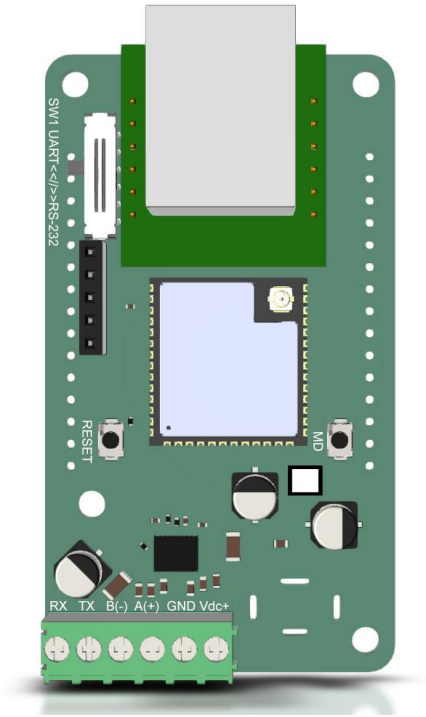


User manual for

CloudScale[Link] Neutron

Connecting scales around the world!

https://cloudscales.com
https://cloudscalelink.com
https://scale-monitor.com

https://www.youtube.com/@ScaleMonitor

Content

1. Manual versions

Version	Description of change
1 – 15.12.2025	First Neutron manual release.

2. Description

This manual describes the operation and features of the **Neutron hybrid module**.

The term *hybrid* means that Neutron can operate in two distinct modes:

CloudScaleLink Mode (Communication-Only Mode)

In this mode, Neutron works solely as a **CloudScaleLink interface**, allowing you to connect **any existing weighing scale** to **Scale Monitor** using:

- UART / RS-232
- RS-485

Expanded Mode with IO Board

By attaching the IO board, you unlock additional hardware features, including:

- **4-channel weighing system** with a **24-bit ADC** capable of up to **4,800 conversions per second**
- **6 digital inputs**
- **6 digital outputs**

Neutron's modular design also supports multiple connectivity options.
Bluetooth BLE and Wi-Fi are included as standard, while **Ethernet connectivity** can be added using an addon.

In this manual, you will become familiar with all available connectivity options and the full set of functions offered by the Neutron hybrid module.

3. Technical specifications

3.1. CPU board specifications

Power supply	5-24Vdc ± 5%	
Serial ports	UART/RS-232: switchable between UART and RS-232 by using SW1 on board RS-232 maximum distance: up to 15 meters	Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps Data bits: 7 or 8 Parity: none, even, odd
	RS-485: yes with address configuration from 0-255; maximum allowed distance: 1200 m with shielded 2 x 24AWG twisted pair with outer braid + aluminium strip	
Bluetooth LE	Bluetooth BLE 5.0	Supports Bluetooth to bidirectional serial redirection to UART/RS-232 or RS-485 port
Wi-Fi	2.4 GHz Wi-Fi (IEEE 802.11b/g/n) Range: up to 50 m indoor up to 150 m outdoor	Supported encryptions: None WPA2-PSK WPA3-PSK WPA2-Enterprise WPA3-Enterprise
Ethernet (optional – product code CS-NA-ETH)	10BaseT/100BaseTX Mb/s	Support Auto Negotiation (Full and half duplex, 10 and 100-based) LED outputs (Full/Half duplex, Link, Speed, Active)
Dimensions	71x40x25 mm (without Ethernet) 74x40x45 mm (with Ethernet)	
Temperature range	-10 ~ +40 °C	
Humidity	Max 85% non-condensing	

3.2. IO board specifications

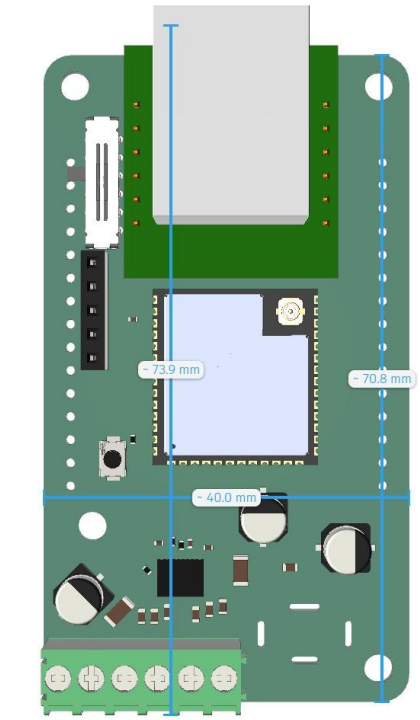
IO board extends Neutron features by adding 4 channel scale and opto-isolated six digital inputs and six fotomosfet outputs.

Power supply	Directly from CPU board, no need for additional supply	
Consumption	+50 mA to CPU board + IO consumption	
ADC	ADC type:	4-channel, 24-bit sigma-delta ADC
	Filters:	Programmable digital filters, up to 4,800 conversions per second
	Internal/displayable resolution:	up to 22 bits (~4.2 million internal divisions), depending on filtering and update rate
	Note: The ADC has 4 multiplexed channels. **Only one scale is converted at a time.**	
No. of scales	you can connect up to 4 scales	Per-scale settings: • Measurement unit (freely configurable text) • Scale type: multi-division / multi-range (up to 3 ranges per scale) • Free configuration of division and maximum capacity for each range • Zero tracking • Zero at power-on (auto zero on boot) • Digital filter settings

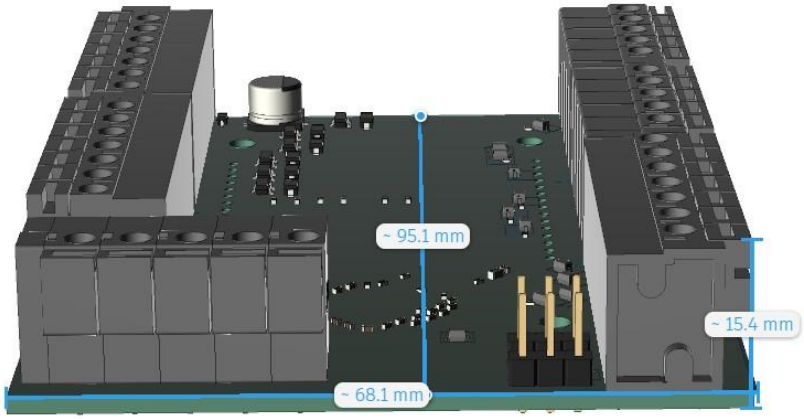
		• Number of divisions for stability detection • Stability window • Calibration with up to 8 linearization points per scale
No. of load cells	Connect up to **16 analog load cells** (350 Ω) Load cell supply 5Vdc ± 5%, max 250 mA Minimum load cell signal per division: 0.023 µV Minimum load cell signal: 1 mV/V (lower sensitivities are supported but maximum resolution might be reduced resolution)	
Load cell connection:	4-wire connection (without sense lines; REF+ and REF− must be closed with jumpers) 6-wire connection (with sense/reference lines)	
Scale interface	Selectable: UART/RS-232 RS-485 Bluetooth BLE 5.0 Cloud (MQTT v3.1 via TCP or WSS secure web socket [certificate required]) HTTP (REST API)	
Scale communication protocol:	CloudScale Communication Protocol (CSCP) See corresponding manual.	
Digital inputs	6 x configurable inputs (optocouplers)	5-24Vdc, max current 100 mA
Digital input functions:	Each digital input can be configured either as an ON/OFF input with real-time state updates via Bluetooth or Cloud, or as a counter input. In counter mode, inputs support counting frequencies of up to 1,000 Hz. Counter values are reported at a fixed update interval of 5 seconds. The maximum supported counter value is 18.4 billion (2^64 − 1). The current input state or counter value can be requested at any time by sending a command. Counters can be freely set or reset. Inputs can be used also for scale function such as zero, tare, etc.	
Digital outputs	6 x fotomosfet outputs	5-24Vdc, max current 150 mA
Digital outputs functions:	Digital output can be controlled via command send via Bluetooth or cloud. Digital outputs can be controlled also via scale depending on the application for instance activated in tolerance, out of tolerance, quick dosing, slow dosing etc.	
Dimensions	96x69x16 mm (without CPU board) 96x69x37 mm (with CPU board and Ethernet module)	
Temperature range	-10 ~ +40 °C	
Humidity	Max 85% non-condensing	

