

VERSO-S

Series Air Handling Units with C3 Control System
Electrical Installation and Operation Manual

| | |
|---|----|
| 1. INSTALLATION MANUAL | 3 |
| 1.1. Air Handling Units Sections Connection | 3 |
| 1.2. Electric Power Supply Connection | 3 |
| 1.3. External Elements Connection | 4 |
| 1.4. Temperature Sensors Installation | 5 |
| 1.5. Control Panel Installation | 5 |
| 2. OPERATION MANUAL | 6 |
| 2.1. Unit Control | 6 |
| 2.2. Switching on the Unit | 6 |
| 2.3. Control Panel Indication | 7 |
| 2.4. Parameters Review | 8 |
| 2.5. Quick Ventilation Level Switchover | 8 |
| 2.6. Unit Programmable Settings | 8 |
| 2.7. Other Control Functions | 12 |
| 2.8. Unit PC control | 13 |
| 2.9. Troubleshooting | 13 |
| Unit Functional Diagrams | 15 |
| Specification | 16 |
| Wiring Diagram | 17 |

1. INSTALLATION MANUAL

Installation works can be performed only by the specialists that have required qualification. During installation following requirements must be fulfilled.

 It is recommended to lay control cables separately from power cables, or use shielded cables. In such case it is necessary to earth cable shielding!

1.1. Air Handling Units Sections Connection

After unit parts have been connected together (see unit installation instruction), unit sections connecting cables and wires are connected.

 Connector connection is performed strictly according to numeration given in wiring diagram, or adequate markings (see unit electric scheme).

 When disconnecting unit sections, do not pull by connecting wires and cables!

1.2. Electric Power Supply Connection

Electrical power supply (400V AC; 50Hz voltage) is connected to the main switch, located on the outside unit wall. It is necessary to connect earthing! When unit is equipped with electric heater, there is a need to connect additional supply to each heaters section main switch.

Unit and electric heater supply cable is selected according to given maximum current in the technical data pages. Cable types are shown in the 1.2 Table:

1.2 Table

Electrical Power Supply Cable Types

| Current, A | Cable Type |
|------------|-------------------------------|
| 15 | 5 x 1,5 mm ² (Cu) |
| 21 | 5 x 2,5 mm ² (Cu) |
| 27 | 5 x 4,0 mm ² (Cu) |
| 34 | 5 x 6,0 mm ² (Cu) |
| 50 | 5 x 10,0 mm ² (Cu) |
| 70 | 5 x 16,0 mm ² (Cu) |
| 85 | 5 x 25,0 mm ² (Cu) |

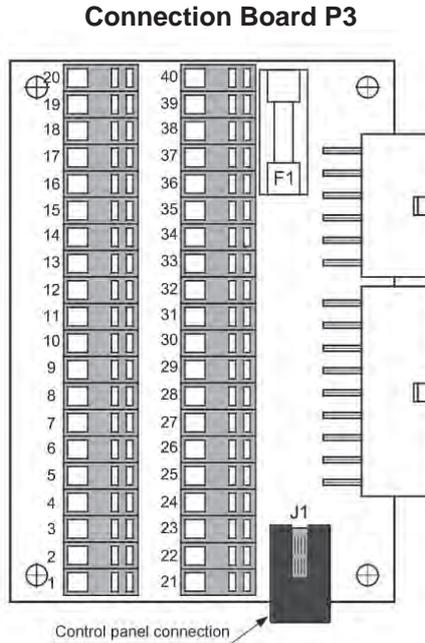
 Unit must be connected to the stationary installation by solid cable through circuit breaker with 300mA current leakage protection.

 Before connecting unit to the electrical power supply, it is necessary to check whether earthing has been installed properly.

1.3. External Elements Connection

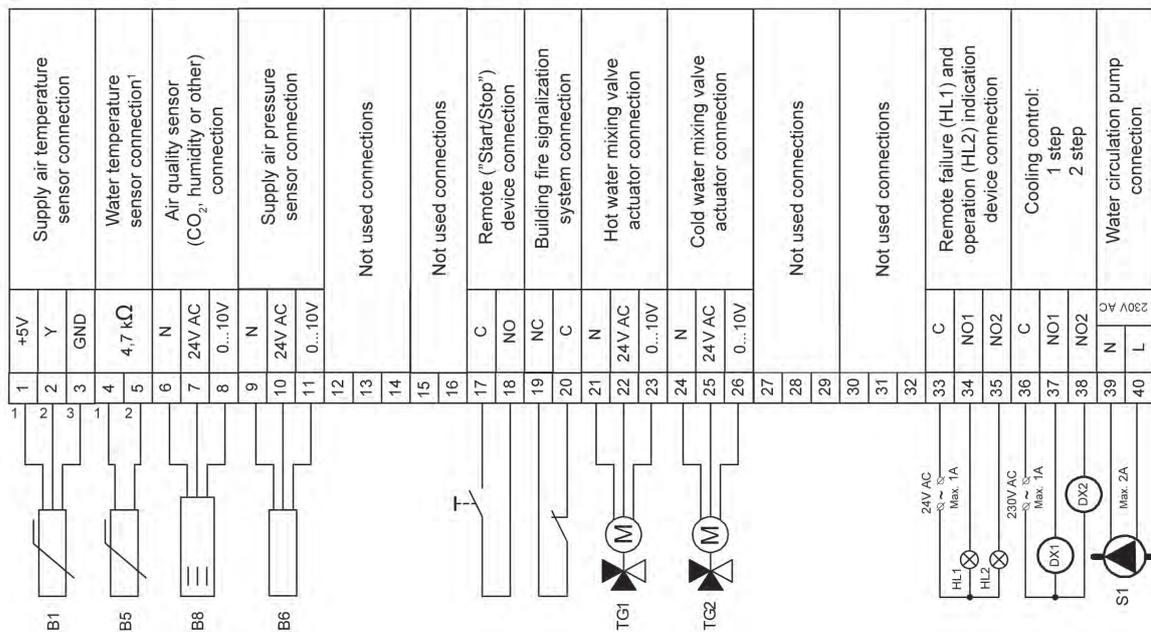
Air handling unit is provided with connection board (1.3 Picture). All external elements are connected to connection board.

