

Zero Service Edition
Software User's Manual

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Section 1. ABOUT THE MANUAL

This manual details using Zero Service Edition software to control, diagnose and set up air handling units equipped with Zero 2 controller-based automatic control systems.

The document which covers the entire functionality and features of the software is intended to assist maintenance services in its installation and setup.

Section 2. SYSTEM REQUIREMENTS, SOFTWARE INSTALLATION AND UNIT CONNECTION TO PC

2.1 System requirements, software installation and removal


Installation and use of Zero Service Edition requires a laptop or PC running Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 8.1 or Windows 10 operating system with administrator permissions (please consult your system administrator).

Use **Setup_Zero_Service_vX_X.exe** file to install the software.

Download the file to your hard drive and run it.

This will initiate the standard Windows installation wizard - just follow the on-screen instructions.



By the time the installation is complete the wizard will have created the  shortcut on the desktop and a new folder in the Start menu containing the shortcuts for running and uninstalling the software.

2.2 Connecting the unit to a computer

To connect the unit to a laptop or a PC use a USB cable.

Units with **USB Type A** connector require an **AM-AM** cable (**Fig. 1**).

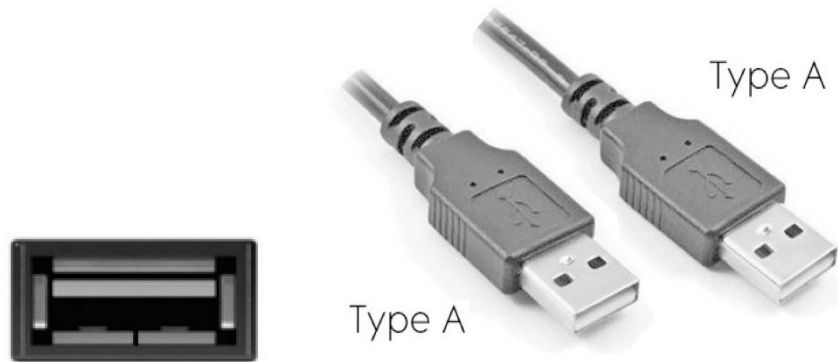


Fig. 1 Type A USB socket in unit casing and AM-AM USB cable

Units with Type B **USB** connector require an **AM-BM** USB cable (**Fig. 2**).

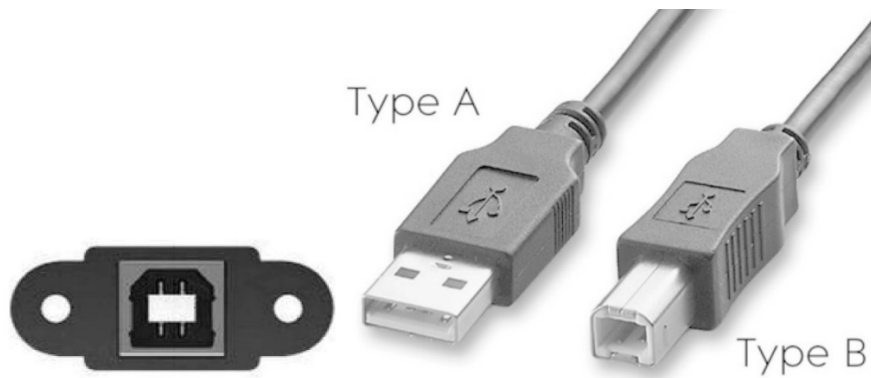


Fig. 2 Type B USB socket in unit casing and AM-BM USB cable

Section 3. ABOUT ZERO SERVICE SOFTWARE

Zero Service Edition software is a PC program. The software has a graphic user interface.

Zero Service Edition allows real-time control of all the parameter values, changing settings on the fly as well as creating configuration profiles, saving them to the computer and uploading them to the air handling unit.

The software also allows convenient testing of the unit for troubleshooting.

A connection from a laptop running Zero Service Edition software provides access to the entire information about the unit health including all the input and output parameters such as sensor temperature sensor readings, control signals, alarm input state etc.

Zero Service Edition software is a convenient commissioning tool.

