



10/2007

INSTALLATION AND SERVICE INSTRUCTIONS



Control units

VCB

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Application, working conditions, construction

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.

Project

Project of control unit consists of selection of needed functions and configuration of inside composition. Project is done automatically using algorithm built in computer program by which the air handling unit is projected as well. Project output is exact production specification of control unit and these individualized lists for particular device:

1. list of connected components
2. schemes of electric wiring of all components
3. list of cables for wiring of all components

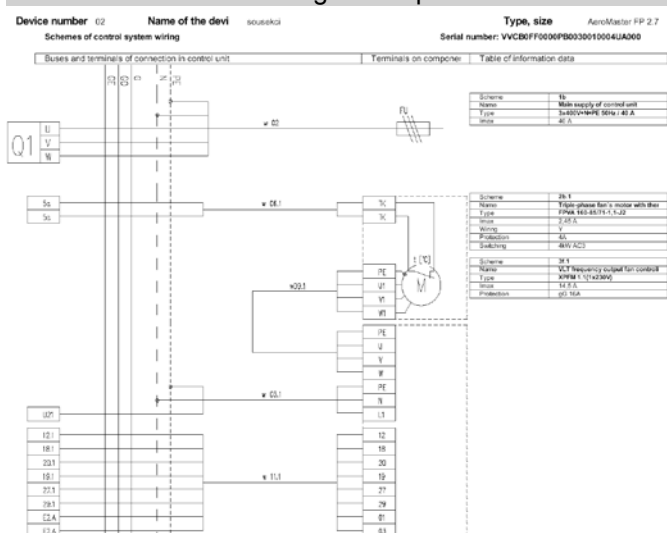
Picture 1 – list of connected components

Device number	Name of the device	Type, size
02	scusekca	AeroMaster FP 2.7

Configuration of control system		
Type of control system	VCB	Order number
Manufacturing code	VVCBFF000PB0030010004UA000	Customer
Protection	IP 65	Manufacturing date
Protection class	1 (EN 61140 ed2)	Serial number

Control / point of connection	Connected component / Value	Scheme number
Main supply - main switch	3x400V+N+PE 50Hz / 40 A	1b
Inlet fan - M1	FFVA 160-8571-1-1-J2	2b.1
Fan 1 output controller-M1	YPRM 1.1 (1x230V)	3b.1
Number of output levels of fan - M1	5	
Pressure difference sensor M1	P93 V (20 - 300 Pa)	11a.1
Type of electric heater	FFVc 2.7/12S	5b.1
Number of section which can be switched	1	
Current valve (pulse output modulation)	No	
Inlet damper or panel with damper	LK 800-320	
Actuator of inlet damper	LM 2.30	13c.1
Pressure difference sensor of filter 1 - inlet	P93 N (50 - 500 Pa)	11b.1
Number of pressure difference sensors of filter	1	
Sensor of inlet air temperature in the duct	NS 130	11e
Connecting sensor or controller	Not connected	
End switches of trip distributors	No	
Characteristics and options of fan output control	Internal controller in control unit	
Internal module for fan output control	MCU-2 / SW 1	
Remote failure / operation of system report	Not connected	
Logic control unit	PH	
HW/option controller	RWD 65 (RHM)	
Supply 24 V	32 VA	
Dimensions of control unit case	810x48x160	
Design of control unit case	Plastic with glass	
Protection of control unit case	IP 65	

Picture 2 – electric wiring of components



Picture 3 – list of cables for components wiring

Cable number	Cable type (recommended)	Power supply	Cable length [m]	Comment
w 02	CYKY 4x2	3x400V+N+PE		
w 03.1	CYKY 3x2	1x230V+N+PE		
w 09.1	CYKY T 4Bx	3x400V+PE		
w 09.1	H05VV-F 2x0.75	24V DC		
w 11.1	SYKPV 4x2x0.5	24V DC		
w 12.1	H05VV-F 2x0.1	24V DC		
w 13.1	CYKY 5x2	3x400V+N+PE		
w 21.1	JYFY 2x0.1	24V AC		
w 18.1	JYFY 2x0.1	24V DC		
w 38.1	CYKY 3x0.1	1x230V AC		
w 38.1	H05VV-F 2x0.1	24V DC		
w 33	JYFY 2x0.1	24V DC		

Documentation

Units can be installed and used only according to provided documentation. Documentation must be available to service attendance and placed preferably close to unit.

List of documentation provided with control unit:

Name	Use/specification
Installation and service instructions	Unit description and use (operation), installation, attendance, service
Record of functional and single part check performance	Unit installation, operation, service ¹⁾
Device service book	Starting procedure, service inspections and their evidence Control system configuration, Unit installation, operation (List of connected elements), ¹⁾

After installation, the documentation must be completed with initial revision of electric device, which is provided by company performing installation of VCB unit. Revision must be performed by specialist with appropriate competence.

Unit operation must be according to operation regulations (page 17).

Working conditions

Control units VCB can be used in dry environment without dust, chemical substances and explosion risk. Electric protection of plastic box corresponds with IP 65 when the door is closed and with IP 40 when the door is opened. 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.

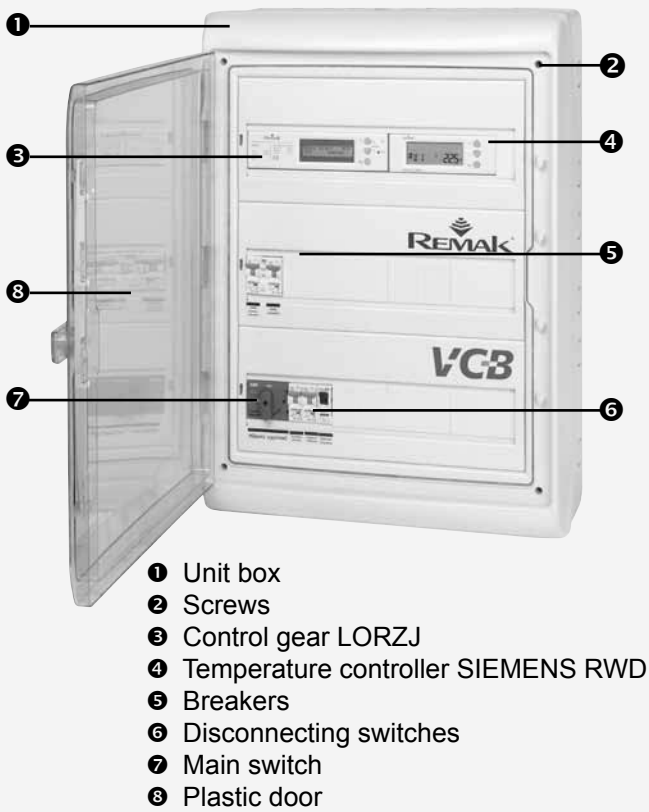
Unit construction

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.

(1) Bound together as Accompanying technical documentation

Application, working conditions, construction

Picture 4 – VCB unit construction



- ❶ Unit box
- ❷ Screws
- ❸ Control gear LORZJ
- ❹ Temperature controller SIEMENS RWD
- ❺ Breakers
- ❻ Disconnecting switches
- ❼ Main switch
- ❽ Plastic door

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

Regulating and control part

Control and regulating functions are provided by two interconnected components:

- temperature controller Siemens RWD
- component for logical and time actions control LORZJ

Particular configuration (there are many options) is determined by required function of control unit (controlled components).

