



Control units

VCB-A

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Introduction

- The VCB-A control unit software (hereinafter referred to as the "Software") is the intellectual property of REMAK a.s. (hereinafter referred to as the "Manufacturer").
 - VCB-A control units are manufactured in accordance with valid Czech and European regulations and technical standards.
 - VCB-A control units must be installed and used only in accordance with this documentation.
 - The manufacturer is not responsible for any damage resulting from using procedures other than specified in this documentation, and the customer bears the risk of such use.
 - The installation and operating documentation must be available for the operating and servicing staff. It is advisable to store this documentation close to the VCB-A control unit.
 - When handling, installing, wiring, commissioning, repairing or servicing the VCB-A control units, it is necessary to observe valid safety rules, standards and generally recognized technical rules.
 - In particular, it is necessary to use personal protective work aids (e.g. gloves) because of sharp edges and corners when performing any handling, installing, dismounting, repairing or checking VCB-A control units.
- All device connections must comply with the respective safety standards and regulations
- Any changes or modifications to individual components of the VCB-A control unit which could affect its safety and proper functioning are forbidden.
 - Before installing and using the VCB-A control units, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.
 - The VCB-A control units, including their individual parts, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified air-handling designer who is responsible for the proper selection and dimensioning of components concerning their compliance with the requirements of the given application. The installation and commissioning may be performed only by an authorized company licensed in accordance with generally valid regulations.
 - REMAK a.s. does not bear any responsibility for direct or indirect damage incurred as a consequence of unauthorized or unqualified use of the Software and/or Hardware, or for damage incurred as a consequence of failure to observe the product's Installation and Operating Instructions.

The updated version of this document is available at our website www.remak.eu

Characteristics

Application

Control units VCB are compact control and power switchboards for decentral control of air handling devices. They are intended for control of basic air treatment, that means heating, cooling and heat recovery. They provide high stability, safety of device and provide easy operating including indication of working states.

Main Features

The VCB-A control unit is designed to provide:

- Complex autonomous operating control of air-handling devices
- Room air temperature control (cascade regulation).
- Control and power supply of air-handling devices
- Protection of connected devices

Control unit ensures all control and protection functions. It is equipped with proportional outputs for 2 main controllable sequences. Sophisticated control algorithms ensure system stability, comfort regulation and energy savings.

■ Three setting options of temperature modes are available:

- Comfort mode
- Economy (middle) mode
- Ventilating mode
- Ample options of time schedules (daily, weekly, yearly) with temperature mode and fan output programming features
- Superior anti-freeze protection and tempering of the exchanger during standby mode.
- Accurate analogue control of peripheral devices (depending on the controlled component)

Unit construction

Control and power parts of unit are placed in one box. Separate components, control and operating elements are placed inside of unit on DIN rails.

Control units VCB are built-in plastic or sheet metal boxes with front transparent door, with control elements placed behind it.

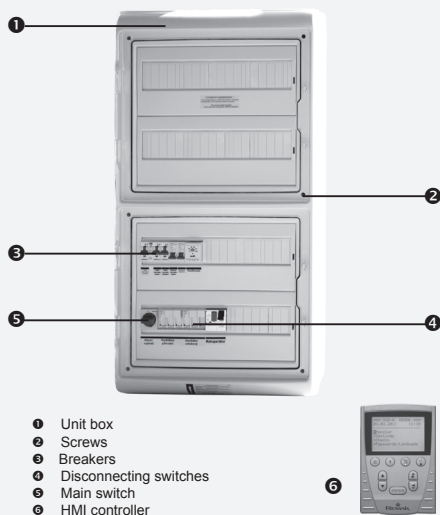
HW and SW Concept of the Controller

The design of the VCB-A is based on the powerful Siemens Saphir (ACX 36) PLC controller, and the system is programmed by special REMAK regulation software to control air-handling devices.

The HMI Siemens ACX84.910 manual controller can be used for local control independently of the communication card – refer to section "HMI Controller Operating Instructions".

Control unit VCB enables to take advantage of one or two control sequences (heating + cooling, heating + heat recovery). Further it is possible to connect components with independent control (for example rotary heat exchanger with regulated efficiency).

Figure 1 – VCB-A unit construction

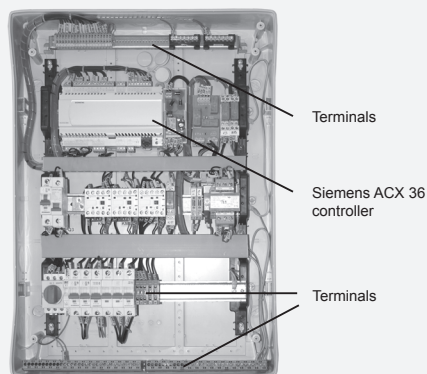


Units are supplied in individual application design and are provided with functions which are necessary for operation control of particular device.

Power part

Power part is just like control part always made to measure of particular air handling unit.

Figure 2 – VCB-A unit internal structure



Project

Boxes

Control units VCB are built-in plastic (units Vento and AeroMaster FP) or sheet metal (AeroMaster XP units) boxes with front transparent door with control elements placed behind the door). According to particular configuration of control unit, these type of box sizes are used. Electric protection of sheet metal box is IP 66 when the door is closed and IP 20 when the door is opened. Electric protection of sheet metal box with additional venting is IP 54 when the door is closed and IP 20 when the door is opened.

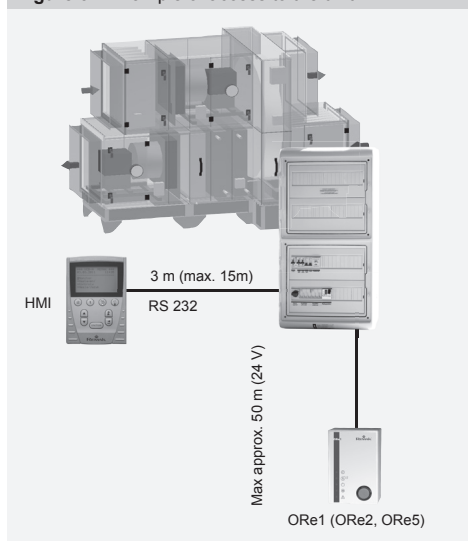
Control units VCB can be mounted directly to surfaces of combustibility grade A and B according to EN 13501-1. Acceptable operating temperature of environment is from 0 °C up to +40 °C.

Table 1 – box dimensions in mm

Type	Height	Width	Depth	Usual use
Plastic	610	448	160	Vento, FP, small XP (single speed)
Plastic	842	448	160	Vento, FP, small XP (single speed)
Sheet metal	800	550	250	XP, demanding Vento devices
Sheet metal	1200	750	300	XP
Sheet metal	1600	750	300	XP
Sheet metal	2000	800	400	XP
Sheet metal	2000	1000	400	XP

Boxes 2000 x 800 x 400 mm and 2000 x 1000 x 400 mm can be also equipped with ventilation system - fan and screen in opposite corners of box.

Figure 3 – Example of access to the unit



Project

The project of the VCB-A system consists in the selection of required functions and the configuration of its internal arrangement. The project is created automatically using the algorithm, an integrated part of the "AeroCad" design program which is simultaneously used for the air-handling unit design. The output project includes an accurate production specification of the control unit and the following individualized lists for a particular device:

- List of connected devices
- Connecting wiring diagram of all components
- Specification of all connecting cables

Figure 4 – sample list of connected components

Device number	Name of the devl	Type, size	AeroMaster FP 2.7
Configuration of control system VCB-A			
Type of control system	VCB	Order number	
Manufacturing code	VCB0FF000P00030010004U000	Customer	
Production	01	Manufacturing date	
Protection class	1 (EN 61440 40.2)	Serial number	
Control unit is intended for connection, control and protection of components listed in following configuration:			
Control point of connection	340V/50Hz/PE (50Hz 415A)	Scheme number	10
Main supply - main switch	FAVA 10-50/1.1-1-20		20.1
Fan fan - M1	XP/0.1 (1.1/0.5/0.2)		30.1
Number of output levels of fan - M1	PS1 V (20 - 300 Pa)		11a.1
Pressure difference sensor M1	PP02 2.7 (125)		50.1
Type of electric heater	1		
Number of section which can be switched	1		
Current value (power output modulation)	140		
Unit danger or power with danger	140 550-300		
Pressure difference sensor of filter 1 - mist	PS1 N (80 - 500 Pa)		11b.1
Number of pressure difference sensors of filter	1		
Sensor of mist or temperature in the duct	NS 120		11a
End switches of fire detectors	Not connected		
Characteristics and options of fan control control	Internal control in control unit		
Internal module for fan output control	M01.2 / 80W 1		
Hardware features 1 operation of system report	AC/DC/0/0/0		
Controller	AC/DC/0/0/0		
Supply 24 V	24V AC		
Dimensions of control unit case	810x440x100		
Design of control unit case	Plastic with glass		
Protection of control unit case	IP 65		

Figure 5 – sample electric wiring of components

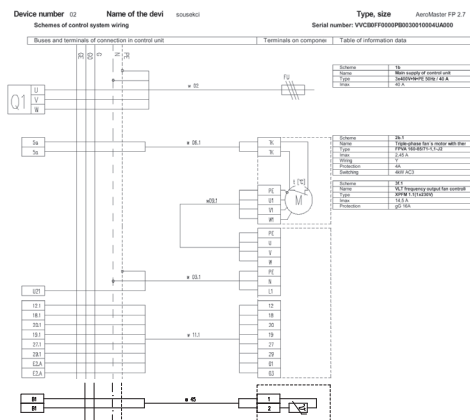


Table 2 – sample list of cables for components wiring

Cable number	Cable type (recommended)	Power supply	Cable length [m]	Comment
02	CHVY 3C5	340V/50Hz/PE	1.2	
03.1	CHVY 3C5	24V AC	1.2	
08.1	CHVY 4B5	340V/50Hz/PE	1.2	
08.2	H05VUF 3x0.75	24V DC	1.2	
11.1	3XVYV 4x0.5	24V DC	1.2	
12.1	H05VUF 3x0.75	24V DC	1.2	
13.1	CHVY 3C5	340V/50Hz/PE	1.2	
14.1	ZTVV 3x0.75	24V AC	1.2	
18.1	ZTVV 3x0.75	24V DC	1.2	
20.1	C0VY 3x0.5	24V DC	1.2	
20.2	H05VUF 3x0.75	24V DC	1.2	
21	ZTVV 3x0.75	24V DC	1.2	

Documentation

Marking of control units

Control unit is always marked by original code (generated by "Design program for calculation and project of control unit AeroCAD" and is set only in Accompanying technical documentation, not on control unit) and by serial number (for communication with producer).