3.3. Dimensions

CPU board with optional Ethernet addon



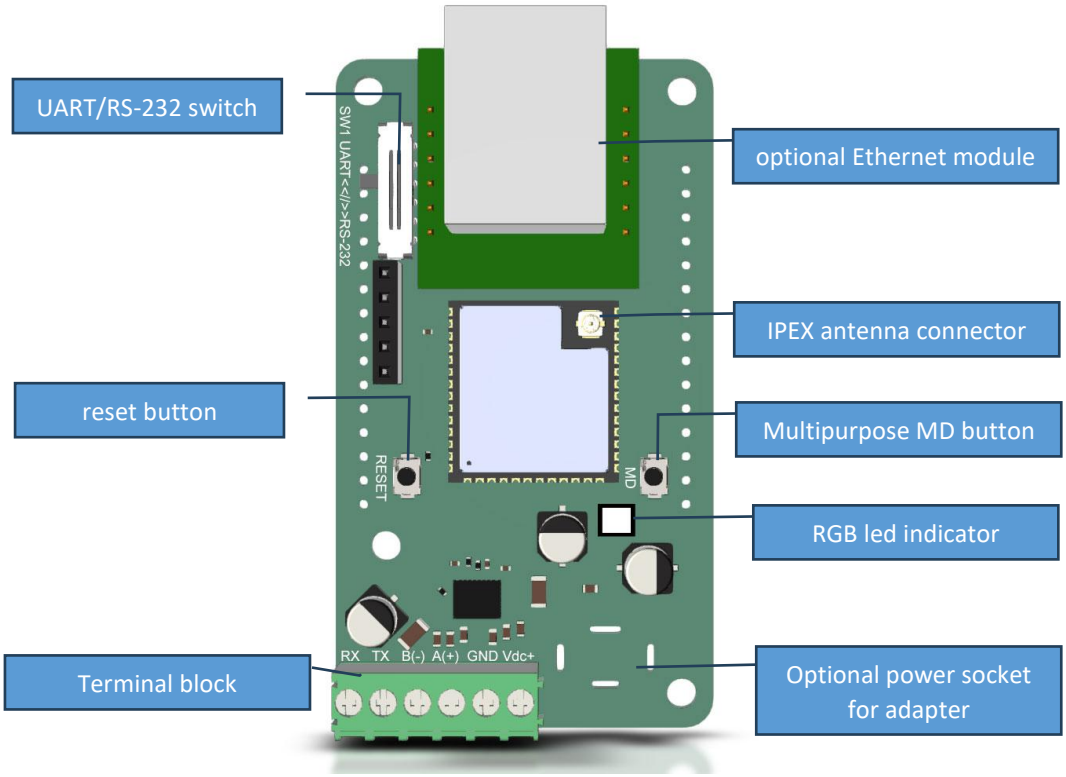
IO board



3.4. CPU Schematic

Neutron has the following hardware elements:

- Reset button
- Multi-purpose MD button
- RGB LED indicator
- SW1 switch for UART / RS-232 mode selection
- Terminal block for power, UART / RS-232, and RS-485 connections
- Optional power socket for adapter
- ntenna connector (U.FL / IPEX connector for external 2.4 GHz antenna)



3.5. MD button

The MD button is a multi-purpose control button.

Each press is acknowledged by a blink of the RGB indicator.

Different functions are activated depending on the number of presses:

- 1 presses: soft restart of the module
- 2 presses: disable DHCP
- 3 presses: enable access point (see chapter 6.2)
- 4 presses: enable Bluetooth, if disabled. Bluetooth is enabled only until module is reboot.
- 5 presses: factory reset of the module

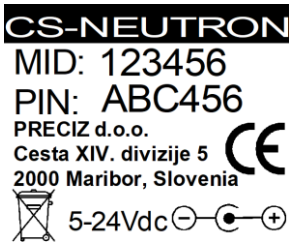
3.6. RGB LED indicator

RGB led indicator provides simple overview of module state:

RGB indicator colour	Wi-Fi connection	Ethernet connection
Green	Connected	Connected
Red	Not connected (no Wi-Fi available, signal to weak, etc.)	Not connected (no cable, Ethernet stopped, no module etc.)
Yellow	Connection failed (bad password, wrong encryption, etc.)	Connected but waiting for IP (only in case DHCP is enabled)
Gray	Wi-Fi disconnected	Lost IP Ethernet IP address lost
Orange	Unknown Wi-Fi status	Cable disconnected
Blue	When blinking it mean Bluetooth debug is activated and waiting for Bluetooth connection	
Off	Module is not powered or not working MD button pressed	

4. Module ID and PIN

All Neutron interfaces have unique module ID (serial number) and PIN. Both information are printed on the label of interface.



If you initialize interface (factory reset) PIN will be reset to factory PIN. You can change pin as you wish via configuration utility.

5. Configuration utilities

Neutron can be configured via four different configuration utilities.

Utility	Interface	Platform	Accessible
BLE	Bluetooth	Any, web based	https://apps.scale-monitor.com/
CMP – cloud management platform	Wi-Fi, Ethernet internet connection required	Any, web based	https://login.scale-monitor.com/
HTTP – internal web server	Wi-Fi, Ethernet LAN connection required	Any	http://192.168.4.1 (if connecting via WIFI access point) or http://ip_address of module
CSLTools	Wi-Fi, Ethernet LAN connection required	Windows only	https://apps.scale-monitor.com/

CMP – cloud management platform supports configuration of all module setting. Other configuration utilities might partially support configuration of Neutron. Each functionality has written under note in dedicated section, if configuration is not supported on any utility.

6. Communication interface

Neutron has Bluetooth and Wi-Fi interfaces enabled by default. These two interfaces are always available for basic communication and configuration.

Under General Settings you can select the communication interface used for internet and LAN access. You can choose either Wi-Fi or Ethernet.

If you do not want to use internet or LAN communication, you can disable the communication interface. In this case, Neutron will operate using Bluetooth only.

In this case you want to use Ethernet then, the Ethernet add-on module must be installed. If the Ethernet hardware is not present, the Ethernet option will not appear in the selection list.

7. Wi-Fi setup

In this section we will explain how to setup Wi-Fi connection.

7.1. Quick Wi-Fi setup by using BLE Bluetooth utility

The fastest way to connect Neutron to a Wi-Fi network is by using Bluetooth and BLE Configuration Utility.
Open the following link on your smartphone, tablet, or PC (with Bluetooth support):

👉 https://apps.scale-monitor.com/bleNeutron.html

Once the page is loaded, allow Bluetooth access and connect to your Neutron module.

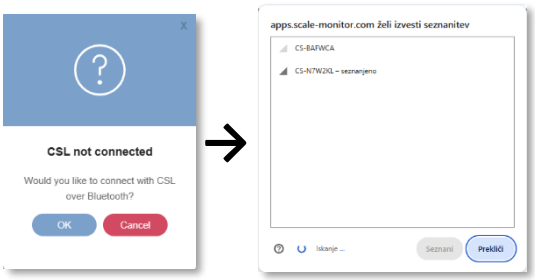
NOTE: if you are **using iPhone or iPad** you will need to access above link via **Bluefy** web browser.
Bluefy browser allows you to establish connection by using Bluetooth Low Energy.

Bluefy web browser is freely available in App store:

https://apps.apple.com/us/app/bluefy-web-ble-browser/id1492822055

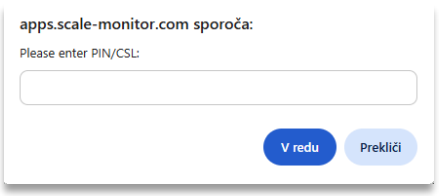
Step 1: Select Your Neutron Device

Once you confirm request for Bluetooth connection a list of available Neutron modules will appear.
Select the Neutron you want to configure and click Pair.



Step 2: Enter Neutron PIN

A new window will appear requesting the Neutron PIN code.
Enter the PIN to establish a secure Bluetooth connection.



