

# REMOTE VISUALIZATION APPLICATION FOR VTS CONTROL SYSTEMS

## OPERATING AND MAINTENANCE INSTRUCTION



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## 1 ABOUT THIS MANUAL

This manual is purposed to introduce the user of the VTS Air Handling Units controlled by original control application to work with Remote Visualization Application – an application run directly from the AHU controller, supporting graphical interpretation of the units operations and range of optimization and economy functions.

The documents explain all steps needed to be taken for establish the communication between the AHU and computer working stations and all functions of the application.

To understand all range of application functionality – please read it, starting from chapter 2 and threw all following ones.

## 2 REMOTE COMMUNICATION SET-UP

The Air Handling Unit equipped with original VTS control application based on uPC controller needs to be connected to the local area network (LAN) and configured. In order to establish this communication, a range of actions must be performed. All of them, aimed to configure the both ways communication between your AHU controller and working station (computer or mobile device) has been listed in the following paragraphs.

### 2.1 TYPES OF CABLES TO APPLY

The only type of cable to use is typical UTP (Unshielded Twisted Pair) cable, class 5 or 6, terminated both sides with RJ45 plug (see example on Figure 1).

For connecting, use no crossover cable (the controller if needed supports auto crossover function)

The length of the cable should be selected according to the distance between your AHU controller and the intended router or PC location.



### 2.2 CONNECTING TO THE AIR HANDLING UNIT CONTROLLER

You may meet various ways of connecting the AHU controller to your network, depending on the AHU type you have. Each of the connecting method is explained below:

#### 2.2.1 VVS STANDARD AIR HANDLING UNITS WITH EXTERNAL CONTROL CABINET

For the VVS Standard air handling unit, where the controller is installed in external cabinet box, the connecting will be done directly to the port located on the controller. For this you will need to cross the UTP cable threwh the glands (select best size from the entire array) and plug it directly to the port shown on Figure 2.

Figure 1 - UTP cable with RJ45

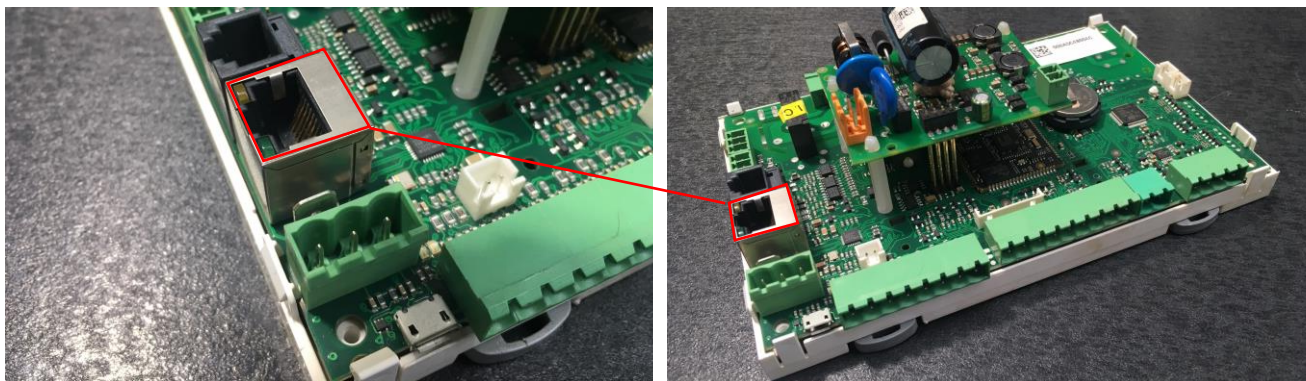


Figure 2 - Location of the RJ45 port on the uPC controller

#### 2.2.2 VVSc FLOOR MOUNTED COMPACT AIR HANDLING UNITS

The VVSc unit is factory equipped with terminal box mounted on the side of the main unit's body. Inside the box a terminal board is installed with the RJ45 socket for TCP/IP communication. The location of the terminal box may vary depending on the AHU execution (for indoor or outdoor application). Plug your UTP cable using one of the ports marked on Figure 3 – anyone which is free.

VVSc unit factory fitted for Indoor installation

VVSc unit factory fitted for Outdoor installation

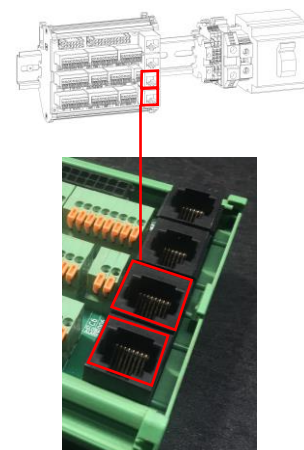
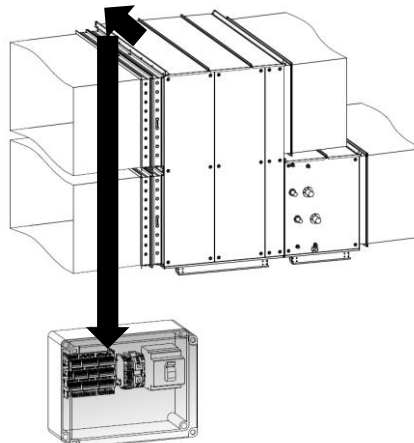
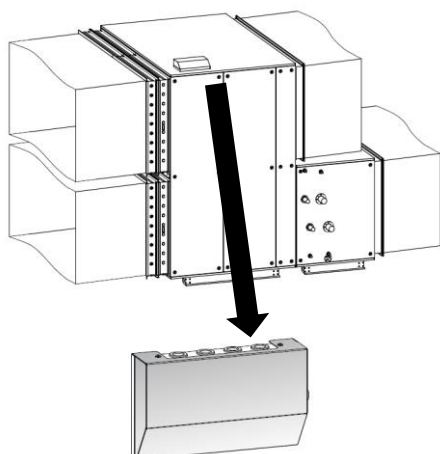


Figure 3 - VVSc - TCP/IP connection

## 2.2.3 VVSs CEILING SUSPENDED AIR HANDLING UNIT

The VVSc unit is factory equipped with terminal box mounted on the side of the main unit's body. Inside the box a terminal board is installed with the RJ45 socket for TCP/IP communication. The location of the terminal box may vary depending on the AHU execution (controller installed in the AHU body or in the terminal box). Plug your UTP cable using one of the ports marked on Figure 4 – anyone which is free.

VVSs unit – controller installed inside the AHU body

VVSs unit – controller integrated with terminal-box

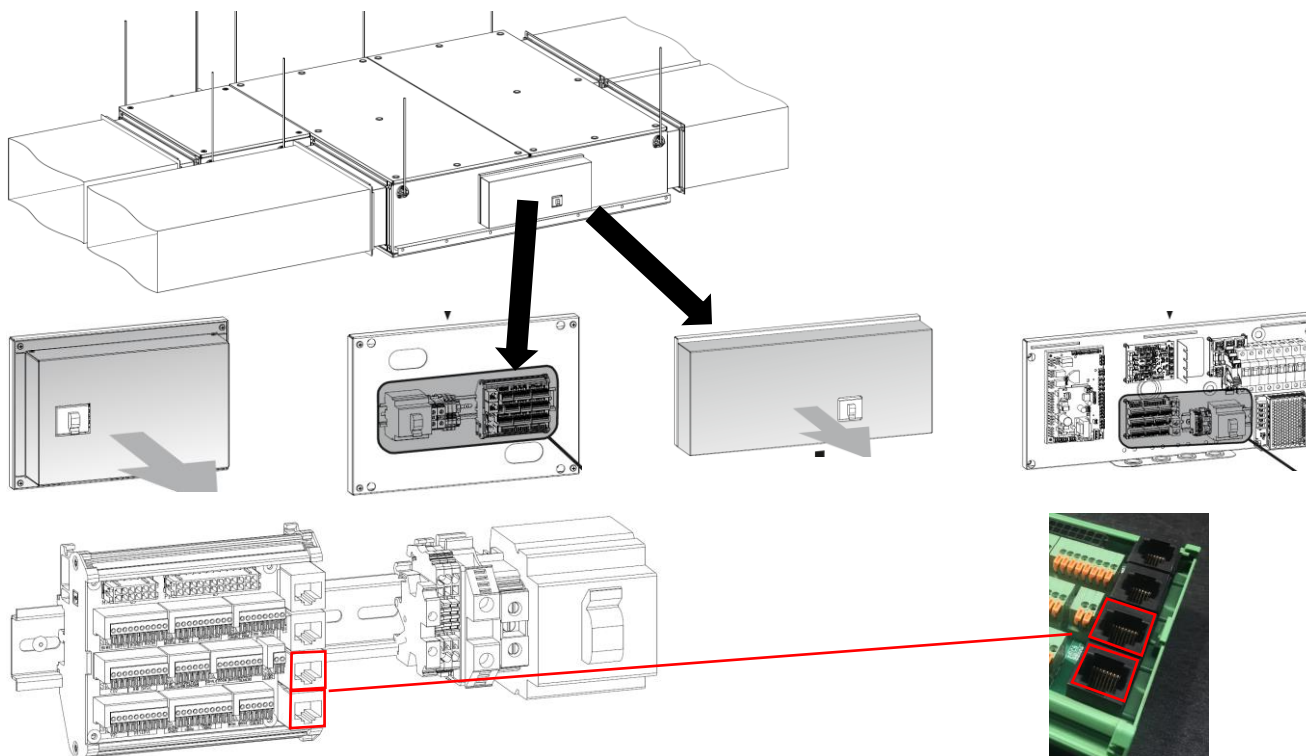


Figure 4 - VVSs - TCP/IP connection

## 2.2.4 MODES OF COMMUNICATION WITH THE AIR HANDLING UNIT

For the remote communication between the Air Handling Unit and the computer or mobile device we recommend one of the methods listed below (see Figure 5 for graphical interpretation):

1. Air Handlin Unit connected to the router by means of UTP cable. Computer working station connected to the router via UTP Cable
2. Air Handlin Unit connected to the router by means of UTP cable. Computer working station connected to the router via WiFi
3. Air Handlin Unit connected to the router by means of UTP cable. Mobile device (tablet) connected to the router via WiFi.