All the configuration parameters (e.g. fan speed, temperature, humidity and operation mode) can be pre-configured and batch-loaded into the unit controller.

Zero Service Edition main window has three tabs:

Program Mode – firmware upgrade tab


Control Mode – unit management and control tab

Demo – demonstration mode tab

Section 4. CONTROLLER PROGRAMMING AND SETUP

4.1 Software window in the firmware upgrade mode and Program Mode tab



Launching the program by double-clicking the  shortcut opens the **Zero Service Edition** main window which has the following appearance in the firmware upgrade mode as given on **Fig. 3**.

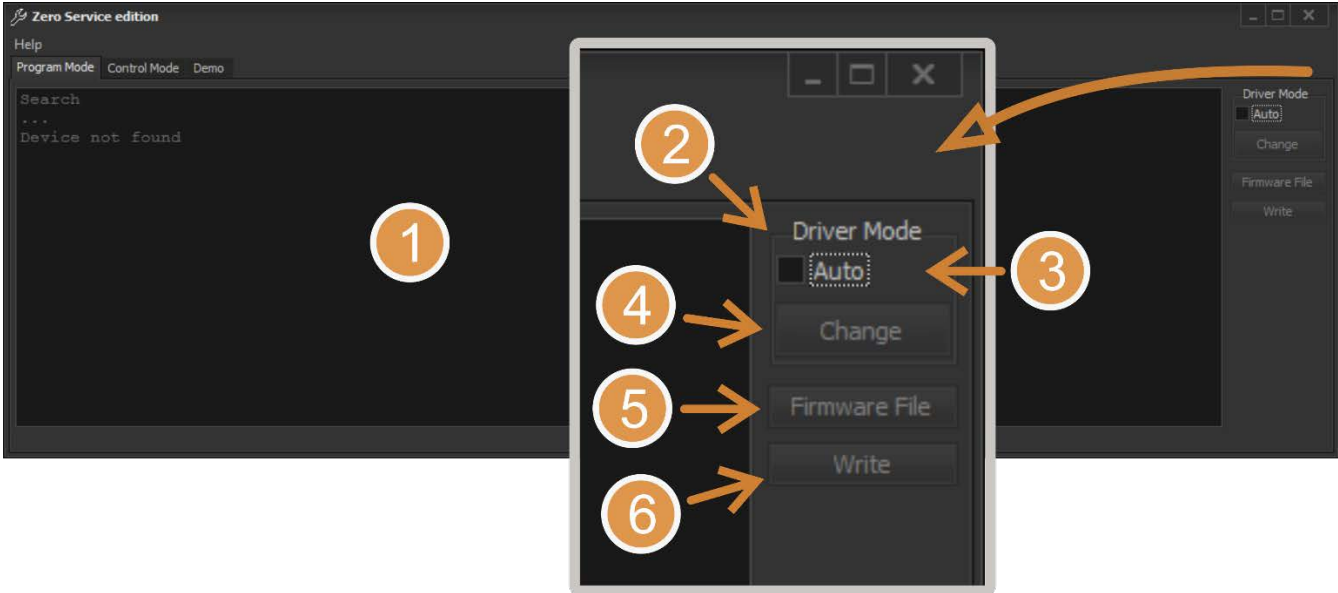


Fig. 3 Program window in firmware upgrade mode

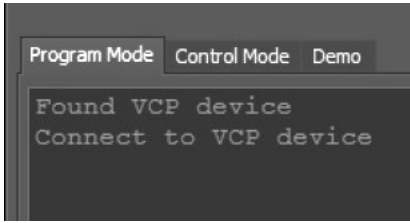
The window interface contains the following control and information display elements:

1. Connection status and firmware information field
2. Circuit board ID change controls
3. ID change mode checkbox. When checked the ID is changed automatically upon discovering a circuit board connection.
4. Manual ID change button
5. Firmware file selection button
6. Firmware upload button

4.2 Zero2 controller circuit board firmware upgrade

Connect the unit to a laptop via a USB cable. You do not have to switch off the unit before making the connection. Wait till the software establishes connection with the unit controller.