1.3 Picture



1.3 a Picture

Control System External Elements Connection Diagram



¹ used only in the units with water heater.

⚠ Pump control output! Direct connection is intended only for small power pumps without ground.

1.4. Temperature Sensors Installation

Supply air temperature sensor B1 (1.4a Picture) is mounted in the air duct in a projected place for it; after electric heater or cooler section (if provided). The minimal distance from the air vent of the unit up to the sensor should be not less than double diameter of the circular connection or a diagonal of rectangular connection.

Water temperature sensor B5 (1.4b Picture) is mounted on the return water pipe, as close as possible to the heater case. It is recommended that the sensor would be thermo insulated!

 Temperature sensors and control panel connections must be sealed with PVC isolation tape.

1.4a Picture

Supply air temperature sensor B1



1.4b Picture

Water temperature sensor B5

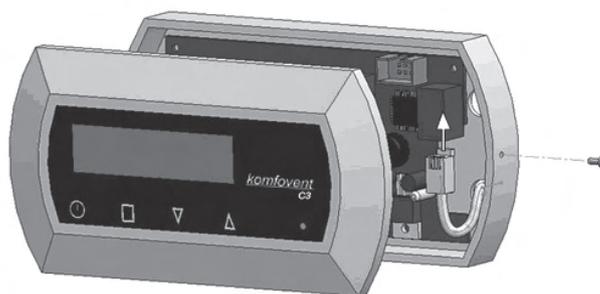


1.5. Control Panel Installation

1. Control panel must be installed in the room under given following conditions:
 - ambient temperature range 0°C ... 40°C;
 - relative humidity limits 20% ... 80%;
 - protection must be ensured from accidentally vertically falling water drops (IP X2).
2. Installation height must be not less than 0,6 m from the ground.
3. Control panel connection is projected through the hole in its backside.(see 1.5 Picture).
4. Control panel is fixed after screwing two holes on the fastening surface.

1.5 Picture

Control Panel Connection



Control panel is connected to connection board J1 socket (1.3 Picture). The length of the cable between the control panel and the unit should not exceed 150 m. Cable type is specified in unit wiring diagram.

 When closing the panel window, do not bend the springs inside as this may inhibit the functions of the panel buttons! Disconnect power supply prior to connecting the control panel!

 Control panel connection and other cable thicknesses are specified in the wiring diagram!

2. OPERATION MANUAL

2.1. Unit Control

Air handling units control system ensures control of the physical processes that are taking place inside the air handling unit. Control system consists of:

- controller board;
- fuses, power and intermediate control boards, which are installed inside the unit;
- control panel, which can be installed in the convenient place for the user;
- air damper actuators;
- pressure and temperature sensors.

Control panel (2.1 Picture) is designed for remote air handling unit control, setting and display of controller parameters. Control panel LCD display with backlight allows monitoring various parameters and text messages. Controller light signals indicate unit operation modes and failures. Air temperature, ventilation intensity, operation modes and other parameters are set by the touch sensitive buttons.

2.1 Picture

General View of the Control Panel



Touch sensitive buttons located on the panel mean:

 start up and shut down of the air handling unit / return to previous menu window;

 entry to parameters change menu / set parameters confirmation;

 navigation in the menu / parameters value change.

2.2. Switching on the Unit

After connecting the unit to the electrical power supply, on the control panel LCD displays start-up window, this is shown in the Picture 2.3.

Unit is switched on (off) by touching and holding  button for 4 seconds till sound confirms the action. After switching on, unit will start operating after short delay (about 60 seconds), until air dampers open up, and fans start running. Unit operation is indicated in the control panel by ventilation intensity and LED signals (see further).

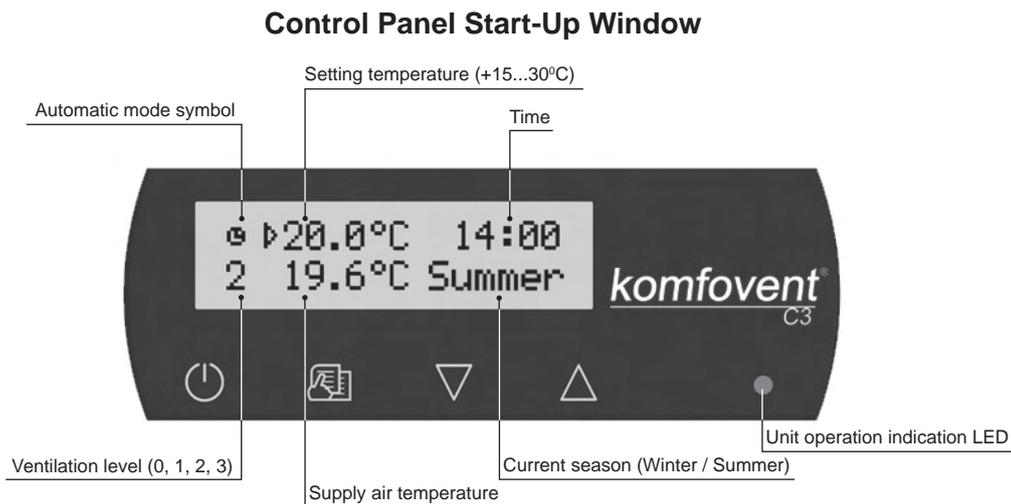
 Do not switch on the unit without connected earthing! Make sure, whether all unit sections are tightly interconnected.

2.3. Control Panel Indication

Data is presented to the user on the control panel LCD display by numbers and text messages, also by two colour LED signals.

Controller display start-up window is shown in the 2.3 Picture.