Documentation

The VCB-A systems can be installed and used only in accordance with the documentation delivered with the system.

List of Documentation

- Installation and Operating Instructions
- Configuration of the control system (summary of attachable components), terminal diagram and list of recommended cables – printed AeroCAD output of the device project.
- Record of functional and single-part tests

Other – General Documentation

The system, resp. unit documentation also includes a collection of operating and inspection documents, and service regulations. The user is responsible for these documents.

Service Regulations

Before putting the air-handling device into permanent operation the user, in collaboration with the designer, respectively manufacturer, must issue service regulations in accordance with local legal regulations. We recommend including the following in these service regulations:

- Air-handling device assembly description, its intended use and a description of its activities in all operating modes.
- Description of all safety and protective elements and their functioning.
- List of health protection principles and safety rules to be observed when operating the air-handling device.
- List of requirements for operating staff qualification and training, a nomenclature list of personnel authorized to operate the air-handling device.
- Detailed emergency instructions.
- Operating particularities during deferent climatic conditions (e.g. summer or winter operation).
- Inspection, checking and maintenance schedule, including a list of checking steps, and their recording.

Documentation Availability

Documentation delivered with the VCB-A control system as well as its operating documentation must be permanently available for the operating and maintenance staff, and stored close to the VCB-A control unit. Installation and operating instructions are also available on our website: <http://www.remak.eu>

Notice

The manufacturer reserves the right to change and/or amend this documentation to include the latest technical innovations and/or to comply with the law, without prior notice. Information on changes and/or updating is always available on our website: <http://www.remak.eu>

Safety Rules

- VCB-A control units are manufactured in accordance with valid technical standards.
- VCB-A control units must be installed and used only in accordance with this documentation.
- The subject that is responsible for use other than specified in this documentation is also responsible for any damage resulting from such use.
- When handling, installing, wiring, commissioning, repairing or servicing VCB-A control units, it is necessary to observe valid safety rules, standards and generally recognized technical rules.
- In particular, it is necessary to use suitable tools and personal protective work aids (e.g. gloves) because of sharp edges and corners, respectively dangerous voltage when performing any handling, installing, dismantling, repairing or checking VCB-A control units.
- Any changes or modifications to individual components of the VCB-A control unit which could affect its safety and proper functioning are forbidden.
- Neither configuration nor documentation may be changed without prior consent from the manufacturer.
- VCB-A control units, including their individual parts, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified air-handling designer who is responsible for the proper selection and dimensioning of components concerning their compliance with the requirements of the given application.
- Any connections, including connecting the VCB-A unit to the power supply, must be performed in accordance with local safety regulations and standards valid for electrical wiring.
- The wiring, installation and/or commissioning may be performed only by an authorized company, respectively by qualified worker, licensed in accordance with generally valid regulations.
- Before installing and using the VCB-A control unit, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.
- The air-handling device can be put into operation only in accordance with applicable service regulations. The operating staff must comply with requirements given by the service regulations, respectively by the manufacturer (authorization of some servicing operations).

Device Handling Conditions

Device Handling Conditions

Only properly qualified personnel are allowed to commission, operate and service this device.

- Only personnel who have been provably trained by the purchaser (manufacturer or authorized manufacturer's representative) in accordance with service regulations valid for the respective air-handling device and warned of possible risks and hazards can operate the VCB-A control unit.

- The removal, bypassing or disconnecting of safety equipment and functions, or protective devices, is forbidden.

- Only faultless air-handling components can be used. Failures which can affect device safety must be removed immediately.

- All precautions concerning electrical accidents must be strictly observed. Any actions restricting safety and/or protective precautions, even temporarily, must be strictly avoided.

- By no means may any guards or other safety equipment be removed. The device and its components may not be operated if safety devices or precautions are ineffective, or if their functioning is restricted.

- Actions which could break the prescribed separation of safe low voltage must be avoided.

- When replacing fuses, the voltage-free state of the control unit must be ensured and only prescribed fuses and protective elements can be used.

- The harmful effects of electromagnetic emissions and overvoltage to signal, control, and power cables, which could cause dangerous unwanted actions or destroy electronic elements, must be avoided.

- Never work on an energized device! Before performing any work on the air-handling unit, disconnect the power supply by means of the main switch, and lock it in its off-position. Use protective work aids in accordance with the service regulations and valid local standards.

- If individual construction assemblies (e.g. el. heater, fan, etc.) are equipped with service switches, they can be switched off by using the appropriate service switch providing that this action is allowed by service regulations, and enabled by features and conditions of the system.

- Never use abrasive cleaners, acid, alkali or solutions aggressive to plastics to clean the control unit.

- Avoid water splashing, hitting and vibrations.

- Air-handling components must always be installed in accordance with the corresponding installation instructions.

Keep all protective elements faultless. After removing failures such as short circuits, etc, always check the function of protective elements; also check the condition of the main and additional interconnections and grounding. To keep the operation safe, it is necessary to check the condition of pumps of water heaters and coolers – i.e. manually check their rotation, and verify their output curves (power oversizing lowers the quality of the control).

Warning

Remote control (as well as automatic time schedules) must always be taken into account when working (inspecting, maintaining, repairing, etc.) on the air-handling device. Therefore, safe access must be ensured – by turning off and securing the main switch – to avoid the device being started by another user.

Transport and PreInstallation Storage

VCB-A control units are packed in cardboard boxes, or installed in the corresponding section of the air-handling unit. When handling them, it is necessary to observe the rules for fragile goods handling.

VCB-A control units can be stored in storerooms which must comply with following conditions:

- Maximum relative air humidity below 85 %, without condensation of moisture.

- Ambient temperature range from -25°C to +60 °C

Stored VCB-A control units must be protected against penetration by dust, water, acids or corrosive substances or other substances that can negatively affect their construction and components (degradation of plastic parts and insulating materials, etc.).

Location and Installation

The location of the VCB-A control unit must be selected concerning easy access of the operator and cable connecting. The surface for the unit installation must be flat and without bumps.

It is important to leave enough space on the operating side of the VCB-A control unit to enable its maintenance and servicing. Prior to installation, check the delivery for completeness and intactness.

VCB-A control units are intended for normal environmental conditions (dust, moisture and chemical-free and non-explosive indoor environment).

They can be mounted directly on A and B combustibility grade materials in accordance with the EN 13 501-1 standard.

Permissible ambient temperature: 0 °C to +40 °C

The VCB-A control unit delivered in plastic distribution board boxes can be hung directly on a wall, or partly embedded into plaster (allowing the cover to be removed).

The VCB-A control unit delivered in steel-sheet distribution board boxes can also be installed directly onto the floor. Connecting cables can be led in using cable trenches, cable trays, or led under plaster. The power cables are connected from the bottom side.

For fixing the control unit onto a wall, we recommend using wall-dowels and wood screws dimensioned according to the wall structure.

Check completeness and intactness of the delivery in accordance with the bill of delivery before installation.

Commissioning

Commissioning

Mounting and Wiring Check

Before putting the device into operation for the first time it is necessary to perform a thorough check and verification of all connections of elements of the control system in accordance with the wiring diagram delivered with the particular control unit. The system must not be powered until this check has been performed.

In particular the completeness, locations and connecting of thermal sensors, fan and heater thermo-contacts must be checked in accordance with the M&C project. Further, connections of all alarm inputs must also be checked. It is also necessary to check fans, electric heaters, heat exchangers, filters and all other components of the connected air-handling unit for correct installation in accordance with the documentation delivered with the air-handling unit. The above-mentioned checks must include functional testing of individual components.

Special attention must be paid to conductive interconnection of all parts of the air-handling unit and other related devices.

Wiring Conditions

The wiring must be performed following valid standards and local safety regulations. In accordance with these local regulations, the initial inspection of the entire device must also be performed prior to its commissioning.

Adjustment

The VCB-A control unit is produced in accordance with the customer's requirements and configuration (the project), and during production it is preset to the basic parameters and thus ready for operation. Providing it is correctly installed, the control unit will start up and regulate the air-handling device to the preset parameters.

The professional operator performing the commissioning must always check, respectively adjust, operating parameters for the air-handling unit according to the actual arrangement and behaviour of the control system, operation or local conditions.

This applies especially for **control constants and parameters, correction values, temperature modes and time-schedules**.

Access to the data points is enabled via HIM controller.

Control of user access and relationship to IT systems represent an important part of the system setting. Default factory setting that must be readjusted is password setting, see Control (HMI Controller Operating Instructions).

