



EN

Compact controlling units of supply  
as well as supply and exhaust air-handling  
units

VS 10–75 CG OPTIMA

VS 40–150 CG OPTIMA SUP

VS 40–150 CG OPTIMA SUP-EXH

Operating and maintenance manual

***VENTUS***

DTR-CG OPTIMA – ver.3.0 (10.2017)



**Controlling units VS 10–75 CG OPTIMA; VS 40–150 CG OPTIMA SUP; VS 40–150 CG OPTIMA SUP–EXH were executed in compliance with the European Standards: EN 60335–1; EN 60439–1; EN 60439–3; EN 50082–1; EN 50081–1**

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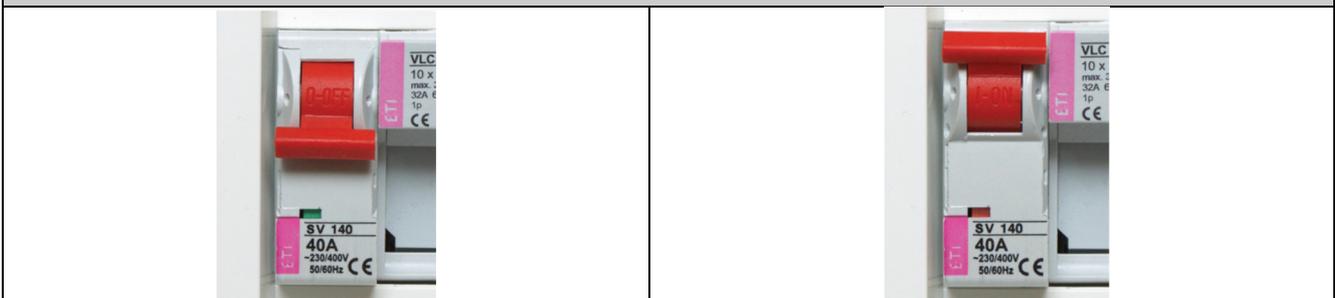
# USER INSTRUCTIONS

## 1. DESCRIPTION OF CONTROL ELEMENTS

### INTRODUCTION

	<p><b>Intended use of the controlling unit:</b>            Protection and control of supply as well as supply and exhaust air-handling units, equipped with:</p> <ul style="list-style-type: none"> <li>○ two fan assemblies with frequency converters</li> <li>○ two air dampers</li> <li>○ a cooler or a heater</li> <li>○ heat recovery system</li> </ul> <p>The special control applications code designated by N..., these applications are intended for duct air-handling units of N-Type that are equipped with:</p> <ul style="list-style-type: none"> <li>○ water heater and cooler</li> <li>○ water heater and glycol pre-heater</li> <li>○ additional functionality of return water adjustment with the view to ensuring heater protection</li> </ul> <p><b>Cooperation scope:</b></p>	
	<p><b>VS 10–75 CG OPTIMA</b></p>	<p><b>VS 40–150 CG OPTIMA SUP VS 40–150 CG OPTIMA SUP-EXH</b></p>
	<p>The systems are equipped with fans of a “Plug” type with a direct drive, supplied from by frequency converters,</p>	
	<p>up to the power of 2.2kW</p>	<p>up to the power of 11kW</p>

### MAIN POWER SWITCH



**Function**

Activation power supply of the control box

### SIGNALLING CONTROLLER OPERATING MODE

There are two LED diodes in the upper right-hand corner of the printed board:

1. The red one with ALR description- the indicator of the alarm status of the controller or of the ventilation system:
  - a. Deactivated – no alarms
  - b. Flashing– alarm status detected

	<p>2. The green one with COMM description- the indicator of the Modbus Master communication link status</p> <p>a. Deactivated- no communication, HMI OPTIMA is not connected</p> <p>b. Flashing– confirmation of stable communication</p>
	<p>1. All controlling units from the type series VS...CG OPTIMA... need to be supplied from the main power supply unit equipped with adequate protection of wires supplying the controlling unit.</p> <p>2. The installation of cabling, the connection of the controlling unit and the activation of the air handling unit can be only performed by specialist service personnel.</p> <p>3. Controlling units of VS...CG OPTIMA... type are intended to be used inside the buildings.</p>
<b>HMI OPTIMA CONTROL PANEL</b>	
	<p><b>LCD display</b>  Displays available parameters, settings and readouts of current values:  Upper line - parameter name  Lower line - parameter value  <i><b>Important!</b> If the text length exceeds the display size, the text is scrolled.</i></p> <p><b>Keyboard</b></p> <ul style="list-style-type: none"> <li>▪ Up/ down arrows  serve for the navigation in the menu and for the change of parameter value</li> <li>▪ OK  serve for the entry to the next menu level, for entering parameters, for approving and saving changes, for approving alarms</li> <li>▪ C  serve for the return to the previous menu level and for the resignation from the change of value or option selection</li> </ul> <p><i><b>Important!</b> Hold simultaneously "▲" and "▼" for approx. 3s in order to enter the internal HMI menu.  Hold [C] for approx. 3 seconds in order to go to the alarms menu.  The details have been presented in the Advanced Instructions.</i></p> <p><b>Integrated temperature sensor</b>  Room temperature measurement  <i><b>Important!</b> Please pay attention to the correct location of the HMI OPTIMA if it is to be used as a master temperature sensor.</i></p> <p><b>Alarm indicator light</b>  Operating time signalling with the controller alarm by means of the flashing HMI backlight</p>
<p><b>Functions:</b></p> <ul style="list-style-type: none"> <li>▪ Operation and setpoints of the air-handling unit</li> <li>▪ The selection and configuration of control application</li> <li>▪ Access to operating parameters of sub-assemblies of air handling unit</li> <li>▪ Setting calendar programmes</li> <li>▪ Display and cancellation of alarm states</li> </ul>	
	<p>The parameters available on the display depend on the air handling unit type and automation application. For example, in air handling units without the heater, the options related to the heating section will not be visible.</p>

## SYSTEM START-UP



Air handling unit start-up is obligatorily locked by the fire alarm, the activation of the thermal protection of motor fans, triple activation of the electric heater protection and triple activation of the anti-freeze thermostat. Each of these occurrences requires the elimination of alarm cause and later alarm cancellation (the details have been presented in the “Advanced Instructions” part)

## TURNING ON THE MAIN POWER SUPPLY



The power supply of the controlling unit is turning on by means of the main switch (Q1M). The correct controller operation is signalled by the flashing of the green “COMM” diode on the printed board inside the controlling unit and on HMI OPTIMA control panel.

The system is ready for operation directly after switching on the power supply.

## FAST START-UP

Fast access to the most important parameters is possible via four first screens of HMI interface. They are intended for the basic, everyday operation of the system. In order to activate the device in a fast start-up, it is necessary to:

- Check the **Air handling unit status** screen  
**Stop** means that the system is not in a configuration mode, there are no alarms or other irregularities and it is ready for operation
- The **Temp. setpoint** screen should be checked, after which the required value should be set, if necessary
- Check the **Temperature readout** screen
- Select **Operating mode** in compliance with the requirement
  1. **Stop** – the system remains deactivated
  2. **I gear**- the system operates, the fans set for the I gear (low efficiency)
  3. **II gear**- the system operates, the fans set for the II gear (intermediate efficiency)
  4. **III gear**- the system operates, the fans set for the III gear (high efficiency)
  5. **Standby** - the system has been stopped with the view to energy saving, however it is ready for automatic start-up with the view to maintaining the temperature of the rooms in the preset scope
  6. **Calendar** - the system works automatically, in compliance with the real time clock programme

Air handling unit  
status

Operating mode  
Deactivated

Temp. setpoint  
22.0°C

Temperature readout  
22.3°C

## 2. BASIC PRINCIPLES OF THE CONTROL PROGRAMME

### MAIN MENU STRUCTURE

**Air handling unit status** - indicates the current status of the ventilation system and the control system

- Deactivated – normal air handling unit stopping other than caused by failure
- Activated – system is running, fans activated and activated functions of heating / cooling / heat recovery, in compliance with the current system status and the requirement
- Alarm condition - the system in the alarm condition
- Stop failure – the system has been stopped by the alarm
- Pre-heating - pre-heating of the water heater with the view to avoiding the activation of anti-freeze alarm during start-up
- Service mode - the system stopped and ready for setting basic parameters, such as automation application code

**Important!** *The service mode is the default status for the new controller. The details have been provided in the Advanced Instructions.*

- Fast heating – a special recirculation mode, enabling fast heating of the rooms with the maximum possible recirculation
- Run down – a special mode of stopping the system equipped with the electric heater or a cooler with a direct evaporation; it delays the stopping of fans in order to ensure safe conditions for heat exchangers.

