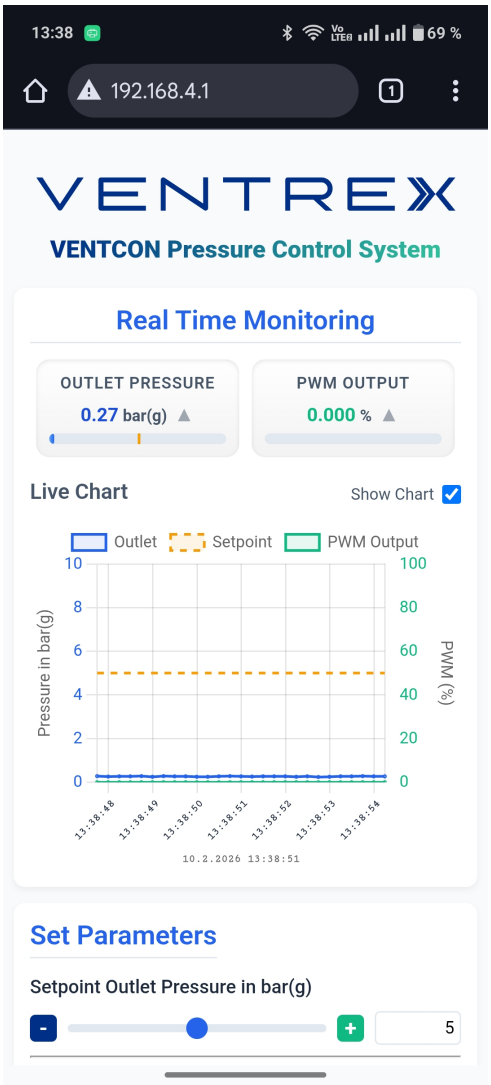
VENTCON

Pressure Control System

Web Interface User Manual



Version 2.0
February 18, 2026

Contents

1 Getting Started

1.1 Connecting to the Device

The VENTCON system creates its own WiFi access point for configuration and monitoring.

1. **Power on** the VENTCON device
2. On your smartphone or computer, open **WiFi settings**
3. Connect to the network: `VENTCON_AP`
4. Enter the password: `ventcon12!` (default)
5. Open a web browser and navigate to: **http://192.168.4.1**
6. A loading screen with the VENTREX logo appears briefly while the interface initializes

Setting	Value
Network Name (SSID)	`VENTCON_AP`
Password	`ventcon12!`
IP Address	`192.168.4.1`

Table 1: Default WiFi Connection Settings

1.2 Browser Compatibility

The web interface works best with modern browsers:

- Google Chrome (recommended)
- Safari (iOS/macOS)
- Firefox
- Microsoft Edge

2 Web Interface Overview

The web interface is divided into several collapsible sections. Tap any section header to expand or collapse it. The main sections are:

- **Real-Time Monitoring** – Pressure and valve duty cycle gauges with live chart (always visible)
- **Control Parameters** – Setpoint and PID tuning (expanded by default)
- **Auxiliary Settings** – Filter, actuator PWM frequency/resolution (collapsed by default)
- **System Information** – Network status (collapsed by default)