Other Settings:

To optimize cooperation of the VCB-A control unit with peripherals, it is necessary to adjust the appropriate values of analogue control signals for heating, cooling, heat recovery and mixing in the "Settings / Configuration" menu. These values are optional from the range of 0-10 V or 2-10 V (preset).

The 2-10 V values are typically suitable for REMAK, resp. Belimo actuators; on the other hand, for the rotary heat exchanger with a frequency inverter it is necessary to adjust the signal of 0-10 V.

Notice

Parameters are structured so that they are available to users according to their authorization. The "role" must be assigned to individual users in accordance with their qualification and operational responsibility.

Basic Parameterization

– Default and common operation parameterization is described in the chapter Control (HMI Controller Operating Instructions).

General Overview of Parameters

For a general overview of parameters accessible from the menu and users' authorizations, refer to "VCB-A – Review of Factory Preset Parameters Values". For an overview of parameters and default values of the HMI controller, refer to "HMI Controller Operating Instructions".

Important Notice

Proper assembly, installation and commissioning are essential for faultless and safe operation of the VCB-A control unit. The components connected to the VCB-A control unit must comply with the specification included in the VCB-A control unit documentation.

During the service life of the device, it is necessary to observe procedures included in the manufacture's documentation delivered with the device, as well as service regulations issued by the user of the device.

Location of Control System Sensors

Sensor NS 120 of the inlet air temperature

The sensor must always be situated behind the heater or cooler. It must not be situated in the room. If the air-handling unit ensures dehumidification functions, an inlet air temperature-humidity combined sensor (QFM 2120) situated in a common casing will be used instead of the standard NS 120 sensor.

Thermal sensor (NS 130R)

The thermal sensor, which is a part of the VO water heater antifreeze protection (return water temperature measurement) must be situated in the return water pipe of the water heater so that it will be sufficiently bathed with water. The heating circuit must comply with all required functions needed for control and safe operation in accordance with the specifications included in the project documentation of the air-handling device (among others, water flow discharge and temperature, respectively to be



Commissioning

filled with antifreeze medium).

Outdoor Air Temperature Sensor (NS120)

The outdoor air temperature sensor should be situated actually outdoors – only then are all functions of the control system ensured even during the STOP mode, respectively immediately after starting up (i.e. pre-recuperation of the heater corresponding to the outdoor temperature). If this sensor is situated in the fresh air supply duct inside the building, the measured temperature will be correct only if fans operate (air is flowing). Otherwise, the starting conditions will be incorrect - which can endanger the safety of the air-handling device, and even cause an accident in the exchanger.

Room Temperature Sensors

Optionally, a room (NS100) or duct (NS120) sensor can be used by the designer. If the air-handling unit ensures dehumidification functions, an inlet air temperature-humidity combined sensor situated in a common casing will be used. According to the designer's selection, the room temperature (as standard NS 100) and humidity sensors can be replaced by the QFA 2020 sensor, respectively the duct temperature (as standard NS 120) and humidity sensors can be replaced by the QFA 2120.

- **Room sensor** needs to be situated in a "representative" place for the room temperature. It must not be affected by local effects (heaters, window, vertical distribution of the room temperature, etc.)
- **Duct sensor** must be placed in the room air outlet duct – the advantage is that it can measure mean temperatures of the air exhausted from the room – without influence from local effects (besides that, it is hidden in the duct and cannot be seen).

The NS120 standard room temperature sensor is delivered inside the control unit. (Other sensors are delivered separately!)

Control and Protective Functions

Control and Protective Functions

Note: This chapter includes only basic control and protective functions. Detailed planning, resp. compatibility of the entire system is ensured by configuration using the "AeroCad" designing software. For more information contact REMAK, a.s.

Main Control Functions

The VCB-A control unit enables automatic control of the following basic control functions to control the temperature of the air:

- Heating

and one of the following functions:

- Cooling
- Mixing
- Recuperation (heat recovery)

- Virtual PID controllers with adjustable constants are assigned for each of the above-mentioned functions. Default parameters are set during production. These parameters can be changed via the VCB-A user interface in the menu "Settings" >> ["Control parameters"].

- Checking, resp. optimizing these parameters is an essential part of the VCB-A commissioning!

- The control ensures economical operation while keeping the hygienic minimum of fresh air delivered. The air cascade temperature regulation is controlled to ensure the desired room temperature.

- The desired room temperature of the air-conditioned room can be assigned by selecting one of three temperature modes. Each mode includes adjustable temperature values to keep the desired room temperature (low limit for heating and high limit for cooling); these values can be changed via the VCB-A user interface menu "Settings" >> ["Temperature modes"].

- First, the control algorithm starts to regulate the processes which do not require energy, i.e. mixing and heat exchange (their interaction can be configured). If control of these processes is not sufficient to keep the required parameters, or these processes are not included in the air-handling unit, then the control processes of heating and cooling are applied. The control algorithm will not allow simultaneous application of heating and cooling; only one control sequence is active. This does not apply for special control applications with controlled dehumidification, where cooling can be activated for dehumidification and after cooling the air down, the heater can be activated for air reheating up to the required temperature.

Temperature Correction and Limitation

It is possible to set limits for maximum and minimum temperature of the supply air, or to set other correction, resp. comfort values (e.g. compensation of setpoint)

Description of Main Control and Protective Functions

The VCB-A control unit cooperating with the appropriate sensors provides the air-handling device with complex protection, including active antifreeze protection, monitoring of fan operational states and filter fouling. Any deviation from the defined states or parameter ranges is monitored and signalled while the safety measures are simultaneously activated. Depending on the failure's seriousness, the following is applied:

- The failure is signalled and protective measures are automatically applied; after the failure has been handled, the unit returns to the standard mode.

- If a serious failure occurs, the unit will switch to the "STOP" mode, and it can be started only after the failure has been removed and the operator has intervened.

Heating Control

The heating control is carried out depending on the desired temperature, i.e. selected temperature mode and readings of inlet, outdoor and heat exchanger return pipe temperature sensors. The heating control can be corrected by correction values, max. or min. limits, respectively by intervention of the antifreeze protection.

Electric Heating

The electric heating control is following:

- By switching the full output of EO or EOS heater.
- By switching the individual sections of the EOSX electric heater.
- By sectional switching of large EO heaters.
- Regulation of the EOS heaters using the PV current valve (up to 45 KW).

Water Heating

- It is controlled via the LMC 24A-SR actuator of the SUMX mixing set, which is governed by the continuous control signal 0-10 V (working range 2-10 V).

Control of the Mixing Set Pump

Mixing Set pump is controlled in relation to the outdoor air temperature and position of the valve (required heating output).

- During the "STOP" mode of the air-handling unit, the pump is switched on when the outdoor temperature drops below 5 °C, and switched off at outdoor temperature >5 °C; in this case the pump rundown time is not applied.

- During the "RUN" mode of the air-handling unit, the pump is switched by the valve actuator control algorithm. The pump is switched on at valve opening request >5 %.

- At valve opening request < 2% the pump is switched off, and a 2-minute rundown is applied.

- The pump 30 second check spinning is performed every Friday at 12:00.

- Electric failure of the pump is monitored using auxiliary contact even during the "STOP" mode.

Control and Protective Functions

Antifreeze Protection of Water Heaters

■ The VCB-A control unit is equipped with three-stage active antifreeze protection.

Antifreeze protection measures include:

- Switching the unit to the "STOP" mode
- Switching the fans off
- Closing the dampers
- Signalling the freeze danger
- Controlling the mixing set
- Switching the pump on
- During the "RUN" mode of the air-handling unit, the antifreeze protection will be applied if the outdoor temperature drops below 10 °C (factory default setting) and the water temperature in the heater return pipe drops below 15 °C (factory default setting). For 60 seconds from this moment the controller will evaluate the outdoor temperature, and if the outdoor temperature continues to drop, the mixing set's valve will be forced to open according to both the value of the outdoor temperature and the water temperature in the heater return pipe. When the outdoor temperature and the water temperature in the heater return pipe return above the limit values, the antifreeze protection will be stopped.

■ During the "STOP" (standby) mode of the air-handling unit, the antifreeze protection will be applied if the outdoor temperature drops below 10 °C (factory default setting) and the water temperature in the heater return pipe drops below 30 °C (factory default moderate heating setting). For 60 seconds from this moment, the controller will evaluate the outdoor temperature, and if the outdoor temperature continues to drop, the mixing set's valve will be forced to open according to both the value of the outdoor temperature and the water temperature in the heater return pipe. When the outdoor temperature and the water temperature in the heater return pipe return above the limit values, the antifreeze protection will be stopped.

■ The control unit continuously checks the water temperature in the heater return pipe. If the water temperature drops below 8 °C (factory default setting) the following protective measures will be immediately applied independently of the outdoor air temperature:

- The air-handling unit and fans will be switched off, the dampers will be closed, and the failure alarm will be signalled.
- The mixing set valve will be forced to open up to 100%, and the circulation pump will be switched on.
- The above described state will last until the operator checks the unit, removes the failure and confirms the device serviceability by pressing the unblocking button.
- The control unit continuously checks the water temperature in the heater return pipe. If the water temperature drops below 6 °C (factory default setting) the following protective measures will be immediately applied independently of the outdoor air temperature.
- The air-handling unit and fans will be switched off, the dampers will be closed, and the failure alarm is on.
- The mixing set valve will be forced to open up to 100%, and the circulation pump will be switched on.

Pre-Starting Preheating of the Air-Handling Unit

■ The Control unit is equipped with a preheating function to avoid the device being recognized as frozen when starting the air-handling unit during winter or transition seasons.

