0.200, then SensoBlock shall be configured with a free address from the range 192.168.0.2 -> 192.168.0.254)
- Subnet Mask
- Default Gateway

```

Windows PowerShell
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\lonic> ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 1:
   Media State . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:
   Media State . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter WiFi:
   Connection-specific DNS Suffix  . :
   IPv6 Address . . . . . : 2a82:2496:4895:4890:bca:c6a6:1d9b:b529
   Temporary IPv6 Address . . . . : 2a82:2496:4895:4890:b000:91ec:139e:63c9
   Link-local IPv6 Address . . . . : fe80::f9e1:bfd1:b4ba:9779%2
   IPv4 Address. . . . . : 192.168.190.25
   Subnet Mask . . . . . : 255.255.255.0
   Default Gateway . . . . . : fe80::12312

Ethernet adapter Bluetooth Network Connection:
  
```

7.5 SensoBlock state after configuration

The SensoBlock device enters its operational mode and reads data from the configured sensors.

The sensor data is forwarded as per the user's settings: over Modbus if the SensoBlock is standalone / gateway, over CAN (to the gateway) if the SensoBlock is a reader.

The configuration page (<http://<HW ID>.local:3321/>) is not available while the SensoBlock device is in operational mode.

How to change the configuration settings of an operational SensoBlock:

- Place the SensoBlock device in initialisation mode by pressing the reset button 3 consecutive times (the LED colour changes to yellow).
- Reconfigure the device (according to the steps described above).

8. Modbus status register⁶

The Modbus Status Register functions as the centralized diagnostic dashboard, consolidating all downstream node fault streams into a single address.

The numbers of the chosen registers should be an even number (0, 2, 4, 6, 8, etc).

- Choose a dedicated Status register
- When everything is OK, the register reads 0.
- The register displays an error code when a problem occurs. If there are multiple problems, the register **alternates between the values** so that Modbus-connected devices receiving data from the SensoBlock gateway detect every alert.

How to read the code:

- When all monitored sensors are OK, the register is 0.
- When an error occurs, the integer packs three fields into one 12-bit pattern (three nibbles, 4 bits each):

	Reader ID	Port	Status
bits	11..8	7..4	3..0

Field	Value	Meaning	Solution
Reader ID	0	The gateway / standalone SensoBlock itself (not a CAN reader)	
	1-9	CAN node identifier on the bus (CAN ID assigned to this SensoBlock unit when in Reader mode)	
Port	0	Device-level issue on that unit (e.g., supply voltage, not a sensor connector)	

⁶ Available for a Standalone or a Gateway device (not for a Reader).

Commented [DD5]: Oare ar trebui sa specificam si endianness?

Commented [CB6R5]: Daca e big endian atunci nu (asta e default network endianness)

	1–5	Sensor port on that unit	
Status	0	OK (register shows 0 when everything is healthy and normal)	
	1	Sensor disconnected / not present	Verify the sensor configuration and assign the sensor to a valid port.
	2	Init or calibration failed	Verify the sensor installation, wiring, and power supply. Restart the device and replace the sensor if the issue persists.
	3	Read failed	Verify the sensor configuration and assign the sensor to a valid port.
	4	Supply voltage too low	Increase the supply voltage.
	5	Supply voltage too high	Decrease the supply voltage.

Example:

Register value (decimal)	Hex (0xRPS)(Reader/Port/Status)	Reader	Port	Status	Meaning
0	0x000	0	0	0	All OK
4	0x004	0	0	4	Gateway supply is too low
35	0x023	0	2	3	Standalone/gateway: port 2 read failed
561	0x231	2	3	1	Gateway: reader 2, port 3 disconnected
805	0x325	3	2	5	Gateway: reader 3, port 2 supply too high

On a standalone SensoBlock, the Reader ID is always 0; only ports 1–5 (and 0 for supply) appear.

The gateway keeps an internal table of active faults, keyed by (Reader ID, Port). Updating the same pair replaces the previous status; it does not create a second slot.