**Operating mode** – the main setpoint of operating mode with HMI OPTIMA

Stop – the system is deactivated

- I gear- the system operates, the fans set for the I gear (low efficiency)
- II gear- the system operates, the fans set for the II gear (intermediate efficiency)
- III gear- the system operates, the fans set for the III gear (high efficiency)
- Standby- the system has been stopped with the view to energy saving, however it is ready for automatic start-up with the view to maintaining the temperature of the rooms in the preset scope
- Calendar - the system works automatically, in compliance with the real time clock programme

**Temp. setting.** – temperature setpoint of the adjuster

- Lower limit: +5°C
- Upper limit: +35°C
- Default: +22°C

**Temperature readout-** the current value measured by the main sensor temperature

**PARAMETERS** – the link for the readouts of main operating parameters

Air handling unit  
status

Operating mode  
Deactivated

Temp. setpoint  
22.0°C

Temperature readout  
22.3°C

PARAMETERS

CALENDAR

SETTINGS

SERVICE MENU

EN/PL/RU

Change password

v1.8 28-08-17  
VS-OPTIMA 2

<p><b>CALENDAR</b> - the link for setpoints of automatic mode</p> <p><b>SETTINGS</b> - the link for detailed controller setpoints</p> <p><b>SERVICE MENU</b> - the link for basic controller setpoints, such as e.g. application code used in the Service Mode of the controller.</p> <p><b>EN / PL / RU</b> – the location of language selection to be displayed on HMI OPTIMA</p> <p><b>Change password</b> - enables the change of the standard password for another one with the view to protecting the controller against unauthorised access</p> <p><b>v.1.8 28-08-17</b> – application identifier</p> <p><b>VS - OPTIMA 2</b> – controller type identifier</p> <p><i><b>Important!</b> Menu screens are dynamically adapted to the controller configuration, selected application and access level.</i></p>	
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	<p>If the system has not been started, please check F1 protection status</p> <p>The correct operation of the device depends on the preset application. Application selection and the settings of operating parameters of the device should be performed by the qualified service, in compliance with the recommendations of the Advanced Instructions</p>
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**HMI OPTIMA SETTINGS AND CONTROLLER CONNECTION**

<p>Holding OK button - entering internal HMI OPTIMA menu</p> <p><b>Choose device</b> – the setting of work with a single controller or a group of controllers.</p> <ul style="list-style-type: none"> <li>▪ Only one device – used for 1:1 connection with a single controller, the standard operating mode in OPTIMA automation (recommended)</li> <li>▪ Scan devices – searching for communication bus with the view to finding many controllers</li> </ul> <p><b>Communication period</b> – the interruption of data update with the controller.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0.0s</li> <li>▪ Upper limit: 10.0s</li> <li>▪ Default: 0.5s (recommended)</li> </ul> <p><b>Communication timeout</b> – the limit of response time for the controller.</p> <p>It is necessary to check converters or repeaters are used on the line.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0.0s</li> <li>▪ Upper limit: 5.0s</li> <li>▪ Default: 0.5s (recommended)</li> </ul> <p><b>Contrast / Minimal brightness / Maximal brightness</b> – LCD display settings</p> <p><b>Activity time</b> – the time from the last use of the keyboard till the sleep mode HMI</p>	<div data-bbox="1034 1106 1422 1211" style="border: 1px solid gray; padding: 5px; text-align: center;">Air handling unit status</div> <div data-bbox="1034 1249 1422 1355" style="border: 1px solid gray; padding: 5px; text-align: center;">Operating mode Deactivated</div> <div data-bbox="1034 1393 1422 1498" style="border: 1px solid gray; padding: 5px; text-align: center;">Temp. setpoint 22.0°C</div>
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<p><b>After activity time</b> – determines HMI behaviour upon entering to the sleep mode</p> <ul style="list-style-type: none"> <li>▪ Nothing – HMI remains on the current screen</li> <li>▪ Alarms menu – HMI displays an alarm screen if an alarm occurs</li> <li>▪ Alarms/1st page – HMI returns to the main menu or displays an alarm screen if an alarm occurs</li> </ul> <p><b>HMI com speed / RS485M com speed</b> – communication speed settings. The first parameter refers to the HMI and the second one to the controller.</p> <p><i><b>Important!</b> Communication speed settings have to be equal. Otherwise the connection between the HMI and the controller shall be lost.</i></p> <p>In case of connection problems verify the settings of communication speed.</p> <p>The details of the connection have been presented on automation connection diagrams.</p>	
<b>LANGUAGE SELECTION English / Polski / Русский</b>	
<p>HMI OPTIMA presents the data in three languages: EN English, PL Polish, RU Russian</p> <p>The factory settings include the English language.</p> <p><i><b>Important!</b> Alarm signalling is always presented in the English language.</i></p>	
<b>PASSWORD INTRODUCTION</b>	
<p>Certain menu areas are protected by password with the view to protection against unauthorised or accidental parameter change.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">Enter password 0 _ _ _</p> </div> <p>Factory password: 1111 The password is entered by changing the field value by means of arrow keys and by confirming with the [OK] button after each digit.</p>	
<b>3. CALENDAR</b>	
<p>The calendar enables automatic operation of the air handling unit in compliance with the programmed time scheme, controlled by means of the Real Time Clock (RTC).</p>	<div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: auto;"> <p>Air handling unit status</p> </div>
<p><b>Set date</b> - shows the current system date and enables the change of this value  <b>Set time</b> - shows the current system time and enables the change of this value  <i><b>Important!</b> Upon the first feeding of supply to the controller, the RTC can be locked. It is easy to determine on the basis of the stopped seconds indicator. After clock setting, the RTC system resumes stable operation and maintains it regardless whether the controlling unit has been supplied or not.</i></p>	<div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: auto; margin-bottom: 10px;"> <p style="text-align: center;">Set date Fri 13-10-17</p> </div> <div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: auto;"> <p style="text-align: center;">Set time 10:05.42</p> </div>

<p><b>Operating mode</b> - the time scheme of system operation in the selected mode, covering specific days of the week and exceptions for defining special dates, e.g. weekends</p> <p><b>Temperature setpoint</b> - the time scheme of operation at the selected master sensor temperature, covering specific days of the week and exceptions for defining special dates, e.g. weekends</p>	<div data-bbox="1034 226 1422 331" style="border: 1px solid gray; padding: 5px; text-align: center;">Operating mode</div> <div data-bbox="1034 371 1422 477" style="border: 1px solid gray; padding: 5px; text-align: center;">Temperature setpoint</div>
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**CALENDAR / OPERATING MODE**

<p>Operating mode- the time scheme of system operation in the selected mode, covering specific days of the week and exceptions for defining special dates, e.g. weekends</p> <p><b>Monday... Sunday</b> - there is a possibility of entering programmes for each day of the week; the following can be set:</p> <p>Programme initiation time</p> <div data-bbox="161 1137 547 1243" style="border: 1px solid gray; padding: 5px; text-align: center;">Time from 08:00.00</div> <p>Programme occurrence definition</p> <div data-bbox="161 1317 547 1422" style="border: 1px solid gray; padding: 5px; text-align: center;">Operating mode Stop</div> <p>Recording the programme in the time scheme</p> <div data-bbox="161 1496 547 1601" style="border: 1px solid gray; padding: 5px; text-align: center;">Save</div>	<div data-bbox="1034 607 1422 712" style="border: 1px solid gray; padding: 5px; text-align: center;">Monday</div> <div data-bbox="1034 752 1422 857" style="border: 1px solid gray; padding: 5px; text-align: center;">Tuesday</div> <div data-bbox="1034 898 1422 1003" style="border: 1px solid gray; padding: 5px; text-align: center;">Wednesday</div> <div data-bbox="1034 1043 1422 1149" style="border: 1px solid gray; padding: 5px; text-align: center;">Thursday</div> <div data-bbox="1034 1189 1422 1294" style="border: 1px solid gray; padding: 5px; text-align: center;">Friday</div> <div data-bbox="1034 1335 1422 1440" style="border: 1px solid gray; padding: 5px; text-align: center;">Saturday</div> <div data-bbox="1034 1480 1422 1585" style="border: 1px solid gray; padding: 5px; text-align: center;">Sunday</div> <div data-bbox="1034 1626 1422 1731" style="border: 1px solid gray; padding: 5px; text-align: center;">Exceptions</div> <div data-bbox="1034 1771 1422 1877" style="border: 1px solid gray; padding: 5px; text-align: center;">Delete all</div>
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<p><b>Exceptions</b> – enable to enter master programmes to the programmes of specific days of the week. There is a possibility of entering 16 exceptions in the time scheme, each of which defined by a priority (the lower priority value, the more important the exception)</p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Date from Fri 13:10:17</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Time from 08:00.00</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Date to Sun 15:10:17</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Time to 19:00.00</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Operating mode Stop</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Priority 16</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Save</div>
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**Delete all** - cancellation of all settings of the **Operating mode** calendar

**CALENDAR / TEMPERATURE SETPOINT**

<p>Temperature setpoint- the time scheme of operation at the selected master sensor temperature, covering specific days of the week and exceptions for defining special dates, e.g. weekends</p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Monday</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Tuesday</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Wednesday</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Thursday</div>
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<p><b>Monday... Sunday</b> - there is a possibility of entering programmes for each day of the week; the following can be set:</p> <p>Programme initiation time</p> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px;">       Time from 08:00.00     </div> <p>Programme occurrence definition</p> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px;">       Temperature setpoint 22°C     </div> <p>Recording the programme in the time scheme</p> <div style="border: 1px solid gray; padding: 5px; width: fit-content;">       Save     </div>	<div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Friday</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Saturday</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Sunday</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Exceptions</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Delete all</div>
<p><b>Exceptions</b> – enable to enter master programmes to the programmes of specific days of the week. There is a possibility of entering 16 exceptions in the time scheme, each of which defined by a priority (the lower priority value, the more important the exception)</p>	<div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Date from Fri 13:10:17</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Time from 08:00.00</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Date to Sun 15:10:17</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Time to 19:00.00</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Temperature setpoint 22°C</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Priority 16</div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin-bottom: 10px; text-align: center;">Save</div>

**Delete all** - cancellation of all settings of the **Temperature setpoint** calendar

**AN EXAMPLE OF THE CALENDAR PROGRAMME**

The assumed operating principle for the office:

- 1. Working days: Monday – Friday:
  - a. Typical office hours: 7-15 - working conditions: +23°C, 3rd gear
  - b. extra hours: 15-17 - working conditions: +22°C, 1st gear
  - c. No workers at night - working conditions: +20°C, Standby
- 2. Weekend: the maintenance of safe conditions in the rooms, energy saving: +20°C, Standby
- 3. Exceptions:
  - a. Christmas: 24th-26th of December – the maintenance of safe conditions in the rooms, energy saving: +18°C, Standby

OPERATING MODE calendar programming – the setting of initiation of operation in the comfort mode

CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME

Time from: 07:00.00

Operating mode: the 3rd gear

**IMPORTANT!** Remember to save the programme!

A new programme

Time from  
07:00.00

Operating mode  
3rd gear

Save

OPERATING MODE calendar programming – the setting of initiation of extra hours in the comfort mode, but with energy saving

CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME

Time from: 17:00.00

Operating mode: the 1st gear

**IMPORTANT!** Remember to save the programme!

A new programme

Time from  
17:00.00

Operating mode  
1st gear

Save

<p>OPERATING MODE calendar programming – the setting of initiation of energy saving mode for the situation “no employees at work”</p> <p>CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME</p> <p>Time from: 22:00.00</p> <p>Operating mode: standby</p> <p><b>IMPORTANT!</b> Remember to save the programme!</p>	<div data-bbox="1034 215 1422 320">A new programme</div> <div data-bbox="1034 349 1422 454">Time from 22:00.00</div> <div data-bbox="1034 483 1422 589">Operating mode Standby</div> <div data-bbox="1034 618 1422 723">Save</div>
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The above steps shall be performed for any working week from Monday to Friday.