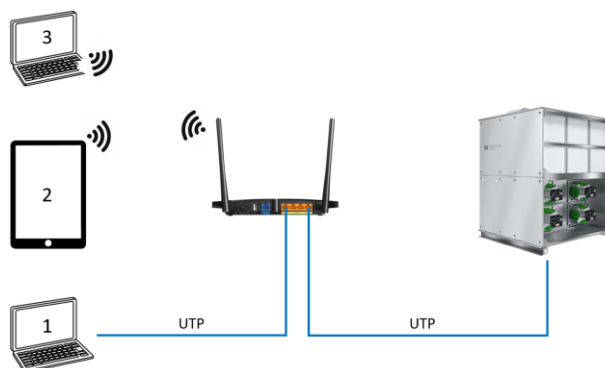


Figure 5 - Communication options with the AHU controller

## 2.2.5 DEFAULT TCP/IP SETTINGS OF THE CONTROLLER

The controller when connected to the router will automatically report under the following IP address:

**192.168.1.111**

Above listed address is assigned to each new controller as per default factory setting. You may change the fixed IP address of your controller using hardware HMI Advanced interface or using its emulation supported by Remote Visualization Application (Refer to chapter 4.2.8 of this manual)

## 2.2.6 COMPUTER NETWORK SETTINGS

## 3 OPENING THE AHU REMOTE VISUALIZATION SESSION

Open the web browser on the computer directly or indirectly connected to the AHU controller. Type the AHU controller address (see default IP address of the controller – chapter 2.2.5). Hit enter button and wait for the controller's web server to respond. The server will show you the main window of the Remote Visualization Application (Figure 6).

### 3.1 INTERFACE LANGUAGE SETTING

At the moment of this manual preparation the Remote Visualization Application support two languages:

- Polish
- English

You can select the interface language using the buttons located in the right-top of the main application window (Figure 6).

Login button

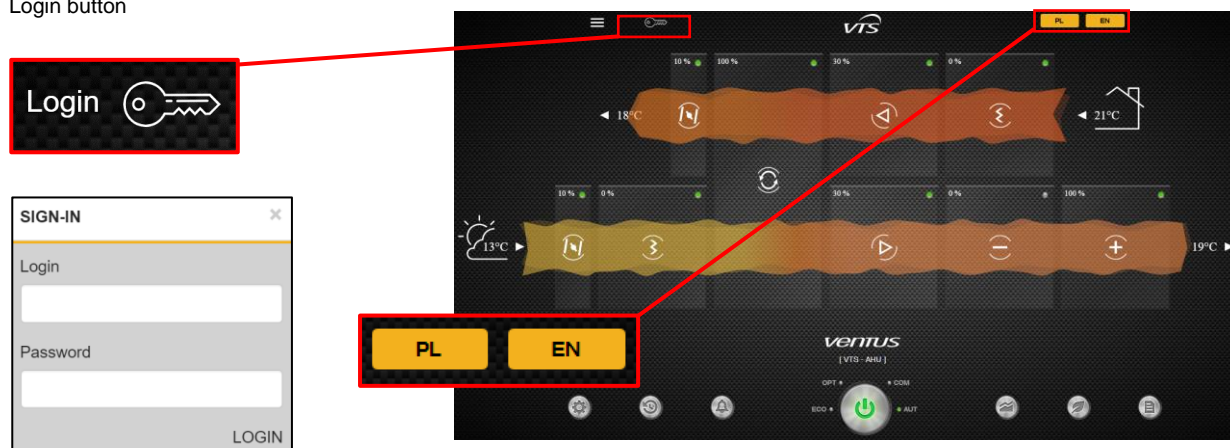


Figure 6 - Main view of the Remote Visualization Application and login popup

### 3.2 LOGIN TO THE REMOTE VISUALIZATION APPLICATION

The default mode of the application limits access to all advanced function – showing only basic ones. To access all advanced functions of the RVA, you need to login. To open the login pop-up hit the “key” button like shown on Figure 6). Use your credentials to login

**Note: The factory default credentials are:**

- Login: service
- Password: service

## 4 AHU VISUALIZATION – THE OVERVIEW

### 4.1 MAIN ELEMENTS OF THE THE REMOTE VISUALIZATION APPLICATION

#### 4.1.1 LOGIN BUTTON

The login button has been described in 3.2

#### 4.1.2 MENU BUTTON



Menu button allows to open the main application menu from where various functions can be activated. Some of the functions included in the application menu can be activated directly from the application main window. Same other – are available only from this menu. The structure of the application menu will be explained in detail in chapter 4.2 of this manual.

#### 4.1.3 OUTDOOR AIR TEMPERATURE INDICATOR



The outdoor air temperature indicator displays the current value measured by the sensor exposed directly to the outdoor air. Besides the informing purpose, current monitoring of the outdoor air temperature is critical for the AHU operations (e.g. applying special AHU startup sequence in order to prevent against water heater freezing).

#### 4.1.4 INDOOR AIR TEMPERATURE INDICATOR



The indoor air temperature indicator displays actual temperature of the air measured by the sensor concerned as indoor. Commonly, this role can be assigned to the HMI Basic interface, as well as the single on-wall air temperature sensor. The AHU controls may concern the reading room temperature sensor as informative only or required air temperature setpoint reference.

#### 4.1.5 MAIN WINDOW BUTTON



This VTS company trademark – is indeed a button which returns you directly to the main RVA window, where AHU Configuration Chart is displayed. In other words – this is simply a Home Button.

#### 4.1.6 VISUALIZATIONS AREA

The visualization area is the centre part of the entire RVA, where various information related with AHU operation can be displayed by means of graphics, charts or tables.

The content of this window may vary, depending on current displaying mode. As per default setting, the visualization area demonstrates the AHU Configuration Chart of your unit with basic information concerning its work parameters. All other modes of the visualization area will be listed and described in detail in the following chapters of this manual.

#### 4.1.7 SETPOINT BUTTON



The setpoint change button opens the pop-up, where modification to the AHU working setpoints can be done, separately for each working mode. The modifications concern air temperature, its humidity, maximum CO<sub>2</sub> concentration and airflow rates. The button is located at the bottom of the RVA interface, first from left.



Figure 7 - Visualization area of the RVA

#### 4.1.8 SCHEDULES BUTTON



This button opens the graphical schedule of the AHU. By means of the graphical interface, the schedule of the AHU can be easily modified to fit your best working scenario. Also, each time interval can have assigned the best operating mode – just to set-up the ventilation system for best performance, together with lowest costs. All information how to set-up your schedule – see chapter 6.3.

#### 4.1.9 ALARMS BUTTON



The Alarm button opens the view of the system alarms history, where all of them are listed with the date and time of occurrence and the short alarm description. Also, the alarm history function distinguishes them into two key groups – the active and non-active ones. Using the Alarm History function, you can easily track all errors which might occur in your Air Handling Unit, deactivate them and even cancel.

#### 4.1.10 RUNNING MODE SELECTOR

The Running Mode selector is the main Air Handling Unit control button, which enables to switch the unit on or turn it off. Also, the button enables quick toggling between one of pre-defined running modes, like Economy, Optimal, Comfort or Auto. Find more detailed information about toggling the AHU between operational modes in chapter 6.2.2.



#### 4.1.11 ECONOMY MONITORING BUTTON



The function marked by the leaf enables to monitor the balance between the recovered and consumed energy. Same like for the Charts function, the Economy monitoring function can be helpful to plan best AHU working scenario and to find best compromise between parameters of the air versus the live costs.

#### 4.1.12 CHARTS BUTTON



This button opens the chart, where various AHU operating parameters can be displayed – both their current value as well as the history of their changes in graphical form. This tool is aimed to support the user in planning best AHU operational scenario, mainly on a basis on its working history records.

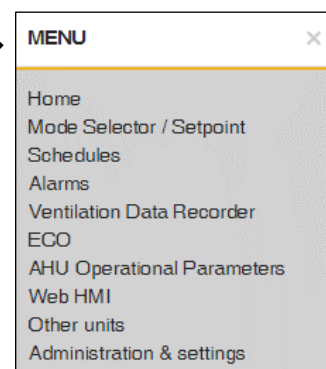
#### 4.1.13 LIST OF VARIABLES BUTTON



This function displays an all range of AHU controller variables – which is helpful when establishing the communication between AHU and Building Management System

### 4.2 MENU OF THE RVA

The menu button opens a list of functions of the RVA which can be activated. Some of these functions can be run using buttons located directly on the RVA interface (listed in chapter 4.1 of this manual). The functions which can be activated from menu are as follows:



#### 4.2.1 HOME

The Home function returns you to the main Remote Visualization Application window. Same like hitting the Main Window Button (4.1.5)

#### 4.2.2 MODE SELECTOR / SETPOINT

Mode selector has the same function as the Setpoint Button (chapter 4.1.7) – it opens the pop-up, where modification to the AHU working setpoint can be done.

#### 4.2.3 SCHEDULES

Activates the Schedules function – same one, which can be triggered by means of the Schedule button (chapter 4.1.8) directly from the RVA interface.

#### 4.2.4 ALARMS

Activates the Alarm function – same one, which can be triggered by of the Alarms button (chapter 4.1.9), directly from the RVS interface

#### 4.2.5 VENTILATION DATA RECORDER

Activated the Ventilation Data Recorder function (fully described in chapter 7 of this manual).