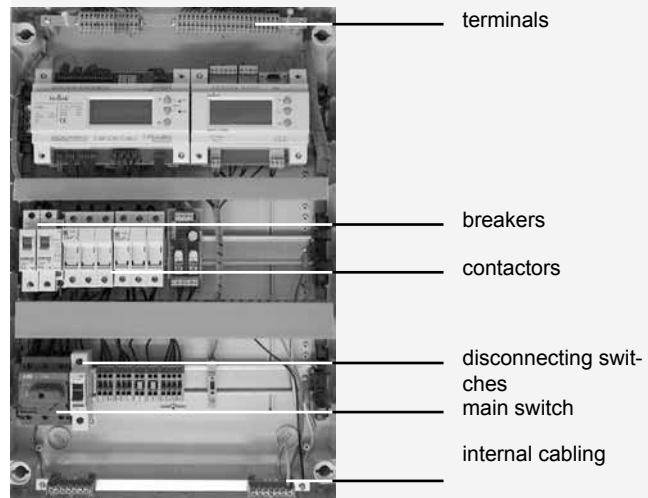
Picture 5 – VCB unit construction



There are three types of gears: RWD 62, RWD 82, RWD 68

Control component LORZJ is intended for control of air handling unit operation. It contains input circuits which scan states of separate parts of air handling unit and also output circuits which control air handling unit according to evaluated input states. Unit is equipped with real time gear which provides air handling unit control according to week time program.

Picture 6 – power part of VCB unit



Power part

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

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.

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.

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)

Temperature controller Siemens RWD provides temperature control by controlling operational devices (water heaters, cooling, heat exchanger). Controller guarantees high accuracy of control action with tolerance of $\pm 1^{\circ}\text{C}$. Controller enables to set comfortable and attenuation temperature which provides economical operation of whole device.

Application, working conditions, construction

Summary of functions			Control method			Control range	
Options	symbol	Controlled component	on / off	step	stepless	production	user
			Control functions				
inlet air temperature	Control functions						
	Comfortable temperature		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	23 °C	-50 °C to +150 °C ²⁾
	Attenuation temperature		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	18 °C	-50 °C to +150 °C
	water heating control	<input checked="" type="radio"/> water heater			<input type="radio"/>		
	electric heating control	<input checked="" type="radio"/> electric heater	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
	condensing unit control	<input checked="" type="radio"/> direct evaporator	<input type="radio"/>	<input type="radio"/>		1 to 2	no
	mixing set	<input checked="" type="radio"/> water cooler			<input type="radio"/>		
	speed control RR	<input checked="" type="radio"/> rotary heat exchanger	<input type="radio"/>		<input type="radio"/>		
air flow	Speed control						
	control of double speed motors	motor		<input type="radio"/>		higher/lower	higher/lower
	control of voltage controllers	controller		<input type="radio"/>		1 - 5	1 - 5
	control of frequency convertors	frequency convertor		<input type="radio"/>		1 - 5	1 - 5
anti-freeze protection	Safety functions						
	Heaters protection						
	anti-freeze protection of water heater on side of air	<input checked="" type="radio"/> water heater	<input type="radio"/>			5,5 °C	no
	anti-freeze protection of water heater on water side	<input checked="" type="radio"/> water heater	<input type="radio"/>			+8 °C (1-19)	no
	fore-heating of water heater during system operation	<input checked="" type="radio"/> water heater	<input type="radio"/>				
	fore-heating of ohřivače	<input checked="" type="radio"/> water heater			<input type="radio"/>	+30 °C (18-45)	no
	delayed start of fan operation	<input checked="" type="radio"/> water heater			<input type="radio"/>	120 + T(0 - 300) s	no
	opening and closure of dampers	<input checked="" type="radio"/>	<input type="radio"/>				
	delayed shutdown of fan operation	<input checked="" type="radio"/> electric heater			<input type="radio"/>	0 to 300 s	no
	maximal temperature check	<input checked="" type="radio"/>	<input type="radio"/>			80 °C	no
	heat exchangers protection	<input checked="" type="radio"/>					
	control of plate heat exchanger bypass damper	<input checked="" type="radio"/> plate heat exchanger	<input type="radio"/>				
	Fan protection						
	fan protection	<input checked="" type="radio"/> fan	<input type="radio"/>				
	thermocontact switching	<input checked="" type="radio"/> fan	<input type="radio"/>				
	shutdown of motor starter	<input checked="" type="radio"/> fan	<input type="radio"/>				
	motor overcurrent at frequency convertor scanning fan	<input checked="" type="radio"/>	<input type="radio"/>				
Programs							
real time		<input type="radio"/>					
week program with option of eight changes daily					0 to 8 changes	0 to 8 changes	
Control							
control from unit		<input type="radio"/>					
remote starting of unit	ORe 1	<input type="radio"/>					
remote temperature setting	QAA 25			<input type="radio"/>		+5 °C - +35 °C	
remote air flow setting	ORe 2		<input type="radio"/>			higher/lower	

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

Standard VCB unit doesn't provide cascade temperature control, mixing control, communication, humidification control, gas heating control, heating pump switching according to outdoor temperature, summer and winter temperature compensation.

(1) VCB controls 1- 2(3) outputs - can be combinations of two kinds (heating - continuous cooling - ON/OFF)
 (2) Maximal acceptable setting for air handling unit is generally to 40 °C

Control, protective functions

Algorithm of control

Temperature controller Siemens RWD automatically performs selection of one out of four basic actions according to required (set) temperature and actual measured temperature:

- ventilation (doesn't require heating or cooling)
- heat recovery (by rotary heat exchanger)
- heating (controller controls heater operation)
- cooling (controller controls cooler operation)

Heating and cooling can work together with heat recovery, or heating and cooling together (without heat recovery).

Control of heating

Water heating is controlled by SUMX mixing set actuator LM 24 SR with continuous control signal (0-10 V).

Electric heating can be controlled by:

- full output power switching – heaters EO, EOS
- separate sections switching – heaters series EOSX, big EO (sectional);
- control using current valve PV - heaters EOS (to 45 kW).

Control of cooling

Water cooling is controlled in the same way as water heating.

Direct cooling is controlled by output power of condensing unit switching. If the condensing unit is double-circuit (or if two single-circuit units are used), the control is double step. VCB provides optimal frequency of condensing unit switching.

Correction of requested value

This function is added at customer request.

Set value of inlet air temperature is adjusted according to outdoor temperature scanned by a sensor (set required temperature on controller is adjusted ("recalculated") according to temperature measured outside).

The purpose of this function is lowering temperature difference (shock) at the entrance to the building from outdoor environment and in other way, too (in certain situation also energy saving).

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 convertor;
 - by independent control system - with frequency convertor 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 convertor (lower quality of device but saving costs for convertor).
- continuous operation (with fans) with possibility of manual shutdown (for example in summer), that means without control.

Fan speed control

Speed control can be common for inlet and exhaust or independent for every branch.

For program mode and for manual mode with external VCB control it provides selection of two step fan output power setting. In this way, following device can be controlled:

- double-speed motors
- five-step voltage controllers
- frequency convertors

Higher and lower speed can be set on VCB unit. Setting is performed by producer or user according to draftsmen setting for required air flow rate.

Example for voltage five-step controllers and frequency convertors:

Higher speed is set for full unit operation –

5. level on speed controller. Lower speed is set for lowered output power (for example 3. level of output power on controller). For week program it means that always when higher speed is requested, the unit will be operated in 5. level and always when lower speed is requested, the unit will be operated in 3. level of controller. For manual mode with internal device, five output power levels can be set for voltage controllers and frequency convertors.

Fans output power controllers

Only controllers of second generation TRN - E and TRN - D and frequency convertors VLT can be standardly connected to VCB control units.

When making project of VCB to air handling unit in program AeroCAD, the right selection and compatibility of components is secured. When ordering control units without project worked in AeroCAD it is necessary to use right controllers.

Protective and safety functions

VCB provides package of protective functions which protect separate parts of controlled air handling unit.