Without running the ID change procedure the field shows the following information once the connection has been established:



In this case click the **Change** button to change the controller ID as required to upgrade the firmware, check and use the controller. Wait till the ID change sequence has completed.

*If the screen shows **Connect to USB device** message instead of **Connect to VCP device** immediately upon establishing connection, changing the controller ID by clicking the Change button is not necessary.*

If the **Auto** mode has previously been selected by enabling Checkbox 3, wait for the automatic ID change sequence to complete after a successful connection.

If the firmware is upgraded for the first time ("clean" upgrade), the program window shows the messages given on **Fig. 4**.

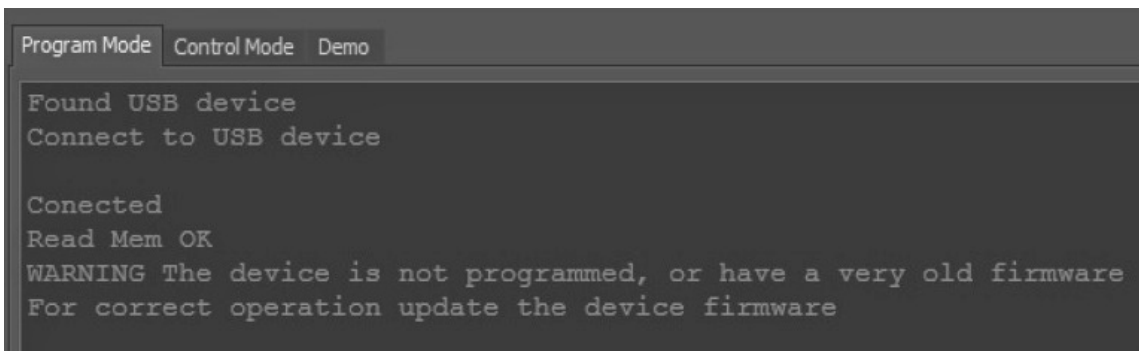


Fig. 4. Information after ID change during a "clean" firmware upgrade

Click the **Firmware File** button to bring up the standard firmware file selection dialogue box. After selecting the necessary file click the **Write** button.

The controller firmware upgrade process is shown on **Fig. 5**.

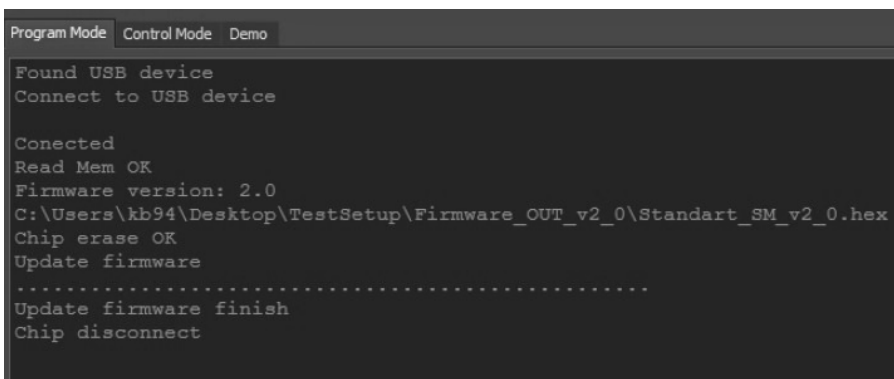


Fig. 5. Controller firmware upgrade

Allow some time for the firmware to upload to the microcontroller memory. Upon a successful upload the program window shows the messages given on **Fig. 6**.



```
Program Mode Control Mode Demo
Found USB device
Connect to USB device

Conected
Read Mem OK
Firmware version: 2.0
```

Fig. 6. Successful firmware upgrade/connection to microcontroller

Firmware upgrade is complete.

Section 5. UNIT CONTROL

The **Control Mode** tab is used to control the unit as well as to create, test and save configuration profiles containing operating parameter sets.

5.1 Control Mode tab

The **Control Mode** tab appearance is given on **Fig. 7**.