#### 4.2.6 ECO

Activates the Alarm function – same one which can be triggered by of the Economy monitoring button (chapter 8: Alarms notifications), directly from the RVS interface

#### 4.2.7 AHU OPERATIONAL PARAMETERS

Activates the list of controller variables – same way like the List of Variables button (chapter 4.1.13) directly from the RVA interface

#### 4.2.8 WEB HMI

The Web HMI Functions runs the on-screen emulator of the HMI Advanced interface (a hardware interface being a main user interface of the VTS Controls).

#### 4.2.9 OTHER UNITS

This function allows to toggle the entire RVA application between other Air Handling Units connected to the same network.

#### 4.2.10 ADMINISTRATION & SETTINGS

The Administration & Settings window allows advanced configuration of the RVS application including modification of the AHU tags, credentials change (login and password), managing the list of other AHUs linked to the application and other. Details of this function will be described in detail in the following chapters of this manual.

## 5 APPLICATION SET-UP

The Remote Visualization Application supports advanced monitoring and of the air handling unit. However, to do so – a proper configuration is required for each monitored AHU separately. All application set-up functions are gathered in the Administration & Settings tool (being the very last of the functions available in the Menu of the entire application (see chapter 4.2.10). To enter the Administration & Setting tool, simply enter the Menu and select Administration & Setting.

The RVA will display a window, where all the application set-up can be done (Figure 8)

Follow next chapters to understand, how to do the proper set up of the Remote Visualization Application.

### 5.1 AHU ID, ENERGY CARRIERS AND CURRENCY

The Application settings section of the application set-up collects the following information.

- AHU Serial Number – a unique number assigned to each air handling unit manufactured by VTS in the x-xxx-xx-xxxx-xxxx format. The serial number is always printed on each AHU rating plate. The serial number entered will prevent from confusing the AHU if searched in global network.
- AHU Tag – information about the tag assigned to your air handling unit which is used to distinguish it. Usually the AHU tag will be the same as printed on the AHU label, for example AHU-01.
- Electricity price [kWh] – price of the 1 kWh of electricity supplied to your air handling unit
- Chilling price [kWh] – price of the 1 kWh of chilling media supplied to the AHU
- Heating price [kWh] – price of the 1 kWh of heating media supplied to the AHU
- Currency code – a 3 characters code identifying the currency being in use for all AHU lifetime costs (for example: EUR, USD, PLN).
- Read QR code – an alternate way you can load the configuration of your actual unit to the visualization using camera of the mobile device. You can be supplied the QR code specific for your unit from the VTS representative. When uploaded, the serial number, AHU tag and AHU functions will get automatically configured.

### 5.2 DATE / TIME

In the Date /time section you can enter current date and time to be uploaded to the AHU controller. You can set the controller time in two ways:

- Hit the “Current time” button to synchronize the AHU controller time with your computer (the one on which you are currently running the RVA).
- Enter your customized time manually to each of the date and time windows (you can use small arrows which appears in each windows when focused). Hit “Set time” button when ready. The new customized time will be sent to the controller and saved. This function is useful if you have Air Handling Units running in various time zones where different time zones are applied. You can set the GMT time for all your units if needed.

### 5.3 AHU FUNCTIONS MANUAL CONFIGURATION

In order to display the graphical AHU visualization in the proper way, you need to configure the RVA in accordance to your AHU configuration.

The configurator demonstrated on Figure 10 is split for Supply and Return section. For each of them you can separately edit the sequence of the air treatment functions of your unit. Each entry field consists of two parameters:

- First – indicated the air treatment function. The available air treatment functions are listed in Table 1:

Table 1 - AHU functions codes

Function code	Supply Air treatment function
X	Cross-plate or Hex heat recovery
R	Rotary heat wheel
M	Mixing box
D	Air damper
E	Empty section
F	Air filter
C	Air cooler
H	Air heater
V	Fan

Function code	Return Air treatment function
X	Cross-plate or Hex heat recovery
R	Rotary heat wheel
M	Mixing box
D	Air damper
E	Empty section
F	Air filter
V	Fan

- Second – parameter used to distinguish the vertical positioning of the function. Available options are:
  - D (Down) – use this option to indicate, that relevant air treatment function is in the bottom deck of the AHU
  - U (Up) – use this option to indicate, that relevant air treatment function is in the top deck of the AHU

At the end of each parameters line (for supply and exhaust) a button with “+” symbol is displayed. Click on it if you need to display more fields (in case of complex AHU with more air treatment functions are applied).

Figure 8 - Administration & Settings window of the RVA

Figure 9 - AHU id, Energy Carriers and Currency settings window

Figure 10 - AHU functions manual configuration interface

See below cases of manually done AHU functions settings and resulting AHU visualization

### 5.3.1 MANUAL AHU FUNCTIONS SETTINGS – CASE 1

Supply and exhaust unit equipped with rotary heat wheel followed by mixing box. Supply functions: Air damper, Pre-filter, Rotary heat wheel, Mixing box Heater, Cooler, Fan; Return functions: Pre-filter, Fan, Mixing box, Rotary wheel, Air damper:

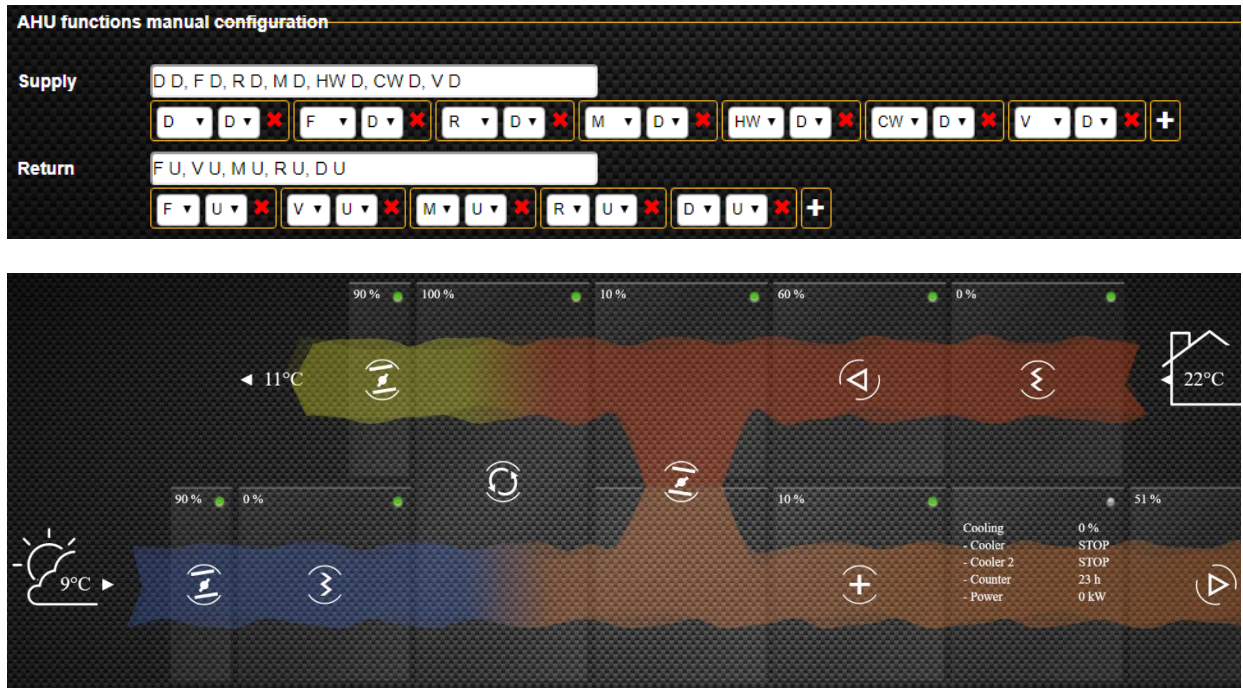


Figure 11 - Manual AHU functions settings - case 1

### 5.3.2 MANUAL AHU FUNCTIONS SETTINGS – CASE 2

Exhaust unit only, with the following range of functions: Air Damper, Fan, Air filter:

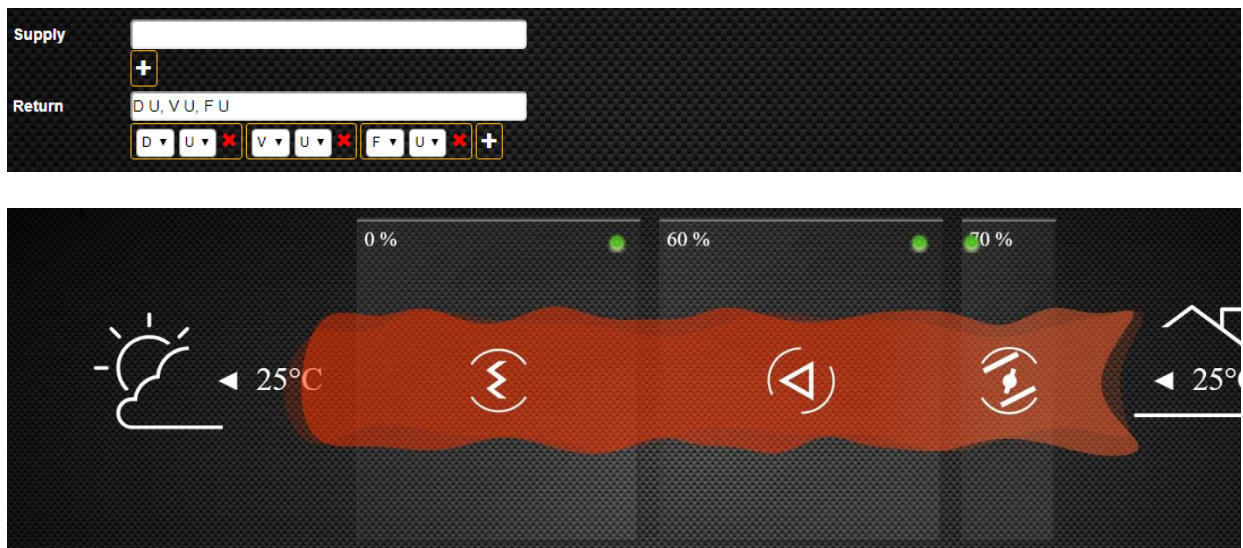
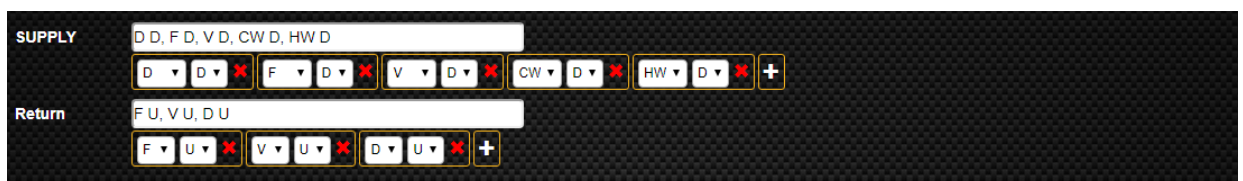