Fan electromotors protection

Control unit VCB provides according to configuration protection of all types of fan motors mounted to air handling devices REMAK. That means:

- motors with external rotor, thermocontacts in winding
- standard asynchronous motors with thermocontacts in winding (single or double-speed);
- motors with external rotor with thermistors in winding or motors without thermocontacts of other than REMAK devices can be connected.

Motors with thermocontacts or thermistors with trigger in control unit or with serial thermocontacts in winding is basic protection against winding overheating owing to overloading or increased temperature of flowing air provided by continuous evaluating of thermocontacts state (they must be wired!).

Standard asynchronous motors or if the motors are not equipped with thermocontacts have protection against overloading provided by motor starters or temperature relay. In this case protection against overheating owing to high air temperature is not provided.

Control, protective functions

Motors wired through frequency convertor are protected by this convertor (its parameters must be set correctly). In case the motors are also equipped with thermocontacts is this second motor protection active as well. In this case protection against overheating owing to high air temperature is not provided as well.

Short-circuit protection (electric safety) is provided by breakers with motor characteristics (for voltage controllable motors with external rotor) or motor starters sometimes in connection with a fuse (for standard asynchronous motors) or fuses (used with frequency convertors).

Anti-freeze protection of water heater

Is framed as two-step - for water and air.

The protection is activated when the temperature:

a) of outlet air from exchanger drops under +8 °C (the user can order special setting in production in range +1°C – 19°C).

b) of inlet air after water heater drops down to +5 °C (can not be changed).

In "STOP" mode, the temperature of water heater is maintained at temperature c. +30 °C. This temperature is preset by producer and can not be changed by user (the user can order special setting in production in range from 18°C to +45°C).

If the water or air temperatures drop under limits, the unit alerts failure and shuts down the fan, closes all dampers and opens water mixing valve to 100%.

Part of anti-freeze protection is fore-heating which provides full power water heating in the heater for two minutes and after this time the fans are started.

Electric heater protection

- protective thermostat shuts down the unit if the temperature in the heater exceeds +80 °C.

- the unit provides function of delayed fan shutdown - after-running. Safe cooling of electric heater section is provided by this. After-running time is set according to specification in range from 60 to 300 s.

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 JM can be alternatively used.

Direct evaporator protection

Is provided by capillary thermostat CAP 3M, which disconnects cooling when the evaporator starts to get frostbitten.

Failure alarm

VCB unit provides well-arranged signalling of failure states. These states are divided into two groups:

Failures with A priority are such states which influence operation of air handling unit in great way. Examples: anti-freeze protection, fan protection, electric heater protection.

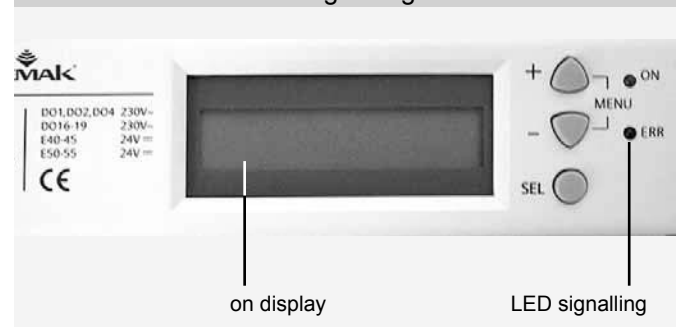
The air handling unit is stopped when these failures originate. Water version is stopped immediately after failure has originated. But according to type of originated failure there are different changeovers to emergency mode (immediate or standard use of AFP of water heating system). Devices with electric heating are according to type of failure either stopped right away - without fan after running (fan failure, external failure of for example fire-stopping damper) or with fan after-running (for cooling of el. heater, for example el. heater failure, cooling failure).

Failures with B priority are such states when set parameters are exceeded but this excess doesn't endanger any part of air handling unit. Example: filter clogging signalling. The control unit signals the failure but it doesn't stop operation of air handling unit.

Failures are signalled

- lighting red diode failure on LORZJ gear;

Picture 7 – unit failure signalling



- on display with failure specification
- acoustic signal

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.

Controllers types for remote control of VCB:

Operation and output power of device:

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 thermocontact (after consultation with producer).

Installation

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).

Air temperature

QAA25 – for remote correction of set temperature. Comfortable remote controller SIEMENS for setting required temperature in room is intended for mounting to the wall. It is operated by turning a selector in range from +5°C to +35°C. Use of controller must be set in configuration for the auxiliary function of remote temperature setting to be activated in production.

Automatic starting after blackout

User can set automatic starting of unit after a blackout. Independently from selected way of control, the unit is during automatic restart set to the same state as before the blackout.

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).

Transport and storage

Control units VCB are packed in cardboard boxes. Considering that it is a electrotechnic product, it is necessary to follow policy for handling of fragile goods.

Storing

Units must be stored in rooms where:

- maximal relative humidity doesn't exceed 85% without moisture condensation
- surrounding temperature ranges from -25°C to +60°C
- no dust, gases and caustic vapours or other chemical adulterants causing corrosion of construction parts and device equipment are present.

Placing

Placing must be done considering good access of attendance and easy cable wiring. Place on the wall for unit installation must be flat.

Securing service accesses

When placing the unit it is necessary to have sufficient room on service side for maintenance and service attendance.

Unit installation

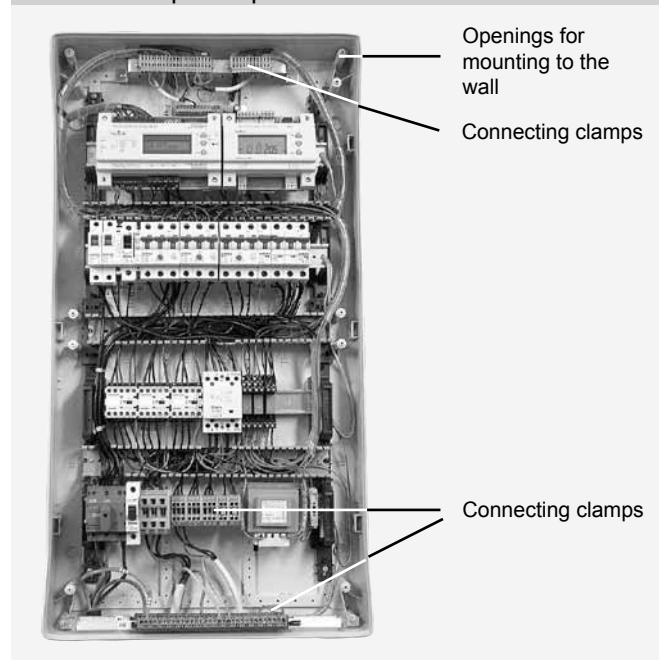
Before actual installation check entireness of delivery according to bill of delivery

Unit installation

- VCB control units are installed in vertical position either directly to wall or embed 50 mm under plaster.

Cables can be brought to the unit through plastic gutters or beneath the plaster. Units can be mounted directly to bases with combustibility grade of A and B according to EN 13501-1.

Picture 8 – power part of VCB unit



- power cables (motors, electric heating, main supply) are connected from below.
- control and communication cables (sensors, actuator control, etc.) are connected from above.
- we recommend to mount the unit to the wall using 4 pieces of plugs and screws considering structure of wall.
- control units 2000 mm high are placed on the floor

Unit connection

Safety instructions

Electric wiring can only be done according to general regulations by authorized worker. Revision of the whole electric wiring must be done before starting operation.