2.3 Picture



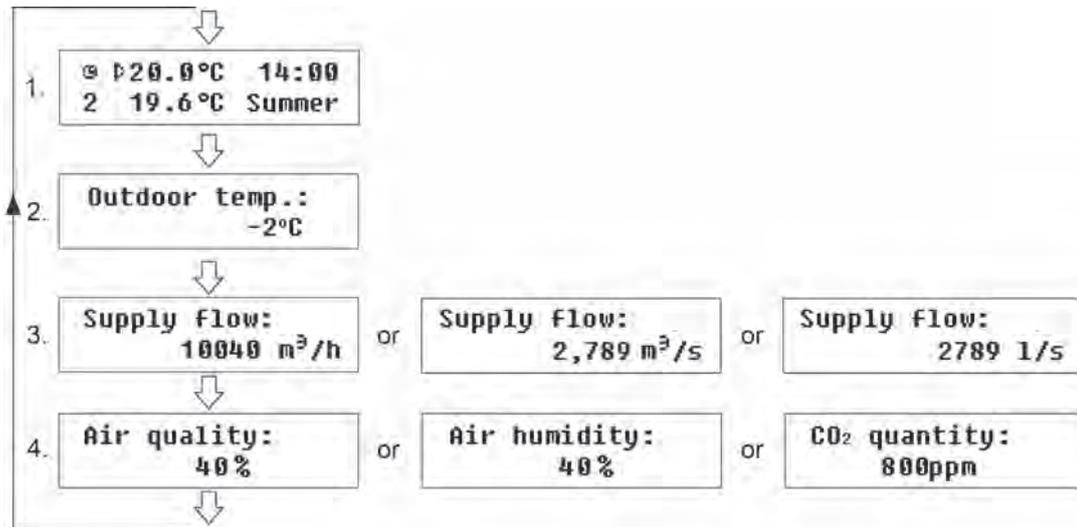
Light Diode Indication:

1. No LED signal indication on the panel – **unit has been switched off.**
2. LED shines steady green and text message is shown – **unit is switched on.**
3. Automatic mode symbol is shown on the panel, while green LED shines – **unit is operating in automatic mode according to weekly schedule.**
4. LED blinks red and green and text message is shown – see 2.9 chapter.
5. LED shines steady red and text message is shown – **emergency unit shut down** (see 2.9 chapter).
6. Nothing is showing on the control panel - **unit does not have electric power supply.**

Note: By pressing any button on the panel automatically switching on the display backlight. Backlight is off after 30 seconds when no buttons are pressed.

2.4. Parameters Review

Main parameters are shown in the start-up window (2.3. Picture). To view other parameters (temperature value or air flow indication) touch ,  buttons till corresponding window appears:



 There is possibility to change air flow indication from m³/h to m³/s or l/s. All you need to do is to press  button while being in an air flow indication window and holding this button go “up” and “down” with ,  buttons till you select the right measures.

 Depending on the type of mounted air quality sensor, the 4th window may appear in one of three ways. It appears when air quality function is activated (see Air quality function setting on page 11).

2.5. Quick Ventilation Level Switchover

Three ventilation levels are projected in the unit. Each of them has its intensity (more detailed settings see in the next chapter). There is possibility to switch ventilation level quickly from start-up window (2.3 Picture).

To increase ventilation intensity: touch and hold  and at the same moment increase ventilation intensity by touching .

To decrease ventilation intensity: touch and hold  and at same moment decrease ventilation intensity by touching .

 If ventilation intensity is changed using quick switchover and unit is operating according to weekly schedule, operation mode automatically is changed to manual mode.

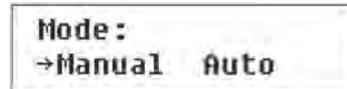
2.6. Unit Programmable Settings

By soft touching  button the parameters menu is entered. Menu window is selected by buttons ,  (see further description). When menu window is selected, touch  for selecting desirable parameters and select the value with , . To confirm the changes touch . To return to previous menu or to start-up window touch .

Note: If touch sensitive buttons are inactive for 1 minute, start-up window is shown.

1. Unit operation modes setting

Two unit operation modes are possible: manual and automatic. In manual mode unit operates continuously by set ventilation intensity. In automatic mode unit works according to weekly schedule (see further weekly schedule setting).

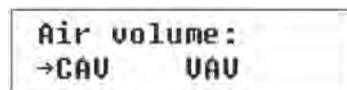


Note: If automatic operating mode is selected, there is a symbol  in the start-up window.

2. Air volume control setting

Supply and exhaust air volumes control modes have been projected in the unit:

- Constant air volume (CAV) control mode - unit supplies and exhausts constant air volume preset by the user, independent of the processing changes in the ventilation system;
- Variable air volume (VAV) control mode - unit supplies and exhausts air volume correspondingly to the ventilation requirements in different premises. In case of frequently changing ventilation demands this air volumes maintenance mode signally reduces unit exploitation costs.



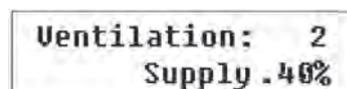
If air handling unit is provided with variable air volume control function, primary control mode calibration (look further) is essential, otherwise after choosing VAV mode unit will not operate.

Variable air volume control mode calibration:

1. Before activating the device you should adjust air distribution and exhaust devices in ventilation system, open all valves for variable air flow in a way enabling air supply to all ventilated premises.
2. Switch on the unit and by choosing menu window for air volume control setting (see above) actuate constant air volume maintenance mode.
3. After choosing the CAV mode and being at the same menu window touch both  and  buttons at the same moment. After this, calibration will start for 3 minutes and during this time unit will start working on maximum ventilation intensity and there will be displayed „Wait...“ on the control panel. During calibration process all buttons are inactive, except , which allows to shut down the unit and stop the calibration.
4. After finishing the calibration process, air handling unit further will operate in the previously settled mode.

