# HEX@ Controller

USER INTERFACE INSTRUCTION MANUAL

# Contents

# 1. Introducing the controller

The controller starts and stops the pump, adjust the pressure setpoints, and monitors alerts. You can also collect data and analyse pump performance to improve processes and lower your operating costs.

## 1.1. Accessing User Interface

You can access the controller from any device connected to the same network (Windows PC, smartphone, tablet, laptop,...)

A Discovery app is available to locate the controller connected to the local network with the help of the IP address.

To access the controller

1. Click the browser's address bar.
2. Type the IP address, 192.168.202.10 and press Enter.
3. To change the display language
   1. Click on the **Flag** icon.
   2. Select the language of your choice.
      The notifications are displayed along with the **Bell** icon.
4. To Sign-in
   1. Click on **Sign in** button
   2. Type Username and Password.
   3. Click **Sign in**.
   4. Use your login credentials or the credentials available on the sticker found on the machine.
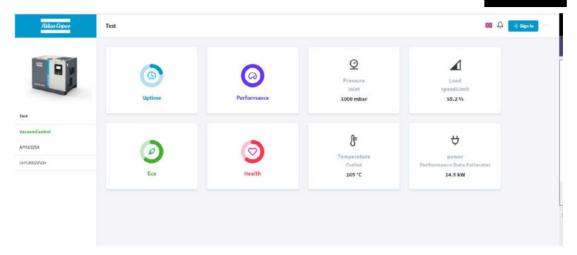
### 1.1.1. Troubleshooting Windows connection problems

If you cannot access the IP address, 192.168.202.10 in your web browser,

1. Press the "**Windows**" button on the keyboard.
2. Search "**View network connections**".
3. Right click on **Ethernet** or **Adapter** (depending on the ethernet connection).
4. Click **Properties** > **Internet protocol version 4 (TCP/IPv4)** > **Properties** > Use following IP address.
5. Enter IP address as 192.168.202.9.
6. Click on **Subnet mask** and 255.255.255.0 number must appear.
7. Click **OK**.

Try to connect through your web browser again.

## 1.1.2. Entering login credentials

To use first time sign-in

1. Click **First sign-in** tab First sign in page displays



2. Type **Username**
3. Type **Password**
4. Click **OK**

You can change login credentials after your first login.
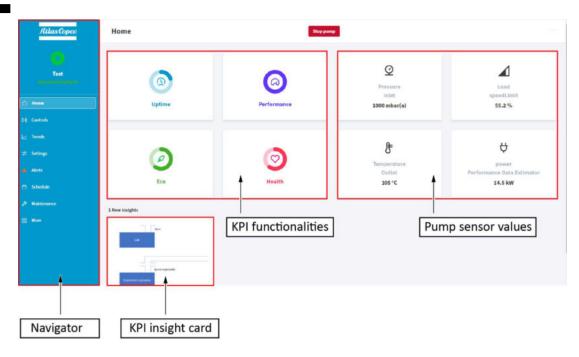
### Entering new password

If you forgot your Username and Password

1. Go to the **Forgot Password** tab.
2. Enter the details from the controller hardware label.

## 1.1.3. Viewing controller home page

The default home page displays after the first login.

The home page is divided into four segments

| Section | Functions |
|---|---|
| Navigation bar | You can see key parts of controller such as<br>▪ Home<br>▪ Controls<br>▪ Trends<br>▪ Settings<br>▪ Schedule<br>▪ Maintenance<br>▪ Alarms<br>▪ More |
| KPI functionalities | You can see pump parameters such as Uptime, Performance, Eco and Health. |
| Pump sensor values | You can see pump sensor values. |
| KPI insight card | You can see KPI functionalities. |

## 1.2. Using Discovery application for finding the pump

To find the pump through the Discovery application

1. Navigate to the App store or Google play store of your mobile device.
2. Search the IP discovery application.
3. Download the IP discovery application.