■ VCB control units get connected (according to type) either to TNS system (1x 230 V +N +PE) or TNS system (3x 400 V +N +PE). At the inlet to the unit there are separately clamps PE and N taken out. Values of output breakers are given by particular group of used motors and in some cases by electric heater. But we always recommend to check breaking ability of safety elements while paying attention to required time of disconnection, short-circuit resistivity and overcharging of appropriate cable.

■ control units are connected to air handling unit by cable system according to project documentation of electric wiring and project of measuring and control. Main supply is connected directly to main switch. Other power cables (fans motors, electric heater and pump of heating substance) are connected in bottom part of control unit to labelled clamps.

Installation

■ sensors, actuators and other components connected to voltage 24 V / AC are connected from above to labelled clamps.

Considering requirements for electromagnetic compatibility we recommend to run control and signal cables separately from power cables with minimal parallel-run and main supply provide with proper protection against overvoltage. To reach high operation reliability and service life of all components it is necessary to make sure that overvoltage does not exceed standardized values.

■ protection against dangerous contact of not live elements is framed as protection with automatic supply disconnection combined with supplementary connection of not live elements of separate device components.

■ during installation, all conducting parts of air handling device must be equipped with fan (castle) washer in place of screw connection on side of nut and screw as well.

■ all non-conducting parts, for example elastic connections must be bridged over with yellow and green wire (or with copper braid) of cross-section of 4 mm², at the ends equipped with cable loops with castle washers

■ the whole air handling unit must be interconnected with control unit by independent yellow and green wire with cross-section corresponding with cross-section of the supply cable or bigger. This conductor is connected in the control unit to the PE clamp.

■ when mounting control unit to the wall, when starting its operation even during regular operation it is necessary to make sure that the inside of unit doesn't get filthy. Control unit contains sensitive electromechanical elements whose foulness could effect safe operation of the whole air handling device.

All elements with electric connection are connected according to individual scheme of connection supplied with every produced control unit.

Temperature sensors

For temperature measuring there are for VCB units standardly used nickel temperature sensors Ni 1000 with temperature factor 5000 ppm/°C. The basic elements are metal nickel-based sensors which are made by technology of sputtering of thin metal layers on ceramic substrate and further processed by common procedures for integrated circuit production. They are characterized by great reliability and high stability if its parameters. The sensors are trimmed by laser beam so that the value of resistance at 0 °C was 1000 Ω.

Types of sensors

These types of sensors are recommended for VCB:

NS 120 - for temperature measuring in air handling duct

NS 130 R - for temperature measuring of outlet water in the collector of water heater

Sensor NS 120 must always be in inlet (after heater or cooler) and connected to the unit, and units controlling water heating must always have sensor NS130R connected in return water.

Also an auxiliary sensor of outside air temperature NS120 or remote controller for setting required temperature can be connected to the unit.

These optional elements (mutually alternative) must be set when configuring control unit (not all of a sudden).

Inlet air temperature sensor (type NS 120)

Placing: to the straight stage of air handling duct in distance of 1 to 5 m from heater to measure temperature of heated air before its exhaust to the room.

Protection stage according to EN 60 529 is IP 65. Sensors are delivered with plastic mounting clip. All metal elements are made of stainless steel grade 17 241 or 17 248. Range of working temperatures is -30 °C to 100 °C. Installation is done so that first using enclosed drilling template mount the plastic clip. After removing sensor cover connect through bushing the cable to the terminal. Then close the cover and insert the sensor to the clip. Conductors with cross-section of 0,35 mm² to 2 mm² are suitable for connection. External diameter of cable from 4 mm to 8 mm.

Note: sensor is used for control but it also works as an element of anti-freeze protection on side of air.

Sensor of return water in heater (type NS 130R)

Placing: They are installed to thread G1/2" in outlet collector on bottom side of the heater so that it was surrounded by water coming out of the heater.

They are developed especially for use in REMAK units as an element of anti-freeze protection. They have short time constant $\tau < 8$ s and $\tau < 15$ s. The actual sensing unit is placed in thin-walled tube 70 mm long on cover with thread G 1/2". The cover and tube are made of stainless steel of grade 17 241 or 17 248. The terminal is connected to the cover by cable 1m long. Protection is IP 65, measuring current max. 1 mA. Range of working temperatures for cover is -30 °C to 100 °C and for actual measuring unit -30 °C to +150°C. Cover mounting is done to thread G 1/2" on bottom side of outlet collector of water heater. The cover is sealed by flat packing on finished surface of collector. During installation of the cable to sensor terminal, the cable must not be twisted. The terminal is placed to suitable place where the connecting cable can reach.

Warning! Perfect sensor installation is condition for functional anti-freeze protection.

Pressure difference sensor (type P33 N)

Placing: on filter, heat exchanger or fan section. Generally it is mounted directly to the housing and measures pressure loss of given section. The sensor doesn't have power supply and when exceeding preset pressure difference the break-make sensor switches over. Switching pressure is set according to filter type on scale of gear wheel after removing the cover.

Parameters setting and control

Starting device operation

Check before first start-up:

- whether air handling device contains all elements necessary for safe operation. Above all check presence, placing and connection of temperature sensors, fan and heater thermocontacts, thermistors, safety thermostats;
- whether fans and electric heaters are correctly mounted (arrow indicates air flow direction);
- conductive connection of all parts of air handling duct and related devices;
- circuits connected to emergency accesses. Circuits can not be shorten out neither disconnected;
- reaction of control unit to separate failure states
- power supply and correct phase sequence

Service book

Service book determines extent and time periods of service checks, revisions and inspections including maintenance.

Service book and its recording enclosure are indivisible part of operation documentation of air handling device. Record performed to service book enclosure must be done in time, intelligible and indelible. Entireness and credibility of record have fundamental signification when analyzing air handling unit operation and deciding about possible claim.

Parameter setting

Setting of all parameters is done using two gears.

Control – LORZJ for setting parameters of control.

Regulating – RWD/OEM SIEMENS for temperature setting.

Picture 9 – operating



Both gears are operated in the same way. Operating is done using three-button keyboard which is separate for LORZJ gear and separate for RWD gear.

Functions of buttons: **(+)** and **(-)**

- function or parameter setting
- motion in the main menu and submenu (up–down)

SEL

- entry to selected mode from the main menu
- confirmation of function or parameter selection
- motion of cursor
- exit from main menu or submenu

Setting required temperatures values

Setting of required temperatures is done on Siemens controller RWD.

Picture 10 – control



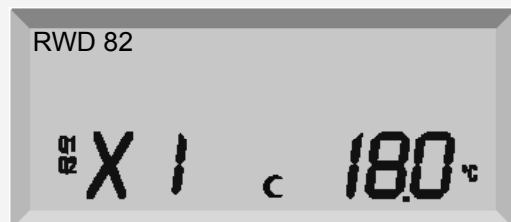
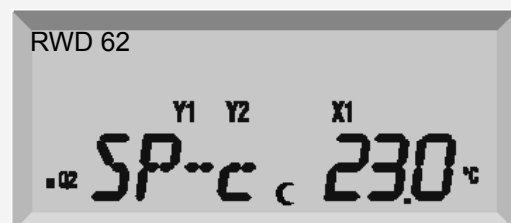
First switch-on

After power supply connection (main switch switch-on) the control unit runs initialization and display check (lighting of all segments). Actual state of device is displayed after the starting actions have been performed.

Picture 11 – example of control for RWD 68



For gears of series RWD 62 and RWD 82, the basic display is different.



Note: In the user menu there are another displays where only informative data are displayed. These displays are not intended for user parameters setting.