**IMPORTANT!** The last time programme of a given week is FRIDAY-STANDBY from 22:00 and it shall last during the whole WEEKEND until the programme MONDAY- the 1st gear at 7:00.

<p>OPERATING MODE calendar programming– setting the break in the operation at Christmas time: 24–26 of December</p> <p>CALENDAR → OPERATING MODE → EXCEPTIONS → NEW PROGRAMME</p> <p>Date from: 24-12-2017</p> <p>Time from: 06:00.00</p> <p>Date to: 26-12-2017</p> <p>Time to: 22:00.00</p> <p>Operating mode: standby</p> <p><b>IMPORTANT!</b> Remember to save the programme!</p>	<div data-bbox="1034 934 1422 1039">A new programme</div> <div data-bbox="1034 1068 1422 1173">Date from Sun 24:12:17</div> <div data-bbox="1034 1202 1422 1308">Time from 06:00.00</div> <div data-bbox="1034 1337 1422 1442">Date to Tue 26:12:17</div> <div data-bbox="1034 1471 1422 1576">Time to 22:00.00</div> <div data-bbox="1034 1606 1422 1711">Operating mode Standby</div> <div data-bbox="1034 1740 1422 1845">Priority 16</div> <div data-bbox="1034 1874 1422 1980">Save</div>
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<p>TEMPERATURE SETPOINT calendar programming – the setting of initiation of operation in the comfort mode</p> <p>CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME</p> <p>Time from: 07:00.00</p> <p>Temperature setpoint: +23°C</p> <p><b>IMPORTANT!</b> Remember to save the programme!</p>	<div data-bbox="1034 224 1425 331" style="border: 1px solid gray; padding: 5px; text-align: center;">A new programme</div> <div data-bbox="1034 367 1425 474" style="border: 1px solid gray; padding: 5px; text-align: center;">Time from 07:00.00</div> <div data-bbox="1034 510 1425 618" style="border: 1px solid gray; padding: 5px; text-align: center;">Temperature setpoint 23°C</div> <div data-bbox="1034 654 1425 761" style="border: 1px solid gray; padding: 5px; text-align: center;">Save</div>
<p>TEMPERATURE SETPOINT calendar programming – the setting of initiation of operation in the comfort mode</p> <p>CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME</p> <p>Time from: 17:00.00</p> <p>Temperature setpoint: +22°C</p> <p><b>IMPORTANT!</b> Remember to save the programme!</p>	<div data-bbox="1034 842 1425 949" style="border: 1px solid gray; padding: 5px; text-align: center;">A new programme</div> <div data-bbox="1034 985 1425 1093" style="border: 1px solid gray; padding: 5px; text-align: center;">Time from 17:00.00</div> <div data-bbox="1034 1128 1425 1236" style="border: 1px solid gray; padding: 5px; text-align: center;">Temperature setpoint 22°C</div> <div data-bbox="1034 1272 1425 1379" style="border: 1px solid gray; padding: 5px; text-align: center;">Save</div>
<p>TEMPERATURE SETPOINT calendar programming – the setting of initiation of energy saving mode for the situation “no employees at work”</p> <p>CALENDAR → OPERATING MODE → MONDAY → NEW PROGRAMME</p> <p>Time from: 22:00.00</p> <p>Temperature setpoint: +20°C</p> <p><b>IMPORTANT!</b> Remember to save the programme!</p>	<div data-bbox="1034 1460 1425 1568" style="border: 1px solid gray; padding: 5px; text-align: center;">A new programme</div> <div data-bbox="1034 1603 1425 1711" style="border: 1px solid gray; padding: 5px; text-align: center;">Time from 22:00.00</div> <div data-bbox="1034 1747 1425 1854" style="border: 1px solid gray; padding: 5px; text-align: center;">Temperature setpoint 20°C</div> <div data-bbox="1034 1890 1425 1998" style="border: 1px solid gray; padding: 5px; text-align: center;">Save</div>

The above steps shall be performed for any working week from Monday to Friday.

**IMPORTANT!** *The last time programme of a given week is FRIDAY "20°C" from 22:00 and it shall last during the whole WEEKEND until the programme MONDAY "22°C" at 7:00.*

<p>TEMPERATURE SETPOINT calendar programming – setting the break in the operation at Christmas time: 24-26 of December</p> <p>CALENDAR → OPERATING MODE → EXCEPTIONS → NEW PROGRAMME</p> <p>Date from: 24-12-2017</p> <p>Time from: 06:00.00</p> <p>Date to: 26-12-2017</p> <p>Time to: 22:00.00</p> <p>Temperature setpoint: +18°C</p> <p><b>IMPORTANT!</b> <i>Remember to save the programme!</i></p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">A new programme</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Date from Sun 24:12:17</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Time from 06:00.00</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Date to Tue 26:12:17</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Time to 22:00.00</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Temperature setpoint 18°C</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Priority 16</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Save</div>
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**4. PARAMETERS**

<p>The screens of the “Parameters” menu display information on the current system status.</p> <p><b>Important!</b> <i>The “Parameters” menu displays read only data. The access to setpoints, limitations, and the tuning of PI adjusters takes place via the “Settings” menu.</i></p>	<div style="border: 1px solid gray; padding: 10px; text-align: center; width: fit-content; margin: auto;">PARAMETERS</div>
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PARAMETERS / TEMPERATURES	
<p>Temperatures readout</p> <ul style="list-style-type: none"> <li>▪ Master sensor– the temperature in the supply sensor or the room sensor, the main value for the temperature adjustment loop</li> <li>▪ Room sensor – the temperature in the room, measured by the sensor integrated with HMI OPTIMA</li> <li>▪ Supply sensor – the temperature of supply air</li> <li>▪ External sensor – outside air temperature</li> <li>▪ Sensor behind the recovery – exhaust air temperature downwards the heat recovery system; it serves for the protection of the recuperator against frost.</li> </ul> <p><b>Important!</b> All values are listed in degrees Celsius.</p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Temperatures</div> <div style="border: 1px solid gray; padding: 5px; text-align: center;">Master sensor 22.6°C</div>
PARAMETERS / DAMPERS	
<p>The status of air supply/ exhaust dampers</p> <ul style="list-style-type: none"> <li>▪ Closed</li> <li>▪ Open</li> </ul>	<div style="border: 1px solid gray; padding: 5px; text-align: center;">Dampers Closed</div>
PARAMETERS / FANS	
<p>Fan status</p> <p><b>Fan status</b> - defines which fans are currently operating</p> <ul style="list-style-type: none"> <li>▪ Stop – no fans are operating</li> <li>▪ Supply – only the supply fan is operating</li> <li>▪ Exhaust – only the exhaust fan is operating</li> <li>▪ Supply/exhaust – both fans are operating</li> </ul> <p><b>Supply setpoint</b> – the readout of supply fan controlling signal, scope 0..100%</p> <p><b>Exhaust setpoint</b> – the readout of exhaust fan controlling signal, scope 0..100%</p> <p><b>Important!</b> The fans control signal is sent by the Modbus communication line to frequency converters.</p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Fan status Deactivated</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Supply setpoint 0%</div> <div style="border: 1px solid gray; padding: 5px; text-align: center;">Exhaust setpoint 0%</div>
PARAMETERS/ WATER HEATER	
<p>Water heater status</p> <p><b>Pump status</b> – circulator pump status</p> <ul style="list-style-type: none"> <li>▪ Deactivated</li> <li>▪ Activated</li> </ul> <p><b>Activated</b> - the control signal for the 3-way valve, scope 0..100% (appropriately 0..10V on analogue output)</p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Water heater</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Pump status Deactivated</div> <div style="border: 1px solid gray; padding: 5px; text-align: center;">Valve opening 0%</div>

PARAMETERS / ELECTRIC HEATER	
The readout of the electric heater controlling signal, scope 0..100% (appropriately 0..10V on analogue output)	<div style="border: 1px solid black; padding: 5px; text-align: center;">Elect. heater 0%</div>
PARAMETERS / WATER COOLER	
<p>Water cooler status</p> <p><b>Pump status</b> – circulator pump status</p> <ul style="list-style-type: none"> <li>▪ Deactivated</li> <li>▪ Activated</li> </ul> <p><b>Valve opening</b>- the control signal for the 3-way valve, scope 0..100% (appropriately 0..10V on analogue output)</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Water cooler</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Pump status Deactivated</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Valve opening 0%</div>
PARAMETERS / DX COOLER	
<p>The status of the cooler with direct evaporation of the medium</p> <ul style="list-style-type: none"> <li>▪ Deactivated</li> <li>▪ Activated</li> </ul> <p><b>Important!</b> <i>The condition of the cooler does not solely depend on the operating mode of the air handling unit. Safe operation of the DX cooler requires the inclusion of defined minimum operating and downtime times in the control strategy.</i></p>	<div style="border: 1px solid black; padding: 5px; text-align: center;">DX cooler Deactivated</div>
PARAMETERS / COOLER	
<p><b>Cooler status</b> - the cooling devices status</p> <ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul> <p><b>Cooling degree</b> – percentage signal of cooling control, scope 0..100% (corresponds to the 0..10V signal).</p> <p><b>Important!</b> <i>This presentation of the cooler status refers is valid for air handing units of N-Type and N... type applications which do not distinguish between a freon cooler and a water cooler.</i></p>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Cooler</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Cooler status Deactivated</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Cooling degree 0%</div>
PARAMETERS / PRE-HEATER	
<p>The glycol pre-heater status</p> <p><b>Pump status</b> – circulation pump status</p> <ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul> <p><b>Valve opening</b>- the control signal for the 3-way valve, scope 0..100% scope (corresponds to the 0..10V signal).</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Pre-heater</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Pump status Deactivated</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Valve opening 0%</div>