   📄 **Note:**

   *Make sure that the network connection is same for the controller and search engine. To do so, check the connection from controller to the customer end connection.*

4. Open the application window.

5. Click on the pump card to display the network IP address.

## 1.3. List of abbreviations

*Table 1  Abbreviations*

| HEX@ | HEX@AtlasCopco controller |
|---|---|
| UI | User Interface |
| HMI | Human Machine Interface |
| IP address | Internet Protocol address |
| DNS | Domain Name System |
| DHCP | Dynamic Host Configuration Protocol |
| mDNS | Multicast DNS |
| M2M | Machine to Machine |
| MQTT | Message Queuing Telemetry Transport |

# 2. Configuring the controller

Configure the controller for your situation and usage.

## 2.1. Connecting the pump to the local LAN network

📄 **Note:**

*Connect the controllers directly to the company network through the X11 port on the rear of the controller with Ethernet cables.*

To connect to the controller

1. Navigate to the IP address in a web browser.
   If you do not have the IP address, use X10 access (OP0020).
2. Click **Sign in**.
3. Enter login credentials to access the home page.
4. Click **More > Preferences > Connectivity > LAN**.
5. Check and confirm with the IT department, if the DHCP has been set automatically.

- If the DHCP is set automatically, the connection is complete.
- If the DHCP is not set automatically, connect the ethernet manually

📄 **Note:**

*If the DHCP is enabled, the connection details will be selected automatically. If it is not displayed, enter the details manually.*

     A. Click **Edit.**
     B. Deactivate **DHCP**.
     C. Enter the connection details manually.
     D. Click **Save**.
     E. Activate **Proxy** if you have to add the Proxy IP address.

## 2.2. Setting the preferred language

To set your desired language

1. Click **More**.
2. Navigate to **Preferences > General > Language.**
3. Select the preferred language.

## 2.3. Setting the physical units

To set the physical parameters units

1. Click **More**.
2. Navigate to **Preferences > General > Units**.
3. Modify the units for different parameters as per your requirement

## 2.4. Setting the date and time

To set the date and time

1. Click **More**.

2. Navigate to **Preferences > General > Date and time**.

3. Modify the time zone, date and time, format of date and time as per requirement.

## 2.5. Creating user profile for customer

📄 **Note:**

*You must create an admin profile for the user (tier level 1). The admin can use his access to create different user profiles for their use.*

To create the user profile

1. Click **More > Manage users > Add user**.

2. Enter the user details.

3. Click **Save user.**

## 2.6. Setting the HMS WiFi bolt

### 2.6.1. Connecting WiFi to the company network

📄 **Note:**

*The controllers can be connected directly to the company network through the X11 port using the Client mode of the WiFi bolt.*

To connect the controller to the WiFi connection

1. Navigate to the IP address in a web browser.

2. Click **Sign in**.

3. Enter your credentials to access the home screen.

4. Click **More > Preferences > Accessories > WiFi bolt**.

5. Configure the WiFi bolt

   A. Enable the WiFi bolt.

   B. Make sure that the WiFi bolt is connected.

   C. Press the **Refresh** button (visible only when the WiFi bolt is not connected).

   D. Select **Client mode**.

   E. Click **Scan** to see the access points.

   F. Select the **WiFi access point** to connect.

   G. Select the **Authentication mode**.

   H. Enter **Password**.

   I. Click **Connect**.

6. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

## 2.6.2. Creating a separate local network with WiFi bolts

📄 **Note:**

*If you do not want a direct connection between the controller and your network, create a separate local network by an access point.*

*The controllers can connect directly to the customer network through the X11 port using the Client mode of the WiFi bolt.*

To create a separate local network with WiFi bolts

1. Connect the WiFi bolt to the pump.
2. Navigate to IP address in a web browser.
3. Click **Sign in**.
4. Type your credentials to access the home page.
5. Click **More > Preferences > Accessories > WiFi bolt**.
6. Configure the WiFi bolt

   A. Enable the WiFi bolt.
   B. Check that the WiFi bolt is connected.
   C. Press the **Refresh** button (visible only when the WiFi bolt is not connected).
   D. Change connection mode to **Access Point**.
   E. Create the access point by typing the name (SSID).
   F. Set **Password** if required.
   G. Set the **Authentication mode** to WPA2.