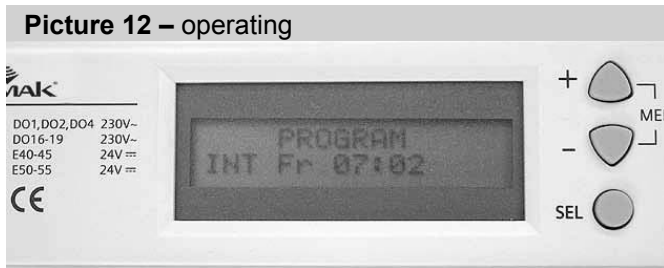
Presetting

The attendance doesn't have to do any primary setting of RWD controller. Presetting is done in production according to configuration of air handling unit. Inlet air temperature (comfortable is set to +23 °C, attenuating temperature is set to +18 °C). The user can change pre-set temperature according own needs.

Parameters setting and control

Unit program setting

Is done using LORZJ gear



Functions

For communication with attendance, the control gear LORZJ is equipped with three-button keyboard and double-row alphanumeric display. Control and unit setting is done via item selection in the menu.

The control unit is equipped with real-time unit which enables to control the air handling device according to week time program.

Signalling of working states is provided by two LEDs and by crystal loudspeaker. The speaker signals press of any button and in case of failure it also signals failure state.

After switching control unit on by main switch and initialization running the unit is ready for starting. After first starting – connection of control unit to voltage the unit skips to the state preset in production.

The display will show state (for water version):



- first three symbols in top row to the left II II II mean unit STOP
- message „STOP“ signals mode that the unit is in
- message „INT“ signals that the control is internal from LORZJ
- message „Po“ displays weekday
- indication „08:00“ shows real time
- indication „038“ – (for water version) shows temperature of heating water at the outlet from water heater in STOP mode

Setting of input and output circuits is following:

- fans stop
- dampers closed
- night attenuation none
- contactor of electric heater is disconnected - for electric version
- anti-freeze control active, controlled from LORZJ gear - for water version
- digital failure inputs in closed state, there is no failure
- inputs for connection of remote controller - according to set state
- controllers

Production setting of LORZJ

Basic parameters:

Selection of control	internal
New start	prohibited
External failure – priority	B
External failure – priority	B
Restart parameter	off

Presetting of time program for units with speed control

Day and week program: The unit enables to set eight time intervals for each weekday where the user can set required modes and values. Within one time interval can be set:

- required temperature (comfortable / attenuating)
- required air flow (higher / lower speed of fan)

Example of week program setting for one weekday (moday):

Program Po	Speed	Time of change	Temperature
Program Po 1	Higher (operation)	05:00	Comfort
Program Po 2	----	06:00	
Program Po 3	----	07:00	
Program Po 4	Lower	15:00	Attenuation
Program Po 5	----	16:00	
Program Po 6	----	17:00	
Program Po 7	STOP	18:00	
Program Po 8	----	19:00	

Symbols „----“ mark inactive points of change. That means that in given time interval is the operation state same as in the previous one.

Setting description

The air handling unit is started at 5:00 to the state of higher fan speed and comfortable temperature, time intervals 2 and 3 have the same program as interval 1. At 15:00 the air handling unit is switched to mode with lower fan speed and attenuating temperature. Following time intervals 5 and 6 have the same program as interval 4. The unit is stopped at 18:00. Program for next weekdays can be freely changed.

The change is always determined by time and not by number of time interval. Therefore it is possible to order functional sections.

Program Po	Speed	Time of change	Temperature
Program Po 1	Higher (operation)	05:00	Comfort
Program Po 2	Lower	15:00	Attenuation
Program Po 3	STOP	18:00	
Program Po 4	----	20:00	
Program Po 5	----	21:00	
Program Po 6	----	22:00	
Program Po 7	----	23:00	
Program Po 8	----	24:00	

Parameters setting and control

Basic indications on display



User setting

After simultaneous pressing buttons for entering the "MENU" (+) and (-) for about 2 seconds, menu "Mode selection" will be displayed as basic menu in main menu.

Main menu

Movement in menu: (+) or (-)
Selection confirmation: **SEL**



Purpose: provides selection of mode which the unit will be operated in.

Manual – manual unit starting (according to requirements set in manual menu).

Program – unit operation according to set program. Program is set in program menu.

Stop - unit shutdown

Submenu

Movement in menu: (+) or (-)
Selection confirmation: **SEL**





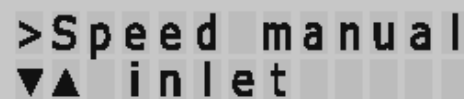
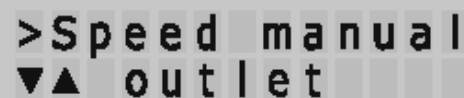
Purpose: provides setting parameters for mode manual - that means manual unit starting.

Set is: attenuating and comfortable temperature

If speed control is required, it is also possible to set fan speed in this menu.

According to customer specification the unit is either equipped with gear for common or separate control of inlet and outlet fan.

Units without speed control don not display submenu "Speed manual".


Parameters setting and control

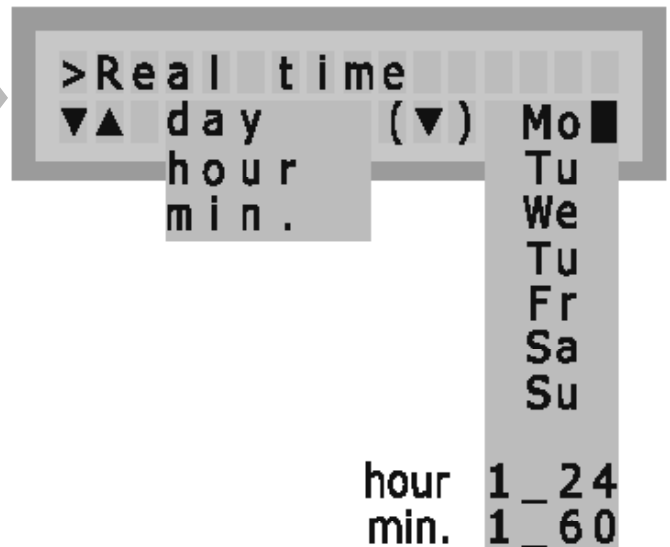


Purpose: provides control unit parameters setting:

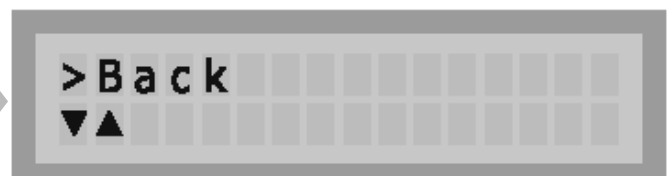
- selection of control from unit or by remote controller
- restart option after blackout without deblocking (restart option enabled) or with deblocking (restart option forbidden);
- priority setting of external failure (example: failure of hot water supply to the heater). When option A selected and a failure occurs, the unit will be shutdown and the alarm will started. When option B selected and a failure occurs, the unit only signals a failure state: by flashing red diod, by sound signal and displaying failure on the display.
- cooling failure setting



Example of real time setting:
Actual time can be set by standard movement in the menu.



Only information about operating software version.



Parameters setting and control



Purpose: it is used for program changes setting during day and week. It is possible to set eight time intervals for each day.

Actual setting:

Weekday setting: by **SEL** button place the cursor behind the weekday and by arrows choose required day.

Time interval setting: by **SEL** button place the cursor behind time interval number and by arrows choose selected time interval.

Operation selection setting (or speed):

place the cursor behind speed selection and choose the state by arrows.

Time beginning of given state setting:

place the cursor behind time indicator (before colon) and by arrows choose the time. Minute setting is analogical.

SEL => arrows (+) and (-) = shift to "Program temperature".

Assignment of temperature mode (comfort x attenuation) to time interval:

by selecting comfortable or attenuating temperature using arrows, assign to given time interval required temperature mode.