Once connected, the status bar at the top will indicate your connection state:

- Green: connection established
- Red: not connected

Step 3: Configure Wi-Fi Settings

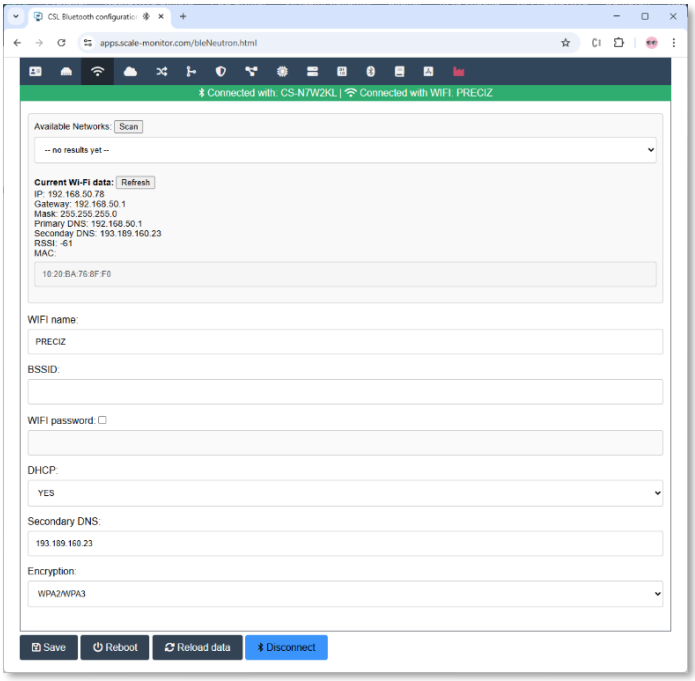
Click the Wi-Fi icon to open the wireless configuration page.

Fill in:

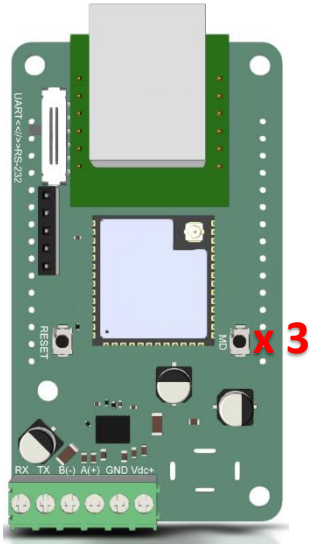
- Wi-Fi Name (SSID)
- Wi-Fi Password

Click Save, wait for confirmation, then click Reboot to apply the new settings.

If the credentials are correct, Neutron will automatically connect to the Wi-Fi network after restarting.



7.2. Quick Wi-Fi setup by using Internal Web Server (HTTP)



Neutron includes a built-in HTTP web server running on port 80.

This allows you to configure the module directly over Wi-Fi without using BLE.

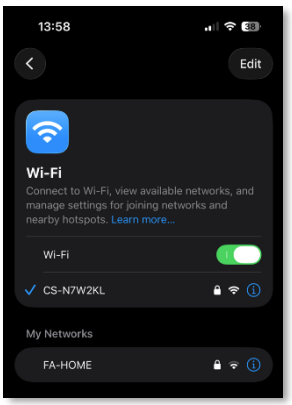
Step 1: Enable Neutron Access Point

To activate the internal Wi-Fi Access Point (AP):

1. Press the MD button 43times.
2. Neutron will start broadcasting its own Wi-Fi network.

You can now connect to this AP from any phone, tablet, or computer.

Step 2: Connect to the Neutron Wi-Fi Network



Open the Wi-Fi settings on your device and look for a network named:

CS-XXXXXX

(Where XXXXXX represents the module ID.)

Select the network and enter the password.

The password is the factory PIN – it does not change even if you modify the module PIN later.

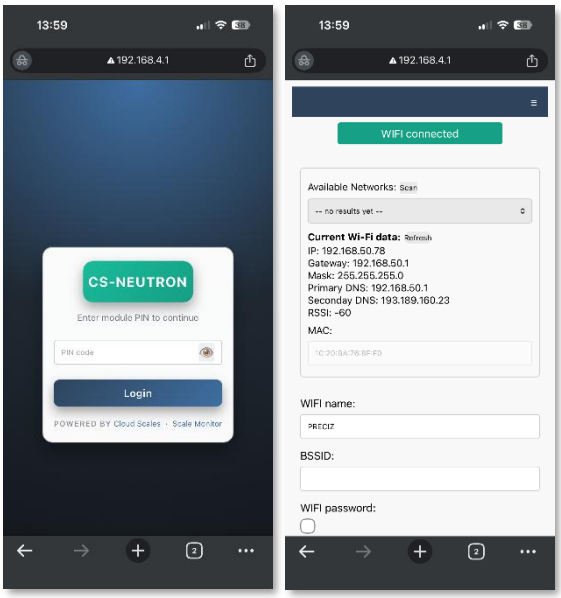
Step 3: Open the Web Interface

Once connected, open a web browser and go to:

👉 http://192.168.4.1

The login page will appear.

Enter your PIN and click Login.



Step 4: Configure Wi-Fi Settings

To connect Neutron to your main Wi-Fi network:

- Open the Wi-Fi page from the menu.
- Enter the Wi-Fi name (SSID) and password (if required).
- Click Save and wait for confirmation.
- Click Reboot to apply the new settings.

After rebooting, Neutron will attempt to connect to the configured Wi-Fi network.

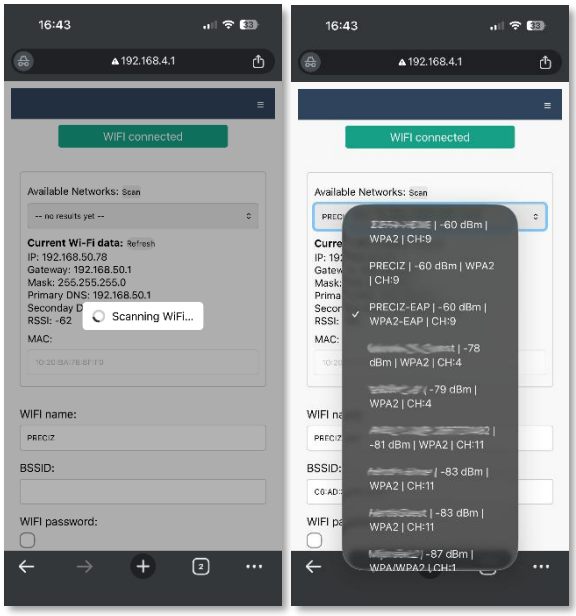
If the connection fails, repeat the steps above to verify and adjust the settings.

7.3. Scan for Available Wi-Fi Networks

If you are unsure of the exact Wi-Fi name or want to see available nearby networs:

- Click Scan to search for nearby networks.
- Select a Wi-Fi network from the list.

When you selected network from the list, the BSSID field will be auto-filled. See BSSID chapter below for explanation when to use it and when not.



Signal strength is displayed in dBm (decibel-milliwatts). A higher value (closer to 0) means a stronger signal. Example: -40 dBm is better than -70 dBm.

Use the table below as a reference:

RSSI (dBm) Signal	Quality Description
-30 to -50	Excellent Very strong and stable signal
-50 to -60	Very Good Reliable connection
-60 to -70	Good Normal operation expected
-70 to -80	Weak Possible drops or interruptions
-80 to -90	Very Weak Likely unstable connection
< -90	Unusable Communication not reliable

7.4. Wi-Fi Settings

To connect Neutron to a Wi-Fi network, configure the following parameters as needed:

1. Open Networks

For an open (unencrypted) Wi-Fi network:

- Enter the **Wi-Fi name (SSID)**
- Set **Encryption** to **None**

2. Secured Networks (WPA2-PSK / WPA3-PSK)

For password-protected networks:

- Enter the **SSID**
- Enter the **Password**
- Set **Encryption** to **WPA2/WPA3**

3. Static IP Configuration (Optional)

If the Wi-Fi network **does not provide DHCP** or if you prefer a fixed IP:

- Enter **IP Address**
- Enter **Subnet Mask**
- (Optional) Enter **Gateway**
- (Optional) Enter **Primary and Secondary DNS**

4. Enterprise Networks (WPA2/WPA3-Enterprise)

For corporate or RADIUS-based networks:

- Enter the **SSID**
- Set **Encryption** to **WPA2/WPA3 Enterprise**
- Enter **Identity**
- Enter **Username**
- Enter **Key/Password**
- Select a **CA Certificate** so Neutron can validate the access point

7.4.1. BSSID

You may enter the BSSID of the access point. The BSSID is the unique MAC address of a specific Wi-Fi access point. When BSSID is entered, Neutron will connect only to that exact access point.

This provides an additional layer of protection because the module will ignore any other access point broadcasting the same SSID.

This prevents accidental or malicious connection to another access point with the same network name.

If you do not know BSSID of the network scan for networks and select network you want to connect from the list and BSSID will be automatically filled out.

Important:

Do not use BSSID in environments where multiple access points share the same SSID (roaming networks).