Figure 12 - Manual AHU functions settings - case 2

### 5.3.3 MANUAL AHU FUNCTIONS SETTINGS – CASE 3

Set of Supply and Exhaust units with no heater recovery. Supply functions: Air damper, Pre-filter, Fan, Cooler, Heater; Return functions: Pre-filter, Fan, Air damper.



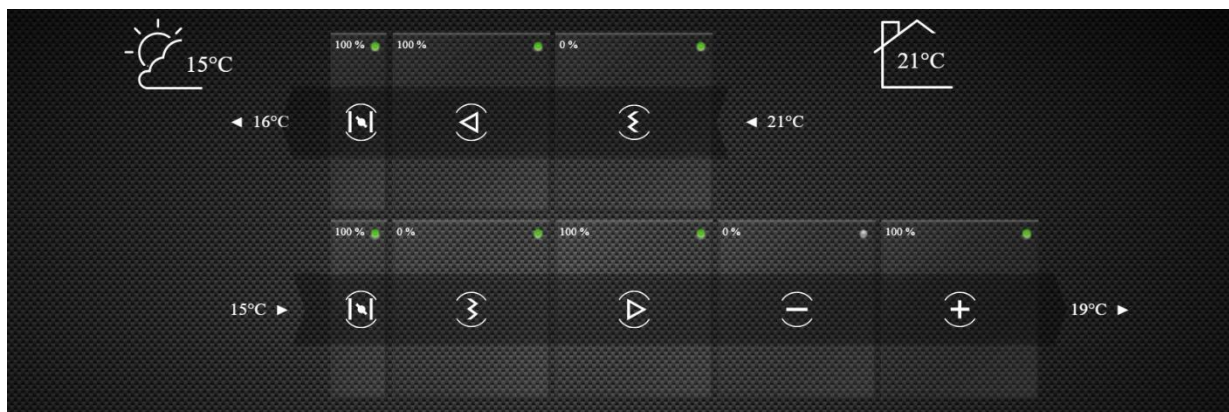


Figure 13 - Manual AHU functions settings - case 3

### 5.3.4 MANUAL AHU FUNCTIONS SETTINGS – CASE 4

Supply and exhaust unit equipped with cross-plate or hex counterflow heat recovery. Supply functions: Air damper, Pre-filter, Cross-plate or hex counterflow heat recovery, Fan, Heater; Return: Pre-filter, Fan, Cross-plate or hex counterflow heat recovery, Air damper.



Figure 14 - Manual AHU functions settings - case 4

Note...

For units where both supply and return air change the AHU deck while passing the heat recovery section (Cross-plate or hex counterflow recuperator), function must be assigned to the relevant AHU deck by the point where air leaves the heat recovery function. So, for the case demonstrated above (chapter 0) the heat recovery section will be:

- Assigned to the bottom deck ("D" setting) for supply air path.
- Assigned to the top deck ("U" setting) for the return air path.

## 5.4 LIST OF AHUS

**Note...** The AHU Serial numbers, AHU Tags and IP addresses given in this chapter – are for example purpose only. When following the instruction of this chapter – you need to refer below instruction to your actual network situation and units connected to it.

As previously explained, each time you want to establish the communication between your computer (or mobile device) and the AHU, you physically open relevant website, served directly by the web server integrated with relevant AHU controller. If you have more than one unit to be remotely monitored, and individual IP address must be assigned for each of the units – just to allow you opening it from your web browser.

To facilitate toggling between units you can save the IP addressed of your remaining unit on each AHU controller. Thanks to this, toggling between may be much faster and easier than entering the IP address by means of typing it in the browser address bar or launching from browser favourites menu.

To explain it, let's assume, that you have 5 air handling unit to manage, each one with different configuration and available under different IP address. The units managed by you are as shown on Table 2.

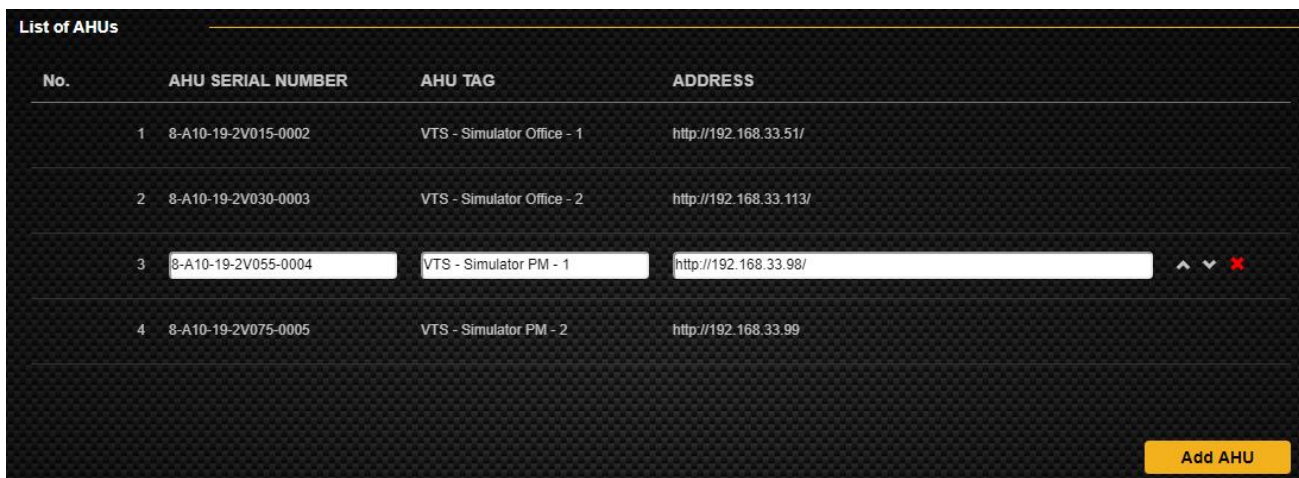
Table 2 - Air Handling Units in local network (example)

AHU SERIAL NUMBER	AHU TAG	ADDRESS
8-A10-19-2V015-0001	VTS - R&D Open Space	<a href="http://192.168.33.93/">http://192.168.33.93/</a>
8-A10-19-2V015-0002	VTS - Simulator Office - 1	<a href="http://192.168.33.51/">http://192.168.33.51/</a>
8-A10-19-2V030 -0003	VTS - Simulator Office - 2	<a href="http://192.168.33.113/">http://192.168.33.113/</a>
8-A10-19-2V055-0004	VTS - Simulator PM - 1	<a href="http://192.168.33.98/">http://192.168.33.98/</a>
8-A10-19-2V075-0005	VTS - Simulator PM - 2	<a href="http://192.168.33.99/">http://192.168.33.99/</a>

The "List of AHUs" function enables saving of AHU serial number, AHU tag and IP address of each unit you need to easily jump to – directly in the controller.

For any of the units (for example 8-A10-19-2V015-0001| VTS - R&D Open Space| <http://192.168.33.93/> - first from the top on the Table 2), addresses of all remaining unit can be saved directly in the controller's memory. To do it, follow below instruction:

- Open the Remote Visualization Application of the 8-A10-19-2V015-0001| VTS - R&D Open Space| <http://192.168.33.93/> unit
- Go to application Menu and select Application settings
- Scroll down to the “List of AHUs” section
- Activate the entry line you want to edit by clicking on it
- Enter relevant information about your remaining AHUs to the available lines.
- If more lines are required, hit the “Add AHU” button (see Figure 15).



No.	AHU SERIAL NUMBER	AHU TAG	ADDRESS
1	8-A10-19-2V015-0002	VTS - Simulator Office - 1	<a href="http://192.168.33.51/">http://192.168.33.51/</a>
2	8-A10-19-2V030-0003	VTS - Simulator Office - 2	<a href="http://192.168.33.113/">http://192.168.33.113/</a>
3	<input type="text" value="8-A10-19-2V055-0004"/>	<input type="text" value="VTS - Simulator PM - 1"/>	<input type="text" value="http://192.168.33.98/"/> <span>↑ ↓ ✕</span>
4	8-A10-19-2V075-0005	VTS - Simulator PM - 2	<a href="http://192.168.33.99">http://192.168.33.99</a>

**Add AHU**

Figure 15 - Direct links to the AHUs save on the controller

After saving your other AHUs, you can reorder them using the upwards and downwards directed arrow on the right side of each line (visible only when relevant line is active for editing). If any of the lines is no longer needed, you can simply delete it using the red cross button. When complete, you can easily jump to any of the listed units by means of Menu → Other unit function.