## 2.6.3. Connecting to a local network with WiFi bolts

To connect to a separate local network with WiFi bolts

1. Navigate to the IP address in a web browser.
2. Click **Sign in**.
3. Use your credentials to access the home screen.
4. Click **More > Preferences > Accessories > WiFi bolt**.
5. Configure the WiFi bolt

   A. Enable the WiFi bolt.
   B. Make sure that the WiFi bolt is connected. If not, press the Refresh button (visible only when the WiFi bolt is not connected).
   C. Change connection mode to **Client**.
   D. Click **Scan** to see the access points.
   E. Select the **WiFi access point** to connect.
   F. Select the **Authentication mode.**
   G. Enter Password.
   H. Click **Connect**.

6. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

## 2.7. Changing display settings

To change the display settings

1. Click **More**.
2. Navigate to **Preferences > Accessories > HMI menu**.
3. Modify the brightness, zoom and colour palette of the HMI as per your requirement.

## 2.8. Backup and restore parameter setting

This feature enables the user to backup and restore the parameters saved in the settings.

To backup the parameter values:

1. Navigate to **Settings**.
2. Click top right icon.
3. Click **Backup locally**.

To restore the parameter settings:

1. Navigate to **Settings**.
2. Click top right icon.
3. Click restore parameters from file.
4. Upload the backup file from your location and upload.

## 2.9. Updating the software

To update the software offline and online

**Updating the software offline**

Update the software offline by manually updating .tar file from the controller.

1. Click **More**.
2. Navigate to **Preferences > Software update**.
3. Click **Manual upload** on the top right corner.
4. Go to Instruction window, drag-drop the .tar file in the instruction window. (Make sure that the file name is correct.)
5. Click **Upload file > Install update > Done**.

**Updating the software online**

Update the software online by updating automatically from the controller.

📄 **Note:**

*Make sure to stop the pump before you do the software update.*

1. Click **Download update file** which has been received from the cloud.

2. Click **Install update > Done**.

### 2.9.1. Troubleshooting software update failure

There is a chance of failure when updating the software. To fix the failure issue

1. Click **View log**.
2. Click **Failed** updates.
3. Check more information on failed updates.
4. Click **Download log**.
5. Restart the controller.
6. Repeat the software update.
7. If the problem persists
   - Click on **Download log**.
   - Send the log file and the software update file (if available) through TechConnect to the second level support.

## 2.10. Allowing remote assistance (optional)

📄 **Note:**

*You can access the controller through TeamViewer. This feature is available on request. Contact us for details.*

To access the TeamViewer support for remote assistance

1. Click **More**.
2. Navigate to **Support**.
3. Click **TeamViewer**.

## 2.11. Checking the pump efficiency (KPI functions)

The controller monitors four Key Performance Indicators, known as pump KPI's. These are Uptime, Performance, Health and Eco . You can access these on the home page of the controller. Click on them to see their historical values.

| Uptime | This indicates if the system was available when vacuum was required. It considers the maintenance times and the pump availability. |
|---|---|
| Performance | This indicates if the system is performing well. Performance is dependent on the application and the below points:<br>- if the pressure stability is around the target pressure<br>- if the pump down time is consistent<br>- if the response time of the machine is quick |

| Eco | This indicates the environmental impact of the machine. It evaluates if the machine could save more energy , for example running at lower speeds below the target pressure. Depending on the pump technology it will monitor the consumption of water or gases. This KPI will evaluate the benefit of an energy recovery option. |
| --- | --- |
| Health | This indicates the system health. It evaluates how long the machine has been running without failure or a warning. It will evaluate if the machine needs service as defined by the promised service due and if any parts of the machine act in an expected matter. |

**KPI Insights**

The KPI insights are insight cards that give more information about the KPI's.

The Insight cards are presented on the home page and can be considered as tips to improve the pump KPI's.

## 2.12. Checking the trend mechanism

To check the trend mechanism

1. Navigate to **Trends**.
2. Navigate to the required function (**Airflow, Power, Pressure, Temperature, Water flow**) tab.

To add the variables as favourites

1. Click on the top right corner of the card.
2. Select **Add to favourites**.
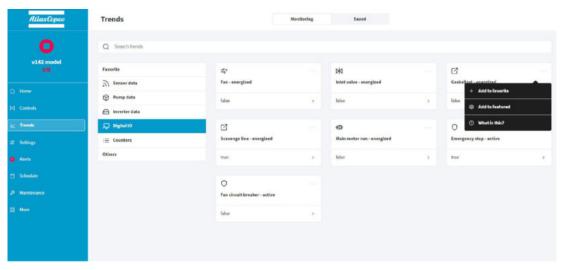
   📄 **Note:**

   *Click on a variable to view the Variable Range.*

The flexibility to add trends based on the preference and save the settings. Charts are grouped into types of measurements that can contain multiple charts.