If BSSID is set, Neutron will not roam and will connect only to the single access point with the specified MAC address, which may result in weak or lost connection if that access point becomes out of range.

8. Ethernet settings

Under ethernet setting you can setup DHCP or static IP:

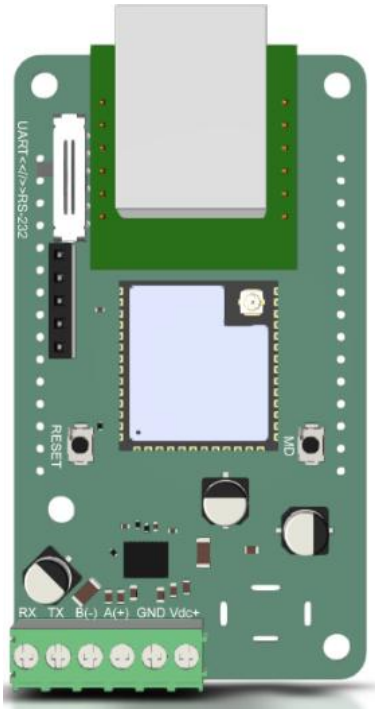
- Enter **IP Address**
- Enter **Subnet Mask**
- (Optional) Enter **Gateway**
- (Optional) Enter **Primary and Secondary DNS**

Important:

Please note that Neutron requires additional addon (product code: CS-NA-ETH). If Ethernet addon is not present or not working you will not be able to see menu to configure Ethernet settings.

9. Serial connection

Neutron provides serial communication that can be used to connect an existing scale via UART, RS-232, or RS-485 to act as a communication bridge, or it can be used to communicate with a scale connected through the expansion board.



Neutron offers two serial ports:

- Serial Port 1: can be used as UART or RS-232
- Serial Port 2: used for RS-485 communication

For both serial port you can choose where it shall be redirected. You can choose from:

- Disabled – no redirection
- Cloud – it will redirect serial port to cloud – see cloud chapter
- Bluetooth for redirection via Bluetooth
- HTTP – it will redirect serial port to internal HTTP server – see HTTP chapter
- TCP – it will redirect serial port to TCP server or client – see TCP chapter

Important:

If you want to use serial port for communication with scale on IO board you must set redirect to disabled.

9.1. UART/RS-232

Serial Port 1 can operate either as a UART port or as an RS-232 port.

By default, it is configured as RS-232.

RS-232 settings allow you to configure the following parameters:

- Serial redirect: disabled, cloud, Bluetooth, HTTP, TCP
- Baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
- Data bits: 7 or 8
- Parity: None, Even, Odd
- String terminator: CR, LF, CRLF, or up to two custom ASCII characters

9.1.1. Switching from RS-232 to UART

You can switch between RS-232 and UART using the SW1 switch.

Important!

Do not connect a UART device when SW1 is set to RS-232 mode, as this may damage the external device.

Likewise, do not connect an external RS-232 device to Neutron when SW1 is set to UART mode as this will damage Neutron.

Always turn off Neutron before switching SW1 between RS-232 and UART to prevent hardware damage.

9.1.2. UART/RS-232 wire diagram using terminal block

To connect an RS-232 or UART device, use the terminal block as follows:

- RX: connect this pin to the transmit line (TX) of the external device
- TX: connect this pin to the receive line (RX) of the external device
- GND: connect to the ground of the external device

Correct wiring of TX, RX, and GND is required for proper communication.

9.2. RS-485

Serial Port 2 is dedicated for RS-485 communication.

RS-485 supports a multi-drop connection, where multiple client devices can be connected on the same pair of wires and communicate with a single master device. This allows several scales or peripherals to share one communication line.

RS-485 port is also used to connect devices that communicate over long distances (up 1200 meters) or in electrically noisy environments, where differential signalling provides improved reliability.

RS-485 settings allow you to configure the following parameters:

- Serial redirect: disabled, cloud, Bluetooth, HTTP, TCP
- RS-485 address: 0-255
- Baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
- Data bits: 7 or 8
- Parity: None, Even, Odd
- String terminator: CR, LF, CRLF, or up to two custom ASCII characters

Neutron automatically manages the RS-485 driver control, ensuring proper switching between transmit and receive modes during communication.

9.2.1. RS-485 wiring

To connect an RS-485 device, use the terminal block as follows:

- A + : connect this pin to the A + line on the external device or RS-485 bus
- B - : connect this pin to the B - line on the external device or RS-485 bus

10. Cloud

Cloud referrers to Scale Monitor cloud platform therefore only basic connection parameters are explained here. If you want to connect Neutron to your cloud (MQTT broker) please request CSL API documentation at support@scale-monitor.com or login to your partner portal.

Under Cloud Settings you must configure the parameters that Neutron will use to establish a connection with the cloud server.

The following parameters are available:

Enabled:

If Cloud is set to "Disabled," Neutron will not connect to the cloud, and remote management will not be available. If enabled Neutron will try to establish connection with cloud.

Connection type:

- TCP: unsecured communication. Use only in trusted local networks or when data you are transferring are not sensitive or confidential.
- WSS: secured communication using encrypted WebSocket. Recommended for all internet connections but please note that in that case you must also upload server CA certificate and there will be speed impact of approximately 10~20 ms.

Server: enter the server URL or IP address.

Port: enter the port number used by the server for incoming connections.

QoS: Quality of Service.

This defines how messages are delivered between Neutron and the cloud:

- QoS 0: the fastest method; messages are delivered once without confirmation. This is default value.
- QoS 1: guaranteed delivery; the message is delivered at least once and confirmed by the server.
- QoS 2: the highest reliability level; messages are delivered exactly once using a two-phase handshake. This prevents duplicates and ensures perfect accuracy, but requires more processing and bandwidth.

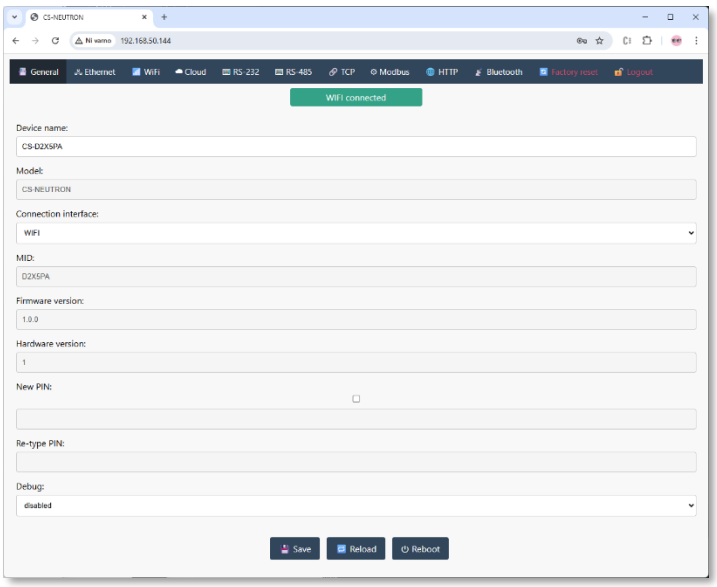
Higher QoS increases reliability but use more bandwidth and therefore also some delay between packages will occur. If you have reliable internet connection QoS you can use QoS 0 but, if your connection is not reliable you shall use QoS 1. QoS 2 is not recommended for continuous communications and shall be used only special cases.

Group topic: for manufacturer use only.

Group topic without SN/MID: for manufacturer use only.

11. HTTP and REST API

The internal HTTP server is intended for local configuration of the module and for providing a REST bridge to the serial ports.



By default, the HTTP server runs on port 80. You can change the port number under HTTP Settings.

If the port is set to 0, the HTTP server will be disabled.

The HTTP server can be accessed by entering the module IP address into a web browser using the following format:

http://ip-address

To change module settings, you must enter the module PIN on the login page.

10.1 REST

Neutron provides a REST interface that can be used as a bridge to the serial ports.

To enable REST communication, you must set the serial redirect mode to HTTP.

If serial redirect is not enabled and a REST URL is accessed, the server will respond with “404 Not Found”.

Serial ports are addressed as follows:

- S1: UART / RS-232
- S2: RS-485

After a request is sent, Neutron waits for a response from the serial port for up to 5 seconds.