SEL => arrows (+) and (-) = shift to "Program speed higher inlet".

Assignment of speed to time interval:

by selecting higher speed for inlet using arrows, assign to given time interval required speed level.

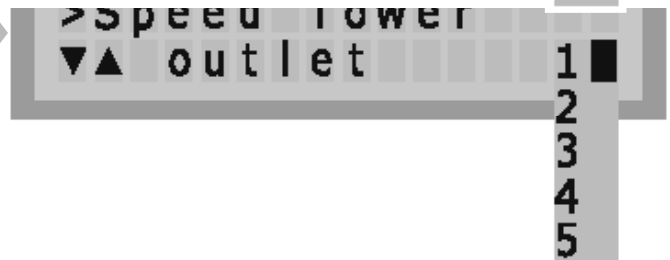
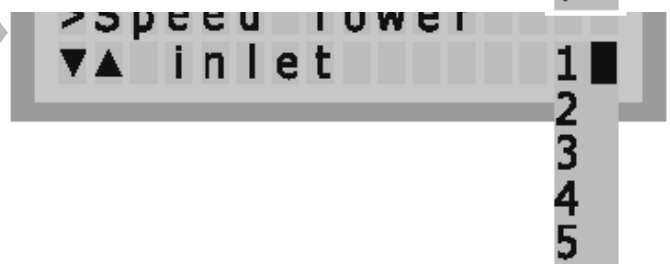
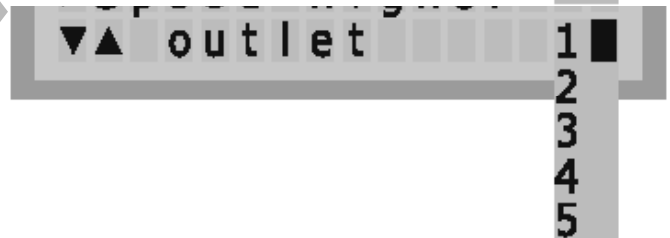
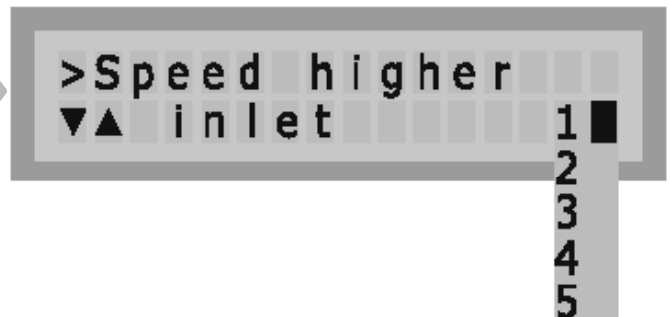
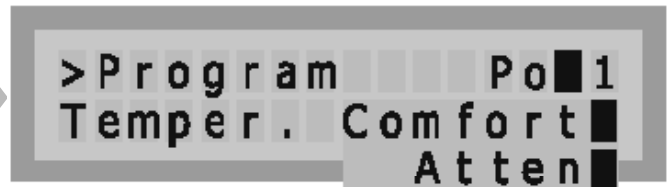
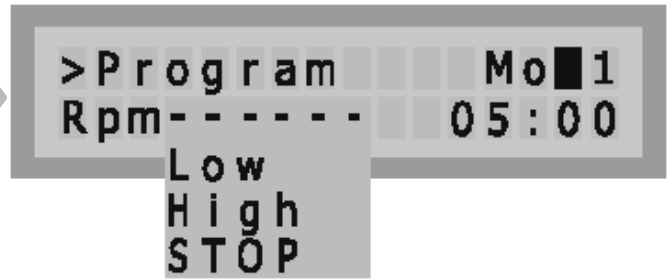
SEL => arrows (+) and (-) = shift to "Program speed higher outlet".

Assignment of speed to time interval:

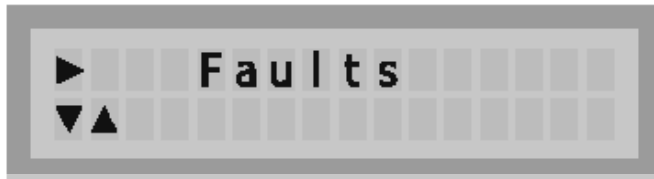
by selecting higher speed for outlet using arrows, assign to given time interval required speed level.

Repeat this procedure for setting lower speeds.

And also repeat this procedure for setting all selected time intervals.



Parameters setting and control



Purpose: actual failure state indication.
 State „OK“ – no monitored function is in failure state.
 State „Alert“ – indicates failure of monitored function (device)

Failure deblocking
 After correcting failure cause, deblocking is done by pressing **SEL** button and failure state switches to "OK".

Note: if any failure of type A is active, the menu "Failures" can not be exit before the failure is corrected.



Before returning to the basic display, all changes must be either confirmed or canceled.

Working states

LORZJ gear can be in different working states which are listed in following overview (basic specifications only)

1 - unit WITHOUT POWER SUPPLY

The unit is entirely out of operation. Only the real time unit works because it's provided with internal battery. The unit can come in to this state - especially in winter and water version of control unit - only for limited time during service etc., because no protective functions are in operation, especially anti-freeze protection of water heaters. In case of power supply disconnection, all possible actions to prevent water exchanger breakdown must be done.

No diode on display is on.

2 - unit in state of INICIALIZING

This unit state occurs only for a limited time after the unit has been connected to power supply. During this time the control microcomputer is inicialized and the data in control gear memory is checked. During this time all inputs and outputs are blocked to prevent origination of random states. Time of inicialization is 4-5 sec. After it is over, the unit can end up in following states:

- new start – the unit is waiting for new start confirmation by attendance. Confirmation is done by pressing SEL button and the unit subsequently starts operation in state before power supply disconnection.
- If function of automatic switch-on after blackout is on, the unit starts operation in state before shutdown without the attendance having to confirm new start. (for



example STOP, PROGRAM, MANUAL).

3 - unit in STOP mode

unit comes to stop mode when:

- a) blackout



- b) manual or program switch-off

- c) failure

The unit provides anti-freeze protection (AFP). Fans are stopped and air dampers are closed. VCB LORZJ watches failures besides fan operation failures. Failures are signalled, or function of anti-freeze protection is active, but no stopping (nor starting) sequences are activated. For right function of anti-freeze protection,

supply of heating substance must be provided!

4 - unit in MANUAL state

"Manual" is working state when the dampers are opened, fans are running, control is on according to setting (comfort x attenuation).

On top row of the display the arrows are flashing, state "Manual" and return water temperature of water exchn-



ager are displayed. VCB controls water freezing, sensor failure and all other failures.

5 - unit in PROGRAM state

The unit is controlled according to preset week program. Program enables to change unit state, for example "STOP", or switching fan speed (using speed gears) or changing temperature states "Comfort" and "Attenua-



tion" according to preset time in the program. VCB controls water freezing, sensor failure and all other failures.

6 - unit in COMFORT state

Temperature controller RWD is set to the state of comfort temperature control (symbol of day is displayed). The unit can be either in state "manual" or "program". In "stop" state is this state only displayed. LORZJ controls water freezing, sensor failure and all other failures.

7 - unit in ATTENUATION state

Temperature controller RWD is set to the state of attenuating temperature control (symbol of day is displayed). The unit can be either in state "manual" or



"program". In "stop" state is this state only displayed. LORZJ controls water freezing, sensor failure and all other failures.

8 - Device START UP

There is either "Program" or "Manual" indicated on the display. It is only transition state when the dampers are

Regulation functions

Control application of RWD controller

Application of VCB control unit is defined, set and "locked" by producer - based on the given air-handling configuration and the adequate control unit configuration (in the AeroCAD project). Rem Resetting the application means a modification of functionality of regulation and a total modification of parameterization to the initial level, therefore the modification is not allowed, when rebuilding the air-handling device it is possible to reset it by the producer or his service engineer.