**Note...** Remember, that each of your units is managed by individual controller, totally independent from any other one. So, to enable toggling between you unit in each direction, you need to edit list of available units on each controller using RVA. Simply, you need to repeat the actions sequence listed in the 5.4 chapter the same number of times as total number of the units managed by you connected to your network.

When all units are registered, you can easily toggle between them using the Menu → Other units function. Example of AHU toggling window is shown on Figure 16.

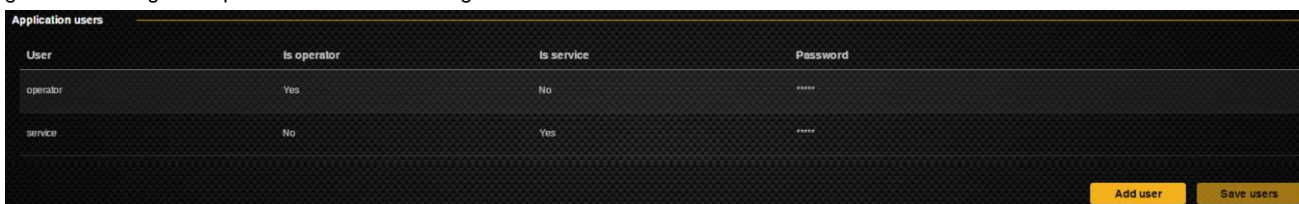


NO	NAME	DESCRIPTION
1	8-A10-19-2V010-0001	VTS - AHU

Figure 16 - AHU toggling window

## 5.5 APPLICATION USERS

The Application Users function allows you to manage the credentials to the Remote Visualization Application. You can easily add new users, grant them a login and password and also manage the roles



User	Is operator	Is service	Password
operator	Yes	No	****
service	No	Yes	****

**Add user** **Save users**

Figure 17 - Application users management window

Hit the “Add user” button to add new one to the list. Set the name of the user, his roles and password.

Each user can be assigned one of the following roles

- User – basic range of access, same as using the application without login. “Is operator” = Yes, “Is service” = No
- Administrator – access to all functions of the Remote Visualization Application: “Is operator” = No, “Is service” = Yes.

## 6 BASIC AHU MANAGEMENT

In this chapter, we will describe the most basic functions of the Remote Visualization Application – which are the minimum to keep remote control on the Air Handling Unit operations.

### 6.1 AHU OPERATIONAL MODES SET-UP

#### 6.1.1 AVAILABLE OPERATIONAL MODES

You Air Handling Unit managed by advanced controller can run in various operational modes, which you can activate depending on your preferences or temporary ventilation needs. The Air Handling Unit managed by its controller can run in one of available modes:

- ECO – which stands for Economy. This mode is best to run the AHU on relatively low airflow rates – which would obviously turn lowest lifetime cost
- OPT – which stands for Optimal. For this mode it is recommended to assign parameters compromising between best comfort and economy of the ventilation system operations

- COM – which stands for COMFORT. For this mode assign parameters allowing to keep best air quality in handled rooms
- AUTO – mode, in which the Air Handling Unit will run in accordance to user-defined schedule (Schedule settings describe in detail in chapter 6.3 of this manual).

The names given to each of the modes cannot be modified. However, various AHU operational parameters assigned to each of the modes can be customized up to your preferences.

## 6.1.2 CUSTOMIZATION OF THE AHU OPERATIONAL MODES

While customizing parameters of each AHU operational modes, you can set the following key parameters:

- Temperature – temperature of the air supplied to the ventilation system (for applications where supply air temperature sensor set as leading) of maintained in the handles room (for applications with room temperature sensor set as leading)
- Humidity – required value of the air humidity. Function is available only if the AHU configuration supports humidity maintenance in the handled rooms
- Air quality – maximum concentration of CO<sub>2</sub> expressed in Parts Per Million (PPM). This function is available only for ventilation systems equipped with CO<sub>2</sub> sensor monitoring air quality of the air (most commonly installed in the return duct, just upstream the AHU)
- Airflow – Supply – value of the supply airflow expressed as percentage of the maximum airflow of your Air Handling Unit
- Airflow – Return – value of the return airflow expressed as percentage of the maximum airflow of your Air Handling Unit



To edit above listed parameters, click the Setpoint button or enter the main menu of the RVA and select Mode Selector function. The application will display the Setpoint menu, where all changes to the AHU modes can be defined (Figure 18)

The Setpoint menu has 4 tabs which allow toggling between operational modes. For ECO, OPTIMAL and COMFORT modes you can set your best parameters by increasing and decreasing valued of relevant parameters using the black arrows (the arrows will appear when parameter is focused by the mouse pointer). The only operational mode for which no changes are available if AUTO – simply, because the role of this mode is to toggle the AHU between ECO, OPTIMAL and COMFORT mode according to the schedule (all schedule operations of the RVA have been described in detail in chapter 6.3 of this manual).

When changes to the mode is done, save your setting by clicking on “Set” button.

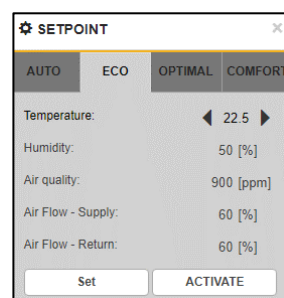


Figure 18 - Setpoint menu

## 6.2 ACTIVATION OF THE OPERATIONAL MODES

### 6.2.1 ACTIVATION BY MEANS OF THE SETPOINT MENU

The Setpoint menu described in chapter 6.1.2 has a “Activate” button in its right-bottom corner (Figure 18), available on each of the tabs. To set desired operational mode, simply select the tab of selected mode and hit “Activate” button. From this time, your unit will run according to the parameters assigned to the activated operational mode.

### 6.2.2 CHANGE OF AHU OPERATIONAL MODE BY MEANS OF RUNNING MODE SELECTOR

The Running Mode Selector placed in the bottom of the main RVA window allows easy toggling between AHU operational modes – with no need of entering the application menu. To switch between modes, click on the switch button (as shown on Figure 19).

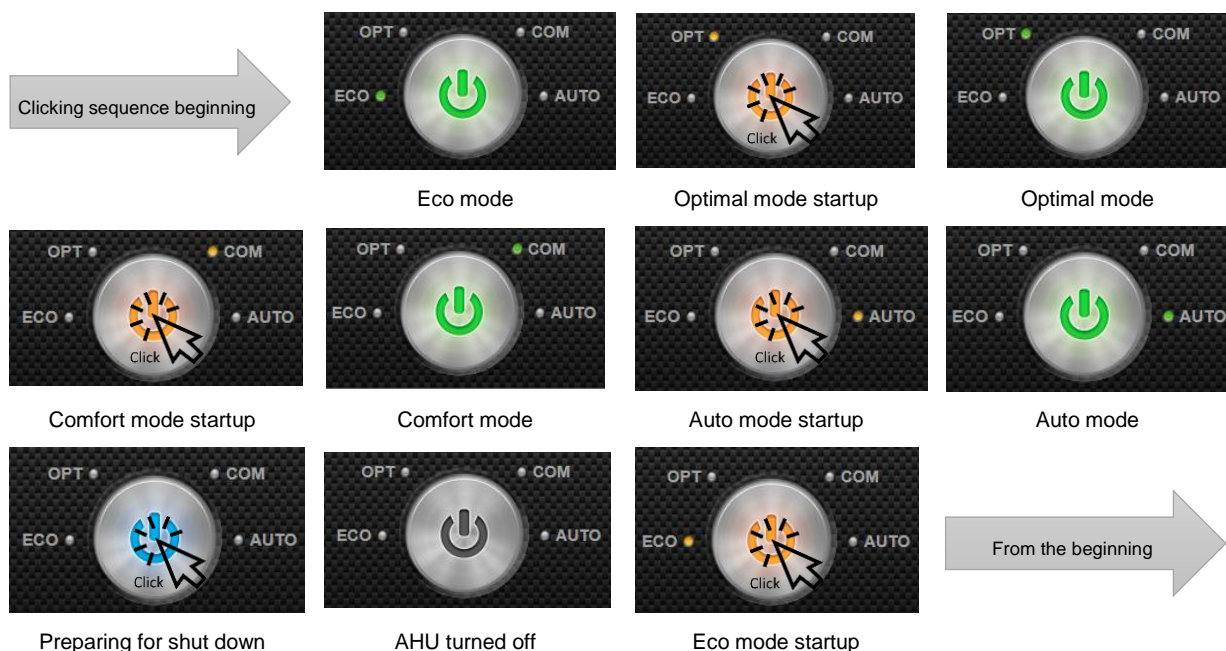


Figure 19 - Running Mode Selector - modes activating sequence

When clicking the Running Mode Selector, the button will shine using the following colors:

- **Green stable light** – when running with the selected operational mode. Active mode will be marked by small green dot next to mode label

- **Orange blinking light** – when changing between the operational modes. The mode being activated will be shown by orange dot next to its label. The transition between modes will take few seconds. When done, the mode selector will turn for green stable light with green dot next to currently activated mode
- **Blue blinking light** – when AHU is preparing shut-down mode.
- **All lights off** – the AHU remains in shut-down mode

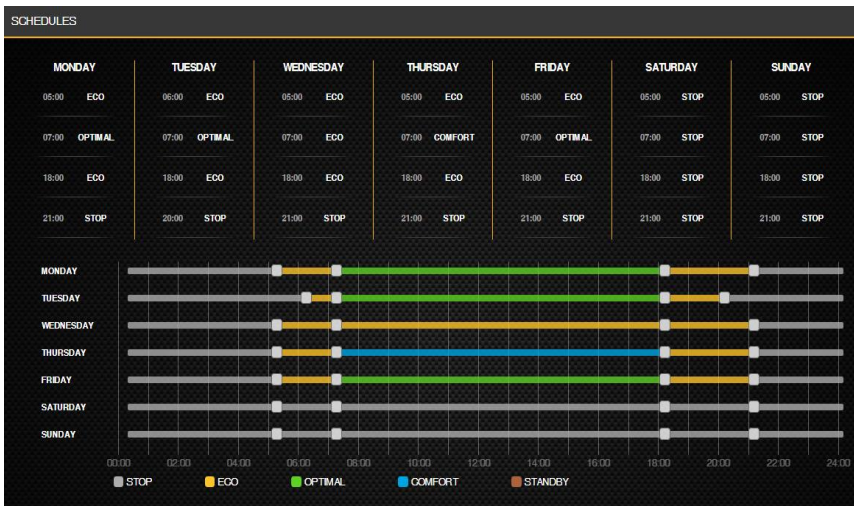
**Tip:** When you want to jump between the AHU operational modes using the Running Mode Selector, you can keep clicking on it till the time the selected mode will be demonstrated by relevant dot.