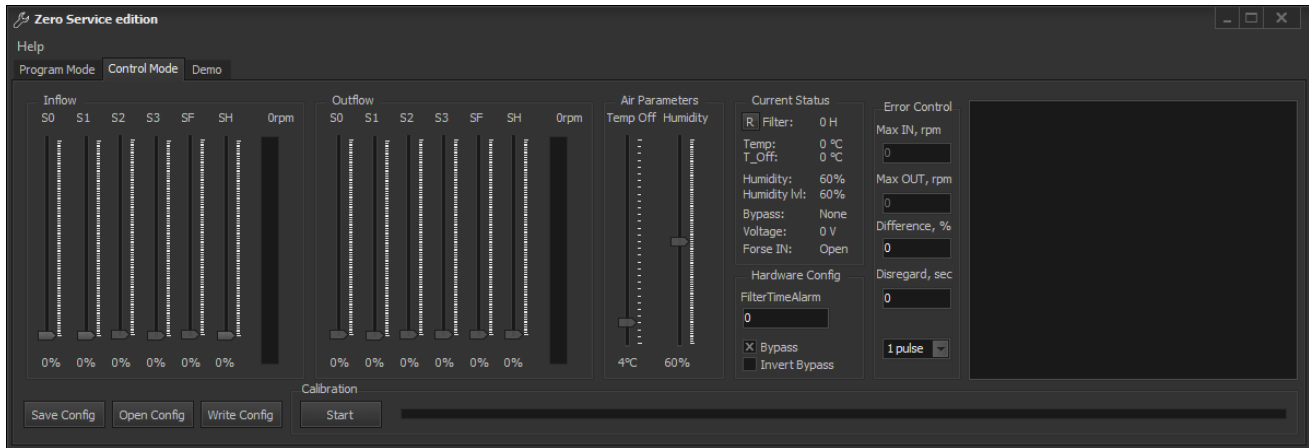


Fig. 7. Control Mode tab

This tab contains management and control elements.

Inflow and Outflow groups for the respective fans:

S0 – speed preset slider for Standby mode (0 % by default)

S1 – speed preset slider for Speed 1

S2 – speed preset slider for Speed 2

S3 – speed preset slider for Speed 3

SF – speed preset slider for unit operation with the external device (e.g. CO₂ sensor) normally open (NO) contact closed which corresponds to **Force IN: Close** status.

SH – speed preset slider for unit operation after exceeding the humidity threshold (**Humidity lvl**) value

Rpm – fan speed bar chart updated in real time

Air Parameters group:

Temp Off – temperature threshold setpoint using the feedback from the exhaust air temperature sensor to activate the heat exchanger freezing protection. The heat exchanger is protected by the supply fan (**factory setpoint 3 °C**).

Humidity – humidity threshold setpoint. When the threshold is exceeded the supply and extract air flow is increased starting from the pre-set **SH** level in proportion to the humidity increase.

Current Status group:

Filter – current number of hours in operation (saved every 3 hours)

R button – reset the number of hours of filter operation

Temp: – current temperature according to the extract air sensor downstream of the heat exchanger

T_Off: – pre-set temperature threshold for activating heat exchanger protection against freezing

Humidity: – current humidity level (according to the humidity sensor)

Humidity lvl: – pre-set humidity threshold after which the fans reach the speed set with the **SH** speed slider

Bypass: – current bypass status

Voltage: – current voltage level at the 0-10 V input

Forse IN: – current status of the input for an external control device with a normally open (NO) contact (e.g. CO₂ or humidity sensor)

Hardware Config group:

FilterTimeAlarm – timer delay before the filter maintenance warning appears

Bypass – bypass function enabled/disabled

Invert Bypass – inverted bypass operation

Error Control group:

Max IN, rpm – supply fan maximum real speed in rpm (defined by calibration)

Max Out, rpm – extract fan maximum real speed in rpm (defined by calibration)

Difference, % – permissible deviation of the current fan speed from the setpoint value in % which is considered to be within normal limits by the controller

Disregard, sec – period of time within which the motor speed deviation from the Difference parameter value (i.e. higher than Disregard parameter value for motors with extended acceleration/deceleration time) is considered to be within normal limits by the controller

Pulse – drop-down list with available denominator values for proper display of the fan revolutions

Calibration group:

Start – calibration start

Calibration progress indicator.