■ The preheating is related to the outdoor air temperature value. When the outdoor air temperature is above 10 °C, the value for the mixing set valve opening is 0%, so the preheating will not be activated. If the outdoor air temperature drops below 10 °C, the preheating will be activated. The mixing set valve will be forced to open at the % value dependent on the outdoor air temperature (factory default settings: +10°C = 0%, 0°C = 33%, -5°C = 66%, -10°C = 100 %) for a 1-minute period. After this time period is over the valve will start to close, "slide down the ramp", until it reaches the control value preset for the mixing set.

■ The preheating will not be activated if the air-handling unit is restarted within 5 minutes of it being stopped.

■ Parameters of the antifreeze protection can be accessed via HMI controller, menu "Settings" >> [Antifreeze protection].

Electric Heater Protection

■ If overheating (failure) of the electric heater is signalled (the inner heater temperature has exceeded +80°C, and the emergency thermostat contacts have been opened), the control unit will evaluate the signal.

■ The electric heater protection in the REMAK unit is doubled – the failure alarm simultaneously enters the controller and auxiliary module.

■ The controller will evaluate the failure state and execute the necessary protective measures; first of all it will block the control signal to the electric heater and disconnect the contactor of the heater. The auxiliary protective module will disconnect the EO/S/X breaker (the breaker supporting trigger is released).

Simultaneously, the control logic ensures safe cooling of the heater upon the unit shutdown – transition to the "STOP" mode. The controller ensures rundown (adjustable) of fans to cool the heating radiator..

Control and Protective Functions

Cooling Control

The water cooling is controlled identically as the water heating. The cooling is enabled according to the outdoor temperature, which must be higher than the adjusted temperature for cooling. The pump of the mixing set is switched on by the control signal of the cooler's valve.

During the "RUN" mode of the air-handling unit, the pump is switched on at cooler valve opening request > 4 %. At valve opening request < 1% the pump is switched off, and a 5-minute rundown is applied. Direct expansion evaporation is controlled by switching the condensing unit output or by stepless control of the inverter condensing unit. If a single-circuit condensing unit is used, it will be switched on when 30% of the control signal is required and switched off at 20% (10% hysteresis) of the control signal.

If a double-circuit unit or two single-circuit condensing units are used, the two-stage switching will be applied. The first stage is switched on at the 35% level of the control signal request, and switched off at the 15% level of the control signal request (20% hysteresis).

The second stage is switched on at upon reaching the 65% level of the control signal request, and switched at the 55% level of the control signal request (10% hysteresis). Minimum running time and minimum shutdown time of condensing unit are adjustable. If a single-circuit or a double-circuit inverter condensing unit is used then it is controlled using the 0-10V control signal and start enable signal. The condensing unit will be switched on when 30% of the control signal is required and switched off at 20% (10% hysteresis) of the control signal. The condensing unit compressor speed is controlled using a 0-10V control signal.

Direct Evaporator Protection

The direct evaporator is protected by the CAP 3M thermostat, which disconnects the control signal if frost on the evaporator is created. If two evaporators are used, then each has its own thermostat.

Rotary heat exchanger output power control

Rotary heat exchanger control can be done:

- by continuous speed control - heat recovery efficiency control:
 - directly by controller (if the controller is not equipped with heating and cooling control) - by frequency converter;
 - by independent control system - with frequency converter with built-in control procedure.
- by ON/OFF control – by controller (if the controller is not equipped with heating and cooling control) - without using frequency converter (lower quality of device but saving costs for converter).
- continuous operation (with fans) with possibility of manual shutdown (for example in summer), that means without control.

The heat recovery is controlled/regulated by the continuous control signal 0-10 V (working range 2-10 V) from the stepless controller = the bypass actuator control, or by changing the speed of the rotary heat exchanger via the frequency converter. 100% heat recovery equals the max. speed of the rotary heat exchanger (50 Hz from FC to motor) or the closed exchanger bypass.

Optionally, the digital output for the auxiliary two-point control (ON/OFF) can (simultaneously) be used and configured (Note: only one auxiliary function can be used). For example, the pump of the glycol circuit or the rotary heat exchanger without a frequency converter can be switched in this way.

Plate heat exchanger protection

Is provided by pressure difference sensor. If the value of pressure loss exceeds set value, the actuator of bypass damper is activated and the damper stays open during frost melting from the exchanger. Even capillary sensor CAP 3M can be alternatively used.

Control of Mixing Sections

Manual control of mixing dampers is enabled by the SGE controller. The signal is directly proportional to the air circulation request, i.e. 100% signal level equals 100% requested air circulation (0% fresh air). Maximum level of air circulation (while fans are running) is limited by the preset (hygienic) minimum of fresh air.

Economical Control of Heat Recovery

If the room temperature is lower than the outdoor temperature, and simultaneously room cooling is required (running), the heat recovery and air circulation functions will be activated at the maximum level to minimize the cooling energy requirements. The activation of this process starts as soon as a 2°C difference is reached (the indoor temperature is lower than the outdoor). The heat recovery and mixing will be stopped as soon as the temperature difference is 1°C (1 °C hysteresis).

If room heating is required, the heat recovery, mixing and heating sequences are gradually applied (the order of heat recovery and mixing sequences can be changed but the heating sequence must always be the last one).

Basic operating Modes

Setpoint Compensation

More specifically, the temperature compensation is a correction (shift) of the required value (setpoint) of controlled (room) air temperature related to the temperature read by an outdoor sensor. This compensation (among other correction values) corrects the temperature given by the settings of the temperature mode used. Most often it is used to smooth the difference between outdoor and indoor temperature (to eliminate thermal shocks), and to reduce energy demands of air-handling devices. On the other hand, in the opposite setting it can increase the differences ("aggressiveness") of the control.

Note: On the controller the setpoints are fully described.

Fan Speed Control

The VCB-A control unit enables program or manual control of the air output, i.e. speed of fans, via:

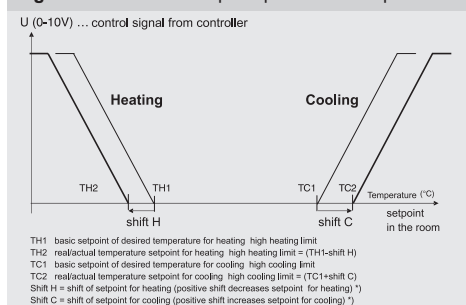
- Five-stage TRN voltage controller
- XPFM frequency converter – in five stages

The control is always common for air inlet and outlet.

Warning

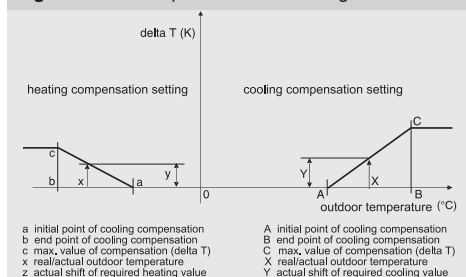
It is not possible to control two-speed motors using the VCB-A!

Figure 21a – Actual temp. setpoint incl. compensation



Definition of the compensation/correction factor (menu [Correction values]). The correction is linear, and can be set (+/- and steepness) independently for desired temperature of heating and cooling.

Figure 21b – Compensation and settings



*) Note: The shift (Delta) can also be negative (reverse shift of setpoint will be applied).

Note: Picture shows both processes together – but in practice always only one of them can be in progress at any time!

Basic Information on Operating Modes

Operating (Work) Modes / Output of Fans

Three basic operating modes are defined for the VCB-A units.

- Manual mode – unit operation in permanent (manual) mode according to actual mode settings (menu "Settings" >> ["Manual mode"]).
- Program mode – automatic unit operation according to preset time schedules, refer to "Time Modes" below.
- Stop mode – the air-handling unit is in standby mode (the fans are stopped). Important safety functions are active, especially antifreeze protection of the water heater and its moderate heating.

In operating modes enabling operation of the unit (the fans are working), i.e. Manual and Program modes, two basic groups of parameters are used to control the air-handling unit.

- Temperature mode, refer to "Temperature Modes".
- Output (speed) of fan(s) – if the air-handling unit includes fan output controllers.

The output of fans can be set at levels corresponding to the configuration of the air-handling unit:

- The fans with two-speed motors >> Off (only in program mode) / Stage1 / Stage2
 - The fan with five-stage control >> Off (only in program mode) / Stage1 / Stage2 / Stage3 / Stage4 / Stage5
- When the fan output controllers are not used, then only "Stop" and "Run" states can be set for manual and program modes (except temperature mode).

Temperature Modes

The VCB-A system offers three adjustable user modes of controlled (room) temperature maintenance.

- "Comfort" (usually the common mode for the temperature control process)
- "Economy" (e.g. night mode)
- "Ventilation" (a typical mode for specific needs of ventilation with minimum need for maintenance of room temperature – holidays, etc.)

The modes are defined according to the level of gradation of the required temperatures, resp. temperature difference (heating and cooling systems) – thus according to comfort. Operating energy demand is also related to the mode selected.

Each temperature mode is defined by setting the heating temperature (lower limit of the room temperature – minimum temperature), and by the cooling temperature (high limit – max. temperature). The controlled temperature zone (threshold) lies between these temperatures. The proper dimensioning of heating and cooling systems is essential to maintain desired temperatures.

The temperature modes are defined so that the less comfort mode has the required temperature:

- for heating (lower limit) always lower than the more comfort mode (resp. the same)
- for cooling (high limit) always higher than the more comfort mode (resp. the same)

Basic operating Modes

This means that the threshold for the room temperature with less comfort modes of systems with heating and cooling is always narrower (or the same) than with more comfort modes.