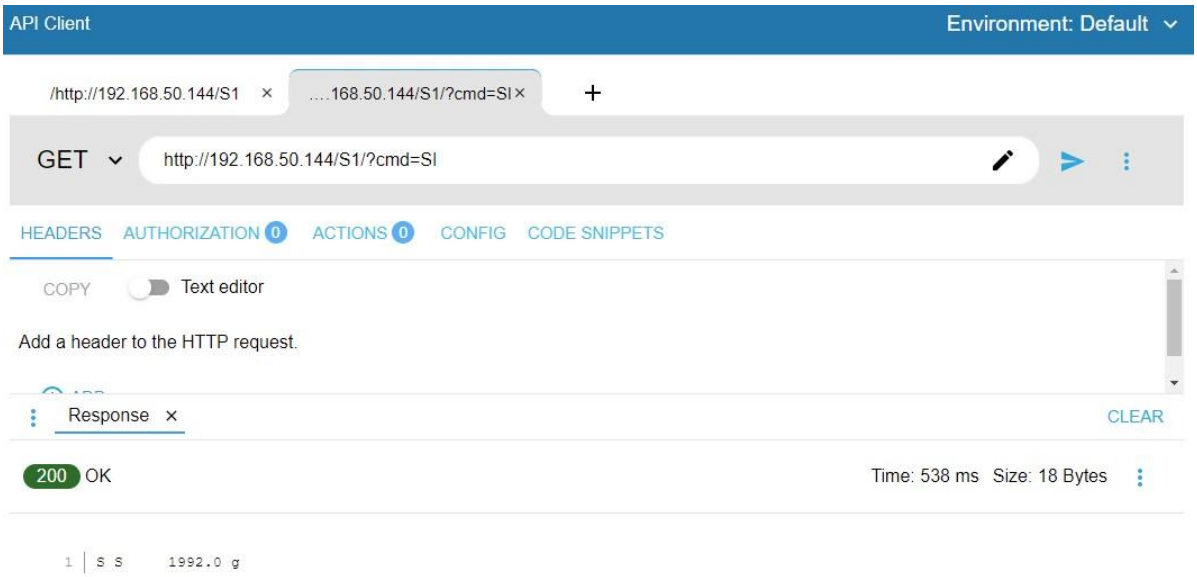
If a response is received, it is returned as the HTTP response body.

If no response is received within the timeout, the response body will contain:

[no serial response]

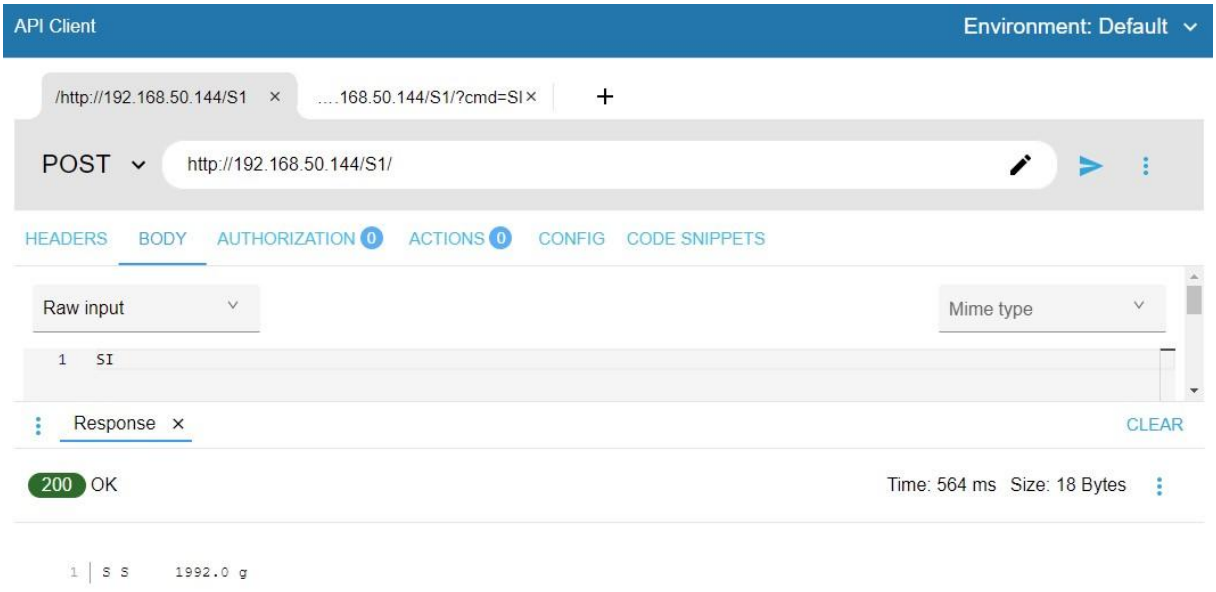
11.1.1. GET

To send data via GET you must add cmd parameter into URL http://ip-adress/S1/?cmd=data



11.1.2. POST

If you use POST method any data sent in plain or under cmd parameter will be forwarded to serial port.



12. Bluetooth

Under Bluetooth settings you can set if Bluetooth interface is enabled or disabled.

If you want to use serial port via Bluetooth bridge you must set under serial redirect Bluetooth on the serial port that you want to redirect.

For serial port redirection you can also set string terminator.

12.1. Debugging via Bluetooth

Neutron provides real-time debugging over Bluetooth.

To enable Bluetooth debugging, open General Settings and set the debug interface to Bluetooth.

After enabling Bluetooth debugging, reboot the module.

During startup, the RGB indicator will blink blue, indicating that Neutron is waiting for a Bluetooth connection.

While waiting, Neutron does not start Wi-Fi, Ethernet, the IO board, or other interfaces. This allows all startup messages to be captured from the very beginning.

Neutron waits up to 30 seconds for a Bluetooth connection.

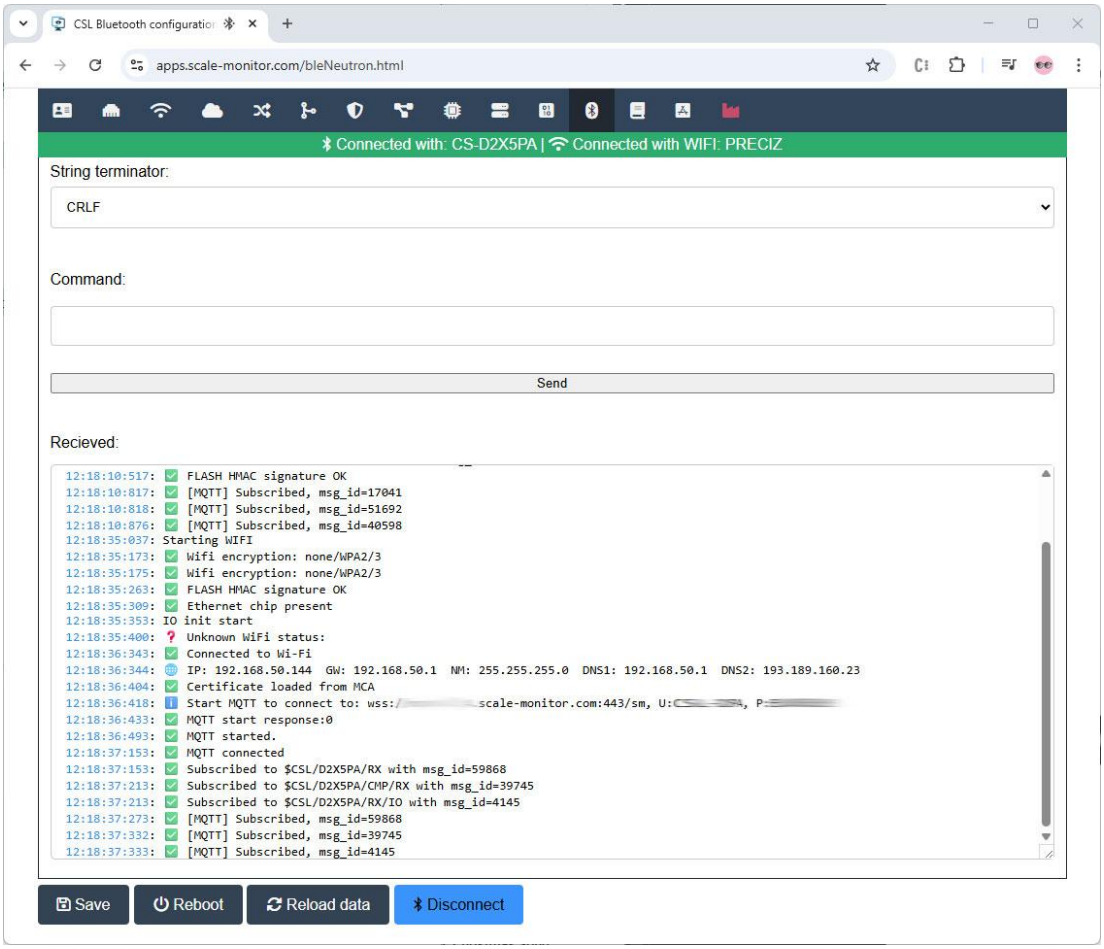
If no connection is established within this time, the module continues the normal boot process. In this case, debug messages will still be available after you connect.