## 6.3 AHU OPERATIONAL SCHEDULE

### 6.3.1 SCHEDULE WINDOW



The Remote Visualization Application enables managing the weekly schedule of your AHU, where various operational modes (Econo, Optimal, Comfort, Off) can be triggered automatically, as per your settings. To enter the Schedule graphical diagram of your unit, hit the Schedules button (like the one on the left).



Operational mode settings window

Time interval sliders

Legend

Figure 20 – AHU Running Schedule

The AHU Schedule window (Figure 20) has 3 functional areas:

- Operational mode setting window – allowing to re-assign the operational mode of each time interval
- Time intervals sliders – enabling easy setting the beginning and end of each time interval.
- Legend – for easy identification of the time interval sliders

### 6.3.2 ASSIGNING THE OPERATIONAL MODE TO THE TIME INTERVALS

The AHU operational modes (described in detail in chapter 6.1 can be easily assigned for one of 4-time intervals for each day of the week. To do so, toggle between ECO, OPTIMAL, COMFORT and STOP mode using the arrows located below and over relevant mode label (the arrows will appear when focused by the mouse).

### 6.3.3 ASSIGNING THE TIME INTERVALS TO EACH MODE

In the same way you can change the beginning time of the operating mode activating time – simply focus on the time label and change the time of mode activation.

The case shown on right demonstrates the following example of AHU schedule for Monday (mind, that all times are given in 24 hours format):

- From 01:00 to 07:00 – AHU running in ECO mode
- From 07:00 till 18:00 – AHU Running in OPTIMAL mode
- From 18:00 till 21:00 – AHU running in ECO mode
- From 21:00 – till end of the day – AHU in STOP mode

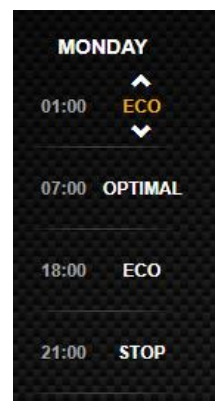


Figure 21 - Monday schedule

### 6.3.4 SETTING THE TIME INTERVALS BY MEANS OF SLIDERS

Each time you change the beginning time of each operational mode (as described in chapter 6.3.3), the time sliders fit their position by the current setting – which helps to manage the entire week schedule – simply, in graphical ways.

The sliders can be also moved by you – which gives you even easier way to set the time intervals of each day schedule. To do so, simply set your time intervals by moving grey blocks to the right or left

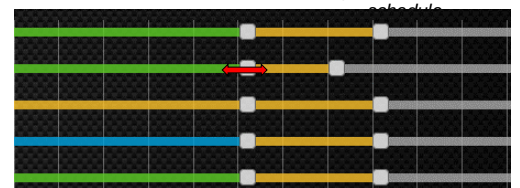


Figure 22 - time intervals sliders

### 6.3.5 SAVING THE TIME SCHEDULE

All changes done to the AHU schedule are applied immediately when modified by your and saved. You don't need to save your settings manually. When done – simply, leave the Schedule window.

## 7 VENTILATION DATA RECORDER

In simple words – the VDR is a tool which job is to record all AHU operational parameters, file them and display the AHU operational history in a form of a time chart. All in all, to help you when working out the best AHU operational schedule, perfectly fitted to the specifics of your ventilation system, also to support best operational economy of your system as well as to meet your preferences. In this chapter, we will demonstrate the range of VDR tool, how it can be helpful while managing your unit and setting up its working scenario.

### 7.1 HOW TO RUN THE VDR

You can run the Ventilation Data Recorder in one of below methods (Figure 24)

- By the RVA main menu – simply select the Ventilation Data Recorder function:
- By pressing button on the main application window as per below:

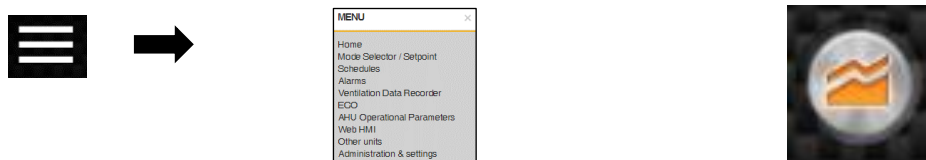


Figure 24 - Ventilation Data Recorder start-up

### 7.2 VENTILATION DATA RECORDER WINDOW

The Ventilation Data Recorder main window consists of the following screen elements:

#### 7.2.1 LEFT MENU

The left menu of the VDR window enables manual selection of customized set of AHU parameters for tracking. Each of the AHU parameter (listed by its name) can be activated using the checkboxes arranged in two columns (#1 for the main chart, #2 for the auxiliary one). Due to large number of parameters to display, the menu has a slider on its right – to scroll down to reach all remaining parameters.



Figure 25 - Ventilation Data Recorder window

#### 7.2.2 TOP MENU

Using top menu of the VDR you can easily chose one of pre-defined parameters set to observe. Any selections of parameters set selected from the top menu will be displayed only on main chart. Available sets are:

- Temperature – mode in which all temperatures with the Air Handling Unit are displayed.
- Humidity – this mode demonstrates information picked by humidity sensors (if applied in the controls set).
- Pressure – demonstrates values of the static pressures measured by static pressure transducers.
- Airflow – allows monitoring of the airflow of supply and exhaust precisely measured by the static pressure transducers installed in the fan compartments.
- CO<sub>2</sub> – gives the actual readings history of the carbon dioxide concentration in the return air (only for systems where CO2 transducer was applied).

Besides the parameters pre-sets, top menu enables

- Quick search of desired parameters by typing their name. The left menu of the VDR will display only parameters which name fits to the text string entered to the text field
- Sampling – allows to change the time interval between following chart updates. You can choose between 5 seconds, 15 seconds, 1 minute, 15 minutes and 30 minutes.

#### 7.2.3 MAIN CHART

The large AHU operational history chart located in the right-upper part of the VDR window. The content of this chart may be affected by marking the parameters in the column #1 if the left menu as well as the parameters pre-sets selection done on the top menu.

#### 7.2.4 AUXILIARY CHART

The auxiliary chart, where secondary set of AHU history records can be displayed in parallel to the set displayed on main chart. The content of this chart can be affected only by selecting parameters from left's menu column #2.

## 8 SYSTEM ALARMS

The Air Handling Unit you are about to manage using the Remote Visualization Application may report wide range of system alarms – to inform you about various occurrences which may adversely affect the performance of your unit or even its safety.

There are many situations which may trigger an alarm in the air handling unit. The most common are:

- Alarm – Filter – Supply – Occurs when any of the air filters in the supply airstream is fully contaminated and its replacement is recommended. This alarm is not critical – it doesn't stop the entire air handling unit. Only prompts you what to do.
- Alarm – Filter Return – same as for the supply, but for any filter in the return air path.
- Water Heater: Low air temperature downstream the coil detected – reports risk of water heater freezing. This is a critical alarm which shuts-down entire AHU and triggers a safety mode.

In the following paragraphs of this manual you will see how you can monitor various alarm occurrences, manage them and cancel.

Alarms notification directly on the AHU Visualization Chart

## 8.1 ALARMS NOTIFICATIONS

The Remote Visualization Application can prompt you about any alarm occurrence in one of the following methods

### 8.1.1 DIRECT ALARM NOTIFICATIONS ON THE AHU CONFIGURATION CHART

Each of the alarms which may occur in your Air Handling Units is usually assigned to specific air treatment function or section. In case of alarm occurrence, a red dot will appear on the upper-right corner of the section it concerns.



Figure 26 - Alarm notifications on the AHU configuration chart

To list the error information, simply click on the relevant AHU Block. Information about all statistics of the section will be listed directly on the block (like on Figure 26)

### 8.1.2 AHU STATUS BAR

Regardless on the current displaying mode of the Remote Visualization Application, the Alarm status bar is displayed at the bottom of the window (Figure 27):

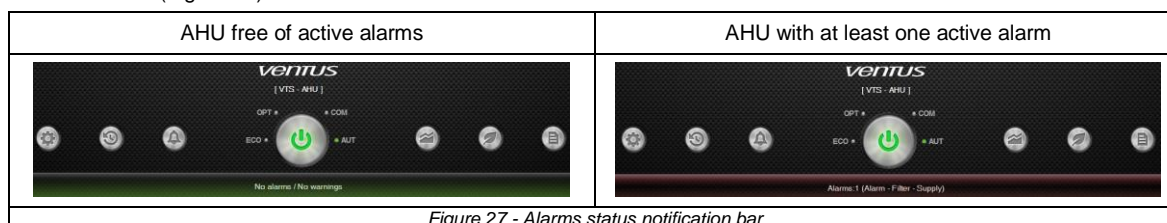


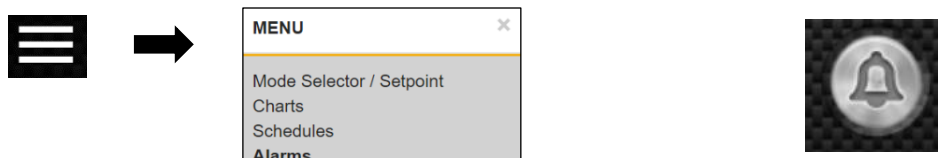
Figure 27 - Alarms status notification bar

- For the AHU free of any active alarms – the Alarm notification status bar remains green with “No alarms / No warnings” message
- For the AHU having at least one active alarm – the Alarm notification turns red with latest error description.