The threshold – the difference between the heating (lower limit) and cooling temperature (high limit) – can be set to 1 Kelvin (1°C).

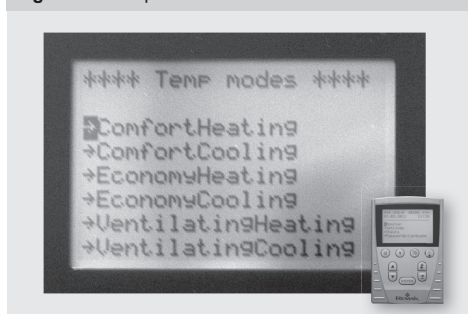
The temperature modes are preset in the menu "Settings" >> [Temperature modes] (administrator authorization).

Note: The system automatically monitors the above-mentioned interrelation of temperatures and according to the interference with the setting immediately adjusts information on the possible maximum and minimum of each value.

Warning

The setting, respectively control process influences correction values.

Figure 8 – Temperature Modes



Time Schedules

The VCB-A system offers three preset time schedules of operational control:

- Daily time schedule – the schedule of the lowest priority, max. 8 change points per day.
- Weekly time schedule – the schedule of higher priority - max. 7 change points per week.
- Yearly time schedule – the schedule of the highest priority - max. 6 change points per year.

These schedules interact together applying a system of priorities. At any instant of time the schedule of highest priority active at the given time controls the operation. Information on the currently active time schedule is in the menu "Monitor" >> ["Current modes"]. The daily schedule is valid for each day of the week. Requests for specific days (e.g. weekends) must be planned from the weekly schedule (including blocking program blocking – device shutdown).

To achieve maximum operating efficiency we recommend setting the independent yearly schedule for each air-handling unit operating season – summer and winter (shutting down for holidays, etc.)

For each time period within the given time schedule there can be determined:

- Whether the respective time schedule is active.
- Initial and end time, resp. day
- Fan speed
- Temperature mode

Note: Even though the daily schedule offers relatively many change points with change options of the temperature mode, we do not recommend planning too many changes, like short operational breaks, etc., of the temperature mode via this program because in relation to the features of the controlled air-handling unit and heating system, the stabilized state of the system can be normally reached rather in hours than minutes. During very short time periods between temperature changes you can expect neither accord of reality with the desired state nor greater economy of operation. For short program cycles it is better to optimize the air output, which enables you to optimize the operating energy demand, and does not cause uncomfortable air-handling system vibrations, rep. vibrations of inlet air. We recommend changing the temperature mode in an interval lasting at least several hours (e.g. day/night or work shifts of different work modes) or days (business day/weekend) if the output control is insufficient, or if it is not possible to use interrupted device operation.

The time schedule should be set by the system administrator in the menu "Settings" >> ["Time schedules"]:

Warning

It is necessary to set accurate system time to ensure correct functioning of time schedules!

The time schedule can be saved only if the time sequence of individual lines is followed. To quickly reset the time schedules back to factory default settings, you can use the parameters (rows) in the upper part of the table.

Control



Operation via HMI controller (Human Machine Interface) enables complex control and monitoring of device operating parameters.

The HMI menu is password protected.

HMI Controller Operating Instructions

Figure 9 – HMI controller



HMI Controller

The signalling is ensured by the LED buttons:

 **Operation of fans** (green LED flashes, F3 button).

 **Failure** (the red LED is on, F3 button).

Further information accessed via menus.

The HMI Controller ACX84.910 (Human Machine Interface) intermediates communication between the control unit and user. It is designed to operate, control and service the air-handling device. The HMI Controller can be connected to the ACX controller, which is a part of the control unit. The same HMI controller can be connected and disconnected during the controller's operation to be used (successively) to control several control units (controllers).

Conditions of Use

Permissible ambient temperature is from -10 to 50 °C
Degree of protection is IP50.

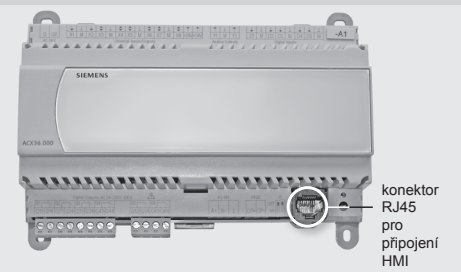
Warning

When repairing the VCB-A unit, it is necessary to turn the main switch off and lock it in its off position to prevent unwanted starting of the unit.

Connection and Location

The HMI controller can be connected via serial interface (8-conductor cable JST) and connector RJ45. The length of the cable is 3 meters. The cable is led to the distributing board through a PG16 grommet. This ensures degree of protection IP20. If a higher degree of protection of the distributing board is required, it is necessary to seal the grommet. The RJ45 connector must be connected to the RJ45 socket in the ACX controller.

Figure 10 – Central module with HMI connection



Warning

The connecting cable must be connected to the RJ45 serial socket, see fig. # 39. The controller must be positioned so that easy access and connection will be ensured.

Description

The HMI Controller ACX84.910 is equipped with a 70x45 mm LCD display, resolution 128 x 80 dots. Eight lines with 20 standard characters or four lines with non-standard characters can be displayed on the screen. The HMI controller is connected to the control unit by the RJ45 cable. The HMI Controller in its upper part is provided with four function keys, F1, F2, F3 and F4, and five control buttons used for the menu navigation, display, change and configuration of measured values and system parameters. On the rear side it is equipped with a magnetic pad to fix it to metal parts (e.g. air-handling components).

Description of Keys and Buttons:



Function key F1. Return to the homepage.



Function key F2. Upon first press it navigates up to the top of actual page, upon the second press it navigates up to the parent page.



Function key F3 is equipped with a green LED. It navigates to the page of the basic control of the unit: operation settings, information on actual device state, control place switching. The flashing green LCD indicates the fan is running.



Function key F4 is equipped with a red LED. It navigates to the page of failures: information on active failures and their types, failure reset, navigation on the failure history page. The flashing red LCD indicates a failure. Upon first press it navigates to the menu of failures, upon the second press it resets the failure.

Control

Description of Control Buttons:



Navigation buttons to move within menus and submenus.



Editing keys to select desired items/values.



Confirms selection.

Display

After connecting the HMI controller using the RJ45 connector, the initial screen of the control menu is displayed. The first three lines are reserved for the page heading, which includes the device name and number, date and time.

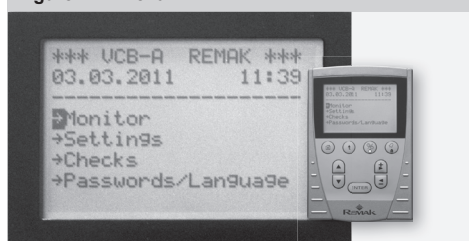
The items of individual menus are on lines 4 to 8. Access to these menus is protected by a password, see below. After entering the password in the "Password" box, it is possible to move among and read or change the parameters in accordance with the user's authorization.

The first three lines are reserved for the page heading, which includes the device name and number, date and time.

Access to the Device Operation Parameters

A transparent tree structure and menu arrangement provides easy navigation when working with the HMI controller. The menu can be accessed after entering the password, which enables access to four access levels according to the user's access authorization. The language can be selected directly on the HMI controller. For details, refer to "HMI Menu".

Figure 11 – menu



Menu "Monitor"

This menu shows a list of parameters to check the air-handling device operation (current modes, temperatures, outputs and operating states).

Menu "Password/Language"

User Roles (Authorizations) and General Specification

Warning

The device parameters are structured and can be accessed by users in accordance with their role (authorization). The roles (authorizations) must be assigned by the system administrator according to the user's qualification and responsibility for device operation.

- **Guest** – enables only viewing of common parameter states

- **User** – enables viewing and control of common parameters, and turning the device on / off.

- **Administrator** – allows the system administrator to view and control common and some system parameters, and change operating parameters and modes.

- **Service** – This role (authorization) is reserved only for the device supplier, respectively for an authorized service provider. In addition to administrator's rights, it allows modifications of expert configuration parameters related to the controlled air-handling unit and its equipment, control constants and parameters of the VO water heater protection.

Warning

- To keep the device secure, we strongly recommend changing the factory user settings when commissioning the device.

- It is advisable to note down the passwords for the "Service" and "Administrator" roles (authorization) and keep them updated and in a secure (confidential) place to be able to keep administrator's access to the system (user administration, expert settings).

- If you forget or lose your "Service" level password, you will have to contact the manufacturer's representative! The "User" and "Administration" passwords can be renewed from the "Service" level, usually by the manufacturer or authorized service representatives.

- The changed user setting cannot be automatically returned (e.g. by reset) to the factory default settings.

- The user of the SERVICE level can change the passwords of all other user levels, the user of the ADMINISTRATOR level can change the passwords of the GUEST and USER levels while the users of the USER or GUEST levels are not allowed to change any passwords.

Control

Default (Factory) Setting of Access to the VCB-A system via HMI

Pursuant to the concept of structured access from the web interface, the HMI controller is secured by a structured system of access rights, refer also to "List and Description of Menu and Default Factory Settings".

The only difference is the system of assigning access authorization; single-user access is applied. Only four access passwords (four-digit) and one of the different access levels of authorization can be assigned.

Factory default access settings:

Role/Authorization Password (factory setting)

HOST:	1111
USER:	2222
ADMINISTRATOR:	3333
SERVICE:	4444

Warning:

- To keep the device and its access secure, we strongly recommend changing the factory preset access setting according to the user's needs.

- It is advisable to note down the passwords for "Service" and "Administrator" roles (authorization) and keep them updated and in a secure (confidential) place to be able to keep administrator's access to the system (user administration, expert settings).