Buttons:

Save Config – saves current configuration to PC

Open Config – opens a file with a previously saved configuration profile

Write Config – uploads the current configuration to the controller (to save the new parameter values in the controller memory use this button to confirm the changes)

5.2 Calibration

Calibration is required before unit commissioning, controller circuit board or motor replacement, or software upgrade.

The calibration enables to define the maximum rotation speed for each fan in the specific air handling unit operating conditions. The obtained results are used for further identification of potential abnormalities in the fan operation.

Connect the unit to the laptop via a **USB** cable (see Section 2).

Power up the unit.

Launch **Zero Service Edition**.

Wait till the circuit board connection is complete. If the circuit board firmware was not upgraded earlier, run the firmware upgrade according to paragraph 4.2 herein.

Disable the unit from the control panel by pressing the respective button as detailed in the control panel operating instructions above (set to **Standby**).

*Disable the unit from the control panel by pressing the respective button as detailed in the control panel operating instructions above (set to **Standby**).*

Go to the **Control Mode** tab.

To initiate calibration click the **Start** button on the **Control Mode** tab. Once the calibration has started, the air handling unit motors spin up to the maximum speed. The calibration progress bar is shown in the program window (**Fig. 9**).

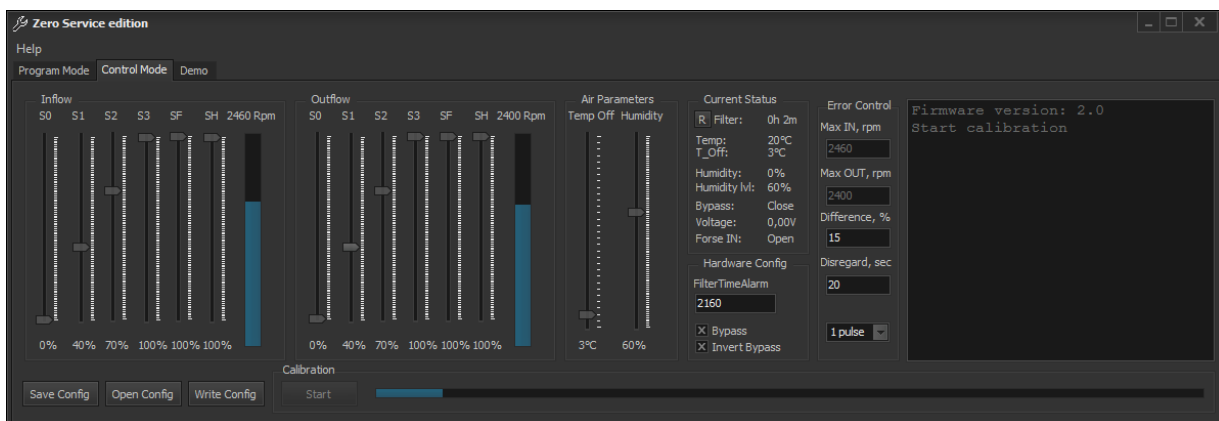


Fig. 9. Calibration progress

Wait for the Finish Calibration message to appear. Correct completion of the calibration process is confirmed by the messages shown on **Fig. 10**.

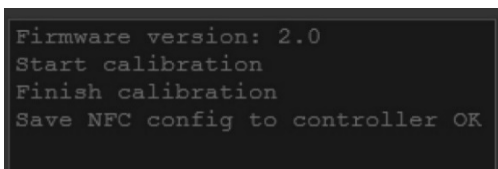


Fig. 10. Calibration process completion

Make sure that the **Max IN** and **Max OUT** fields contain non-zero values. If the **Max IN** and **Max OUT** fields contain fan speed values which are several times larger than those stated in the "Technical Specifications" section of the user's manual, you may use the Pulse drop-down list and select a denominator value other than 1 in the **Max IN** and **Max OUT** fields to ensure proper fan speed display.