With regard to the type standardization (especially the inlet air temperature control) and the unification of Remak control systems (standardized temperature sensors) all the possible applications of RWD controllers are not supported and realized in VCB control units, only the particular applications, i.e. applications without supporting function (basic ... #x0) or with supporting function of compensation (#x4) or with supporting function of remote setup of the requested value (#x1) where x is the number of the main function of the application.

Description of the HW (I/O) controller:

The controllers have 3 inputs. First universal input (main, X1) is the main controlled value - it is always used for the sensor of inlet air temperature.






The second universal input (auxiliary, X2) can be used for the auxiliary functions (one of the following options):







- Remote setting of the desired value
- Compensation of the desired value




Separate digital input is intended for switching-over Day / Night – it is controlled by the logical module LORZJ (output INTO...) according to the set time-scale or the manual setting (comfort / standby).

There are 3 outputs at the controller, or 2 only: Regulation outputs are always (and at the each controller) two, whereas not both of them must be used. They can be analog (0-10V) or binary (digital = ON/OFF). Complements of the controllers are 2xAO u RWD 62 (Y1, Y2), 1xAO+1xDO u RWD 68 (Y1, Q1) a 2xDO u RWD 82 (Q1,Q2).

RWD 62 and RWD 68 controllers (used with water heaters) hold even third output – binary (Q2), which is used for the fault signalling of dangerous (freezing) temperature of the air behind water heater (when lowering of temperature at sensor X1 below 5°C (i.e. Q2SP – 1/2 Q2SD) the disconnecting of the Q2 output happens). Output is in the control unit internally connected to the logical module LORZJ (in series with fault reporting from the pump etc.)

Application numbers of RWD 62.1/RMK controller in VCB control unit ⁽¹⁾					
H = heating C = cooling (in both cases this function can be supplied by heat recovery system as well)	Main function				
	 #1x H	 #2x H + H	 #3x H + C	 #4x C	 #5x C + C
Auxiliary functions	Application number				
#x0 Without auxiliary function (input X2 not used)	#10	#20	#30	#40	#50
#x1 Remote setting (X2-QAA25)	#11	#21	#31	#41	#51
#x4 Compensation (X2-NS1x0)	#14	#24	#34	#44	#54

Application numbers of RWD 68.1/RMK controller in VCB control unit ⁽¹⁾						
H = heating C = cooling (in both cases this function can be supplied by heat recovery system as well)	Main function					
	 #1x H	 #3x H+H (independent)	 #4x Dig H + ana C	 #5x Ana H + dig C	 #7x C+C (independent)	 #8x C
Auxiliary functions	Application number					
#x0 Without auxiliary function (input X2 not used)	#10	#30	#40	#50	#70	#80
#x1 Remote setting (X2-QAA25)	#11	#31	#41	#51	#71	#81
#x4 Compensation (X2-NS1x0)	#14	#34	#44	#54	#74	#84

Application numbers of RWD 82.1/RMK controller in VCB control unit ⁽¹⁾			
H = heating C = cooling (in both cases this function can be supplied by heat recovery system as well)	Main function		
	 #2x H+H (independent)	 #4x H+C	 #6x C+C (independent)
Auxiliary functions	Application number		
#x0 Without auxiliary function (input X2 not used)	#20	#40	#60
#x1 Remote setting (X2-QAA25)	#21	#41	#61
#x4 Compensation (X2-NS1x0)	#24	#44	#64

(1) first number: the main control sequence, second number: the auxiliary function

RWD temperature controller parameterization

RWD controller setting

Normal mode – basic display and settings (desired values)

Main display

Main display shows in the idle mode (according to the controller type – some characteristics only):



- (a) outputs Y1 and Y2 in volts
(0 to 10 V is displayed as 0,1,2...10)
- (b) outputs Q1, Q2 closure
(„without symbol“ = OFF, ■ = ON)
- (c) active mode day (comfort) or night (stand-by)
☀ = day, ☾ = night
- (d) measured value at inlet X1 v °C, °F, %
or without SI-units.
- (e) signalisation of auxiliary function (if selected).

REM = remote setting (#x1),

COMP = compensation (#x4)

Listing and setting in the normal mode display (main display) – user

Listing of items accessible from the main display is in the following table:

Display	RWD62	RWD68	RWD82	Setting	Commentary
Q1 SP – h ☀ 19.0 °C	-	X	X	X	Desired value of heating for day/comfort (or indirect incidence).*
Y1 SP – h ☀ 19.0 °C	X	X	-	X	Desired value of heating (or indirect incidence) for day/comfort.*
Y1 SP – c ☀ 21.0 °C	-	X	-	X	Desired value of cooling for day/comfort (or direct incidence).*
Q2 SP – c ☀ 21.0 °C	-	-	X	X	Desired value of cooling for day/comfort (or direct incidence).*
Y2 SP – c ☀ 21.0 °C	X	-	-	X	Desired value of cooling for day/comfort (or direct incidence).*
Q1 SP – h (15.0 °C	-	X	X	X	Desired value of heating for night/stand-by (or indirect incidence).*
Y1 SP – h (15.0 °C	X	X	-	X	Desired value of heating for night/stand-by (or indirect incidence).*
Y1 SP – c (25.0 °C	-	X	-	X	Desired value of cooling for night (or direct incidence).*
Q2 SP – c (25.0 °C	-	-	X	X	Desired value of cooling for night/stand-by (or direct incidence).*
Y2 SP – c ☀ 25.0 °C	X	-	-	X	Desired value of cooling for night/stand-by (or direct incidence).*
XDZ 3,0 K				X	Dead band is given by the desired values of heating and cooling for day.*
X1 20.0 °C	X	X	X		X1 – value loading from the main sensor (inlet)
X2 10.0 °C	X	X	X	-	X2 – value loading from the auxiliary sensor (external)*
X2 SP 22,5 °C	X	X	X	-	X2 – loading of value set on the room transmitter of the desired value QAA 25 (for day/comfort).*
Q1 oFF	-	X	X	-	Output: presentment of output on display Q1 digital output – ZAP/ON or VYP/OFF*
Y1 5.0	X	X	-	-	Output: displayed value of output Y1 value in volts
Q2 On	-	-	X	-	Output: displaying of output Q2 digital output – ZAP/ON or VYP/OFF
Y2 0.0	X	-	-	-	Output: displayed value of output Y2 value in volts
Q2 SP-c 5,5°C	X	X	-	-	Setpoint of anti-freeze protection of water heater on air
Q2 SD 1,0 K	X	X	-	-	Zone of hysteresis of water heater anti-freeze protection on air
Q2 	X	X	-	-	Symbol of function of anti-freeze protection of water heater on air
 #51	X	X	X	-	Application number and regulation of sequential scheme

* Depends on the application

Another presentment on the display can be selected by repeated pressing of „+“ button (or „-“). It shows the basic user characteristics of the controller, some of them can be re-set. Please see the table: (sequential display when listing with „+“ button, starting and final display is not included).

Desired value on the display can be changed by pressing the „SEL“ button for input/saving. Increase of the value can be done by pressing the „▲“, button, decrease by pressing the „▼“ button. When the desired value is reached, press „SEL“ button to save the new desired value.

After c. 15 – 20 seconds without the service intervention the controller's display turns back to the basic - main display.

Notes:

(1) Setting of the desired values is accessible also from the program mode from PS4 block, except from the mode of the main display.

(2) After selecting the application there are only these characteristics displayed, which relate to the enabled functions. For example, when the second analog input is not used, the X2 value is not displayed.