**Figure 1** Checking the trend mechanism

### 2.12.1. Using trend actions

To access the options in variable tab click the dots at the top right corner.

- add/remove from favourites
- details of function of respective variables
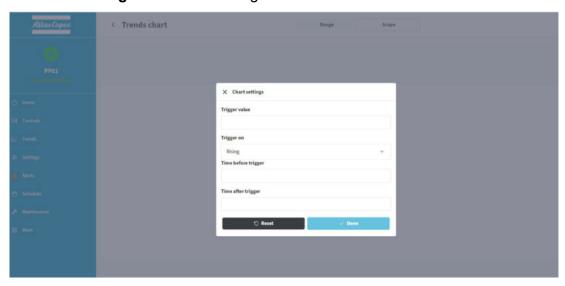
### 2.12.2. Viewing chart settings

The chart settings allow you to choose the trigger values for different parameters.

To access the Chart settings

1. Click **Scope > Settings.**
2. Choose from **Rising** or **Falling** for **Trigger on.**
3. Select the time before and after triggers as per your requirements.

**Figure 2** Chart settings



### 2.12.3. Modifying pump sensors on Home page

To select the featured items position from Trends page on home page

1. Navigate to **Trends** page.

2. Click top right anchor on the tiles
3. Select **Add to featured**.
4. Select the Slot.
    - Slot1 - Top left
    - Slot2 - Top right
    - Slot3 - Bottom left
    - Slot4 - Bottom right

**Figure 3** Modification of pump sensors on the home screen
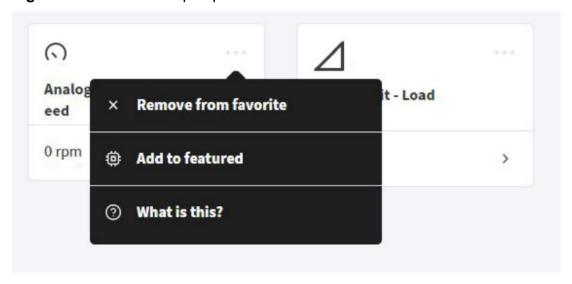


**Figure 4** Slots



## 2.13. Checking the service interval (Pump maintenance)

Navigate to the Maintenance screen to check the upcoming service intervals. Different service intervals are displayed based on the machine type and severity of the operating conditions. Each interval indicates the time left before the service must performed. This can be an amount of running hours or after a fixed period. Click on a specific service interval to see additional service information.

# 2.14. Setting a custom digital output function

The machine has three digital outputs that gives additional feedback signals to external hardware.

The three outputs by default, are set up as follows:

- Dout_E1 is enabled if the machine is started
- Dout_E2 is disabled if the system has a warning
- Dout_E3 is disabled if the system has a failure

The outputs can give other feedback signals as well.

To set a custom digital output

1. Navigate to **Settings > Multi functional digital outputs**.
2. Change the **Active function code**.

When set to a value different than 0, a specific function is activated to control this digital output. Refer to *Table: Function codes* for a list of function code.

*Table 2  Function codes*

| Function code | Function |
|:---:|:---|
| 2 | Indicates that the machine is started |
| 3 | Indicates that the machine has a warning |
| 4 | Indicates a failure |
| 5 | Indicates that a connection to the cloud is done |
| 6 | Indicates that the system is ok without warning or failure |
| 7 | To start a fixed speed booster when the process pressure is below a threshold and the backing pump is running. Only available if the fixed speed booster option is installed. |
| 8 | Indicates that the machine is producing vacuum (open inlet valve) |
| 9 | Indicates that the machine is running a pre purge cycle (heating up) |
| 10 | Indicates that the machine is running a post purge cycle (machine keeps itself heated ready for operation) |
| 11 | Indicates that the Pumpdown optimization function is activated (Only available if the Pumpdown optimization option is installed) |
| 12 | Indicates that the pressure is above the pressure setpoint |
| 13 | Indicates that the machine is performing a leak detection cycle (only available when the leak detection option is installed) |
| 14 | Indicates that the machines is running a purge cycle (pre, post or manual purge) |