5.3 Fine-tuning **Disregard** and **Difference** parameters

The emergency signal may appear during the acceleration or deceleration of fans while changing from one operation mode to another or upon reaching stable operation.

The emergency signal may appear during the acceleration or deceleration of fans while changing from one operation mode to another or upon reaching stable operation.

Engage Speed 3 and observe the indicator on the control panel until the fans have completed the acceleration phase. If the emergency indicator starts blinking during the acceleration phase and/or upon reaching stable operation, follow the algorithm on **Fig. 11**.

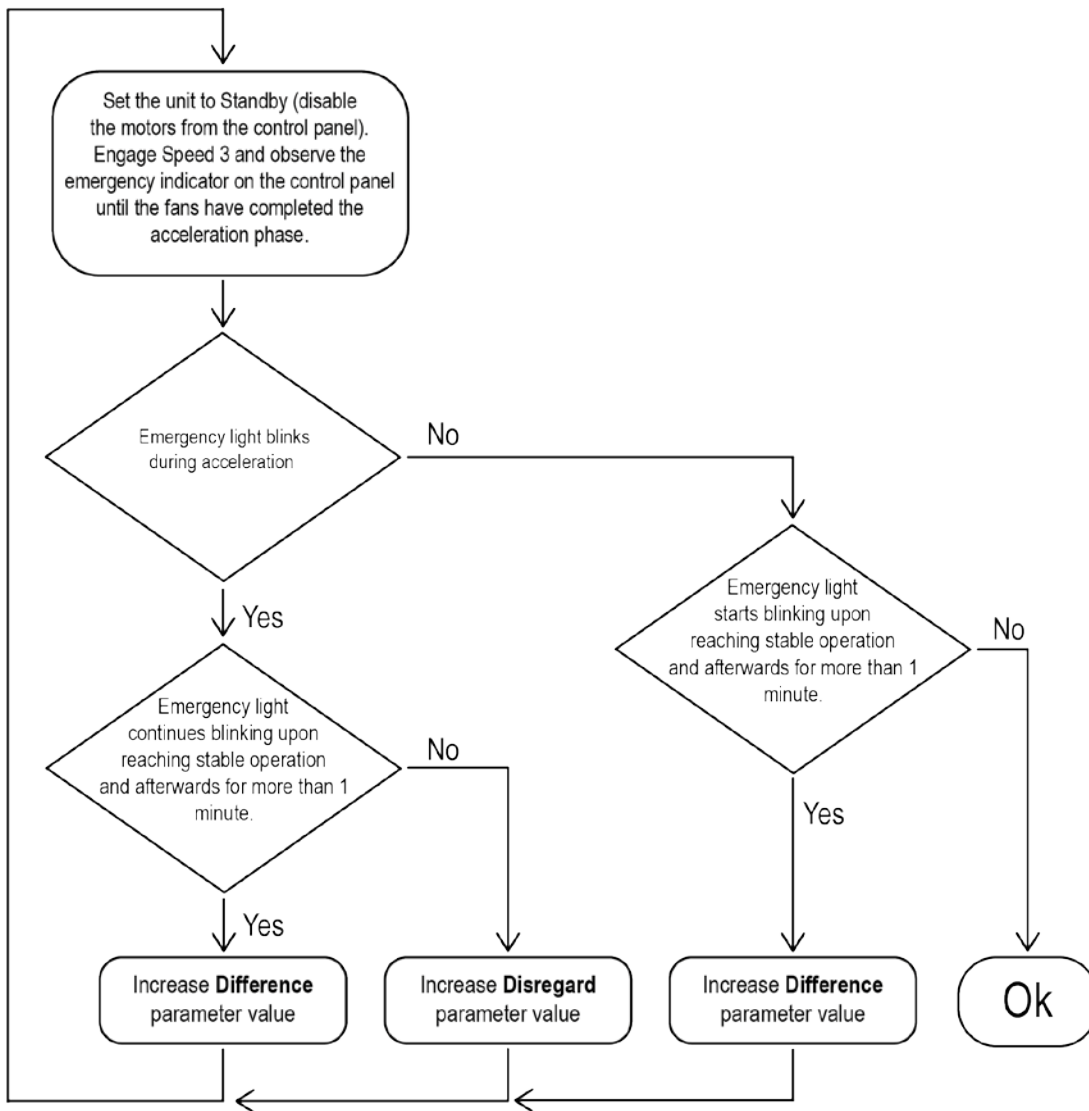


Fig. 11. Disregard and Difference selection algorithm

Click the **Write Config** button to record the new parameters to the controller memory after every change.