- If you forget or lose your "Service" level password, you will have to contact the manufacturer's representative. The "User" and "Administration" passwords can be renewed from the "Service" level (usually by the manufacturer or authorized installer/ M&C service providers).

- The changed user setting cannot be automatically returned (e.g. by reset) to the factory default settings.

Example of HMI Use – Password Entry:

After connecting the HMI controller (connecting the connector RJ45), a flashing cursor appears at the position of the menu PASSWORD ENTRY, confirm by pressing ENTER. Using the navigation buttons, go to the ENTER PASSWORD menu and confirm. Now you are in the password entry menu, the cursor flashes on the first password digit position. Using the editing keys enter the first password digit and confirm. The cursor moves to the next password digit position, and the procedure is repeated until the fourth digit of the password is set and confirmed.

Note: The user must log out of the "Enter password" menu after finishing work with the HMI controller, if not the system will automatically log out the use after 10 minutes of inactivity.

Menu "Settings"

Date and Time (System Time)

This option sets the actual VCB-A system date and time – this is necessary for correct operation.

For quick setting, use the icons provided; upon clicking them, the actual values from your PC will be entered to the correspondent fields. New settings must be saved to be applied. The VCB-A system switches automatically between summer and winter system time in accordance with standard European terms.

Note: The parameter "System time validity" does not mean that the time values are correct (the device is not able to communicate with reality); it just indicates that the time was adjusted by the operator.

Default Application Parameterization

To ensure comfort, economical and easy-to-operate device operation, it is necessary to carry out the main settings which define the parameters and air supply, respectively the process and stability of the temperature control in the ventilated room. It is necessary to set parameters in all corresponding submenus:

- Temperature modes
- Time schedules
- Manual mode
- Control parameters
- Correction values
- Antifreeze protection
- Control constants

For a description of parameters, refer to the section "List and Description of Menus and Default Factory Settings" and the VCB-A interface on-line Help. The submenu "Device configuration" should be configured during the device commissioning, refer to "Parameter Settings".

Menu "Checks"

It includes the failure check and inspection administration submenus.

Failure (Digital) Inputs – States of External Components

If a failure of any external component connected to the failure inputs occurs (fault state of the contact), the alarm is automatically activated by the VCB-A control unit in accordance with its internal algorithm – while simultaneously indicating the faulty object and if necessary (serious failure) stopping the device.

In addition, the states of the failure inputs can be monitored in the menu "Checks" >> ["Failure inputs"]. Individual parameters in this submenu display the actual physical state of the digital failure inputs of the controller.

The information on failures of temperature sensors, respectively their state evaluation outside the standard working range of the measured value, is specific error messages. The VCB-A automatically signals not connected, disconnected or short cut temperature sensor, or the exceptional measured value.

Control

These components (temperature sensors) are not of the contact type, and they (their states) are not displayed in the "Failure inputs" menu.

Reset of Failures



In this submenu there is only one parameter which can be used to reset the list of active failures and failure inputs.

Resetting of the failure may only be performed after it has been checked, its reason found and removed.

See also "Signalling – Failure".

Inspection and Maintenance Schedule

The VCB-A scheduling system supports the planning of regular service inspections of controlled technology.

The maintenance schedule is based on hours of operation and/or the date.

Maintenance Planning According to Hours of Operation

The limit of hours of operation for main device component (fans, pumps) maintenance can be preset by this parameter. This limit is then checked by the system and if exceeded, an error message including hours of operation of the given component is reported (for further information, refer to "Hours of Operation")

After performing the maintenance, it is necessary to set a new limit of operating hours for the next inspection. Simultaneously, the system enables planning according to the date. The limit for the first maintenance of the air-handling unit is set in the factory at 4000 hours of operation. This is also the recommended "planning step" for subsequent maintenance intervals. It is assumed that repeated maintenance would be performed every 4000 hours of operation.

Maintenance Planning According to the Date (Season)

Similarly as with the hours of operation limit, this parameter enables you to set the date of the nearest service inspection as a maintenance limit, if reached (exceeded), an error message is reported. After performing the maintenance, it is necessary to set a new valid date for inspection.

The inspection should be scheduled for the beginning of the summer and winter season – to check and prepare the device for specific conditions of the respective season (heating/cooling) – in relation to the associated technologies (heating and cooling circuits).

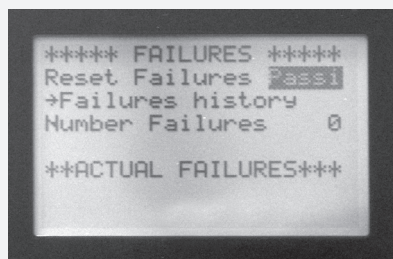
List and Description of Menu and Default Factory Settings

Warning:

The device parameters are structured and can be accessed by users in accordance with their role (authorization). The roles (authorizations) must be assigned by the system administrator according to the user's qualification and responsibility for device operation. Following the above-mentioned rule, the HMI menu is also structured – some menus are not accessible and some parameters cannot be changed by users of roles (authorizations) lower than Service.

The HMI menu is displayed (see pages 18-20) for the highest access right, and all possible combinations of air-handling devices are taken into account.

Figure 12 – reset poruch



HMI menu

Menu HMI VCB-A						
Menu		Description	Factory setting			
			Value	Min	Max	
Monitor						
Current modes						
ControlPlace		Control place				
DefaultOperMod		Default device operating mode				
CurrenOperMod		Current device operating mode				
FanStatus		Fan status				
CurrentTempMod		Current temperature mode				
TimeSchedule		Stand-by time schedule				
State Ore		External control state (ORe)				
CurrentContSeq		Current control sequence				
NumbOfFailures		Current number of failures				
Temperatures						
Room		Room temperature (exhaust)				
Inlet		Inlet air temperature				
Outdoor		Outdoor air temperature				
RetWaterHeat		Return-water temperature of the water heater				
AirHeatExchan		Exhaust air temperature behind the heat exchanger				
ReqHeatLoLim		Required heating water temperature (lower limit)				
ReqCoolHiLim		Required cooling water temperature (high limit)				
Outputs						
FanOutput		Fan output				
RequirFanOutput		Required fan output (stage)				
Fan		Fan				
RequirFanOutput		Required fan output				
HeatingValve%		Position of the heating mixing set valve %				
HaetingEOValve%		Control output level for electric heating %				
CoolingValve%		Position of the valve for cooling %				
CoolingState		State of the control output for cooling				
CoolingCapacity		Cooling capacity (2 st)				
MixSectPosition%		Position of the control output for mixing sections%				
HeatExchangPos%		Position of the control output for the heat exchanger%				
Working states						
GroupAlarm		Error output status - Remote report (summary)				
FanState		Fan state				
DigitalRecover		State of the digital output for heat recovery				
HeatingPump		Heating pump state				
ElectricHeater		Electric heater state				
CoolingCompres		Cooling compressor state				
WaterCoolPump		Water cooling pump state				
Damper		Shutting damper state				
Settings						
Date and time						
DayOfWeek		Day of the week				
Date		Date				
SystemTime		System time				
TimeValidity		System time validity				
Temp modes		Temperature modes				
ComfortHeating		Comfort heating				
TemperatureHeating		Temperature heating	22,6	10*	35*	°C
ComfortCooling		Comfort cooling				
TemperatureCooling		Temperature cooling	24,6	10*	35*	°C
EconomyHeating		Economy heating				
TemperatureHeating		Temperature heating	21,6	10*	35*	°C
EconomyCooling		Economy cooling				
TemperatureCooling		Temperature cooling	26	10*	35*	°C
VentilatingHeating		Ventilating heating				
TemperatureHeating		Temperature heating	20,6	10*	35*	°C
VentilatingCooling		Ventilating cooling				
TemperatureCooling		Temperature cooling	28	10*	35*	°C
Manual mode						
FanOutput		Fan output for manual mode				
TempMode		Temperature mode for manual operation				
Time schedules						
Daily schedule		Daily time schedule				
WeeklyTimeSchedule		Weekly time schedule				
YearlyTimeSchedule		Yearly time schedule				
ResSchedDaily		Reset of time schedules to the default factory settings (Daily)				
ResSchedWeek		Reset of time schedules to the default factory settings (Weekly)				
ResSchedYear		Reset of time schedules to the default factory settings (Yearly)				
Options ORe2						
Speed low		Fan output for manual mode ORe2 speed low				
Speed high		Fan output for manual mode ORe2 speed high				
Control parameters						
MinValueFrsHwAir		Minimum volume of fresh air	30	0	100	%
TempEnableCooling		Minimum outdoor temperature to enable cooling	14	-5	35	°C
FanStartUpDelay		Fan start-up delay (after damper)	30	0	300	s
MinimFanRun		Minimum time of the fan run	15	10	120	s
FanDelaySwitch		Delay for switching two-speed motors from higher to lower speed	12	5	30	s
FanRunDownElmtg		Fan rundown for electric heating	60	0	300	s

* min./max. values are automatically changed in accordance with selected temperature modes