| Function code | Function |
|---|---|
| 15 | Can be used as a custom pressure switch function, meaning the output will be enabled below or above a settable pressure level |
| 16 | Indicates that the motor is running above minimum speed |
| 18 | Indicates that the emergency stop is in a safe position (not tripped) |
| 19 | Indicates that the fan circuit breaker is enabled (not tripped) |
| 20 | Indicates that the remote start digital input is enabled |
| 21 | Indicates that the manual purge digital input is enabled |
| 22 | Indicates that the remote digital setpoint selector is enabled |
| 23 | Indicates that the remote maximum speed input is enabled |

## 2.15. Enabling remote speed control

The machine is by default equipped with a remote or analog speed control functionality. It is possible to control the machine speed from an analog input, overwriting the machines own pressure setpoint control. The machine will limit the requested speeds in case they are outside of its allowed range.

To enable the remote speed control

1. Connect a 0 - 20 mA or 4 - 20 mA 2-wire connection to the AIN_E4 connector pins 11 and 12 on connector X1.
2. Navigate to **Settings** menu.
3. Search for the **Multi Functional analog inputs**.
4. Set the **AI_E4_0_20mA.ActiveFunctionCode** to 1 to enable the remote speed control. The controllers external input AIN_E4 is now used for this functionality.

## 2.16. Enabling remote pressure setpoint control

The machine is by default equipped with a remote or analog speed control functionality. It is possible to control the machine speed from an analog input, overwriting the machines own pressure setpoint control. The machine will limit the requested speeds in case they are outside of its allowed range.

To enable remote pressure setpoint control

1. Connect a 0 - 20 mA or 4 - 20 mA 2-wire connection to the AIN_E4 connector pins 11 and 12 on connector X1.
2. Navigate to **Settings** menu
3. Search for the **Multi Functional analog inputs**.
4. Set the **AI_E4_0_20mA.ActiveFunctionCode** to 2 to enable the remote setpoint control. The controllers external input AIN_E4 is now used for this functionality.
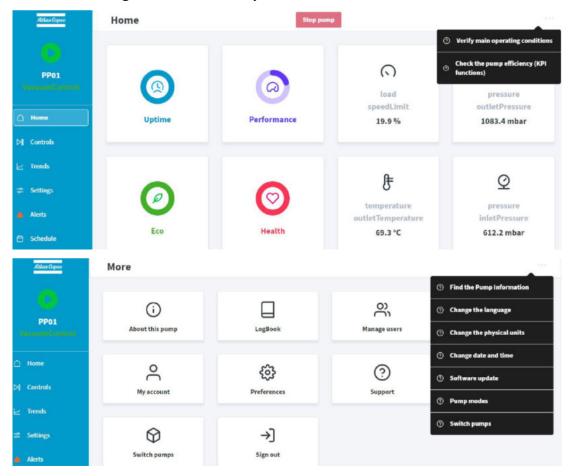
## 2.17. Finding the pump information

To find the pump information, click **More > About this pump.**

## 2.18. Getting help

It displays the anchor points on top right corner of each page with topics related to that particular page. If you go to the particular topic you can find the information about the functionality.

**Figure 5**  User friendly manual

# 3. Operating the pump

Start the pump, view the status, pressure, motor speed, and outlet temperature. Change pressure setpoints, change the mode between load-dependent or fixed-speed modes, adjust automatic restart, or set schedule actions.

## 3.1. Verifying main operating conditions

By looking at menu bar you can check the main operating conditions of the pump . The menu bar includes following

1. Pump running status
   - Off - The pump is ideal and waiting for a start command
   - VacuumControl - The pump is in operation and generates vacuum at its inlet
   - Failure - The pump has a critical error. It needs to be investigated and reset before the pump re-start.
   - PrePurge/PostPurge/ManualPurge - The pump heat up to the desired operating temperature without generating vacuum.
2. Inlet pressure
3. Motor speed
4. Outlet temperature

You can see the pump operating condition by navigating to home page.