PARAMETERS / H/C EXCHANGER	
<p>The status of the universal exchanger operating as a cooler or a heater.</p> <p><b>Pump status</b> – circulator pump status</p> <ul style="list-style-type: none"> <li>▪ Deactivated</li> <li>▪ Activated</li> </ul> <p><b>Valve opening</b>- the control signal for the 3-way valve, scope 0..100% (appropriately 0..10V on analogue output)</p> <p><b>Mode</b>- current operation type</p> <ul style="list-style-type: none"> <li>▪ Winter (heating) – the exchanger operates as a heater, the control signal increases if the temperature is below the setpoint</li> <li>▪ Summer (cooling) – the exchanger operates as a cooler, the control signal decreases if the temperature is above the setpoint</li> </ul> <p><i><b>Important!</b> Exchanger supply switching between the chiller and the boiler must be handled manually. The mode selection must comply with the current setting of the exchanger supply.</i></p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">H/C exchanger</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Pump status Deactivated</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Valve opening 0%</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Mode Winter (heating)</div>
PARAMETERS / RECOVERY DEGREE	
<p>The readout of the signal controlling the rotating exchanger or the cross-flow heat exchanger, scope 0..100%</p>	<div style="border: 1px solid gray; padding: 5px; text-align: center;">Degree of recovery 0%</div>
PARAMETERS / ROTARY EXCHANGER	
<p>The rotating exchanger status</p> <p><b>Degree of recovery</b>- the readout of the signal controlling the recovery, scope 0..100%</p> <p><b>Frequency</b> – the readout of current output frequency of the exchanger</p> <p><b>Error code</b> – the readout of status record from the frequency exchanger</p> <p><i><b>Important!</b> Detailed information on error codes has been included in the documentation of frequency exchanger.</i></p>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Rotating exchanger</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Degree of recovery 0%</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Frequency 0.0Hz</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Motor revolutions 0 rpm</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px; text-align: center;">Error code 0x00</div>
PARAMETERS / MIXING DEGREE	
<p>The readout of the controlling signal of mixing dampers, scope 0..100% (appropriately 0..10V on analogue output)</p>	<div style="border: 1px solid gray; padding: 5px; text-align: center;">Mixing degree 0%</div>

5. SETTINGS	
<p>The settings is a part of menu in which the setpoints, limitations, PI parameters and other configuration data can be edited.</p>	
SETTINGS / DEFAULT MODE	
<p>The determination of the default manner of system operation in the calendar mode, if the current time and date is not contained in any programme defined by the calendar. Such a situation can take place, if the calendar mode is activated without its prior programming.</p> <ul style="list-style-type: none"> <li>▪ Stop (factory setpoint)</li> <li>▪ I gear</li> <li>▪ II gear</li> <li>▪ III gear</li> <li>▪ Standby</li> </ul> <p><b>Important!</b> In the listed case the temperature setpoint is downloaded from "Temp. setpoint" from the main menu.</p>	<div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: 0 auto;"> <p>Default mode Stop</p> </div>
SETTINGS / STANDBY MODE	
<p>The determination of activation conditions in the standby mode.</p> <p><b>Active for-</b> allows for the activation of the standby function for different types of heat exchangers installed in the air handing unit</p> <ul style="list-style-type: none"> <li>▪ Inactive– the standby function has been locked</li> <li>▪ Heating– active standby only for the heating (the system is started if the room becomes too cold)</li> <li>▪ Cooling– active standby only for the cooling (the system is started if the room becomes too hot)</li> <li>▪ Heating/ cooling – active standby for both situations</li> </ul> <p><b>Important!</b> The setting of standby mode function must comply with the heat exchangers actually installed in the system.</p> <p><b>Standby hysteresis-</b> the determination of how much the current temperature must differ from the setpoint so that the air handling unit could be started.</p> <p><b>Important!</b> The accepted room temperature range in the standby mode is equal to the temperature setpoint <math>\pm</math> hysteresis.</p>	<div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: 0 auto; margin-bottom: 10px;"> <p>Standby mode</p> </div> <div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: 0 auto; margin-bottom: 10px;"> <p>Active for Heating/cooling</p> </div> <div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: 0 auto;"> <p>Standby hysteresis 4°C</p> </div>
SETTINGS / SEASON	
<p>The setpoint which is typical for the systems with a universal H/C exchanger. It determines the manner of system and temperature adjusters operation.</p> <ul style="list-style-type: none"> <li>▪ Winter – the exchanger operates as a heater (factory setting)</li> <li>▪ Summer – the exchanger operates as a cooler</li> </ul>	<div style="border: 1px solid gray; padding: 10px; width: fit-content; margin: 0 auto;"> <p>Season Winter</p> </div>

SETTINGS / EFFICIENCY

The setpoints that refer to fans and heat exchangers efficiency.

**I gear HE limit**- the determination of the maximum control signal for the heater during fan operation at the I gear

- Lower limit: 10%
- Upper limit: 100%
- Default: 100%

The same setpoint is possible for the II gear

**I gear Cooler limit** - the determination of the maximum control signal for the cooler during fan operation at the I gear

- Lower limit: 10%
- Upper limit: 100%
- Default: 100%

The same setpoint is possible for the II gear

**Supply fan I gear/ Exhaust Fan I gear** - the setpoint of fan efficiency when set at the I gear

- Lower limit: 20%
- Upper limit: 100%
- Default: 50%

The same setpoint is possible for the II gear and the III gear

Efficiency

I gear HE Limit  
100%

I gear Cooler Limit  
100%

Supply fan I gear  
50%

Supply fan II gear  
100%

Supply fan III gear  
100%

SETTINGS / TEMP. ADJUSTER.

**T<sub>max</sub> of supply** – the setpoint of the upper temperature limit in supply duct

- Lower limit: +20 °C
- Upper limit: +50°C
- Default: +40°C

**T<sub>min</sub> of exhaust** – the setpoint of the lower temperature limit in supply duct

- Lower limit: +0 °C
- Upper limit: +30°C
- Default: +15°C

**Min. cooling temp.** - the setpoint of the limit for cooling activation. If the outside temperature falls below the limit, the cooling functions shall be locked and the system will only be able to ventilate with the view to temperature reduction in the room.

- Lower limit: -10 °C
- Upper limit: +20°C
- Default: +12°C

Temp. adjuster

Tmax of supply  
30°C

Tmin of supply  
15°C

Min. cooling temp.  
15°C

PI of heating

Kp for heating

Ti for heating

<p><b>Heating PI / cooling PI / supply PI</b> – the setpoints for PI adjusters in the temperature adjustment loop</p> <ul style="list-style-type: none"> <li>▪ <math>K_p</math> – adjuster enhancement</li> <li>▪ <math>T_i</math> – adjuster integral gain</li> <li>▪ Default setpoints for heating and cooling: <math>K_p = 1</math>; <math>T_i = 60s</math></li> <li>▪ Default setpoints for supply limitations: <math>K_p = 2</math>; <math>T_i = 10s</math></li> </ul> <p><b>Important!</b> Heating and cooling adjusters refer both to heating and to cooling, and also to heat recovery devices. The PI supply adjuster is responsible for the maintenance of temperature of the supply air in the scope designated by <math>T_{max}</math> of supply and <math>T_{min}</math> of supply.</p>						
<b>SETTINGS / DAMPERS</b>						
<p>The settings related to a special supply damper (anti-freeze damper) in VS10–15 systems with the cross-flow exchanger that has not been equipped with a bypass.</p> <p><b>Min. fresh air</b>- the setpoint of the minimum fresh air quantity upon full control of anti-frost protection</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0%</li> <li>▪ Upper limit: 100%</li> <li>▪ Default: 30%</li> </ul> <p><b>Anti-frost protection</b> – setpoint of the lower limit of exhaust air temperature downwards the recovery.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: -10 °C</li> <li>▪ Upper limit: +15°C</li> <li>▪ Default: +5°C</li> </ul> <p><b><math>K_p</math> / <math>T_i</math></b> – PI adjuster setpoints for anti-frost protection.</p> <ul style="list-style-type: none"> <li>▪ <math>K_p</math> – enhancement</li> <li>▪ <math>T_i</math> – adjuster integral gain</li> <li>▪ Default: <math>K_p = 5</math> / <math>T_i = 10s</math></li> </ul>	<table border="1" style="width: 100%; text-align: center;"> <tr><td>Dampers</td></tr> <tr><td>Min. fresh air 30.0%</td></tr> <tr><td>Anti-frost protection 3°C</td></tr> <tr><td><math>K_p</math> 10</td></tr> <tr><td><math>T_i</math> 180</td></tr> </table>	Dampers	Min. fresh air 30.0%	Anti-frost protection 3°C	$K_p$ 10	$T_i$ 180
Dampers						
Min. fresh air 30.0%						
Anti-frost protection 3°C						
$K_p$ 10						
$T_i$ 180						
<b>SETTINGS / FANS</b>						
<p><b>Pressure switch delay</b>- the delay of testing the pressure switch status after fan start-up</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 30s</li> </ul> <p><b>Activation delay</b> - the delay of system start</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 5s</li> </ul> <p><b>Deactivation delay</b>- the delay of system stoppage in the case of of the systems which are equipped with an electric heater or a DX cooler. The delay is executed if a heater or a cooler has been used.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 30s</li> </ul>	<table border="1" style="width: 100%; text-align: center;"> <tr><td>Fans</td></tr> <tr><td>Pressure switch delay 30s</td></tr> <tr><td>Activation delay 5s</td></tr> <tr><td>Activation delay 30s</td></tr> </table>	Fans	Pressure switch delay 30s	Activation delay 5s	Activation delay 30s	
Fans						
Pressure switch delay 30s						
Activation delay 5s						
Activation delay 30s						