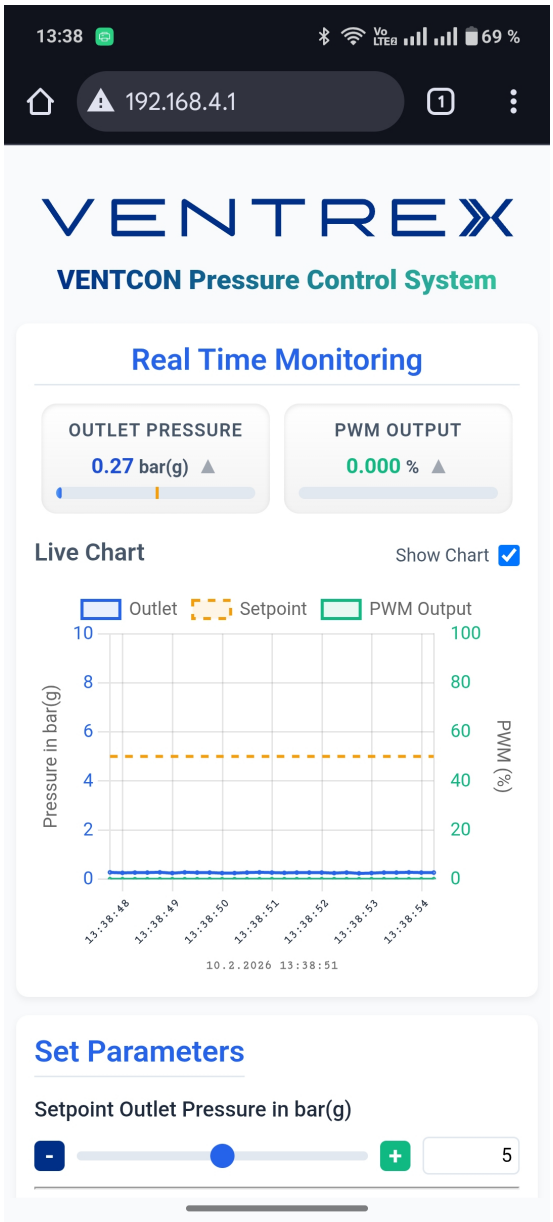


Figure 1: Top portion of the web interface showing real-time monitoring

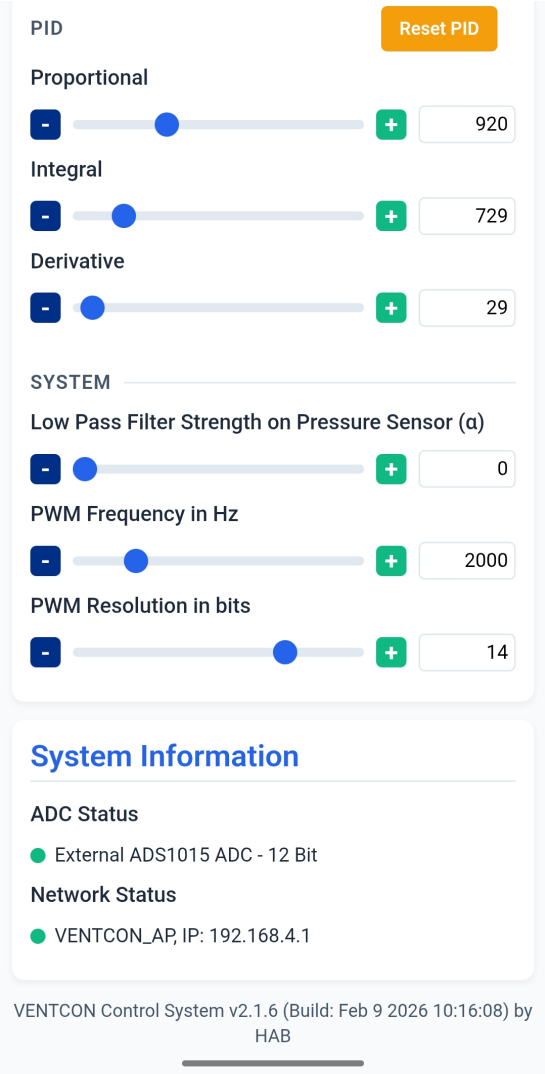


Figure 2: Bottom portion showing parameter controls

3 Real-Time Monitoring

3.1 Pressure Gauge

The **Outlet Pressure** gauge displays:

- Current pressure value in **bar(g)**
- Horizontal bar showing pressure relative to full scale (0–10 bar)
- **Target marker** (vertical line) indicating the setpoint position
- **Trend indicator** (▲) showing if pressure is rising, falling, or stable

3.2 Valve Duty Cycle Gauge

The **Valve Duty Cycle** gauge shows:

- Current valve control output as a **percentage** (0–100%)
- Green-colored value for easy identification
- Trend indicator showing output direction

3.3 Live Chart

The live chart provides a time-series visualization of:

- **Blue line**: Actual pressure
- **Red dashed line**: Setpoint (target pressure)
- **Green line**: Valve duty cycle percentage

Toggle the chart: The chart is shown by default. Use the "Show Chart" checkbox to hide/show it. Hiding the chart can improve performance on slower devices.