3. Setting ventilation level

Three ventilation levels have been projected in the unit: 1, 2 and 3. Each of these levels may be set for manual or automatic operation mode. To set ventilation level in manual mode, select menu window:



For each of three ventilation intensity levels maintained air flow can be adjusted and set separately for supply and exhaust air. It can be set from 20 up to 120% by 1% steps.



Air handling unit is designed and calculated to operate on maximum 100% intensity with exceptions when intensity might be set more than 100%.

4. Setting temperature value

Air handling unit maintains preset temperature by the user. To set temperature value select menu window:

```
Setting temp.:
  > 20.0 °C
```

5. Setpoint sliding

The setpoint can be shifted from -9 to +9°C from the temperature set value at specified by user time period. To set setpoint sliding select menu window:

```
Setpoint sliding
  0 °C 00:00 00:00
```

6. Exhaust air recirculation

Air handling unit with recirculation section has air recirculation function, that is, when for a specified time period all exhaust air flow is returned back to the room.

```
Recirculation:
  Off 00:00 00:00
```

“On”- recirculation function on.

“Off”- function off.



This function is provided only for units with recirculation section; otherwise this menu window is not available on the control panel.

7. Air quality function setting

To set the air quality (AQ) function select menu window:

```
"AQ" function:
  On VOC1 40%
```

“On” - AQ function on.

“Off” - function off.

After function is activated, the type of sensor, which is connected to the unit, is selected:

“VOC1” (Volatile Organic Compound) – air quality sensor having signal-dependent linear relationship, the maximum value of output signal corresponds to the highest air quality.

“VOC2” – air quality sensor having inverse relationship, the maximum value of output signal corresponds to lowest air quality.

RH – relative humidity sensor.

CO₂ - carbon dioxide sensor.

Depending on the sensor type, the value of AQ function is set, according to it the intensity of the unit is regulated. If actual air quality value varies from the setpoint then ventilation intensity will increase otherwise – decrease.

For instance, if the humidity maintaining system is designed in the device, and there is additional relative humidity (RH) sensor, then by setting 65% in the air quality window, and by regulating the intensity of ventilation automatically, humidity of 65% will be maintained, i.e. if humidity increases, ventilation intensity will be increased as well, and if humidity reduces, the device will switch back to the previous mode.

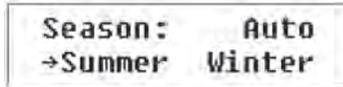
```
"AQ" function:
  On RH 65%
```

8. Season setting

For the air handling unit operating in most economical mode, summer and winter seasons have been provided.

- By setting “Winter” season, unit cooling function is blocked.
- By setting “Summer” season, unit heating function is blocked.
- By setting “Auto”, automatic season selection will take place. Depending on the heating and cooling demand, the season is selected automatically.

To set season select menu window:



Note: If air temperature during summer season is insufficient, air handling unit can be preset and for “Winter” season mode, its energy expenditures will be minimal.

9. Day and time setting

For the unit proper operation in automatic mode according to preset weekly schedule the day of the week and time should be set:



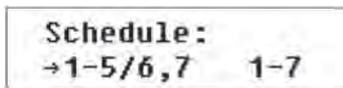
Days notation:

Mo – Monday, Tu –Tuesday, We – Wednesday, Th – Thursday, Fr – Friday, Sa – Saturday, Su – Sunday

10. Weekly schedule setting

Two ways for weekly schedule setting have been projected:

- “1-5/6,7” - simplified schedule setting option: one schedule for all work days and the other for weekend operation;
- “1-7” - weekly schedule setting option: different operation schedule for each day.



 There is one operation schedule with two setting options.

After selecting program for each day of the week “1-7” schedule setting window is introduced:

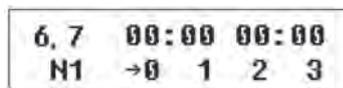


Each day of the week has 3 events: N1, N2, N3. Settings start from Monday (Mo). When the event of the day is selected, event start and end time is set and ventilation intensity level (0, 1, 2, 3) is assigned.

Before selecting work days and weekend operation mode schedule “1-5/6,7” menu window is introduced:



After event (N1, N2, N3) is selected for work days “1-5”, each event start and end time and ventilation intensity is set the same way. The same way three unit operating events are set for the weekend:

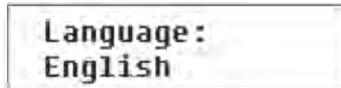


Note: Every event start and end time is set from 0:00 to 23:59 h.

For instance: Monday: N1 from 00:00 to 07:00 2 ventilation level
 N2 from 10:00 to 20:00 1 ventilation level
 N3 from 20:00 to 23:59 3 ventilation level

11. Language setting

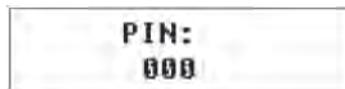
Language selection menu has been projected on the control panel. To set language the last menu window should be selected:



12. Menu locking

The PIN code is provided to lock entering to the parameters setting menu. If the menu is locked, only main parameters can be reviewed also the unit may be switched on or off.

To enter the PIN code, touch  +  and hold for 4 seconds till corresponding window appears:



To enter the PIN code follow these steps:

1. Touch  or  to enter the first digit.
2. Touch  to go to the second digit.
3. Repeat the steps above to enter the second and the third digits.
4. After third digit is entered touch  to confirm the code.
5. Touch  and  and hold for 4 seconds to save the code into controller memory.

 The menu can be unlocked only with the PIN code. If the code is forgotten, contact local service team.

2.7. Other Control Functions

1. Remote unit control

Unit is provided with remote control possibility using external device (button, timer, other sensor), which is connected to the contacts 17, 18 (see chapter 1.3) of the connection board.

This function can perform one of two operations:

- remote unit switching on and off;
- remote unit intensity control (additional ordered function).

1.1. Remote unit switching on or off

If the unit is not operating according to programmed week schedule, by connecting (short-circuit) 17, 18 contacts unit will be switched on and will operate with the intensity set in the menu window „Ventilation“ (see page 10); by disconnecting contacts unit operation will return to previous mode. If unit is operating in auto mode with chosen intensity, to switch it off by remote switch contacts 17, 18 must be connected (short-circuit).