📄 **Note:**

*The load of the pump indicates how fast the pump is running. 100% means that the pump is at its maximum speed and cannot produce more flow.*

## 3.2. Changing the connection mode

You can change the pump connection mode from the **Controls** screen. No other source than the one selected can start or stop the pump.

The most common connection modes are:

- Front panel - It is used when the control panel installed on the pump without HMI.
- Fieldbus - It is used when external PLC controls the pump over ethernet.
- Hardware IO - the hard-wired connections (if installed).
- Central system - It is used when the pump is part of a central vacuum system. In this case an overruling central controller will control all different pumps together.
- Local web UI -It is used when the HMI installed on the pump.
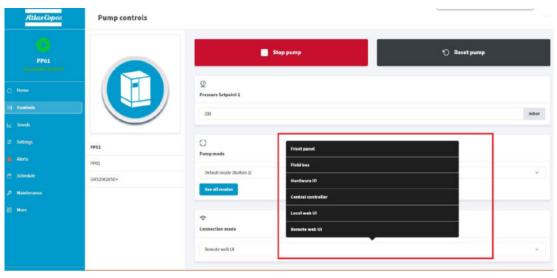- Remote web UI - It is used when the interface is accessed from external devices like laptop or phones.

### 3.2.1. Viewing front panel controls

There are following four icons on the front panel that influence the start and stop command.

1. Start/Stop icon - It is a lit up LED which indicates that the pump is in operation.
2. Mode icon - It switches the mode on the pump. A LED is lit up to indicate the active mode.
3. Connection mode icon - It declares the source of pump control.
   - A lit up LED indicates that the pump can be controlled from the front panel.
   - A non-lit LED indicates that the pump is controlled from a different source like from an external PLC.
4. Reset icon - It resets a failure on the pump after the problem is solved.

**Figure 6** Change the connection mode



## 3.3. Starting and stopping the machine

You can start or stop the pump through the controller. Press the green or red button to start or stop the pump respectively.

- A dark green button indicates that the pump is off and can be started.
- A dark red button indicates that the pump is in operation and can be stopped.
- A greyed out button indicates that the pump cannot be controlled from this interface because the connection mode is not set to this controller.

**Figure 7** Different colors of the start/stop button on the Controls page



## 3.4. Changing the pressure setpoint

To change the pressure setpoint, proceed as follows:

1. Navigate to **Settings.**
2. Navigate to **Pressure setpoint control**.
3. Modify the settings to tune the pumps control to the process requirements.
   - Setpoint1 - Indicates pressure setpoint value number 1
   - Setpoint2 -Indicates pressure setpoint value number 2
   - SetpointSelection - Indicates which pressure setpoint is active.
   - Offset & MinRunTime - Indicates both settings are used to decide when the machine can go to standby.

If the process pressure is smaller than the pressure setpoint, the machine will slow down and eventually shut off to save energy. It shuts off automatically when

- The inlet pressure is below the setpoint minus the offset.
- The machine speed is very slow for a minimum time dictated by the MinRunTime.

## 3.5. Setting the pump modes

The pump modes allows the user to setup pump operations.

There are 4 modes available:

- Default mode: This mode is intended for use in central vacuum applications with some variability in load. The pump operating speed will adjust as a function of the inlet pressure vs the target Setpoint with a medium level of reactivity.
- Fixed speed mode: This mode is intended for cyclic applications with a holding period. The pump will run at 100% of it's maximum speed until the target pressure is reached, then it will switch to the inputted holding speed until the inlet pressure rise and reaches the target Setpoint. The pump will not stop running like in PI control and stay ready to ramp up to maximum speed at any moment.
- Slow PI: This mode is intended for use in central vacuum applications with some variability in load. The pump operating speed will adjust as a function of the inlet pressure vs the target Setpoint with a medium level of reactivity.

- Force max speed: This mode is intended for use in cyclic applications. The pump will ignore the PI control method and run at 100% maximum speed. It can also be used during commissioning to check the ultimate pressure of the vacuum pump in the given installed conditions.

The user can activate any modes

1. Click **More**.

2. Navigate to **Modes**.

3. Create a new mode or select the mode from available **Modes.**

To add settings for the different modes

1. Click **Settings > Details.**

2. **Add** the desired settings and details.