If the **Disregard** value exceeds 60 seconds or the **Difference** value exceeds 20 % during the selection process, this may be due to a faulty motor which should be brought to the attention of the maintenance service.

Section 6. UNIT OPERATION SIMULATION USING DEMO TAB

The **Demo** tab is intended for simulating air handling unit operation as if the laptop running the program was connected to an operating unit with a live main window and control panel. The simulation does not require actual connection to a unit controller and can be launched on any computer from within the software.

The simulation mode allows sending commands from the control panel and changing the current ambient conditions while observing the control system response to the inputs.

The settings and processes in the **Demo** tab have no relation whatsoever to managing a real air handling unit and do not affect the settings made on the **Control Mode** tab.

The **Demo** tab which is intended for demonstration only allows an insight into the software operation and features as well the capabilities of a controller-equipped air handling unit.

6.1 Demo tab elements

The **Demo** tab appearance is shown on **Fig. 12**.

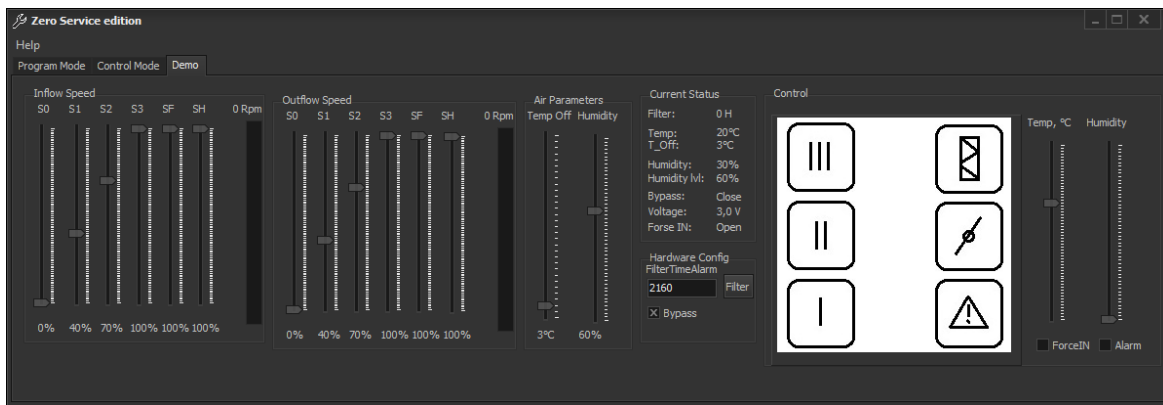


Fig. 12. Program window in the **Demo** mode

The **Demo** tab includes the following element groups:

Inflow Speed, Outflow Speed, Air Parameters, Current Status, Hardware Config and **Control**.

The **Inflow Speed** and **Outflow Speed** groups are similar to the ones on the **Control Mode** tab and enable mode-specific speed settings for the respective fans.

The **Inflow Speed** and **Outflow Speed** groups are similar to the ones on the **Control Mode** tab and enable mode-specific speed settings for the respective fans.

The **Current Status** group also includes the same elements as in the identically named one on the **Control Mode** tab except the filter operating time reset button.

The **Hardware Config** group also includes the same elements as in the identically named one on the **Control Mode** tab except the **Invert Bypass** checkbox.

The **Control** group contains the field which simulates an actual control panel (the control panel functions are detailed in the user's manual for touchscreen control panels) and the controls which enable simulating ambient parameter changes.