 Remote unit switching on and off is available only when auto mode is set!

1.2. Remote unit intensity control

If this function is ordered in advance, unit intensity will be controlled by contacts mentioned above.

If contacts 17, 18 are interconnected, the fourth level of intensity will be activated, after disconnecting – unit will return to previous mode. Adjusting intensity of the fourth level for supply and exhaust fans is performed in the „Ventilation“ window, only when this function is activated, i.e. when these contacts are short-circuited.

 Remote unit intensity control has the highest priority and operates in every mode, even the unit is switched off.

2. Ventilation correction in the winter

In wintertime, when heating power is not enough and supply air temperature is below setting value, ventilation intensity automatically is decreasing in one level. If there is not enough, one more level (up to minimum) till set supply air temperature will be maintained.

3. Pump control

Units with water heater are designed with water circulation pump control. In winter pump operates continually, in summer season it is off. When outdoor temperature is lower than 5°C, pump is automatically turned on. Pump is connected to the connection box contacts (see 1.3. chapter).

4. Remote unit operation and failure indication

If the information about unit operation mode is requested (when unit is operating and when is not) indication device (for ex. bulb) must be connected to the contacts 33 and 35 of connection board. In the connection box (see chapter 1.3.) are provided 33, 34 contacts, which are intended for connection of unit's emergency stop indicating device, for ex. bulb.

5. Summer night cooling*

If the room temperature (exhaust air) in summer at night is 5°C higher than the setpoint and the outside temperature is between 12°C and the setpoint, the ventilation level is automatically switched to the third intensity level at 00:15 am. The unit will operate at the third intensity level till 06:00 am (the end of the set function) or when the outside air cools down (warms up) too much, or the room temperature equals the setpoint. The summer night cooling is being performed only by fans, without heat or coolness recovery and additional air heating or cooling. When function is switched off the unit continues operating at the previous mode.



Function starts operating automatically only if the unit operates at the first or second ventilation intensity level. Function stops operating, when the ventilation intensity level is being changed.

* - additionally ordered function.

2.8. Unit PC control

This is additionally ordered function and for it implementation special network module "Ping" is provided. Connection diagrams and installation requirements of network module are given in the "Ping" module installation manual.

After connecting units through special network modules to computer network or Internet and given an IP address, *Ventilation Control System* visualization program allows the operator from his computer not only to monitor, but also to control air handling units operation: to turn on/off, change ventilation intensity and etc. It also allows indicating failures. Detailed unit computer control description is given in the computer program using instruction.

2.9. Troubleshooting

If the unit is not working:

- Make sure if the unit is connected to the electrical power supply.
- Check if the unit main switch is on, it is located on the unit wall (if designed).
- Check all control block fuses. If needed, change failed fuses with the new ones that are the same electrical parameters as old ones (fuses types are shown in wiring diagrams).
- Check if there is not failure indication on the control panel. If there is indication, it needs to be eliminated first. To eliminate failure use 2.9 Table, which describes failures.
- If nothing is indicating on control panel, check whether cable connecting control panel with the unit is not damaged.

2.9 Table

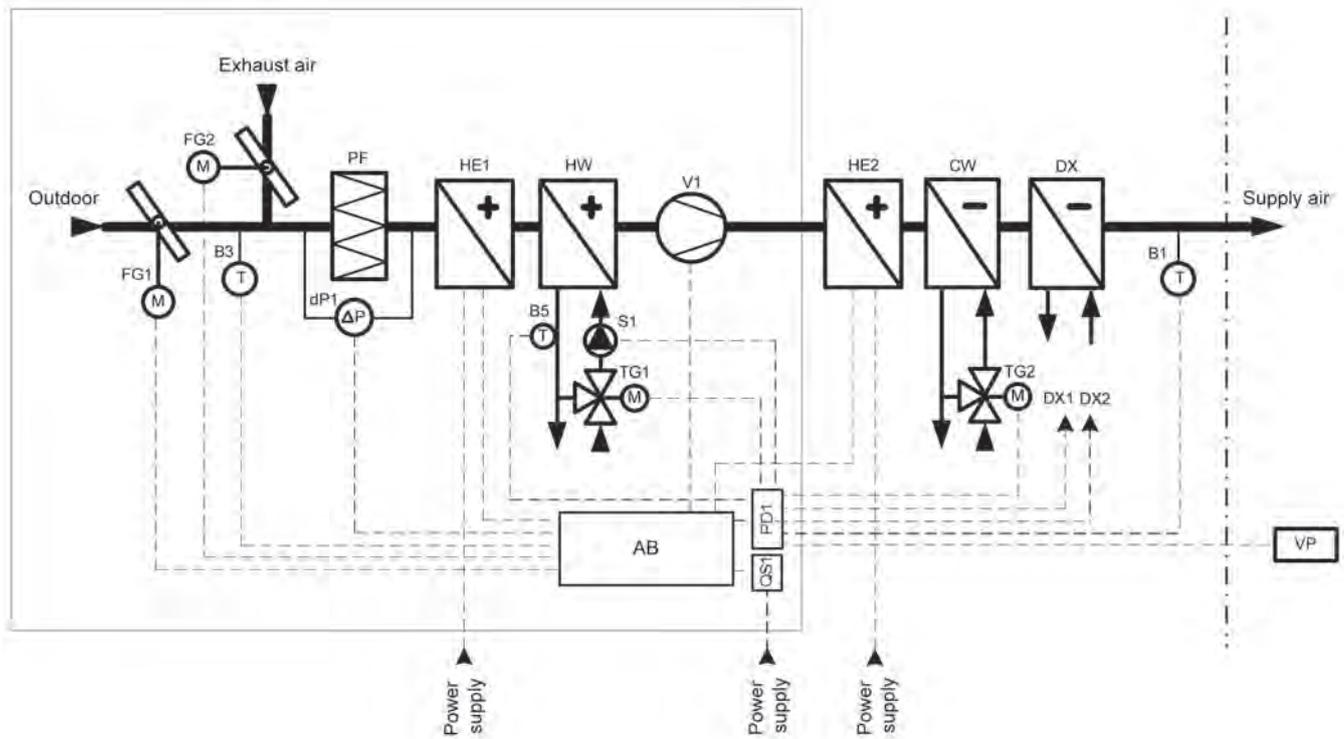
Failures indicated on the control panel, possible reasons and it elimination