<p><b>Supply fan delay</b> - the time between the opening signal of the dampers and the start-up of the supply fan.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 10s</li> </ul> <p><b>Exhaust fan delay</b> - the time between the opening signal of the dampers and the start-up of the exhaust fan.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 10s</li> </ul>	<div data-bbox="1034 248 1425 353" style="border: 1px solid gray; padding: 5px; text-align: center;">Supply fan delay 10s</div> <div data-bbox="1034 394 1425 499" style="border: 1px solid gray; padding: 5px; text-align: center;">Exhaust fan delay 10s</div>
<b>SETTINGS / HEATER</b>	
<p><b>Pre-heating/ Max. Outside T.</b> - upper temperature limit for the pre-heating procedure. Upon this temperature value, the valve starts to open.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0 °C</li> <li>▪ Upper limit: +30°C</li> <li>▪ Default: +8°C</li> </ul> <p><b>Preheating / Min. Outside t.</b>- lower limit temperatures for the pre-heating procedure. Upon this temperature value, valve opening reaches 100%.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: -40 °C</li> <li>▪ Upper limit: 0°C</li> <li>▪ Default: -15°C</li> </ul> <p><i><b>Important!</b> Between the points Max and Min Outside T., the valve position is calculated according to linear characteristics. E.g.: in the middle of the scope, the valve shall be open in 50%.</i></p> <p><b>Pre-heating / Heating time</b> – settings for pre-heating time. After this time the unit passes to normal operation, and the regulation of valve opening is executed according to the PI adjuster for the heating sentence.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 30s</li> </ul> <p><b>Pre-heating / Decrease time</b> – time for valve closing after the termination of the pre-heating procedure. During the controlled closure, the valve shall receive a signal from the PI adjuster, thanks to which reaching 0% by the valve can be avoided. The decrease time parameter serves for the minimisation of risk of anti-freeze alarm occurrence.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 30s</li> </ul>	<div data-bbox="1034 656 1425 761" style="border: 1px solid gray; padding: 5px; text-align: center;">Heater</div> <div data-bbox="1034 801 1425 907" style="border: 1px solid gray; padding: 5px; text-align: center;">Preliminary heating</div> <div data-bbox="1034 947 1425 1052" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. Outside T. 8°C</div> <div data-bbox="1034 1093 1425 1198" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. Outside T. -15°C</div> <div data-bbox="1034 1238 1425 1344" style="border: 1px solid gray; padding: 5px; text-align: center;">Heating time 30s</div> <div data-bbox="1034 1384 1425 1489" style="border: 1px solid gray; padding: 5px; text-align: center;">Decrease time 30s</div> <div data-bbox="1034 1529 1425 1635" style="border: 1px solid gray; padding: 5px; text-align: center;">Water heater</div> <div data-bbox="1034 1675 1425 1780" style="border: 1px solid gray; padding: 5px; text-align: center;">Temp. of pump activation</div> <div data-bbox="1034 1821 1425 1926" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. valve opening 0.0%</div>

**Temp. of pump activation** – outside temp. setpoint. which forces the circulation pump to operate in a continuous manner.

- Lower limit: -20 °C
- Upper limit: +15°C
- Default: +8°C

**Min. valve opening** - the lower limit of valve opening. For the operating unit, the control signal of the valve shall be at least at this level.

- Lower limit: 0%
- Upper limit: 100%
- Default: 0%

**Pump protection / Set protection** – the setting of activation/ deactivation of protection against sticking of pump seals.

Seal sticking may occur during long pump downtime.

- Inactive (default setpoint)
- Active

**Pump protection / Downtime period** – pump downtime period between activations with active pump protection.

- Lower limit: 1 day
- Upper limit: 30 days
- Default: 7 days

**Pump protection / Activation time** – operating time setpoint pumps

- Lower limit: 1s
- Upper limit: 3600s
- Default: 30s

**Setpoint  $T_{bwtr}$**  – the setting of required temperature of water returning from the heater, During air handling unit stoppage, the adjuster supervises the setpoint. If the air handling unit operates, the setpoint  $T_{bwtr}$  is treated as the lower limit of the return water temperature.

If  $T_{bwtr}$  decreases, the adjuster forces the valve to open, regardless of the main heating control loop.

- Lower limit: +20 °C
- Upper limit: +70°C
- Default: +50°C

**Important!**  $T_{bwtr}$  control has the higher priority over the main temperature control loop, which can lead to room overheating.

**Important!** The feature of the return water temperature is locked, if the outside temperature is higher than the activation temperature of the pump.

- $K_p T_{bwtr}$  – adjuster enhancement
- $T_i T_{bwtr}$  – adjuster integration coefficient
- Default:  $K_p = 1 / T_i = 60s$

Heater

Pump protection

Set protection  
Inactive

Downtime period  
7 days

Activation time  
30s

$T_{bwtr}$  setpoint

$K_p T_{bwtr}$   
1.0

$T_i T_{bwtr}$   
60s

SETTINGS / PRE-HEATER	
<p><b>Temp. setpoint</b> - the setpoint for the pre-heater</p> <p><i><b>Important!</b> Pre-heating adjuster compares the setpoint with the readout from B3 sensor. The task of the adjuster consists in the maintenance of B3 temperature which equals the setpoint.</i></p> <p><i><b>Important!</b> Please check the application scheme for the correct sensor connection.</i></p> <ul style="list-style-type: none"> <li>▪ Lower limit: -24 °C</li> <li>▪ Upper limit: 0°C</li> <li>▪ Default: -9°C</li> <li>▪ <math>K_p</math> – adjuster enhancement</li> <li>▪ <math>T_i</math> – adjuster integration coefficient</li> <li>▪ Default: <math>K_p=1</math> / <math>T_i=60s</math></li> </ul> <p><b>Minimum valve opening</b>- lower limit of valve opening. During the operation of the air handling unit, the control signal of the valve shall be at least at this level.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0%</li> <li>▪ Upper limit: 100%</li> <li>▪ Default: 20%</li> </ul> <p><b>Pump protection / Set protection</b> – the setting of activation/ deactivation of protection against sticking of pump seals. Seal sticking may occur during long pump downtime.</p> <ul style="list-style-type: none"> <li>▪ Inactive</li> <li>▪ Active (default setpoint)</li> </ul> <p><b>Pump protection / Downtime period</b> – pump downtime period between activations with active pump protection.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 1 day</li> <li>▪ Upper limit: 30 days</li> <li>▪ Default: 7 days</li> </ul> <p><b>Pump protection / Activation time</b> – operating time setpoint pumps</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 1s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 30s</li> </ul>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Pre-heater</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Temp. setpoint</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;"><math>K_p</math> 1.0</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;"><math>T_i</math> 60s</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Min. valve opening 20%</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Pump protection</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Set protection Active</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Downtime period 7d</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Activation time 30s</div>
SETTINGS/ COOLING PUMP PROTECTION	
<p>Cooling pump protection- an optional function for the protection of the cooling medium pump against seal sticking. The details have been provided in the chapter <b>SETTINGS / HEATER</b>.</p>	
SETTINGS / DX COOLER	
<p><b>Min. operating time</b> - the setpoint of the minimum operating time of the air handling unit with a freon cooler</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 60s</li> </ul>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">DX cooler</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Min. operating time 60s</div>

<p><b>Min. downtime</b> - the setpoint of the minimum downtime for the air handling unit with a freon cooler</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0s</li> <li>▪ Upper limit: 3600s</li> <li>▪ Default: 60s</li> </ul> <p><b>Min. operating temp.</b>- the setpoint of the outside temperature locking cooler operation.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0 °C</li> <li>▪ Upper limit: +20°C</li> <li>▪ Default: +12°C</li> </ul>	<div data-bbox="1034 286 1425 394" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. downtime 60s</div> <div data-bbox="1034 416 1425 524" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. operating temp. 8°C</div>
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SETTINGS / RECOVERY

<p><b>Adjustment division</b>- the parameter defining which part of the signal 0..100% from the main temp. adjuster shall be used for controlling heat recovery.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0%</li> <li>▪ Upper limit: 100%</li> <li>▪ Default: 30%</li> </ul> <p><b>Anti-frost protection</b> – setpoint of the lower limit of exhaust air temperature downwards the recovery.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: -10 °C</li> <li>▪ Upper limit: +15°C</li> <li>▪ Default: +5°C</li> </ul> <p><b>Anti-frost protection Kp / Anti-frost protection Ti</b> – PI adjuster setpoints for the anti-frost protection.</p> <ul style="list-style-type: none"> <li>▪ Kp – enhancement</li> <li>▪ Ti – integral operating time</li> <li>▪ Default: Kp=5 / Ti=10s</li> </ul>	<div data-bbox="1034 714 1425 822" style="border: 1px solid gray; padding: 5px; text-align: center;">Heat recovery</div> <div data-bbox="1034 860 1425 967" style="border: 1px solid gray; padding: 5px; text-align: center;">Adjustment division 30%</div> <div data-bbox="1034 1003 1425 1111" style="border: 1px solid gray; padding: 5px; text-align: center;">Anti-frost protection 5°C</div> <div data-bbox="1034 1149 1425 1256" style="border: 1px solid gray; padding: 5px; text-align: center;">Kp Anti-frost protection</div> <div data-bbox="1034 1292 1425 1400" style="border: 1px solid gray; padding: 5px; text-align: center;">Ti Anti-frost protection</div>
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SETTINGS / MIXING CHAMBER