9. Calibrating the sensors

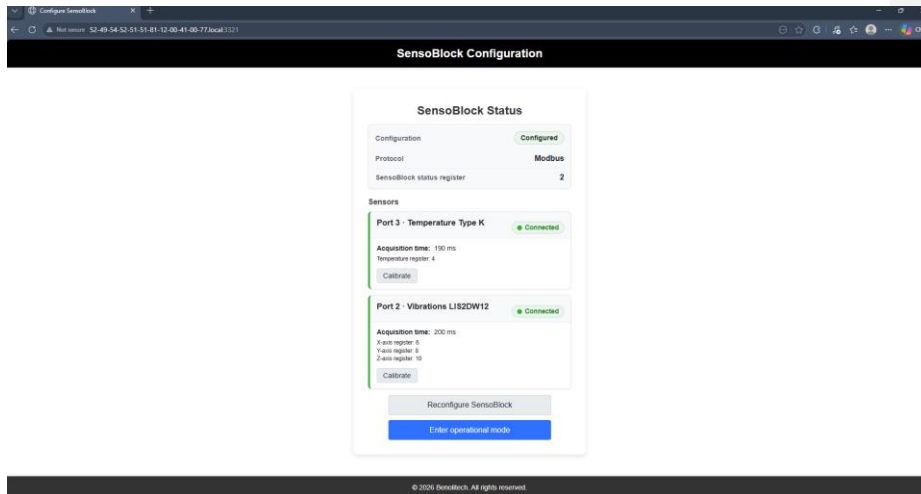
In order to perform a manual calibration of the sensors, follow the steps below. The Calibrate button becomes available when the SensoBlock device is in initialization mode.

Once the **Calibrate** button becomes available:

- The sensor shows "connected" on the Status screen.
- You can calibrate the sensors **ONLY** on the device you are connected to — you cannot remotely calibrate the sensor of another reader in the chain.

How to perform the calibration:

1. Press **Calibrate** on the desired sensor.



2. Wait for live sensor data values.
3. Enter the reference (known good) value:
 - temperature: a value in °C;
 - vibrations: X, Y, Z in **m/s².
4. Press **Apply** to confirm calibration.
5. Close the window when done.

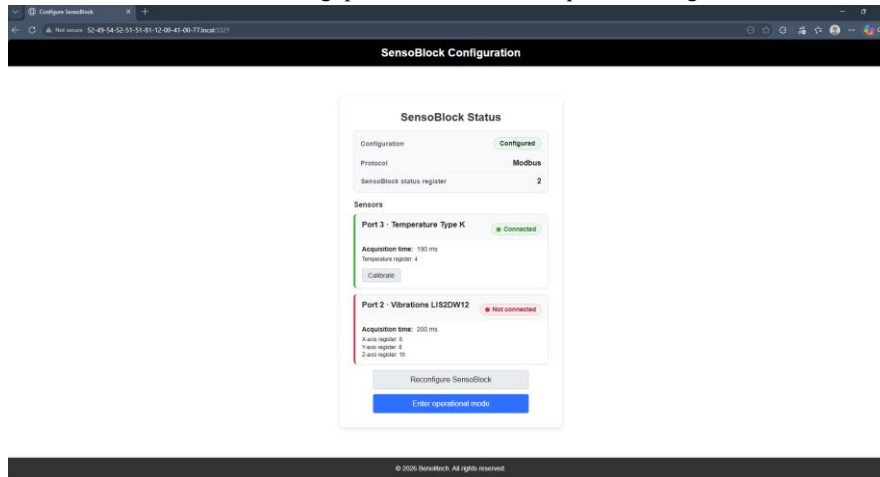
Value limits (for safety reasons)

Type	Rule
Temperature sensor	Reference must be within ± 10 °C of the live data reading
Vibrations sensor	On each axis (X, Y, Z), reference within ± 5 m/s ² of the live data reading