| Message | LED | Possible Failure Cause | Failure Elimination |
|------------------------------|------------------------|---|---|
| Change supply air filter | Red and green blinking | Supply air filter is clogged. | After unit is off, it is necessary to change filter. |
| Low supply air temperature | Red light | Supply air temperature dropped lower allowable level. | Check program settings, unit heater operation. |
| Supply air overheating | Red light | Supply air temperature is higher allowable level. | Check program settings, unit heater operation. |
| Supply air fan overheating | Red light | Supply air fan motor overheated due to excessive load. | Check if air filters are inserted, if the unit doors are closed, if unit ventilation system has been installed correctly. |
| Heater off | Red and green blinking | Heater is disconnected due to low air flow. | When heater cools down, protection restores automatically. It is recommended to increase ventilation intensity level. |
| Electric heater overheating | Red light | Electric heater overheating protection is on. | To restore protection, it is possible only after pressing "RESET" button, which is located on the heater. |
| Return water low temperature | Red light | Return water temperature in water heater dropped lower allowable level. | Check circulation pump and heating system condition, heating valve actuator performance. |
| Fire alarm | Red light | Received fire alarm signal from the building fire system. | When fire alarm signal disappears, unit needs to be restarted from control panel. |
| B1 sensor failure | Red light | Supply air temperature sensor is not connected or broken down. | It is necessary to check sensor connections or change the sensor. |
| B3 sensor failure | Red light | Outdoor temperature sensor is not connected or broken down. | It is necessary to check sensor connections or change the sensor. |

-  It is possible to restore emergency overheating protection with button "RESET", only if before heater overheating cause has been clarified and eliminated.
-  If the unit has been stopped and there is red light diode signal on the controller, and text message is shown meaning failure, failure needs to be eliminated!
-  Before performing any jobs inside the unit make sure that the unit is stopped and disconnected from the electrical power supply.

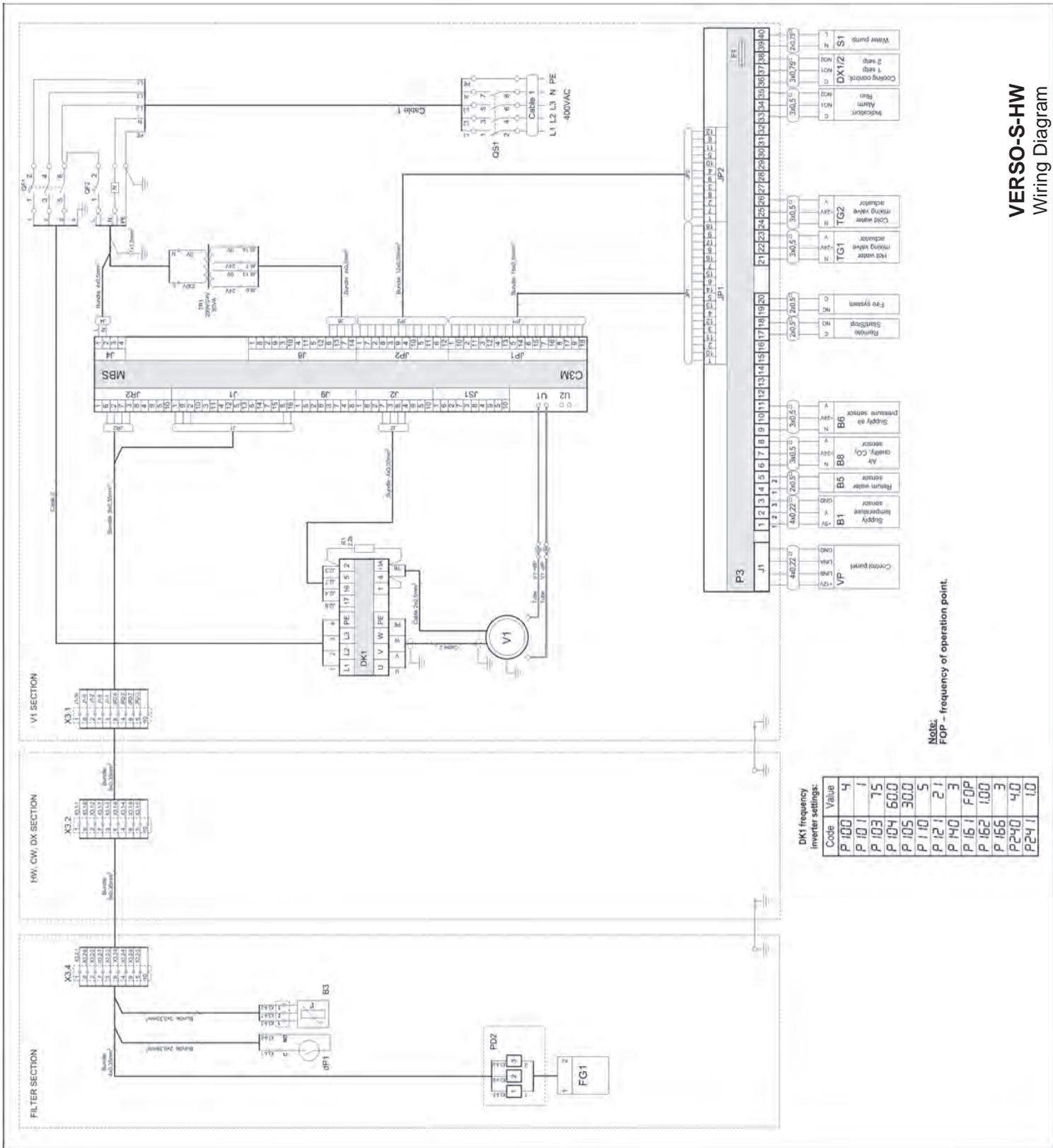
After failure has been eliminated and power supply connected, text message appears about previous failure. If there are no more failures, unit is switched on by pressing  button; unit continues operating by preset mode. However if the failure has not been eliminated, unit either starts operating and after some time it stops again, or it does not operate and failure message is indicated.