HMI menu

DelayFanFlwAlarm	Delay of the air flow alarm	60				s
MinTimeSwitchEIHtg	Minimum on/off time of the electric heater	10				s
MinTimeSwitchClg	Minimum on/off time of the cooling compressor	240				s
MaxTempReturWater	Maximum temperature of return-water from the water heater	70	20	90		°C
HtgPmpRunDown	Heating pump rundown	1				min
Correction values						
MinInletAirTemp	Minimum inlet air temperature	15	10	35		°C
MaxInletAirTemp	Maximum inlet air temperature	35	15	40		°C
MaxValCompClg	Maximum value of summer compensation (cooling)	2	-10	10	K	
ClgCompStart	Cooling compensation – initial point	25	10	35	°C	
ClgCompEnd	Cooling compensation – end point	35	26	35	°C	
MaxCompHtg	Maximum value of winter compensation (heating)	1	-10	10	K	
CompHtgStrt	Heating compensation – initial point	0	-20	10	°C	
CompHtgEnd	Heating compensation – end point	-20	-35	0	°C	
CorrectRoomTemp	Correction of required room temperature (from QAA27)					
RoomTemp	Room temperature (exhaust)	0				°C
InletTemp	Inlet air temperature	0				°C
OutdoorTemp	Outdoor air temperature	0				°C
RetWaterTemp	Return-water temperature from the water heater	0				°C
ExhaustTempExchang	Exhaust air temperature behind the heat exchanger	0				°C
CascRegLimit	Maximum influence of cascade control	10	1	20		°C
Anti freeze						
RetWaterAlarmTemp	Return water alarm temperature (anti-freeze protection system)	8	3	20		°C
AirAlarmTemp	Inlet air alarm temperature (anti-freeze protection system)	6	3	15		°C
ActiveAntiFreeze	Active anti-freeze protection water temperature - valve opening	15	10	40		°C
WaterTempStopMode	Moderate heating temperature of the water heater in Stop mode (fans off)	30	15	60		°C
MinOutTempBoilSwit	Minimum outdoor temperature to enable boiler switching in Stand-by mode	10	10	20		°C
HeatingUpCurve	Heating-up curve of the water heater circuit when starting AHU					
			X1 = -10	Y1 = 100		°C/%
			X2 = -5	Y2 = 66		°C/%
			X3 = 0	Y3 = 33		°C/%
			X4 = 10	Y4 = 0		°C/%
HtgUpTimeWatHtr	Heating-up time of the water heater circuit when starting AHU	60	20	300		s
HtgUpTimeBoilHtr	Heating-up time of the boiler circuit when starting AHU	120	10	600		s
PreHtgRamp	Setting of preheating cease ramp steepness of the water heater circuit when starting	10	0	100		%/min
HeatExFreezeAlarm	Heat exchanger freezing alarm temperature	1	-10	30		°C
RequieWaterTemp	Required heating water temperature	45				
LimitatHeatDrop	Limitation of the requested heat drop steepness	10	0	100		
EquilthermCurve	Equiltherm curve for heating request					
			X1 = -15	Y1 = 90		°C
			X2 = -5	Y2 = 75		°C
			X3 = 5	Y3 = 60		°C
			X4 = 15	Y4 = 45		°C
Control factors						
FactorsHtg	Factors - Water heating					
IntegFactorHtg	Integration factor of water heating sequence	45				s
DerivFactorHtg	Derivative factor of water heating sequence	10				s
PropFactorHtg	Proportional factor of water heating sequence	5				
FactorsClg	Factors - Cooling					
IntegFactorClg	Integration factor of cooling sequence	60				s
DerivFactorClg	Derivative factor of cooling sequence	0				s
PropFactorClg	Proportional factor of cooling sequence	-5				
FactorsHeatExchang	Factors - Heat exchanger					
IntegFaktorHR	Integration factor of heat recovery sequence	45				s
DerivFaktorHR	Derivative factor of heat recovery sequence	0				s
ProporFaktorHR	Proportional factor of heat recovery sequence	7				
FactorsMixing	Factors - Mixing					
IntegFactorMixing	Integration factor of mixing sequence	45				s
DerivFactorMixing	Derivative factor of mixing sequence	15				s
PropFactorMixing	Proportional factor of mixing sequence	7				
FactorsHtgSeq	Factors - Heating sequence					
IntegFactorHtgSeq	Integration factor of cascade sequence for heating	600				s
PropFactorHtgSeq	Proportional factor of cascade sequence for heating	20				
FactorsClgSeq	Factors - Cooling sequence					
IntegFactorClgSeq	Integration factor of cascade sequence for cooling	600				s
PropFactorClgSeq	Proportional factor of cascade sequence for cooling	-20				
FactorsEIHtg	Factors - Electric heating					
IntegFactorEIHtg	Integration factor of electric heater sequence	60				s
PropFactorEIHtg	Proportional factor of electric heater sequence	2				
FactorsInletLmtrMax	Factors - Limiters of inlet maximum temperature					
IntegFacinletLmtrMax	Integration factor of inlet maximum temperature limiter sequence	150				s
PropFacinletLmtrMax	Proportional factor of inlet maximum temperature limiter sequence	-5				
FactorsInletLmtrMin	Factors - Limiters of inlet minimum temperature					
IntegFacinletLmtrMin	Integration factor of inlet minimum temperature limiter sequence	150				s
PropFacinletLmtrMin	Proportional factor of inlet minimum temperature limiter sequence	10				
FactorsRtnWatLmtr	Factors - Limiters of return-water temperature					
IntegFactRtnWatLmtr	Integration factor of return-water temperature limiter sequence	300				s
PropFactRtnWatLmtr	Proportional factor of return-water temperature limiter sequence	-3				
FactorsAntifreeze	Factors - Super antifreeze protection					
IntegFactAntifreeze	Integration factor of Super antifreeze protection sequence	90				s
PropFactAntifreeze	Proportional factor of Super antifreeze protection sequence	20				
FactorsHeatExFreez	Factors - Heat exchanger antifreeze protection					
IntegFactHeatExFreez	Integration factor of heat exchanger antifreeze protection sequence	150				s
PropFactHeatExFreez	Proportional factor of heat exchanger antifreeze protection sequence	20				
Device config	Device configuration					



HMI menu

TypeOffFan	Type of fan control				
TypeOfHeating	Type of heating				
HtgSignType	Signal for heating valve actuator control				
AirMixing	Air mixing				
AirMixingTypeSig	Signal for mixing valve actuator control				
HeatRecovery	Heat recovery				
HeatRecovTypeSig	Analogue signal for heat recovery				
HeatRecovDO On	Digital heat recovery on				
HeatRecovDO Off	Digital heat recovery off				
MixHeatRecovPrio	Order of mixing and heat recovery sequences				
TypeOfCooling	Type of cooling				
SigClgValve	Signal for cooling valve actuator control				
ControlType	ControlType				
DO7 Config	Configuration of the DO7 control function				
AO2 Config	Configuration AO2				
LON Config	LON Configuration				
UI6 Config	UI6 input configuration				
UI14 Config	UI14 input function configuration				
OS version	Controller OS version				
ApplicationVersion	Control application software version				
DateOfDrafting	Date of drafting				
HMI SoftVersion	HMI version				
Checks					
Failure inputs					
FansState	Fans				
AirFlowState	Air flow				
HtgPmpState	Water heater pump				
ElHtrState	Thermal protection of the electric heater				
CoolingState	Cooling				
InletFiltrSt	Inlet filter				
OutletFiltrSt	Outlet filter				
ExternAlrmSt	External fault alarm (fire ...)				
Counter of motor					
FanHours	Counter of operating hours - fans				
HtgHours	Counter of operating hours - heating				
ClgHours	Counter of operating hours – cooling				
ElHtrHours	Counter of operating hours – electric heater				
MaintenSchedule					
InspeCountMotor	Next inspection (according to hours of operation)				
InspectionYear	Next inspection (according to date) - year				
InspectionMonth	Next inspection (according to date) - month				
InspectionDay	Next inspection (according to date) - day				
InspectionHour	Next inspection (according to date) - hour				
Passwords/Language					
Log in					
Log out					
Change Password					
Stage:					
EnterNewPassw:					
Language selection					
Current Language					
Button F3					
*** State WBC ***					
ControlPlace	Control place				
DefaultOperMod	Default device operating mode				
CurrentOperMod	Current device operating mode				
FanStatus	Fan status				
CurrentContSeq	Current control sequence				
CurrentTemp	Current temperature (Room)				
Button F4					
***** FAILURES *****					
Reset Failures	Reset failures				
Number Failures	Current number of failures				
Failures history					
NumFailureHistory	Number failures history				
ACTUAL FAILURES					
OutSnr	External temperature sensor				
FrstSnr	Return water temperature sensor				
HRFrstSnr	Heat exchanger freezing sensor				
InletSnr	Inlet temperature sensor				
RmSnr	Space temperature sensor				
ExternAlrmEr	External failure				
FanAlrmEr	Fan				
FanFlwErrEr	Flow				
HtgPmpErrEr	Water heating pump				
HtgEOAlmEr	Electric heater				
SplyFiltrDirtyEr	Supply filter				
ExtrFiltrDirtyEr	Extract filter				
ClgHumAlmEr	Cooling				
HtgFrstDlctr	Heater freeze protection				
HtgFrstAlm	Freeze protection - water				
HtgFrstAirAlm	Freeze protection - air				
HRFrstMsg	Heat exchanger freezing				
Service	Scheduled maintenance				
ClgHours	Operation hours - cooling				
FanHours	Operation hours - fan				
HtgEOHours	Operation hours - electric heating				

Complementary control, Failures

Complementary control



In addition to the PC control via internet browser, the VCB-A unit can (in some cases) be designed to be alternatively controlled via manual controller Ore1, which enables switching of basic operating modes (Manual, Program and Stop):

If the device is configured to be alternatively controlled via ORe remote controller, it is possible to toggle the control places in the HMI menu – parameter Control place, respectively using F3 button. When the Control place is switched to HMI, the ORe controller will be disabled by the control system, and it will not respond to the control button.

Remote control of VCB unit

Way of starting and control is set by user by option in control unit settings. External remote control can be chosen instead of internal control on keyboard of control unit. Remote control provides unit starting and air flow control, or air temperature control without communication with control unit, directly from ventilated (air conditioned) room.