Note: Bluetooth debugging is available only through the BLE utility at:

https://apps.scale-monitor.com/

Once connected via Bluetooth, real-time debugging and remote support are possible even if Neutron is not connected to the internet.

You can see debug messages under Bluetooth tab of BLE utility:



12.2. Debug serial port redirection

To debug or test serial port redirection, enter the command or data into the Command field under Bluetooth tab and press the Send button.

The data will be forwarded to the serial port which has redirection set to Bluetooth.

Any response received from the serial device will be displayed in the Received field.

13. TCP

Under the TCP tab you can configure TCP communication settings.

First, select the TCP connection type which can be:

- Server,
- Client,
- Server&client

13.1. Server mode

In server mode, Neutron listens for incoming connections from external programs or systems.

You must specify the TCP port on which Neutron will listen.

The default TCP port is 10010.

13.1.1. TCP Server Port Exclusive

When TCP server port exclusive mode is enabled, Neutron will accept only one TCP connection at a time.

If a connection is already established, any new incoming connection will be rejected.

When TCP server port exclusive mode is disabled, a new incoming connection will be accepted and any existing connection will be disconnected.

13.2. Client mode

In client mode, Neutron actively establishes a TCP connection to an external system.

You must enter the destination IP address and TCP port.

Neutron continuously monitors the TCP connection.

If the connection is lost, for example due to Wi-Fi signal loss or server unavailability, Neutron will automatically attempt to reconnect until the connection is restored.

13.3. TCP bridge to cloud

If you want to redirect TCP communication to the cloud, you can enable the TCP bridge to cloud feature.

When enabled, all data received on the TCP connection, whether operating in server or client mode, will be forwarded to the cloud and vice versa.

Cloud redirection can be enabled independently for server mode and client mode.

This feature is especially useful when connecting Ethernet or Wi-Fi devices, such as scales or label printers (for example Zebra printers), directly to the cloud when these devices support only TCP communication.

Detailed information about the TCP-to-cloud bridge is available in the CSL API documentation.

13.3.1. Connect Ethernet or Wi-Fi Printer to Scale Monitor Cloud

To connect an Ethernet or Wi-Fi printer to the cloud, open the TCP settings and set the TCP mode to Client.

Under Client settings, enter the printer IP address and TCP port.

The most commonly used printer port is 9100.

If you do not know the printer IP address, refer to the printer manufacturer's documentation.

For example, many Zebra printers allow printing or displaying the network configuration by pressing a specific key combination. The exact procedure depends on the printer model.

In Scale Monitor, open Settings and enable the option "Use bridge mode" under Label Printer settings.

If the same CloudScaleLink module is used for both the scale and the label printer, enter the same MID and PIN that are configured for the scale connection.

13.3.2. Printer Confirmation Messages (Zebra)

If you want to receive a confirmation message in Scale Monitor indicating that a label was printed successfully, or alert message such as out of labels, no ribbon, cover opened etc. you must change the TCP configuration.

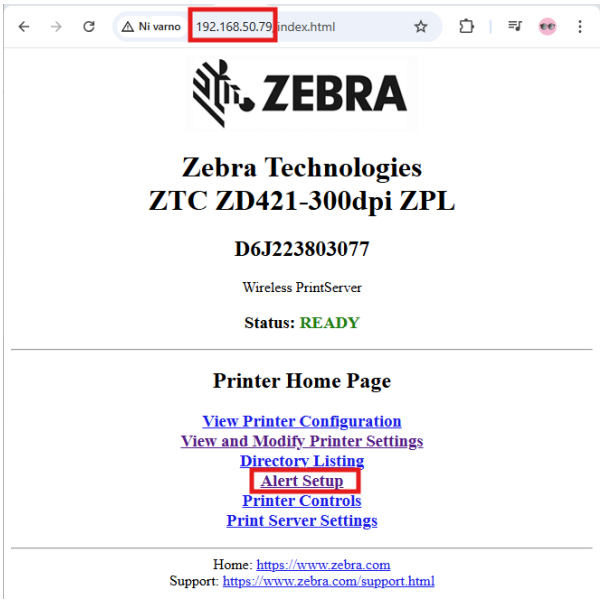
In TCP settings, set the TCP type to Server & Client.

Under Server settings, enable the option Bridge to cloud.

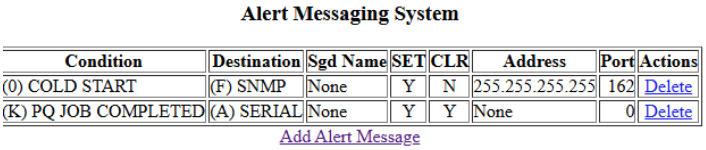
Next, open the Zebra printer configuration page by entering the printer IP address into a web browser.

Once the printer web interface is open:

Open the Alert Setup section.



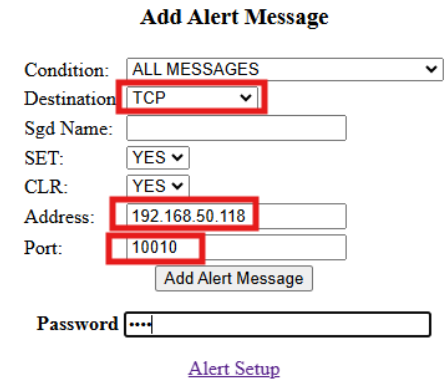
Click Add Alert Message.



Select Destination type TCP.

Under Address, enter the IP address of the CloudScaleLink (Neutron) module.

Under Port, enter the TCP server port. The default value is 10010.

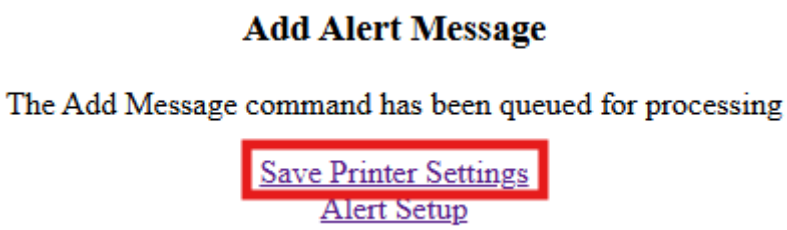


Click Add Alert Message.

Note: You will be prompted to enter a password. The default password is 1234.

After the alert message is added, a confirmation window will appear.

It is very important to click Save Printer Settings.



If you do not save the settings, they will be lost when the printer is rebooted.

Once configured, the Zebra printer will send print confirmation messages back to Scale Monitor.

All other settings remain the same as previously configured.

14. IO board

The IO board provides the following features:

- 4-channel 24-bit sigma-delta ADC with up to 4,800 conversions per second
- 6 digital inputs (can also be used as counters up to 1,000 Hz)
- 6 digital outputs

Note: Digital inputs and outputs can be configured only using the BLE utility or the Cloud interface.