VERSO-S - Air Handling Units Functional Diagram



Note: Position of the detailed item (bend) is indicated in the drawing of the specific unit.

| Mark | Name |
|-------------|---|
| AB | Control box |
| B1 | Supply air temperature sensor |
| B3 | Outdoor temperature sensor |
| B5 | Return water temperature sensor |
| C3 | Controller |
| CW | Water cooler |
| DK1 | Supply air fan frequency inverter |
| dP1 | Supply air filter dif. pressure switch |
| DX1, DX2 | DX cooling control |
| E | Electric heater power control board |
| EK1 ... EK3 | Electric heater stages |
| FG1 | Fresh air damper actuator |
| FG2 | Recycled air damper actuator |
| HE1, HE2 | Electric heater |
| HW | Water heater |
| K1...K6 | Electric heater stages protection relay |
| MBS | Main board |
| QF1... QF3 | Circuit breaker |
| QS1... QS3 | Electric heater main switch |
| P3 | External connection board |
| PF | Air filter |
| S1 | Circulation pump |
| SIM1...SIM6 | Triac |
| TG1 | Hot water mixing valve actuator |
| TG2 | Cold water mixing valve actuator |
| TK1 | Electric heater 80°C overheating protection (automatic reset) |
| TK2 | Electric heater 120°C overheating protection (manual reset) |
| TK3 | Triac 70°C overheating protection (automatic reset) |
| TR1 | Transformer 2x24V AC |
| V1 | Supply air fan |
| VP | Control panel |
| X1...X4 | Connections between unit sections |



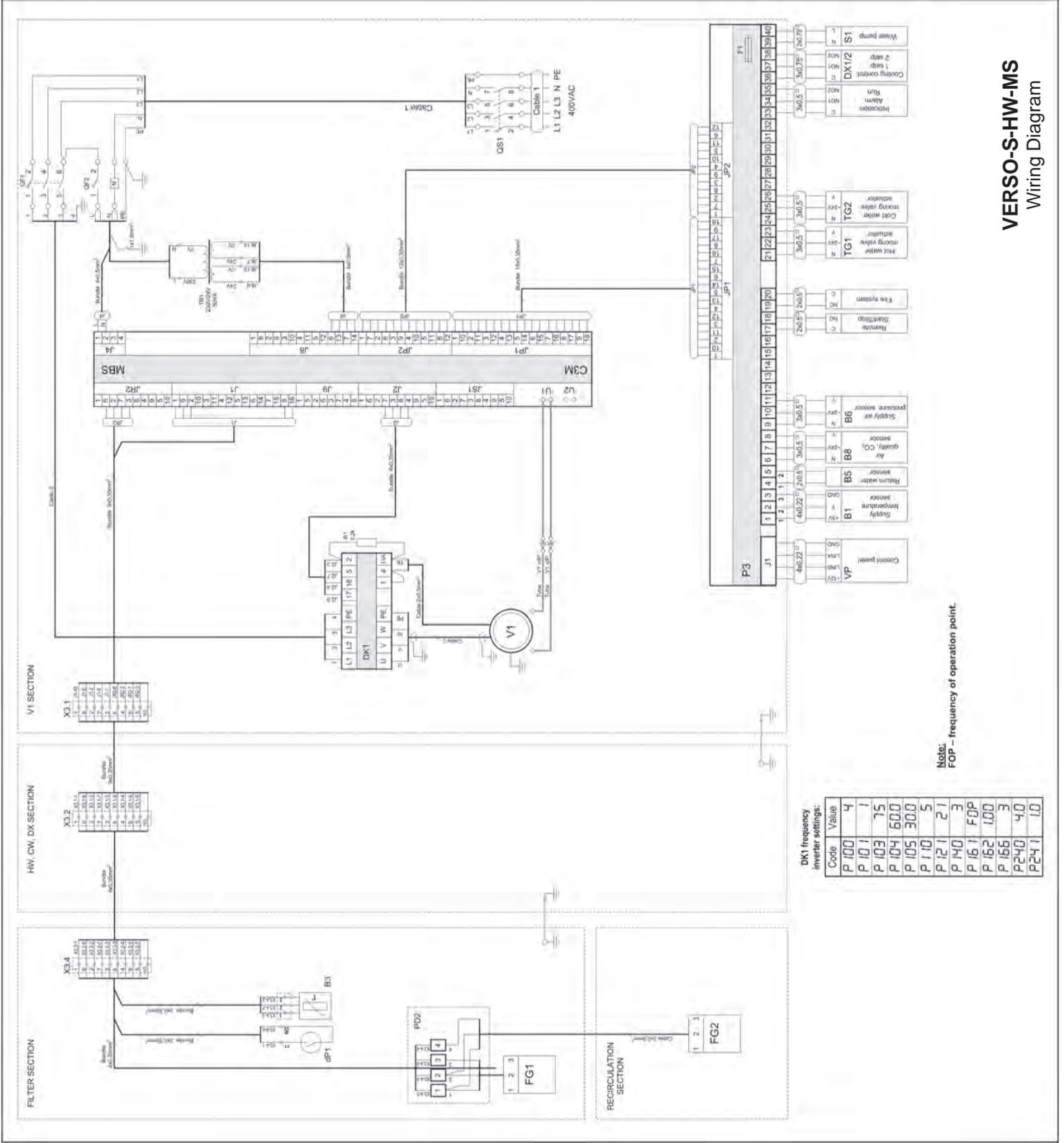
DK1 frequency inverter settings:

| Code | Value |
|-------|-------|
| P 100 | 4 |
| P 101 | 1 |
| P 103 | 75 |
| P 104 | 600 |
| P 105 | 300 |
| P 110 | 5 |
| P 121 | 21 |
| P 140 | 3 |
| P 161 | FOP |
| P 162 | 1.00 |
| P 166 | 3 |
| P 240 | 4.0 |
| P 241 | 1.0 |

Note: FOP - frequency of operation point.