ORe1 – for VCB they control air handling unit with fans without output power control - the controller can stop and start the device and switch it to time program

ORe2 – for VCB they control air handling unit with fans equipped with output power control – the controller can stop the device or start it in two preset output power levels and switch it to time program.

Both controllers also signal operation modes and device failures. For needs of control from superior system or technology it is possible to replace controllers ORe2 and ORe1 by two non-voltage contacts; for specific functions (narrowed to switching 2 modes) even with one thermo-contact (after consultation with producer).

ORe5 – for direct operating of fan output power controllers without use of internal driver and for device (control unit) starting and shutdown.

Use with VCB is limited because it is not possible to use output power control according to time program (stopping and starting is possible using program).

Remote signalling

VCB control unit can be optionally equipped with one or two outputs for remote signalling.

According to configuration, signalled can be:

- only failure (voltage output 24 V / 0,1 A)
- failure and operation (2 non-voltage contacts, max. 230 V / 10 A).

Failures

The VCB-A control unit monitors, evaluates and informs on various types of system failures.

The failures are signalled, see the article above; orange in the web interface, red on the HMI controller and text at the bottom of the right panel (if the failure signalling is not switched off in the menu "Connection" >> ["VCB-A interface"]). Failures are also listed in the menu: Monitor" >> ["Current failures"].

The last 15 failure events are saved in the device memory (failure start and end); they can be displayed in the menu "Statistics" >> ["History of events-errors"] (refer to "History of Events-Errors"; ceased failures, refer to Warning above).

Error messages include object identification, i.e. the components identified as faulty, which must be checked for failure reasons before quitting the failure state.

The failure reset, refer to "Failure Reset".

For further specific information, refer to "Administration/ Checks, Statistics, and E-Mail Configuration".

Failure (Digital) Outputs

VAlI important components of the air-handling unit (fan motors, electric heaters, etc.) are equipped with failure outputs (contacts) which after being connected to the correspondent inputs (contacts) are monitored and evaluated by the VCB-A control unit, respectively by the controller. If a failure occurs (fault state of the contact) the alarm is automatically activated in accordance with the internal algorithm – while simultaneously indicating the faulty object and if necessary (serious failure) stopping the device. The failure states can also be checked in the menu "Checks" >> ["Error inputs"]. Individual parameters in this submenu display the immediate state of digital failure inputs to the controller in any mode. For more information, refer to "Checks, Failures, Statistics, Failure states".

Note: In the stop mode (at the beginning of start up) the sensors of the air flow and filter fouling signal the actual state of contacts, which in this working mode equals a failure state (contacts are opened). Under such circumstances, the system does not evaluate this state as a failure (the evaluation is carried out after expiration of the delay time which has been set in the menu).

Similarly, in the stop mode – no air flow – the contacts of the filter fouling sensor are switched to the idle state (closed) which does not correspond with the failure state, even though a failure occurred and was signalled during previous operation (the failure will be signalled again after device start up – if the failure has not been removed).

Possible Reasons for Failure Alarms

Failures of Temperature Sensors

The information on failures of temperature sensors, respectively their state evaluation outside the working range of measured value, is specific error messages. The controller automatically signals not connected, disconnected or short cut temperature sensors, or the emergency value, and in case of main control (e.g. inlet air) or protective (antifreeze protection) sensors, shuts down the system. Failures of outdoor and indoor temperature sensors disable functions related to the input value from the respective sensor. The VCB-A system requires all sensors in accordance with the device specification.

VO Water Heater Antifreeze Protection and Heat Exchanger Frost Back Failures

Antifreeze protection system of the VO water heater signals a failure on the basis of air or water temperature drop below the preset limits. For antifreeze protection details, refer to "Control and Protective Functions" above

Operating Hours

The preset limit of hours of operation for device maintenance is checked by the system, and if exceeded it is signalled as an error (without influencing the device operation). For further information, refer to "Inspection and Maintenance Schedule".

Possible Reasons for Failure Alarms

Antifreeze Protection Alarm

- Low water temperature in the water heat exchanger circuit.
- Check the water temperature in the water heat exchanger circuit.
- Check the heating water supply source.
- Check and if necessary clean the filter of the SUMX mixing set.
- Check the heat exchanger for fouling.
- Check the switching and operation of the pump.
- Check the operation of the three-way valve actuator.
- Check the NS 130 sensor in the duct

Failure of the Electric Heater

- Check the thermo-contacts of the electric heater.
- Check the switching of the electric heater.
- Check the circuit breaker and condition of the EOS(X) electric heater.
- Check and clean the filter insert.
- Check dampers for opening.
- Check the air flow regularity

Particularities of Electric Heaters

EOS electric heaters are designed for long, safe and reliable service. As semiconductor relays (SSR) are used in their construction it is necessary to pay special attention to operating conditions, especially to overvoltage, installation and allowable the SSR relays to warm up. SSR relays are modern semiconductor power components designed to switch output stages of electric heaters while producing a low level of electronic hash when switching.

The max. pole voltage for SSR technology must not exceed 1,200 V. As standard, SSR relays are equipped with overvoltage protection. If the voltage exceeds the values allowed by the ČSN 330420 standard for installation category III, the service life of SSR relays can be reduced and/or they can even be destroyed. If this is the case, the supply line must be provided with multi-stage overvoltage protection. A greater danger of overvoltage can be caused by closely situated 22kV / 400V transformers, highly loaded parallel lines, frequency converters, etc.

Overheating of the inner semiconductor structure of SSR relays can cause its destruction. The design of the SSR relay ensures sufficient cooling providing its cooler is situated in an air flow. Overheating can also be caused by increased contact resistance of the supply terminals and supply cable. Therefore, when installing or inspecting the device, it is essential to pay special attention to the tightening of screws on the SSR terminals.

Fan Failure

- Check the connection of thermo-contacts.
- Check the motor circuit breaker condition.
- Check the V-belt condition.
- Check the fan for free rotation.
- Check the connection and functioning of the P33N pressure difference sensor.
- Check the motor input current.
- Check the frequency converter condition

Air Flow Failure

- Check the V-belt condition.
- Check the fan for free rotation.
- Check the connection and functioning of the pressure difference sensor.
- Check the fan run and direction of the propeller rotation.
- Check the frequency converter condition

Emergency Alarms –Fire, Smoke

- Check the state of the fire dampers.
- Check the condition of connected external devices.

Filter Fouling

- Check the filter for fouling, and replace if necessary
- Check the P33N pressure sensor setting

Cooling Failure

- Check the condition of the connected cooler
- Cooling Malfunction – without failure report
- Check the switching and operation of the water cooler's pump (at active cooling signal over 20% = 2V)

PMO Sensor Failure

- Check the temperature of the heating water.
- Check the connection of the NS 130R sensor.
- Replace the sensor

The network control light does not flash

- Check the supply voltage.
- Check the breaker of auxiliary circuits
- Check the power supply fuses

Spare Parts and Service

Troubleshooting

When performing any work or troubleshooting on the air-handling device, it is necessary to disconnect the power supply from the entire distribution board using the main switch. Pay special attention to proper operation of the assemblies ensuring device protection (SUMX mixing sets, motor and electric heater thermo-contacts). Verify proper functioning of the evaluating, protective and switching elements. Check the control signal. Check the tightening of terminal screws; both controller's and peripherals' terminals.

Regular Inspections

Service inspections of the entire air-handling device should be performed at least twice a year (transition of the unit operation from one season to another – summer/winter and vice-versa).

Extra inspections must be performed after the device repair or emergency.

The maintenance of the VCB-A control unit itself includes just regular cleaning, inspection of screw connections, conductors, and component fixing, etc. The components inside the box must be regularly cleaned of dust and other dirt. If necessary, clean the face side of the box with a soft wet cloth. Common cleaners can be used. The system performs regular preventive spinning of the pump. Therefore, if preparing the air-handling unit for summer operation, respectively if the heating system is drained, it is necessary to disconnect the pump of the mixing set from the power supply by turning the switch to the "OFF" position to protect the pump from damage.

When changing back for the winter season, the pump must be activated in reverse order, i.e. turned "ON", and its function verified.

The same applies for the cooling system (though the pump of the cooling system is not preventively spun).

Spare Parts and Service

Spare parts are not a part of the VCB-A control unit delivery. If needed, they can be ordered from the manufacturer or local distributor.

Guarantee and after-sales servicing can be ordered from the manufacturer or authorized service providers (see the list at www.remak.eu).

Disposal and Recycling

The VCB-A control unit contains electronic, metal and plastic parts. After exceeding its service life limit the VCB-A unit belongs to waste group Q14 according to the Waste Act (č.185/2001 Sb.) Regarding the possibility of part recycling, VCB-A belongs to waste group R5 by course of the above-mentioned Waste Act.

The VCB-A control unit contains the following types of waste, in accordance with Directive No. 381/2001 Sb:

- 15 01 01 Paper and cardboard packing (packaging, documentation) - must be delivered to a collecting centre.
- 15 01 02 Plastics (plastic box) - must be delivered to a collecting centre.
- 16 06 30 Disabled material containing dangerous substances (printed circuit boards incl. parts and batteries) - must be delivered to a specialized collecting centre.
- 16 06 04 Disabled alkali batteries (batteries on the printed circuit board or replaced batteries) - must be delivered to a specialized collecting centre.

Further, applicable national regulations and directives must be observed.

Warning

The manufacturer reserves the right to change and/or amend this documentation to include the latest technical innovations and/or to comply with the law, without prior notice.

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