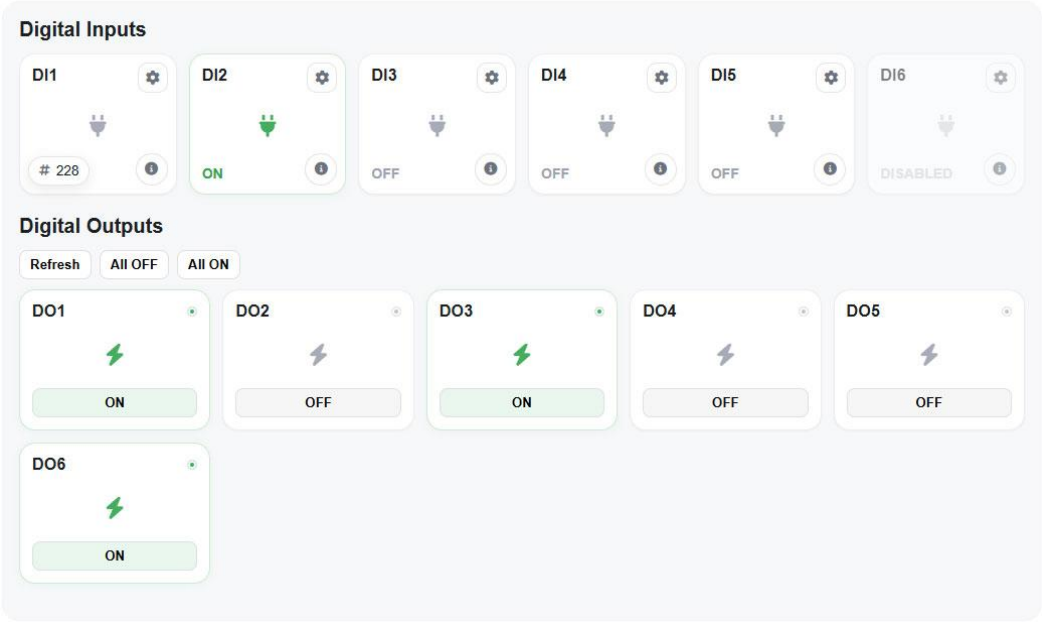
Note: if you need to control outputs via command or read state of inputs, counter values etc. please see CSL API documentation.

14.1. Digital Inputs

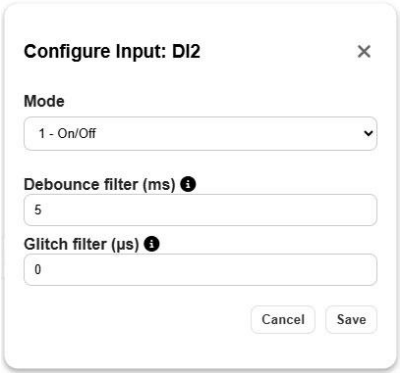
Each digital input can be configured either as an ON/OFF input or as a counter.

Using the Mode setting, you can select whether the input behaves as an ON/OFF switch or as a counter.

Under IO tab you will see input&outputs dashboard where current states are shown. By clicking on gear icon you can setup settings.



14.1.1. ON/OFF Mode

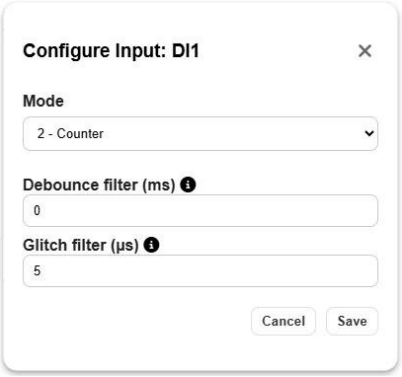


When ON/OFF mode is selected, a debounce filter must be configured.

The debounce filter defines how long the input signal must remain stable before the state change is accepted.

Typical debounce values range from 5 ms to 100 ms.

14.1.2. Counter Mode



When Counter mode is selected, a glitch filter must be configured.

The glitch filter ignores short electrical noise pulses. Pulses shorter than the configured time are not counted.

This filter is used only in counter mode.

Typical glitch filter values range from 1 µs to 20 µs.

15. Scale

The IO board features a 4-channel 24 bit ADC with up to 4.800 conversions per second.

Each ADC channel can be configured as an independent scale.

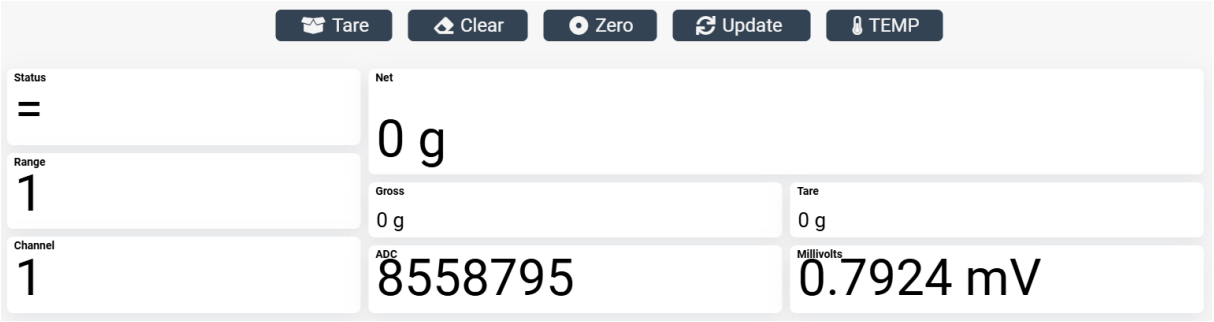
For communication with the scale, the following interfaces are supported:

- UART / RS-232
- RS-485
- Bluetooth BLE 5.0
- Cloud connection using MQTT v3.1 over TCP or secure WSS (certificate required)
- HTTP (REST API)

The communication protocol is described in the CloudScale Communication Protocol (CSCP) manual.

15.1. Display overview

In calibration menu display has following visualization:



The calibration menu provides the following visual information:

- **Status** - The status indicator shows the current weighing condition:
  - = stable weight
  - ~ unstable weight
  - UL: underload
  - OL: overload
- **Range** - Displays the active weighing range (1 to 3), depending on the scale configuration and current gross weight.
- **Channel** - Displays the active ADC channel (1 to 4), depending on the selected channel.
- **ADC Value** - Shows the raw ADC converter value based on the current load cell signal.
- **Millivolts** - Displays the measured signal from the load cell(s) in millivolts.

The following functions can be executed directly from the calibration menu:

- Tare
- Clear tare
- Zero

- Temperature

By pressing the TEMP button, the ADC internal temperature reading is displayed.

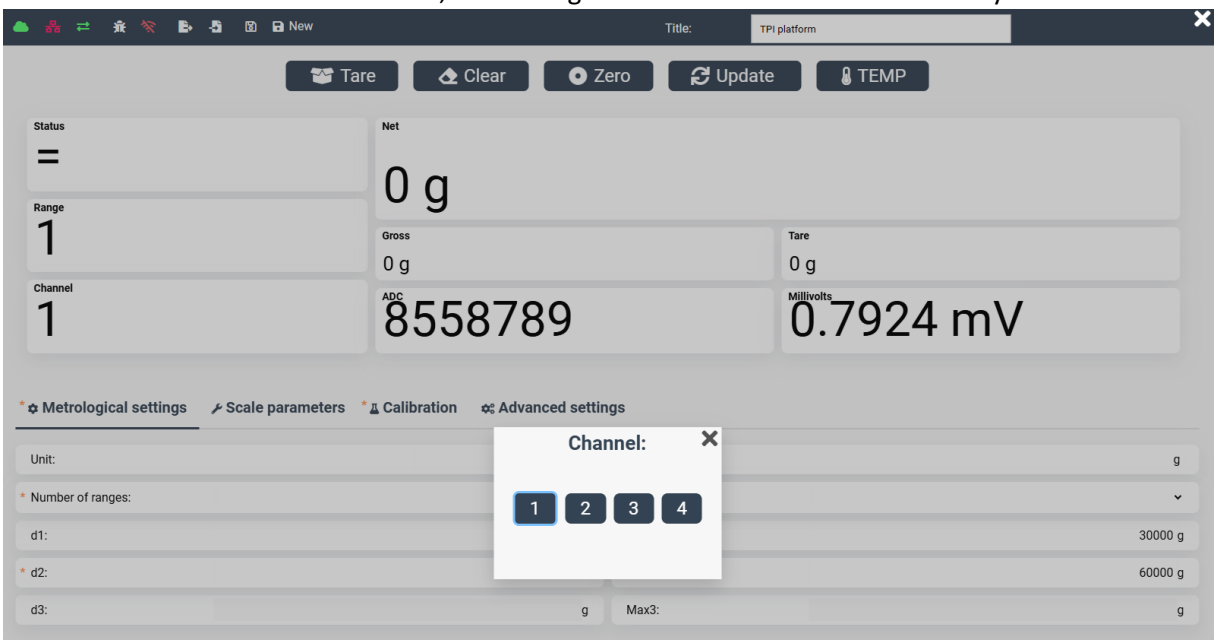
Note:

When temperature is being measured, ADC conversion for weighing is temporarily suspended.

15.2. Channel switching

To switch between channels, click on the Channel field.