## 8.2 ALARMS WINDOW DISPLAYING

You can enter the Alarms window in one of two below listed methods

- By the RVA main menu – simply select the **Alarms** function:
- By pressing the bell-marked button on the main application window as per below:



The Bell symbol on the button will turn orange, when new alarms occurs. If no – the bell button remains grey.

## 8.3 ALARMS MANAGEMENT

Activation of Alarms window will result in displaying the list of all alarms which have occurred in your Air Handling Unit, in a form of a table (Figure 28). In the following paragraphs of this chapter we will show in detail how you can manage them.

### 8.3.1 ALARM DISPLAY TABLE

All alarms are listed as a table, with the following columns (Figure 28):

- No – number of the alarm listed. The number 1 is always the one which has occurred the most recently, listed at the top.
- Date – Date of alarm occurrence, in accordance to the system date settings
- Time – Time of alarm occurrence, in accordance to the system time settings
- Name – Short description of the alarm type

### 8.3.2 ALARMS SORTING

The Alarms window allow sort the alarms being displayed by all off the above listed columns. To change the alarms sorting method, simply click on relevant header. An orange arrow directed upwards or downwards will appear next to selected header, indicating the sorting column and sequence (ascending or descending). The case shown on Figure 28 demonstrates both active and non-active alarms by the number of the line in descending sequence (most recent ones at the top).

ALARMS				
ACTIVE ALARMS				
NO	DATE	TIME	NAME	
1	2019-11-27	09:33:44	Alarm - Antifreeze - Digital Input	RESET ALARM
2	2019-11-27	09:21:48	Alarm - Filter - Supply	RESET ALARM
3	2019-11-27	09:21:49	Alarm - Filter - Return	RESET ALARM
HISTORICAL ALARMS				
NO	DATE	TIME	NAME	
1	2019-11-27	09:33:44	Alarm - Antifreeze - Digital Input	
2	2019-11-27	09:21:49	Alarm - Filter - Return	
3	2019-11-27	09:21:48	Alarm - Filter - Supply	
4	2019-11-28	11:32:33	Alarm - Offline PCB I/O	

Figure 28 - Alarms window of RVA

### 8.3.3 ALARMS STATUSES

The Alarms window splits alarms into two following groups:

- Active alarms – which have not been cancelled since their occurrence. These alarms are always displayed at the top part of Alarms window in bright white colour
- The non-active alarms – which have been already cancelled. The list of non-active alarms is simply an alarms occurrence archive. It lists all alarms by date and time of their occurrence and. The list of non-active alarms is considered an archive – and can't be deleted using the Remote Visualization Application.

### 8.3.4 ALARMS CANCELLING

Each time you cancel – it means that turn it from active mode to inactive and move it to the alarms archive. For critical alarms (like *“Water Heater: Low air temperature downstream the coil detected”*) – alarm cancelling will resume normal operation of your AHU. For non-critical ones – cancelling means only, that you have acknowledged the information carried by it.

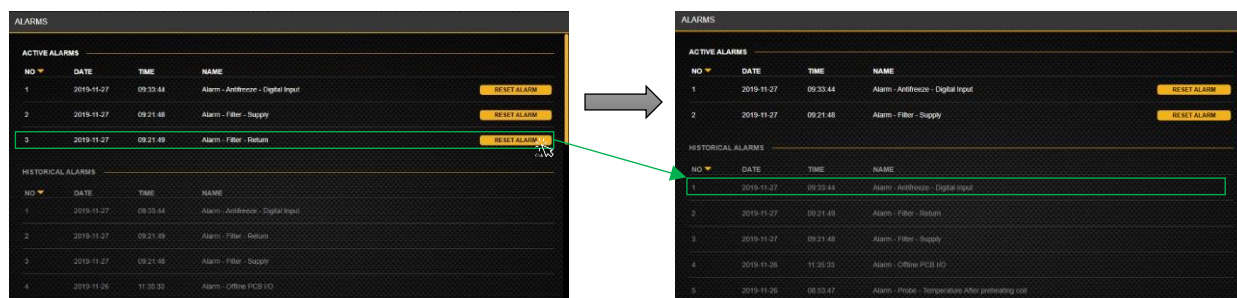


Figure 29 - Alarms resetting and moving to the archive

The sequence alarm cancelling has been demonstrated on Figure 29. On the left, the alarm window lists 3 active alarms. In this very case, the alarm no. 3 (Alarm – Filter – Return) has been cancelled and moved to the non-active alarms list (archive).

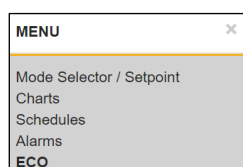
## 9 VENTILATION SYSTEM ECONOMY

Besides the Ventilation Data Recorder (a functionality described in detail in chapter 7 of this manual), the Remote Visualization Application offers another tool enabling advanced monitoring of ventilation system operational economy, expressed not only engineering units but also in financial ones – simply the savings in your preferred currency.

### 9.1 HOW TO RUN THE ECO FUNCTION

You can enter the ECO window in one of two below listed methods

- By the RVA main menu – simply select the **Alarms** function:
- By pressing the leaf-marked button on the main application window as per below:



### 9.2 SECTIONS OF THE ECO FUNCTION

Entire ECO function demonstrates the economy-related information, in the form of 4 reports:

- Summary of savings
- Recovery / Heating / Cooling capacity
- Electric Power Consumption
- Fan setpoint

Each time you run the ECO function – a Summary of saving section appears – as first from the top (Figure 30).

You can skip between the reports on one of the following ways

- By pressing relevant buttons located in the top-right corner – by using the keys you will immediately skip to the section you need
- By using the slider (right side of the ECO window) – to scroll-down the window, smoothly passing the sections one by one.

We will describe them in the following paragraphs of this chapter in detail

## 9.2.1 SUMMARY OF SAVINGS

The Summary of Savings reports gives you the essence of information display in all three following reports (Recovery/Heating/Cooling capacity, Electric Power Consumption, Fan Setpoint). The window consists of 6 pie charts, where each of them demonstrates specific information.

1. Recovery – heat recovery since last counter reset expressed in kWh
2. Recovery – heat recovery since last counter reset expressed in selected currency.
3. EC motor - electric energy saved due to high efficiency EC fans application as a comparison to standard 3-phase asynchronous motors of IE2 class expressed in kWh.
4. EC motor - electric energy saved due to high efficiency EC fans application as a comparison to standard 3-phase asynchronous motors of IE2 class expressed in selected currency.
5. Regulation algorithm – additional savings resulting from application of advanced AHU control algorithms expressed in kWh. This information concerns only electric energy consumed by fan motors.
6. Regulation algorithm – additional savings resulting from application of advanced AHU control algorithms expressed selected currency. This information concerns only electric energy consumed by fan motors.

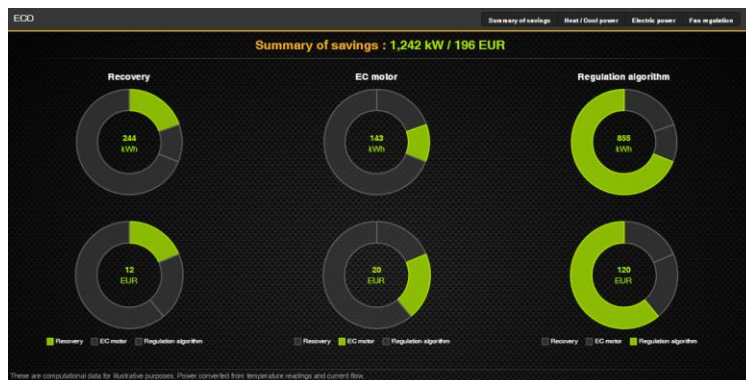


Figure 30 - ECO - Summary of savings

## 9.2.2 RECOVERY / HEATING / COOLING CAPACITY

The Recovery / Heating / Cooling capacity report allows monitoring of all processes economy related with heating or cooling media consumption, including savings resulting from application of heat recovery system. The report is split into 4 sections – each marked on the Figure 31)

- Section 1 – presents last 24 hours of heat recovery and heating/cooling energy consumption of your unit in the form of circle chart. Using this chart, you can find, what was the share of each heating/cooling or heating/cooling recovery activity during last entire day. Below the chart, same information.
- Section 2 – demonstrates last 30 days of the AHU heating/cooling energy and heat recovery use. This time the information given using vertical bars – one per each day. The bars are split in the same way as the circle chart (section 1), showing heater, cooler use together with heat recovery contribution.
- Section 3 – lists the total heating and cooling consumption. “Total” means – since the time counter of each air treatment function was reset on HMI Advanced interface. In this section the information is given both in engineering units (kWh) and actual cost (resulting from the currency and energy unit cost you’ve defined while setting up the Remote Visualization Application – refer to chapter 5.1).
- Section 4 – lists the actual performance of the heat recovery system (Recovery Efficiency chart) applied in your unit and its maximum recorder use. Also, the current use of heating or cooling function expressed in kW is listed (Actual capacity chart).