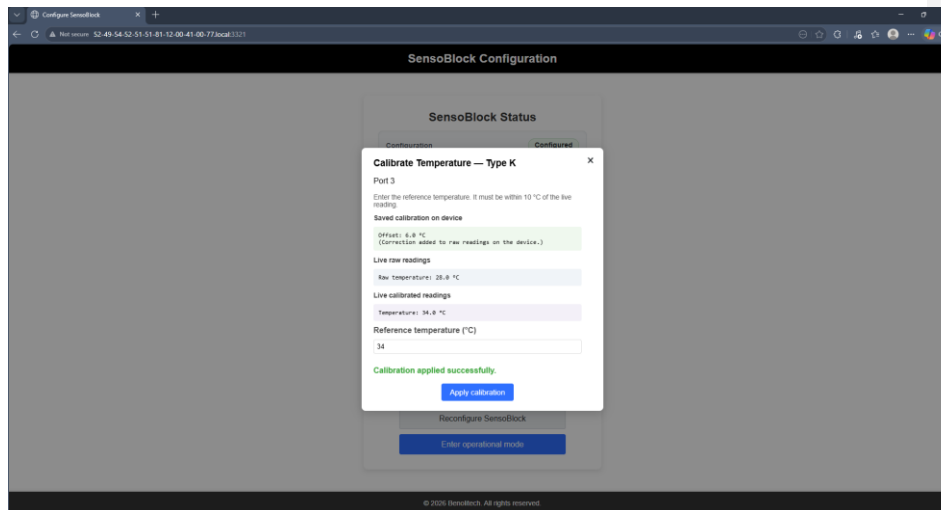
If you exceed these limits, the calibration is refused.

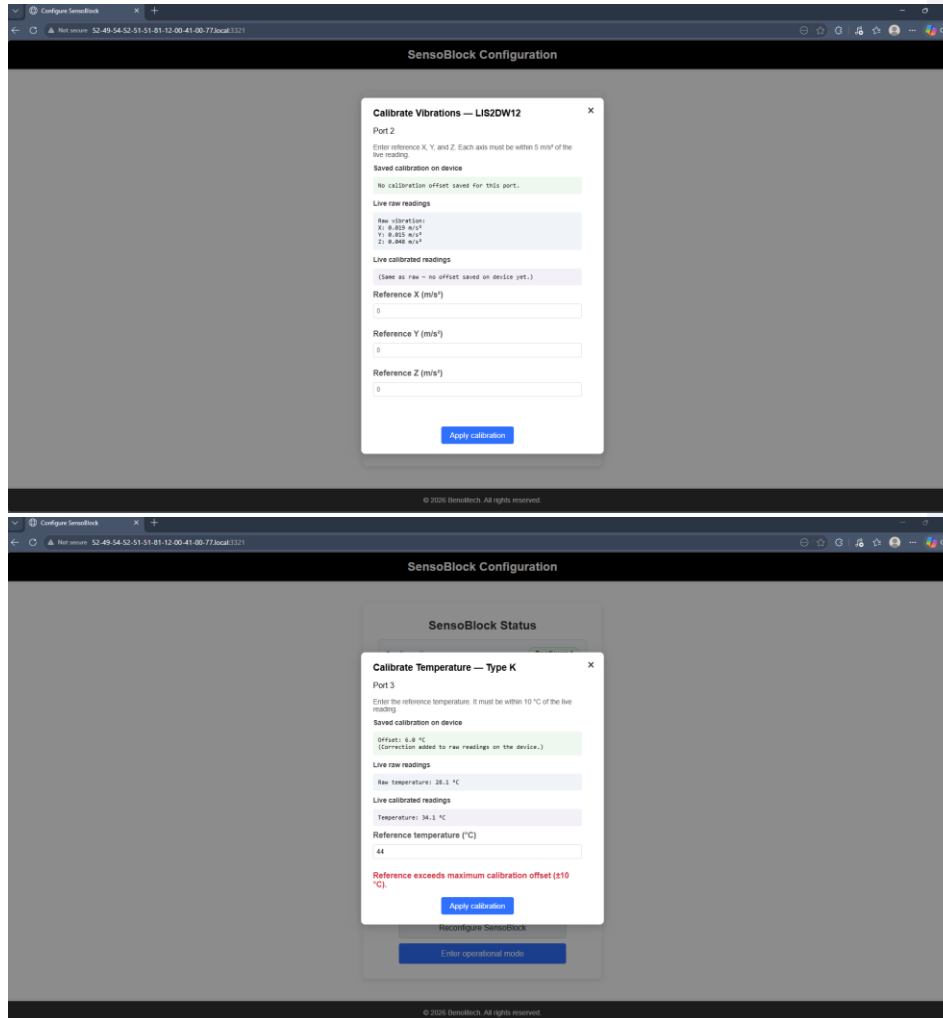
Common calibration messages:

- **Port is not stable** — wait until the sensor stabilizes (see Status), then try again.
- **Device health fault** — resolve the device health issue before calibrating.
- **Not connected** — check wiring, power, and the correct port in configuration.