<p><b>Adjustment division</b>- the parameter defining which part of the signal 0..100% from the main temp. adjuster shall be used for the control of the mixing chamber.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0%</li> <li>▪ Upper limit: 100%</li> <li>▪ Default: 30%</li> </ul> <p>Min. fresh air- the setpoint of the minimum fresh air quantity</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 0%</li> <li>▪ Upper limit: 100%</li> <li>▪ Default: 30%</li> </ul>	<div data-bbox="1034 1527 1425 1635" style="border: 1px solid gray; padding: 5px; text-align: center;">Mixing box</div> <div data-bbox="1034 1673 1425 1780" style="border: 1px solid gray; padding: 5px; text-align: center;">Adjustment division 30%</div> <div data-bbox="1034 1816 1425 1924" style="border: 1px solid gray; padding: 5px; text-align: center;">Min. fresh air 30%</div>
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<p><b>Fast heating / Fast heating</b> – the setpoint of activation/ deactivation of fast heating functionality When this function is active and certain conditions have been complied with, the air handling unit shall perform heating upon full recirculation.</p> <ul style="list-style-type: none"> <li>▪ Inactive (default setpoint)</li> <li>▪ Active</li> </ul> <p><b>Fast heating / Temp. setpoint.</b> – temp. setpoint. for the fast heating function</p> <ul style="list-style-type: none"> <li>▪ Lower limit: 10 °C</li> <li>▪ Upper limit: 30 °C</li> <li>▪ Default: 18°C</li> </ul> <p><b>Fast heating / Hysteresis</b> – the setpoint of actual temperature deviation from the preset value that shall activate the fast heating function.</p> <ul style="list-style-type: none"> <li>▪ Lower limit: +2 °C</li> <li>▪ Upper limit: +10°C</li> <li>▪ Default: +4°C</li> </ul>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Fast heating Inactive</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px; text-align: center;">Temp. setpoint 18°C</div> <div style="border: 1px solid gray; padding: 5px; text-align: center;">Hysteresis 4°C</div>
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## ADVANCED INSTRUCTIONS

### 6. SERVICE MENU

The service menu contains all important setpoints that are required for the correct configuration and safe activation of the unit. Moreover, it contains the functionalities facilitating the maintenance and problem solving by the qualified service personnel.

#### SERVICE MENU / SERVICE MODE

**Service mode** - the setpoint enabling activation/ deactivation of the service mode

- Deact. – service mode deactivated, the controller ready for normal operation
- Act. – service mode activated, the controller ready for configuration and locked- no control functions can be performed
- The default status after the first connection of power supply shall be Act.- the service mode is the factory status, since the controller needs to be configured before the normal operation.

***Important!** The controller shall not switch to normal operation if the service mode is activated. After the termination of configuration, change service mode to Deact.!*

#### SERVICE MENU / APPLICATION SELECTION

**Application selection**- the sub-menu for entering application code that defines the actual type of the air handling unit.

- **Application type**– the letter setpoint of the application code, listed under technical data of air handling units.
  - AD
  - AP
  - AR
  - AS
  - ND
  - NS
- **Application code** – numerical designation of the application code
- 0..257

- **Code confirmation**– feedback which states whether the introduced code complies with the list of allowed applications.
- **Error**– check the entered application type and code.
- **OK** – setpoint correct

## SERVICE MENU/ CONFIGURATION

**S6 switch mode** – the setpoint for the universal digital input for the auxiliary S6 start/stop switch (Aux).

- **OR** – the status of S6 switch is logically summed up with the start / stop order set in the HMI  
*Important! OR is the default configuration*

- **AND** – the status of S6 switch is logically multiplied with the start / stop order set in the HMI  
The type of DI1 input- the configuration of the universal digital D1 input, three different modes can be selected:

- **S1F (Fire)** – the fire alarm signal, stopping and locking of the air handling units (until the alarm cause has been eliminated), NC dry contact
- **xSxH (Filters)** – warning of the excessive pressure drop on the filter, default setting for DI1, displays the alarm without affecting the air handling unit operation, NO dry contact
- **S6 (Aux)** – external start/stop signal, NO dry contact

*Important! The settings of DI1 input mode are available only for N... type application, in the case of which DI1 input is configurable. Since input functions are different for A... and N... applications, attention should be paid to application diagrams and the connections should be made according to the diagrams.*

**Master sensor / Master sensor** – the selection of the main sensor for temperature regulation.

- Supply T. – supply air temperature sensor
- HMI – room temperature sensor integrated with HMI OPTIMA

**Master sensor/ Max. HMI reaction time**- the waiting time for communication If the value is exceeded, the controller shall report the measurement error of the master sensor.

- Lower limit: 0s
- Upper limit: 100s
- Default: 15s

**DX protection mode**- the setpoint for the digital input of the freon unit alarm

- NC – normally closed (default)
- NO – normally open

**Fan inverter type** – the selection of the type of applied frequency converter of supply and exhaust fans

- iC5, iG5
- EC Comp. mini (EC Compacto Mini)

**Recovery inverter type** – the selection of the type of applied frequency converter of rotating recovery

- iC5, iG5
- EC Comp. mini (EC Compacto Mini)

**EC Modbus settings** – parametrization menu of EC Compacto Mini motor via the Modbus link

*IMPORTANT! During EC Compacto Mini motor parametrization it is necessary to disconnect the OPTIMA controller supply and exclusively the supply of the motor which we want to parametrize, e.g. exclusively the supply, the exhaust or the rotating recovery.*

**EC Modbus settings/ Current address** - the default Modbus address of EC Compacto Mini motor (factory set to 1)

**EC Modbus settings/ Additional address** - the Modbus address of EC Compacto Mini motor which shall be set in the motor after “loading the setpoints”

The setpoints of motor addresses required for the correct operation with the OPTIMA controller:

- 2 – supply
- 3 – exhaust
- 4 – rotating recovery

**EC Modbus settings / Status** - the information on the communication status between the Modbus of EC Compacto Mini motor and the controller

**EC Modbus settings / Load setpoints** – the loading of communication setpoints of EC Compacto Mini motor, before the initiation of setpoints loading make sure that:

- the correct connections of the supply and control (Modbus) have been performed of the OPTIMA controller and the selected EC Compacto Mini motor for which we want to load the setpoints
- the correct setpoints of the current and the target address have been performed
- the menu EC Modbus settings/ Status indicates the correct communication between the OPTIMA controller and the EC motor

**Tset 30% / 30s** – test start-up of the EC Compacto Mini motor with 30% efficiency during 30s

**RPM** – the Modbus readout of EC Compacto Mini motor speed

**Supply inverter / Communication** - the setpoint of activation/ deactivation of communication with the supply fan frequency converter

- Inactive (default)
- Active

**Supply fan / Modbus address** - the setpoint of the auxiliary address for frequency converter of the supply fan

**Supply inverter / Min. frequency** - the lower frequency limit, corresponding to 0% of the fan setpoint

- Lower limit: 10Hz
- Upper limit: 50Hz
- Default: 20Hz

**Supply inverter / Max. frequency** - the upper frequency limit, corresponding to 100% of the supply fan setpoint of the supply fan

- Lower limit: 10Hz
- Upper limit: 100 Hz
- Default: 60Hz

**Supply inverter / Acceleration time** - the setpoint for the acceleration time of the supply fan

- Lower limit: 30s
- Upper limit: 120s
- Default: 60s

**Supply inverter / Deceleration time** - the setpoint for the deceleration time of the supply fan

- Lower limit: 20s
- Upper limit: 100s
- Default: 60s

**Exhaust inverter / Max. frequency** - the upper frequency limit, corresponding to 100% of the setpoint of the exhaust fan

- Lower limit: 10Hz
- Upper limit: 100 Hz
- Default: 60Hz

**Exhaust inverter / Acceleration time** - the setpoint for the acceleration time of the exhaust fan

- Lower limit: 30s
- Upper limit: 120s
- Default: 60s

**Exhaust inverter / Deceleration time** - the setpoint for the deceleration time of the exhaust fan

- Lower limit: 20s
- Upper limit: 100s
- Default: 60s

**Rotating recovery inverter / ...** - the same settings for the frequency converter of the rotating exchanger motor

**Communication waiting time**- the setpoint of the maximum waiting time for subordinate device response. If this time is exceeded, the controller shall detect communication error. It is recommended not to modify this parameter.

Factory setpoint: 0.15s

**Communication interruption time** - the setpoint of idle time on the communication line between sending subsequent packages. It is recommended not to modify this parameter.

Factory setpoint: 0.5s

## SERVICE MENU / INPUT READOUTS

**Digital inputs**– the readout of the real status of digital inputs

- D1 - Open / Closed
- D2 - Open / Closed
- D3 - Open / Closed
- D4 - Open / Closed

**Sensor inputs**- the readout of real values of Pt1000 sensors

- P1
- P2
- P3

## SERVICE MENU / OUTPUT READOUTS

**Relay outputs**- the readout of actual statuses of digital outputs

- REL1 - Deact. / Act.
- REL2 - Deact. / Act.
- REL3 - Deact. / Act.

**Analogue outputs** – the readout of actual values of analogue outputs

- A1 – 0..10V
- A2 – 0..10V

## SERVICE MENU / INPUT EMULATION

**Digital inputs** - the overwriting of digital input statuses

- D1 – No / Set as open / Set as closed
- D2 – No / Set as open / Set as closed
- D3 – No / Set as open / Set as closed
- D4 – No / Set as open / Set as closed

**Sensor inputs** - the overwriting of actual values read out by Pt1000 temperature sensors

- Emulation P1 – Inactive / Active – choose Active in order to overwrite
- Temperature P1 – introduce value
- Emulation P2 – Inactive / Active – choose Active in order to overwrite
- Temperature P2 – introduce value
- Emulation P2 – Inactive / Active – choose Active in order to overwrite
- Temperature P3 – introduce value

## SERVICE MENU / FORCING OUTPUTS

**Relay outputs** - the overwriting of actual statuses of digital outputs

- REL1 – No / Force deact. / Force act.
- REL2 – No / Force deact. / Force act.
- REL3 – No / Force deact. / Force act.

**Analogue outputs** - the overwriting of actual values sent to digital outputs

- Forcing A1 – Inactive / Active – choose Active in order to overwrite
- Voltage A1 – 0..10V
- Forcing A2 – Inactive / Active – choose Active in order to overwrite
- Voltage A2 – 0..10V

## SERVICE MENU / RESTORING TO FACTORY SETTINGS

In order to restore factory settings of the controller, enter the SERVICE MENU / RESTORATION OF FACTORY SETTINGS and press OK, and later reconfirm.