4 Parameter Controls

4.1 Adjusting Setpoint

The **Setpoint Outlet Pressure** slider controls the target outlet pressure in bar(g):

1. Drag the slider left/right to change the value
2. Use the − and + buttons for fine adjustment
3. Or type a value directly in the number input field
4. A blue **"Apply Changes"** button appears at the bottom
5. Tap "Apply Changes" to send the new value to the device

4.2 PID Parameters

The PID controller can be tuned using three sliders:

Parameter	Effect
Proportional (Kp)	Controls response strength. Higher values = faster response but may cause overshoot
Integral (Ki)	Eliminates steady-state error. Higher values = faster error correction but may cause oscillation. The label displays the integration time constant $T_i = K_p/K_i$ in real time.
Derivative (Kd)	Dampens oscillations. Higher values = more damping but may slow response. The label displays the derivative time constant $T_d = K_d/K_p$ in real time.

Table 2: PID Parameter Effects

Reset PID Button: Tap this button to re-initialize the PID controller with current settings. Useful after making significant parameter changes.

4.3 Configuring Slider Limits

Each control parameter slider (Setpoint, Kp, Ki, Kd) has a **gear icon** next to its label. Tapping this icon opens a settings dialog where you can customize:

- **Minimum**: The lowest value the slider can reach

- **Maximum**: The highest value the slider can reach
- **Step**: The increment size when using +/− buttons

This feature allows you to narrow the slider range for finer control, or expand it for wider adjustment ranges. Custom slider limits are saved automatically and persist across power cycles. **Note:** The auxiliary settings sliders (filter, PWM frequency, PWM resolution) do not have configurable limits.

4.4 System Parameters

4.4.1 Low Pass Filter Strength on Pressure Sensor (α)

Controls noise filtering on the pressure sensor:

- **0**: No filtering (raw sensor data)
- **1**: Maximum filtering (very smooth but slower response)
- Recommended: **0.1–0.3** for most applications

4.4.2 Actuator PWM Frequency

Sets the pulse-width modulation frequency for the valve actuator:

- Range: 100–10,000 Hz
- Higher frequencies reduce audible noise
- Default: 2000 Hz

4.4.3 Actuator PWM Resolution

Sets the PWM resolution in bits:

- Range: 8–16 bits
- Higher resolution = finer control
- Default: 14 bits (16,384 levels)

5 System Information

The **System Information** section (collapsed by default) displays:

- **Network Status**: A colored indicator dot (green when connected) alongside the access point name and IP address (e.g., `VENTCON_AP, IP: 192.168.4.1`)

6 Applying Changes

Important: Changes to parameters are not applied immediately. After adjusting any slider:

1. A blue floating button labeled "**Apply Changes**" appears at the bottom of the screen
2. Review your changes
3. Tap the button to send all pending changes to the device
4. The button disappears once changes are applied

All changes applied through the web interface are automatically saved to flash memory and persist across power cycles.

7 Troubleshooting

Problem	Solution
Cannot find WiFi network	Ensure device is powered on. Wait 10 seconds after power-up.
Page loads slowly	Hide the live chart. Reduce polling in congested WiFi areas.
Sliders not responding	Ensure you're connected to VENTCON_AP, not your regular WiFi.
Changes not taking effect	Tap the "Apply Changes" button after adjusting parameters.
Settings lost after restart	Settings are saved automatically when applied. If the issue persists, power-cycle the device.

Table 3: Common Issues and Solutions

8 Quick Reference

Action	How To
Connect to device	WiFi: `VENTCON_AP` / Password: `ventcon12!`
Open web interface	Browser: `http://192.168.4.1`
Expand/collapse sections	Tap section header
Adjust setpoint	Drag slider or use +/– buttons
Fine-tune PID	Adjust Kp, Ki, Kd sliders
Customize slider range	Tap gear icon next to slider label
Apply changes	Tap blue "Apply Changes" button
Reset PID controller	Tap "Reset PID" button
Toggle live chart	Use "Show Chart" checkbox

Table 4: Quick Reference Guide