Temp, °C – this slider allows to simulate current temperature changes according to the feedback from the sensor in the exhaust air duct downstream of the heat exchanger. The current value is displayed in the **Temp:** field of the **Current Status** group.

Humidity – this slider allows to simulate current humidity changes according to the feedback from the sensor in the exhaust air duct or in the ventilated space. The current humidity value is displayed in the **Humidity:** field whereas the sensor voltage is displayed in the **Voltage:** field of the **Current Status** group.

Force IN – this checkbox allows to simulate changes in the current state of the external input (CO₂ sensor/humidistat). The current state is displayed in the **Force IN:** field of the **Current Status** group.

Alarm – this checkbox allows to simulate an alarm caused by an emergency.


6.2 Simulation of software-controlled unit operation

To simulate air handling unit operation and run the program in the demonstration mode install the software onto any suitable computer and run it (see Section 2, page 4).

Go to the **Demo** tab which contains the default parameter configuration (see Fig. 12). These parameters correspond to a unit in the **Standby** mode.

6.2.1 Simulation of unit operation via control panel



Clicking on any of the speed buttons –  – simulates unit operation in the respective mode. The bar charts in the supply and exhaust fan groups shall display the speed level whereas the **Prm** field will show the numerical value of the rotation speed in rpm. In addition to that the **Filter:** field of the **Current Status** group initiates a countdown which imitates the filter operating hours countdown at a rapid pace.


As soon as the filter operating time reaches the threshold set in the **Filter Time Alarm** field of the **Hardware**



Config group, the **Control** field in the control panel representation simulates a filter replacement signal .

To reset the filter operating time counter left-click on the filter maintenance pushbutton and hold it for 5 seconds. After that the button is no longer highlighted in red and the counter in the **Filter:** field of the **Current Status** group is reset.



Clicking on the  pushbutton simulates bypass damper opening and the button becomes highlighted in blue. The message in the **Bypass** field of the **Current Status** group changes from **Close** to **Open**. In units without a bypass (**Bypass** checkbox in the **Hardware Config** disabled) this results in a simulated deactivation of the supply fan as reflected by the bar chart in the **Inflow Speed** group.

6.2.2 Simulating control system response to changes in ambient conditions

The ambient condition parameters and the control system response to their changes depending on the current status of the air handling unit are given in the table below.

Control	Simulated parameter change	Unit status	Control system response
Temp, °C slider	Current temperature according to the sensor in the exhaust air duct downstream of the heat exchanger.	Standby	No response to change.
		An operating speed selected	If the temperature drops below the value defined in the T_Off field (3 °C by default) the supply fan is enabled.
Humidity slider	Current humidity according to the sensor in the exhaust air duct or in the ventilated space.	Unit status independent	Upon reaching a pre-set level defined in the Humidity lvl: fields the fan speed stabilises at the level set with the SH slider if the SH setting is higher than the current speed.
Force IN checkbox	Current external input state (CO ₂ sensor/humidistat).	Unit status independent	While simulating closing the Force IN sensor contacts the fan speed is set at the level defined with the SF slider if the SF value is higher than the current speed.
Alarm checkbox	Emergency occurs.	Unit status independent	While simulating an emergency the emergency indicator on the control panel is highlighted in red.

Section 7. HOTKEYS

Key combination	Description
<F10>	Highlight the Help button
<↓>, <↑>	Select Help file type
<Enter>	Run selected Help file
<Esc>	Remove selection
<Ctrl>+<Tab>	Switch between program tabs
Program Mode tab	
<Tab>	Highlight the Auto checkbox and buttons
<Пробел>	Changes the highlighted checkbox state
Control Mode and Demo tabs	
<Tab>	Toggle between interface elements
<Пробел>	Change highlighted checkbox state Press highlighted buttons
<Enter>	Press highlighted buttons
<↑>, <→>	Move highlighted slider one bar up
<↓>, <←>	Move highlighted slider one bar down
<Ctrl>+<W>	Record the current configuration to computer memory
<Ctrl>+<O>	Open configuration file
<Ctrl>+<S>	Save configuration file
<Ctrl>+<R>	Reset filter operating time