3. Click **Done**.

## 3.6.    Adjusting the pump settings

To adjust the pump settings

1. Navigate to **More**.

2. Click **Mode > Default mode**.

3. Set the values to fine tune the pump performance. In the Default mode, you can change following settings:

   - Force max speed
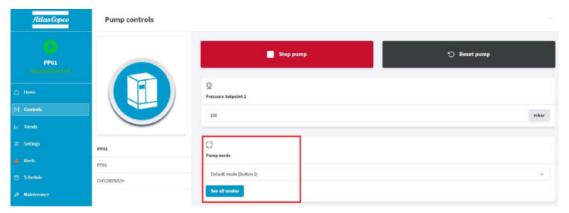   - Proportional gain
   - Integral gain.

      📄 **Note:**

      *Change the values of proportional gain and Integral gain only in steps of 0.5 so that you do not damage the pump.*

## 3.7.    Changing the pump mode

You can change the pump mode from the front panel or the user interface. You can set the pump to Active mode directly from the controls page.

On the front panel a blinking led indicates the active pump mode (1, 2, 3 or 4). When you click on this icon, the next mode will have a blinking LED for a second before it becomes active.

**Figure 8** Changing the pump mode

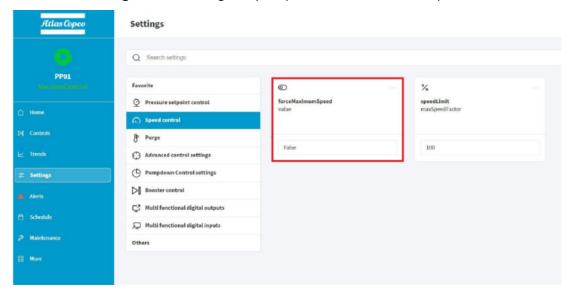## 3.8. Forcing the machine to run at maximum speed

The pump is by default set to control its motor speed intelligently. The pump will regulate itself to maintain the inlet pressure equal to the user pressure setpoint.

To change the speed control function

1. Navigate to **Settings > Speed control settings**.
2. Search **forceMaximumSpeed**.
3. Enable the Setting.

The pump will always run at its maximum speed.

**Figure 9** Forcing the pump to run at maximum speed



## 3.9. Starting the pump automatically after a supply voltage interruption

The controller has a built-in function to automatically restart the vacuum pump if the voltage is restored after a voltage failure. By default this function is disable.

To set the pump to automatically restart

1. Navigate to **Settings > Advanced control settings**.

There are 4 settings influencing this functionality:

- **Active** - Enables that the machine automatically restarts after a voltage failure if voltage is restored.
- **AravfPowerDownTime** - Sets the maximum time for the machine to be without voltage and restart again when the voltage is restored..
- **RestartDelay** - Sets a restart delay to the machine if the machine can automatically restart. This is useful in case multiple machines are set to restart at the same time.
- **AravfPowerDownTimeInfinite -** Sets the AravfPowerDownTime to infinite. This means that the machine will restart after a voltage failure regardless how long it took to restore the voltage.

## 3.10. Setting the schedules

To create a new schedule, proceed as follows:

1. Navigate to **Schedule**.
2. Click **New schedule**.
3. Enter schedule name.
4. Click **Create schedule > New event.**
5. Select actions (Start pump, Stop pump, Start purge, Stop purge, Change mode) based on preference.
6. Select the **Interval type**.
   A. If the Interval type is Timed
      - Enter start day, time and repeat information.
   B. If the Interval type is neos-runningTime-Running hours, fan-switchCount-Counters, mainMotorRunEnable.-switchCount-Counters
      - Enter running hours

## 3.11. Responding to an alert

An alert can be recognised by a failure or warning message on the bottom of the home page.

- A failure will stop the pump and requires a manual reset. It is displayed in red.

  When the pump is in failure mode, it cannot be started before the root cause of the failure is gone and the failure has been manually reset.

- A warning will not stop the pump and does not require a reset. It is displayed in orange on the user interface.

To investigate the alert, failure or warning

1. Navigate to **Alerts**. You can see a list of all current alerts.
2. Select the specific alert to get more information about the possible root cause and the solutions.

If the failure is solved, click on **Reset pump** to reset the alert. You can also see the previously solved alerts by clicking on the history button.

**Figure 10** Responding to an alert