VERSO-S-HW
Wiring Diagram

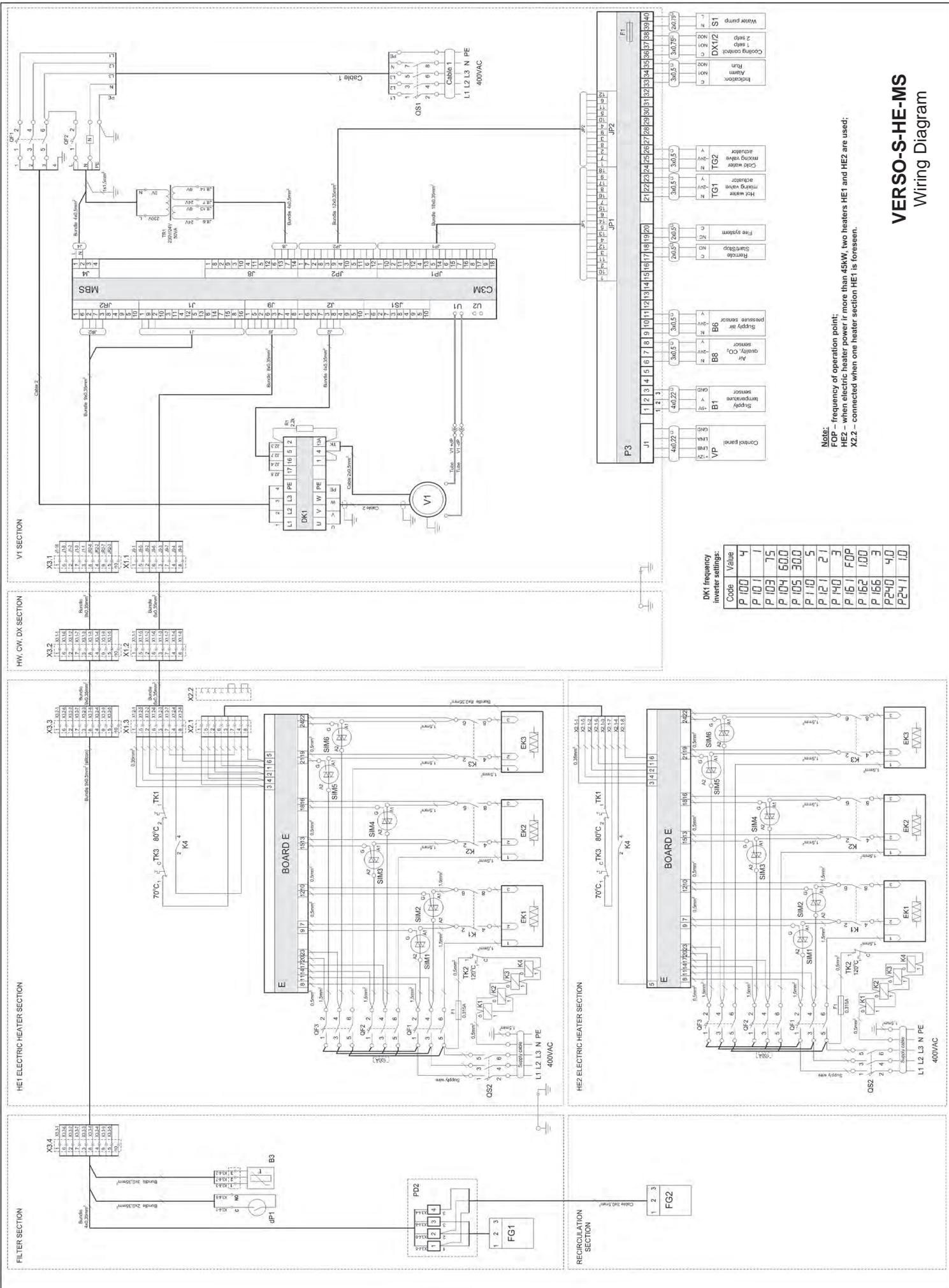
VERSO-S-HW-MS Wiring Diagram



DK1 frequency inverter settings:

| Code | Value |
|------|-------|
| P100 | 4 |
| P101 | 1 |
| P103 | 75 |
| P104 | 60.0 |
| P105 | 30.0 |
| P110 | 5 |
| P121 | 21 |
| P140 | 3 |
| P161 | FDP |
| P162 | 1.00 |
| P166 | 3 |
| P240 | 4.0 |
| P241 | 1.0 |

Note: FOP - frequency of operation point.



DK1 frequency inverter settings:

| Code | Value |
|------|-------|
| P100 | 4 |
| P101 | 1 |
| P103 | 75 |
| P104 | 600 |
| P105 | 300 |
| P110 | 5 |
| P121 | 21 |
| P140 | 3 |
| P161 | FOP |
| P162 | 1.00 |
| P166 | 3 |
| P240 | 4.0 |
| P241 | 1.0 |

Notes:
 FOP - frequency of operation point;
 HE2 - when electric heater power is more than 45kW, two heaters HE1 and HE2 are used;
 X22 - connected when one heater section HE1 is forseen.

VERSO-S-HE-MS

Wiring Diagram



UAB AMALVA

Ozo str. 10,
LT-08200 VILNIUS, LITHUANIA
e-mail info@amalva.lt
www.amalva.com
www.komfovent.com