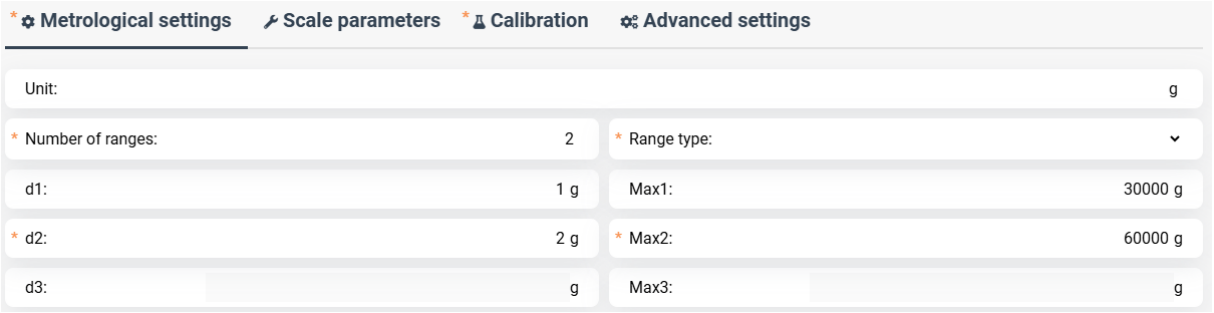
When a different channel is selected, the settings for that channel are automatically loaded.



15.3. Metrological settings

Under Metrological Settings you can configure the following parameters for the selected channel:

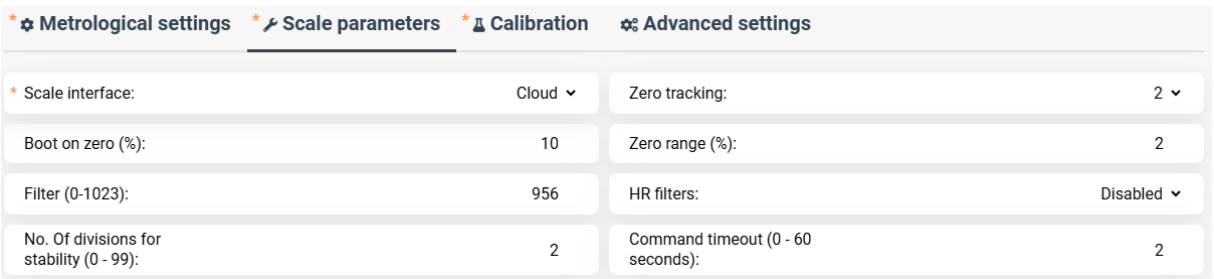
- **Unit** - The unit is not predefined. You can enter standard units such as kg, g, t, mg, lb, or define a custom unit.
- **Number of ranges** - Select the number of weighing ranges. Supported values are 1 to 3.
- **Range type** - Select how the scale behaves across ranges:
  - **Multi-division**: the scale always returns values using the same division.
  - **Multi-range**: the scale returns values using the division of the currently active range (highest interval).
- **Divisions (d1–d3)** - d1 defines the division for range 1, d2 for range 2, and d3 for range 3.
- **Maximum values (Max1–Max3)** - Max1 defines the maximum weight for range 1, Max2 for range 2, and Max3 for range 3.



15.4. Scale parameters

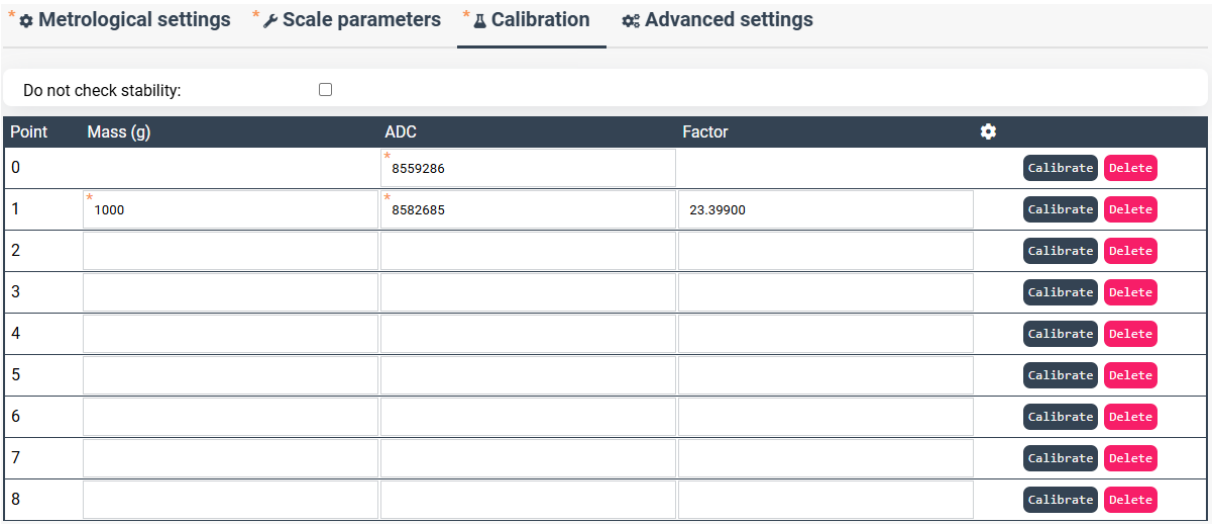
In the Scale Parameters menu you can configure the following settings:

- **Scale interface** - Select the interface used to communicate with the scale.
  For Scale Monitor operation, set the interface to Cloud, RS-232, or Bluetooth, depending on your Scale Monitor configuration.
- **Zero tracking** - Select the zero-tracking range in divisions.
  Available values: Disabled, 1/4, 1/2, 1, 2, 4, 8, or 10 divisions.
- **Boot on zero** - Defines the percentage of the scale maximum that can be automatically zeroed when the module powers on.
- **Zero range** - Defines the zeroing range, expressed as a percentage of the scale maximum, that can be zeroed after executing a zero command.
- **Filter** - Defines the digital filtering level.
  Filter value 0 disables filtering and allows the maximum conversion rate of 4,800 Hz.
  Higher filter values provide a more stable reading but increase stabilization time.
- **HR filter -** High-resolution filter that provides additional noise reduction. Using this filter improves stability but requires a longer stabilization time.
- **Number of divisions for stability** - Defines how many divisions the weight may change while still being considered stable. *If set to 0, the weight is always considered stable.*
- **Command timeout** - Defines the maximum time allowed for a command to be executed.
  For example, if the timeout is set to 2 seconds and a tare command is sent, the scale will wait up to 2 seconds for the weight to become stable. If stabilization takes longer than the configured timeout, a timeout error occurs and the command is cancelled.



15.5. Calibration

The Calibration tab is used to calibrate the scale.



The first step of calibration is always the zero-point calibration.

After zero calibration, you can configure up to 8 additional linearization points.

15.5.1. Automatic Calibration

To automatically calibrate a point, enter the weight value corresponding to the load that will be placed on the load receptor.

After entering the weight, click Calibrate to start the calibration procedure for the selected point.

Important:

The applied load must increase with each calibration point.

Each subsequent calibration point must use a higher load than the previous one.

If a lower load is used, the ADC value will decrease and a calibration error will occur.

15.5.2. Calibration Status Messages

Once calibration starts, status messages are displayed in the Net field:

- CS- calibration starting
- C1 to C10- repetition count while waiting for a stable signal
- CF- calibration finished successfully
- CE- calibration error

If the signal is still not stable after 10 repetitions, a calibration error (-CE-) will occur.

In this case, you can either repeat the calibration point and provide more stable enviroment or enable the option “Do not check stability”.

When this option is enabled, the scale will not verify signal stability, allowing the calibration point to be stored even if the signal is unstable.

15.5.3. Manual Calibration

The scale can also be calibrated or fine-tuned manually by entering ADC values and calibration factors directly.

15.6. Advanced settings

Under Advanced Settings you can configure the stability window.

The stability window is a time-defined interval used to confirm that the scale reading is stable.

After the scale detects stability based on the “Number of divisions for stability” parameter, it waits for an additional time window before reporting a stable status.

Stability window options:

- **Quick** - The scale waits 0.25 seconds before releasing the stable indication.
  If the weight changes during this time, the stable status is not released.
- **Medium** (default) - The scale waits 0.5 seconds before releasing the stable indication.
- **Slow** - The scale waits 1 second before releasing the stable indication.

Recommendations:

For high-resolution scales, Medium or Slow stability is recommended to ensure reliable stability detection.

For standard-resolution scales (up to 10,000 divisions) operating in stable environments, the Quick setting can be used.

The Wait ADC parameter is reserved for manufacturer use and should remain disabled during normal operation.