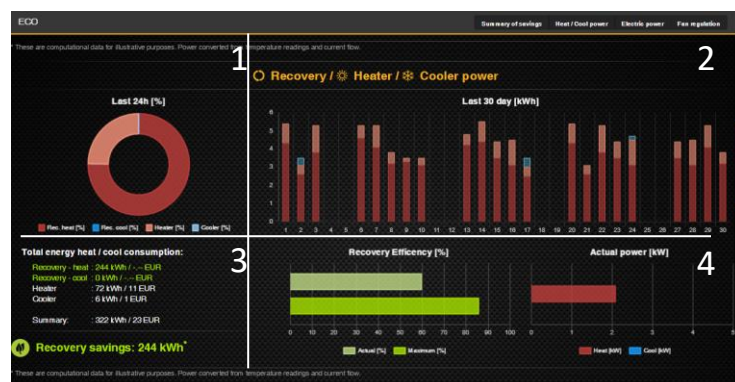


Figure 31 - ECO: Recovery / Heating / Cooling capacity

## 9.2.3 ELECTRIC POWER CONSUMPTION

The Electric Power Consumption report enables monitoring of power consumed by the fans of your unit as well as the drive of the rotary heat wheel (if driven by EC motor). Entire report consists of 4 sections (Figure 32):

- Section 1 – shows, the time share between each of the operational modes in which the AHU was running since last resetting of the time counter (HMI Advanced).
- Section 2 – demonstrates last 30 days of the AHU electric power consumption. Each of the bar (representing each of the day) is split between power consumed by supply fans, return fans and rotary heat wheel drive (is applied)
- Section 3 – lists the electric energy consumed by you unit since last counters reset (HMI Advanced) and its cost (as a calculation of the electric energy unit cost and the currency defined in the RVA settings (chapter 5.1). For air handling unit where EC fans are applied, savings resulting from application of EC motors versus classical AC ones is listed (AC/EC savings).
- Section 4 – is a chart on which current electric power consumption of the fans and heat wheel drive is plotted.



Figure 32 - ECO: Electric Power Consumption

## 9.2.4 FAN SETPOINT

The Fan setpoint report (Figure 33) concerns fans of your air handling unit. It shows in detail information about their operations cost and how their setpoints were changing in last 24 hours. In this report we have 3 sections:

Section 1 – lists the flowing information

- Parameters for calculations – information taken for all further calculations
  - Fan power – Total nominal capacity of applied motor(s) (supply and return)
  - Work counter – number of hours since recent counter reset
- VTS Optimization – information of fans economy resulting from applied advanced regulation algorithms

- Consumption – history of electric power consumption expressed in kWh and relevant currency
- Standard regulation – information about hypothetical electric power consumption assuming lack of advanced fan set point regulation. This information is only for comparison purpose.
  - Consumption - Consumption – history of electric power consumption expressed in kWh and relevant currency.

Section 1 – demonstrates all information listed in Section 1 on the time-chart. The following information is displayed:

- History of fan capacity actual setpoint resulting from advanced regulation – the green line
- Hypothetical electric power consumption assuming lack of advanced fan set point regulation. The blue line.

Section 3 – history of running mode changes for last 24 hours.

- Background colours of the chart – demonstrates running mode resulting from schedule or manual settings. Colours of relevant modes are listed on the chart key below.
- Yellow curve – supply fan set point expressed as percentage of its full capacity
- Red curve – return fan set point expressed as percentage of its full capacity



Figure 33 - ECO: Fan setpoint

## 10 AHU SYSTEM VARIABLES DIRECT ACCESS

The Remote Visualization Application has an auxiliary function aimed to support the integration of the VVS air handling units controls with the Building Management System.

As commonly known, the integration assumes that the AHU would be under the surveillance of another overriding control infrastructure of the building – called a BMS. To establish this both ways communication, all relevant information between these both systems must be exchanged as range of system variables.

The BMS variables are listed on special documents released by VTS (not in this very manual) and must be in possession of the the system integrator (person specialized in controls system integrations) at the time of setting up the system.

The AHU system variables direct access allows the BMS integrator to track the variables and their current values at the time of the integration works. In other words, the integrator is able to make a cross-check if the relevant variable acquired from the controller is in 100% the one he needs to link.

The window (Figure 34) is divided into two sections

1 – set of buttons for the list filtration down to groups of parameters. The factory defined groups are:

- DI – digital inputs
- DO – digital outputs
- AO – Analog outputs
- AI – Analog inputs
- Heater – variables specific for heater's operations
- Cooler – variables specific for cooler's operations
- Recovery – variables specific for heat recovery system operations
- Humidity – variables related with air humidity monitoring and control
- PID – variables of proportional integral derivative calculations.
- Alarm – variables related with alarm occurrences
- App.Code – variables representing currently applied control application.
- The last on the right is the text box where the variable known by its name can be typed and easily filtered.

2 – a widow, where all system variables are displayed by their name together with their current values.

OPERATIONAL PARAMETERS									
NAME	VALUE	NAME	VALUE	NAME	VALUE	NAME	VALUE	NAME	VALUE
Alarm - Clock board alarm	0.00	Alarm - Clock board alarm	0.00	Alarm - Clock board alarm	0.00	Alarm - Clock board alarm	0.00	Alarm - Clock board alarm	0.00
Alarm - Fan Return 1 - Hardware Fault	0.00	Alarm - Fan Return 1 - Hardware Fault	0.00	Alarm - Fan Return 1 - Hardware Fault	0.00	Alarm - Fan Return 1 - Hardware Fault	0.00	Alarm - Fan Return 1 - Hardware Fault	0.00
Alarm - Fan Return 10 - Hardware Fault	0.00	Alarm - Fan Return 10 - Hardware Fault	0.00	Alarm - Fan Return 10 - Hardware Fault	0.00	Alarm - Fan Return 10 - Hardware Fault	0.00	Alarm - Fan Return 10 - Hardware Fault	0.00
Alarm - Fan Return 2 - Hardware Fault	0.00	Alarm - Fan Return 2 - Hardware Fault	0.00	Alarm - Fan Return 2 - Hardware Fault	0.00	Alarm - Fan Return 2 - Hardware Fault	0.00	Alarm - Fan Return 2 - Hardware Fault	0.00
Alarm - Fan Return 4 - Hardware Fault	0.00	Alarm - Fan Return 4 - Hardware Fault	0.00	Alarm - Fan Return 4 - Hardware Fault	0.00	Alarm - Fan Return 4 - Hardware Fault	0.00	Alarm - Fan Return 4 - Hardware Fault	0.00
Alarm - Fan Return 3 - Hardware Fault	0.00	Alarm - Fan Return 3 - Hardware Fault	0.00	Alarm - Fan Return 3 - Hardware Fault	0.00	Alarm - Fan Return 3 - Hardware Fault	0.00	Alarm - Fan Return 3 - Hardware Fault	0.00
Alarm - Fan Return 7 - Hardware Fault	0.00	Alarm - Fan Return 7 - Hardware Fault	0.00	Alarm - Fan Return 7 - Hardware Fault	0.00	Alarm - Fan Return 7 - Hardware Fault	0.00	Alarm - Fan Return 7 - Hardware Fault	0.00
Alarm - Fan Return 8 - Hardware Fault	0.00	Alarm - Fan Return 8 - Hardware Fault	0.00	Alarm - Fan Return 8 - Hardware Fault	0.00	Alarm - Fan Return 8 - Hardware Fault	0.00	Alarm - Fan Return 8 - Hardware Fault	0.00
Alarm - Fan Supply 1 - Hardware Fault	0.00	Alarm - Fan Supply 1 - Hardware Fault	0.00	Alarm - Fan Supply 1 - Hardware Fault	0.00	Alarm - Fan Supply 1 - Hardware Fault	0.00	Alarm - Fan Supply 1 - Hardware Fault	0.00
Alarm - Fan Supply 10 - Hardware Fault	0.00	Alarm - Fan Supply 10 - Hardware Fault	0.00	Alarm - Fan Supply 10 - Hardware Fault	0.00	Alarm - Fan Supply 10 - Hardware Fault	0.00	Alarm - Fan Supply 10 - Hardware Fault	0.00
Alarm - Fan Supply 2 - Hardware Fault	0.00	Alarm - Fan Supply 2 - Hardware Fault	0.00	Alarm - Fan Supply 2 - Hardware Fault	0.00	Alarm - Fan Supply 2 - Hardware Fault	0.00	Alarm - Fan Supply 2 - Hardware Fault	0.00
Alarm - Fan Supply 3 - Hardware Fault	0.00	Alarm - Fan Supply 3 - Hardware Fault	0.00	Alarm - Fan Supply 3 - Hardware Fault	0.00	Alarm - Fan Supply 3 - Hardware Fault	0.00	Alarm - Fan Supply 3 - Hardware Fault	0.00
Alarm - Fan Supply 4 - Hardware Fault	0.00	Alarm - Fan Supply 4 - Hardware Fault	0.00	Alarm - Fan Supply 4 - Hardware Fault	0.00	Alarm - Fan Supply 4 - Hardware Fault	0.00	Alarm - Fan Supply 4 - Hardware Fault	0.00
Alarm - Fan Supply 5 - Hardware Fault	0.00	Alarm - Fan Supply 5 - Hardware Fault	0.00	Alarm - Fan Supply 5 - Hardware Fault	0.00	Alarm - Fan Supply 5 - Hardware Fault	0.00	Alarm - Fan Supply 5 - Hardware Fault	0.00
Alarm - Fan Supply 6 - Hardware Fault	0.00	Alarm - Fan Supply 6 - Hardware Fault	0.00	Alarm - Fan Supply 6 - Hardware Fault	0.00	Alarm - Fan Supply 6 - Hardware Fault	0.00	Alarm - Fan Supply 6 - Hardware Fault	0.00
Alarm - Fan Supply 7 - Hardware Fault	0.00	Alarm - Fan Supply 7 - Hardware Fault	0.00	Alarm - Fan Supply 7 - Hardware Fault	0.00	Alarm - Fan Supply 7 - Hardware Fault	0.00	Alarm - Fan Supply 7 - Hardware Fault	0.00

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