Calibration is saved on the device; you can view the stored offset in the same window.





10. LED status meanings

Yellow: Device in initialization or configuration mode

Green: Device in operational mode

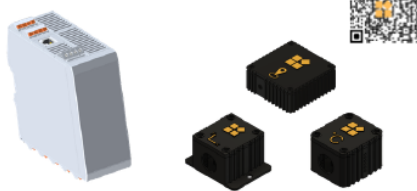
Red: Device in error mode

11. Technical Specifications & Known limitations

The technical specifications of the device are shown below:



SensoBlock
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Made in Romania



Sensors family

Port	Description	
1	I ² C/4-20mA/0-10V	
2	I ² C/4-20mA/0-10V	
3	4-20mA/0-10V/Thermocouple	
4	4-20mA/0-10V/Thermocouple	
5	CAN/I ² C	
6/7	SPI/UART	

Inside SensoBlock	STM32H7 series - 32-bit ARM Cortex®-M7 core Status RGB LED RTC for precise time and logging Internal temperature and humidity sensor Internal vibration sensor Full SW support - located in Europe	
Connectivity	Ethernet	10/100Mb/s, TCP, IP, Modbus , Websockets
	GPRS	Quad-band: 850/900/1800/1900MHz, up to 85.6Kbps
	WiFi	2.4GHz, IEEE 802.11b/g/n/ax, data rate up to 150Mbps
	Bluetooth	5.3, Mesh, up to 2Mbps
	Lora for IoT	868 Mhz
Family of Sensors Units	Vibration	Type: MEMS Measurement range(g): ±16 Measurement range(mm/s): 0-25
	Temperature	Type: E, J, K, S, R Range: -20°C ~ 1024°C Accuracy: 0.25°C
	Pressure	0 ... 0.2 A 0 ... 600 BAR 0 ... 3 A 0 ... 7500 PSI Accuracy ± 0.5 %
	Position (GPS)	Sensitivity: -162 dBm indoor
	Any other sensor	Customised solutions on-demand
Power	DC input voltage	12-24 V
	Power consumption	4W
Environmental requirements	Operation temperature	Range: -40°C ~ 85°C
	Operational humidity	Range: 10%-90%
	Operating conditions	Keep away from fire, high humidity,
Physical specs	Dimensions (L x l x h)	12.5 x 13 x 5 (cm)
	Mounting	DIN Rail
		Reset button

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www.benolitech.com/sensoblock



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12. Reset & Recovery

- Normal reset: Pressing the reset button restarts the device (keeping its configuration).
- Return to initialization state: when pressing the reset button 3 consecutive times, the device enters the initialization state (the LED colour changes to yellow).

13. Device disposal

The device should be disposed following the local guidelines for disposal of material.

14. Support & Contact

For technical support, contact:

- **Website:** <https://www.benolitech.com/sensoblock>
- **Email:** hello@benolitech.com
- **Support hours:** Monday to Friday, 9 to 18 CET

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Commented [DD7]: To yellow

Commented [CB8R7]: Atunci sa mentionam explicit yellow si in celelalte locuri unde spunem ca se schimba

Commented [IM9R7]: Done

ANNEX 1 - Frequently Asked Questions

1. Can I use the device without an internet connection?

Yes. The device can operate in a local setup, sending data to on-premises systems.

2. What should I do if sensors are not detected?

- Verify physical connections
- Ensure correct port assignment in configuration
- Check sensor compatibility

3. What happens after a reset?

- Short button press: restarts device (keeps configuration)
- Multiple button presses (3): enters initialisation mode

4. How to share the internet connection with a SensoBlock through the ETH port?

Go to **Control Panel** -> **Network and Internet** -> **Network and Sharing Center** -> **Change adapter settings** (left menu) -> Right click on the **Wi-Fi connection** -> **Properties** -> **Sharing** tab -> Tick **Allow other network users to connect through this computer's Internet connection** -> In the **Home networking connection** field choose the network you want to share