**Important!** *The restoration of all factory settings leads to the permanent deletion of all settings introduced beforehand.*

In case of problems with the restoration of factory settings by the HMI (e.g. the HMI does not communicate with the controller) perform the following procedure:

- disconnect the power supply
- set all addressing switches as ON (remember the original setting in order to enter it after the performance of the procedure)
- connect the power supply (the alarm diode should be lit and emit continuous light)
- once again disconnect the power supply
- set the addressing switches in the previous combinations and connect the power supply
- (done)



SERVICE MENU / LPS ALGORITHM			
LPS algorithm indicates the speed of application execution in “loops per second”			
7. CONFIGURATION OF FREQUENCY CONVERTERS			
<p>Since the Modbus communication is used in the controlling unit for the control of frequency converters, the correct operation of the air handling unit requires the correct configuration of these devices before the activation of the air handling unit.</p> <p><b>Important!</b> <i>Incorrect configuration of frequency converters can lead to dangerous failure of the air handling unit!</i></p> <p>Maximally three inverters can be installed behind the OPTIMA controlling unit:</p> <ul style="list-style-type: none"> <li>▪ the frequency converter of a single supply fan</li> <li>▪ the frequency converter of a single exhaust fan</li> <li>▪ the frequency converter rotating exchanger (see the documentation: drive assembly for rotating exchangers)</li> </ul> <p><b>Important!</b> <i>Remember of the correct addressing of frequency converters, which is decisive for the correct operation of the air handling unit.</i></p>			
THE CONFIGURATION OF iC5, iG5 FREQUENCY CONVERTERS			
<p><b>Important!</b> <i>Factory settings of LS frequency converters can be restored by setting value 1 for H93 parameter and later by disconnecting and reconnecting the power supply.</i></p>			
Parameter setpoint	Code	Value	Comments
Manner of control	DRV	3	Modbus
Manner of referencing frequency	Frq	iC5:8 / iG5:7	Modbus
Manner of stopping	F4	0	slowdown time
Maximum output frequency	F21	100.0	Hz
Rated motor frequency	F22	50.0	Hz
U/f specifications	F30	1	square specifications
Motor overload protection	F50	1	active
Number of motor poles	H31	*	see the rating plate
Rated motor slip	H32	**	calculated
Rated motor current	H33	*	see the rating plate
Idle run current	H34	*	1/3 rated current
Modbus address	I60	*	2 – supply fan 3 – exhaust fan 4 – rotating recovery
Reaction to communication interruption	I62	2	stoppage time
Communication waiting time	I63	10.0	s
<p>The formula for the calculation of the rated slip:  <math>H32 = (1 - H31 * \text{rated\_rpm} / 6000) * 50 \text{ Hz}</math></p>			
THE CONFIGURATION OF EC COMPACTO MINI MOTORS			
<p><b>Important!</b> <i>EC Compacto Mini motors do not have an incorporated display. The configuration of EC Compacto Mini motors takes place automatically via Modbus communication during the EC motor loading, see SERVICE MENU / CONFIGURATION / EC MODBUS SETTINGS.</i></p>			

## 8. ALARM OPERATION

The alarm status is indicated by the flashing screen on HMI OPTIMA device, by the switch of the relay output and by the LED diode on the main PCB controller inside the control box.

In the HMI the access to the alarms is available through the Alarms Menu. The menu can be accessed after long pressing of the [C] button (for approx. 3 s).

**Important!** Under factory settings mode, the HMI automatically switches to the Alarms Menu when the alarm is triggered. Real behaviour depends on HMI settings.

Each alarm is displayed in the following manner:

A9\_HW\_ThAir  
09:05.16 22-10

when A9\_HW\_ThAir means the alarm name, the bottom line indicates the date and the time of alarm activation. Apart from the displayed text, the alarm diode starts to flash when a new alarm appears.

All alarms can be divided into two groups:

- Self-resetting alarms – the air handling unit is activated automatically when the alarm signal disappears, marked with codes A1, A2 ...
- Locking alarms– air handling unit restart requires a manual confirmation, marked with codes A50, A51...

In order to confirm the alarm it is necessary to hold the [OK] button. Earlier the alarm cause should be eliminated. Otherwise the symbol [\*] shall be displayed next to the alarm name, informing that the cause of alarm has not been eliminated. In such case the diode will stop to flash and it will emit a red light.

**Important!** Each locking alarm requires a separate confirmation. Holding the [OK] button only confirms the alarm displayed on the HMI.

### THE LIST OF SELF-RESETTING ALARMS

Alarm name	Description	Input	Controller reaction
A1_Filter	indicates filter contamination	D3	no reaction
A2_FCsCom	the communication error of supply fan converter	Modbus	immediate stop
A3_FCeCom	the communication error of exhaust fan converter	Modbus	immediate stop
A4_Tmain	the outage of the master temperature sensor	–	air handling unit deactivation
A5_Tsup	the outage of the supply temperature sensor	P1	air handling unit deactivation
A6_Tout	the outage of the outside temperature sensor	P2	air handling unit deactivation
A7_Trec	the outage of the exhaust temperature sensor downwards the recovery	P3	air handling unit deactivation
A8_HE_Th	electric heater overheating alarm	D2	air handling unit deactivation
A9_HW_ThAir	water heater anti-freeze alarm	D2	air handling unit deactivation, pump activation, valve 100%
A10_DX	freon cooler alarm	D2	cooler stoppage
A11_FCrCom	the communication error of rotating exchanger relay	Modbus	air handling unit stoppage
A12_InEmul	input emulation	–	air handling unit deactivation
A13_OutForce	output forcing	–	air handling unit deactivation
A14_Troom	lack of HMI room sensor	Modbus	air handling unit deactivation
A15_preHW_ThAir	anti-freeze alarm of the water pre-heater	D3	air handling unit deactivation
A16_Tbwtr	the outage of the back water temp. sensor	P3	air handling unit deactivation

			air handling unit deactivation
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### THE LIST OF BLOCKING ALARMS

Alarm name	Description	Input	Controller reaction
A50_MotSup	motor / supply frequency converter alarm	Modbus	immediate stop
A51_MotExh	motor / exhaust frequency converter alarm	Modbus	immediate stop
A52_3xTmain	the error of the master temperature sensor which is repeated 3x during an hour	–	air handling unit deactivation
A53_3xTsup	the error of the supply temperature sensor which is repeated 3x during an hour	P1	air handling unit deactivation
A54_3xTout	the error of the outside temperature sensor which is repeated 3x during an hour	P2	air handling unit deactivation
A55_3xTrec	the error of the exhaust temperature sensor downwards the recovery which us repeated 3x during an hour	P3	air handling unit deactivation
A56_3xHE_Th	electric heater overheating alarm which is repeated 3x during an hour	D2	air handling unit deactivation
A57_3xHW_ThAir	water heater anti-freeze alarm which is repeated 3x during an hour	D2	air handling unit deactivation, pump activation, valve 100%
A58_3xDX	freon cooler alarm which is repeated 3x during an hour	D2	cooler stoppage
A59_MotRRG	the alarm of the protection of the motor/ rotating exchanger frequency converter	Modbus	air handling unit deactivation
A60_Fire	the activation of fire protection via the binary input	D1	immediate stop
A61_3xTroom	the error of the room temperature sensor which is repeated 3x during an hour	–	air handling unit deactivation
A62_3xTbwtr	the error of the back water temperature sensor which is repeated 3x during an hour	P3	air handling unit deactivation

### 9. TECHNICAL DATA

Parameter	VS10–75 CG OPTIMA	VS40–150 CG OPTIMA SUP	VS40–150 CG OPTIMA SUP–EXH
Weight	6.5	7.0	7.5
Dimensions W x H x D	240x300x130	240x400x130	240x400x130
Electric supply system	TN		
Rated supply voltage	~230V	3~400V	3~400V
Rated current I <sub>n</sub>	31A	28A	49A
Rated insulation voltage U <sub>i</sub>	400 V		
Rated impulse withstand voltage U <sub>imp</sub>	2.5 kV		
Rated short-time current I <sub>cw</sub> for specific circuits – the effective value of the periodic component withstood for 1 second, i.e. the expected short-circuit current at rated connection voltage	6kA		
Peak rated withheld current I <sub>pk</sub> at cosφ = 0.5	10.2kA		
Rated short-circuit current	6kA		
Rated simultaneity factor	0.9		
Nominal frequency	50Hz±1Hz		
Protection rating	IP20		
Approved working temperature	0...+40°C		
Supply voltage of control circuits	24 VAC		
EMC environment	1		

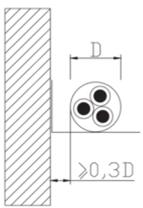
**PARAMETERS OF THE PROTECTION DEVICES**

F1	6.3A / 250V 5x20 glass fuse
F2	6.3A / 250V 5x20 glass fuse
F3	10A / 250V 5x20 ceramic fuse
F4	10A / 250V 5x20 ceramic fuse

**INPUTS/ OUTPUTS EQUIPMENT CHARACTERISTICS**

<b>Digital inputs D1..D4</b> Nominal input supply High status discovered in the range of	24 VAC / 24 DC 15..27VAC / 16..38VDC
<b>Temperature measurement outputs P1...P3</b> Sensor type Min. resistance load Refreshment time Scope Accuracy Resolution	Pt1000 0Ω 60 ms -76..+105°C ±0.5°C 8bits / °C
<b>Analogue outputs A1, A2...</b> Nominal voltage Max. load Min. resistance load Resolution	0..10V 20 mA 500Ω 7 bits / V
<b>Relay outputs</b> Max. switching voltage Min. switching voltage Rated current in AC1 / DC1 class The minimum current Rated long-term load	250 VAC 5VDC 8A 10mA 8A

**10. CABLING**

	The wires supplying the controlling unit and the fan drive shall be connected in compliance with the Electrical Diagram. Wire cross-sections have been selected in compliance with long-term current load capacity of multi-core wires routed in the air (on supports, ladders, in perforated trays) located far from the wall with at least 0.3 of wire diameter in PVC insulation for 3 loaded cores. Due to the selectiveness of protections, the length and the manner of wire routing and short-circuit currents it is necessary to verify cross-sections of the supply wires listed in the table.
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Wire type	Drawing	Description	Parameters
[1]		Control wires with copper cores shielded with copper wires in PVC insulation	Nominal voltage: 300/500 V Ambient temperature: -30 do +80°C
[2]		Multi-core wires with copper cores in PVC insulation	Nominal voltage: 450/750V Ambient temperature: -40 do +70°C
[3]		Multi-core wires with copper cores in PVC insulation	Nominal voltage: 150 V Outside temperature; -20... +60°C

Name of element/ connection point	Symbol	Wire type	Cross-section [mm <sup>2</sup> ]
Controlling unit supply	CG	[2]	Table A
controller	N1	–	–
fire alarm relay	S1F	[2]	2x0.75
multi-function switch	S6	[2]	2x0.75
supply air temperature sensor	B1	[1]	2x0.75
outside air temperature sensor	B3	[1]	2x0.75
exhaust air temperature sensor downwards the recovery system	B4	[1]	2x0.75
alarm relay of the electric heater	ter.22:23 VTS-E-0005	[2]	2x0.75
anti-freeze thermostat of the water heater- air side	S2F	[2]	2x0.75
analogue valve of the heater and the water cooler	Y1	[1]	3x0.75
the power control input of the electric heater	ter.15:21 VTS-E-0005	[1]	3x0.75
the contactor of the water heater circulation pump	M1	[2]	3x1.5
return water temperature sensor of the heater	B7	[1]	2x0.75
anti-freeze thermostat of glycol pre-heater	S6F	[2]	2x0.75
analogue valve of glycol pre-heater	Y6	[1]	3x0.75
circulation pump of glycol pre-heater	M3	[2]	3x1.5
alarm relay of the cooling device	S5F	[2]	2x0.75
activation input of the cooling system	E1	[2]	2x0.75
activation input of the cooling unit- grade I	E2.1	[2]	2x0.75
analogue signal controlling the cooling device	Y2	[1]	3x0.75
frequency converter of the rotating exchanger	U1	[1] [2] [3]	3x1.5 / 4x1.5
alarm signal of the rotating heat exchanger	via Modbus	[3]	UTP 2x2
the output of activation of rotation of the heat exchanger			
input of reference speed signal of the rotating heat exchanger			
recirculation damper actuator	Y3	[1]	3x0.75
by-pass relay of the cross-flow exchanger	Y4	[1]	3x0.75
analogue valve of the heater and the water cooler	Y5	[1]	3x0.75
Air handling unit alarms	E4	[2]	2x0.75
HMI OPTIMA	N3	[3]	UTP 2x2
<b>Supply elements</b>			
pressure switch of the pre-filter status control, supply	1S1H	[2]	2x0.75
pressure switch of the secondary filter status control, supply	1S2H	[2]	2x0.75
pressure switch of the fan compression control of the electric heater control module	1S3H	[2]	2x0.75
frequency converter of the supply fan	1U1	[1] [2] [3]	Table A UTP 2x2
damper actuator - supply	1Y1	[2]	3x0.75
<b>Exhaust elements</b>			
pressure switch of the control of pre-filter status, exhaust	2S1H	[2]	2x0.75
exhaust fan frequency converter	2U1	[1] [2] [3]	Table A UTP 2x2
damper actuator- exhaust	2Y1	[2]	3x0.75

**Table A**

Rated motor power	Rated motor current	Frequency converter fuse	Wire supplying the frequency converter	Wire supplying the motor	Wire supplying the control box		Rated control box current	
[kW]	[A]	–	[mm <sup>2</sup> ]	[mm <sup>2</sup> ]	[mm <sup>2</sup> ]		[A]	
3~230V / 50Hz		~230V / 50Hz	–	–	Air supply	Supply-Exhaust	Air supply	Supply - Exhaust
0.55	2.5	gG10	3x1.5	4x1	3x1.5	3xTable C	14	Table B
0.75	3.0	gG10	3x1.5	4x1.5	3x2.5		14	
1.1	4,5	gG10	3x1.5	4x1.5	3x2.5		17	
1.5	6.0	gG20	3x2.5	4x1.5	3x4		17	
2.2	8.0	gG20	3x2.5	4x1.5	3x4		20	
3~400V / 50Hz		3~400V / 50Hz						
3.0	6.0	gG16	4x2.5	4x2.5	5x4	3xTable C	8 / 7.5 / 13	Table B
4.0	8.0	gG16	4x2.5	4x2.5	5x4		10 / 9.5 / 15	
5.5	11.0	gG20	4x2.5	4x2.5	5x4		13 / 12.5 / 18	
7.5	15.0	gG20	4x2.5	4x2.5	5x6		18 / 16.5 / 22	
11.0	21.0	gG25	4x4	4x4	5x6		23 / 22.5 / 28	

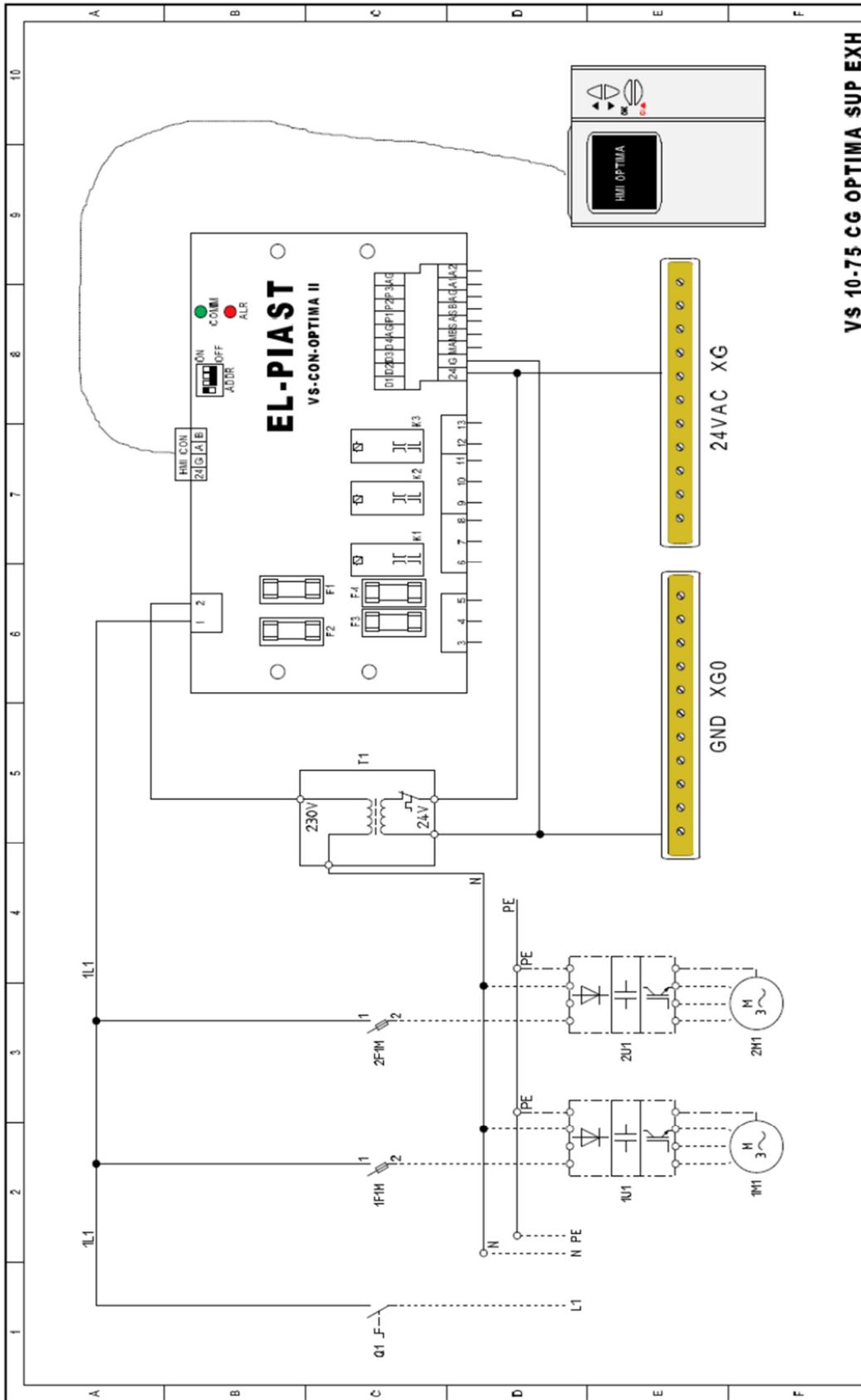
**Table B**

P	0.55 kW			0.75 kW			1.1 kW			1.5 kW			2.2 kW			3 kW			4 kW			5.5 kW			7.5 kW			11kW				
kW	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3		
0.55	19																															
0.75	19			19																												
1.1				22			25																									
1.5				22			25		25																							
2.2				25			28		28			31																				
3				12.5	10	13	14	10	13	15.5	10	13	17.5	10	13	14	13.5	19														
4				14.5	12	15	16	12	15	18.5	12	15	19.5	12	15	16	15.5	21	18	17.5	23											
5.5				17.5	15	18	18	15	18	20.2	15	18	22.5	15	18	19	18.5	24	21	20.5	26	24	23.5	29								
7.5				21.5	19	22	23	19	22	24.5	19	22	26.5	19	22	23	22.5	28	25	24.5	30	28	27.5	33	32	31.5	37					
11				27.5	25	28	29	25	28	30.5	25	28	32.5	25	28	29	28.5	34	31	30.5	36	34	33.5	39	38	37.5	43	44	43.5	49		

**Table C**

P [kW]	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11
0.55	4									
0.75	4	4								
1.1		4	6							
1.5		6	6	6						
2.2		6	10	10	10					
3		6	6	6	6	6				
4		6	6	6	6	6	6			
5.5		6	6	6	10	10	10	10		
7.5		10	10	10	10	10	10	10	10	
11		10	10	10	10	10	10	16	16	16

# 11. ELECTRICAL DIAGRAMS



VS 10-75 CG OPTIMA SUP EXH