User can modify only thermal characteristics, other settings can be performed by administrator or service engineer only.

Notation on the main display

Legend – notation on the main display*

Name	Description	Display, range
Main display		
	Setting options	
#10	Number	10...89 (all numbers are not included)
	Day	
	Night	
X1	Universal (main) input X1	· Ni 1000W: -50...150°C (invariable) · Pt 1000W: -20...180°C (invariable) · 0-10 V ss: -100...8000
X2	Universal (auxiliary) input X2	· Ni 1000W: -50...150°C (invariable) · Pt 1000W: -20...180°C (invariable) · 0-10 V ss: -100...8000 · Optional resistance: range between 0...1000 W
Y1	Analog output 1	0.0...10.0 V ss
Y2	Analog output 2	0.0...10.0 V ss
°C	Degrees of Celsius	
°F	Degrees of Fahrenheit	
K	Kelvin	
%	Percentage share (e.g. relative humidity)	
---	Without units (e.g. pressure, air quality, volume of air)	
Sec	Second	

Name	Description	Display, range
Main display		
OUT RANGE	Setting is out of range	
Err	Sensor fault	
#10*	* = Using of non-standard sensor	
Q1	Digital output	■ activated non-active
Q2	Digital output 2	■ activated non-active
REM	Remote setting mode for selection or activation	
COM	Mode of compensation of the desired value for selection or	
On	On	
Off	Off	
SP-h	Desired value of heating for regulation of temperature	
SP-c	Desired value of cooling for regulation of temperature	

Mode of characteristics' setting (PS), displays sequence – administrator

- Press „+“ and „-“ and hold for 5 seconds for entry into PS mode.
- Press „+“ for display of the next page OR for increase of the value.
- Press „-“ for display of the previous page OR for decrease of the value.
- Press „SEL“ for display of each one of the PS pages OR for the modification and saving of the value, when logo is displayed on the picture

PS mode – parameterization of the controller

Programming	
PS 1	Mode of parameterization: selection of application number
PS 2	Mode of parameterization: selection of units, sensors for X1 and X2
PS 3	Mode of parameterization: auxiliary functions
PS 4	Mode of parameterization: main regulation function
PS Next	Input of another setting (passing into the next setting)
PS Exit	Finalizing of characteristics setting, return from modes of parameterization

Notes:

(1) When performing the modification (in the moment of the first modification of value) of the controller's parameterization in PS mode the controller enters the stand-by mode and the controlling function and all outputs are deactivated, which for VCB with RWD62 and RWD82 controllers also means the failure notification „Heater failure“ in the LORZJ module and the stopping of AHU. After finishing the RWD parameterization (through EXIT PS) the controlling application is activated again. In case of signalled fault on the LORZJ module it must be override and the device must be restarted again.

When entering the PS mode the PR4 mode is displayed first. For the controller's configuration it is necessary to enter the PS4 mode by pressing the SEL button and to modify the accessible values. Subsequently the controller enters next block PS3, PS2, PS1 with possibility of other settings. (PS1 = selection of the controlling application cannot be modified, it is locked by the manufacturer). The cycle (sequence of passing through parameterisations) is HD** <-> PS4 (<-> ŽH**) <-> PS3 <-> PS2 <-> PS1.

PS4 Settings for the main controlled value – PI constants, MIN/MAX of commands variable*

Název	Description	Display, range
TN	Constant of integration for Y1	0...4096 sec
XP	Throttling range Y1	0.05...7300 (Dependent of X1 range setting)
T1	Minimal time out for Q1	0...255 sec
T2	Minimal time out for Q2	0...255 sec
TCYC	Time of gear overrun	1...255 sec
MIN	Boundary value for Y1 or Y2	0...100%
MAX	Boundary	MIN...100% or 0%...MIN
SD	Switching difference - hysteresis	0.05...7300
MIN	Boundary value for Y1 or Y2	0...100%
MAX	Boundary value for Y1 or Y2	MIN...100% or 0%...MIN

* Characteristics are summarized for all types of RWD controllers and used application numbers.

** HD = main display, ŽH = desired value

Regulation function

PS3 Auxiliary function "compensation" characteristics

Parameter	Description
	COMP Initial value for heating / indirect incidence (SHSTH)
	COMP Ending value for heating / indirect incidence (SHENH)
	Shift of heating / indirect incidence (SFTH)
	COMP Initial value for cooling / direct incidence (SHSTC)
	COMP Ending value for cooling / direct incidence (SHENC)
	Shift of cooling / direct incidence (SFTC)

Notes:

- (1) Mode of parameterizing (block) PS3 is displayed only if it is relevant for the given (set) controlling application, i.e. when the application with auxiliary function is selected.
- (2) PS1 block (setting of the controlling application) can be viewed only. VCB is locked by the manufacturer in order to prevent the modification (basic relation to the air-handling device and designed function of the controller).

Time out when setting the RWD

After finishing the setting of desired value in the basic mode (even when interruption without confirmation) the controller automatically breaks the setting after 20 seconds, if no button for saving the modification is pressed (last set value) and it returns to the basic display. Modifications of the desired values in the mode of parameterizing (PS) are not time limited. The controller leaves the parameterizing mode only after the complete finalization of the whole process.

PS2 Setting of units, sensor types X1 and X2, ranges

Name	Description	Display, range
UNT	Unit type	°C, °F, % or ----(without
X1LS	X1 thermal sensor Ni 1000W Landis & Staefa	Ni 1000W: -50...150°C
X2LS	X2 thermal sensor Ni 1000W Landis & Staefa	Ni 1000W: -50...150°C
X1Pt	X1 platinum thermal sensor Pt 1000W	Pt 1000W: -20...180°C
X2Pt	X2 platinum thermal sensor Pt 1000W	Pt 1000W: -20...180°C
X1 0-10	X1 sensor with active signal 0-10 V ss	0-10 V ss: -100...8000
X2 0-10	X2 sensor with active signal 0-10 V ss	0-10 V ss: -100...8000
ΔX1	Shift calibration for X1 (only for Ni & Pt sensors)	-5...5 K or -9°F...9°F
ΔX2	Shift calibration for X2 (only for Ni & Pt sensors)	-5...5 K or -9°F...9°F
X1 L	Initial value X1 (only for 0-10 V ss)	-100...8000
X2 L	Initial value X2 (only for 0-10 V ss)	-100...8000
X1 H	Ending value X1 (only for 0-10 V ss)	-100...8000
X2 H	Ending value X2 (only for 0-10 V ss)	-100...8000
X2VR	Variable resistor	0...1000 W

For the regulation sensor (temperature sensor connected to the universal input X1) the NS 120 must be set X1LS (Ni1000; limits setting is automatic). Auxiliary input X2 is set:

- for compensation sensor NS 120 (NS100) > X2LS (Ni1000; limits setting is automatic)
- for remote controller QAA 25 > X2Vr (resistance input; limits setting must be X2L=0°C, X2H=50°C)

Illustration 4 – setting of RWD controller from production – printed configuration paper

Configuration paper contains all data about the controller's setting including the connected sensors and output peripherals. It is the part of equipment, accompanying documentation for the VCB units.

SIEMENS

Project:
Title:
Project Ref:

Controller Model: RWD62
Application No.: 10 Canned Application

Main Application Diagram:

Parameter Setting 5 (PS 5) -- Setpoint Set up

Day time operation	Night time operation
Setpoint for Heating: 23°C <input checked="" type="checkbox"/>	Setpoint for Heating: 18°C <input checked="" type="checkbox"/>

Parameter Setting 4 (PS 4) -- Main Control Loop Setting

Parameter for output Y1

P - band (XP)	20K	<input checked="" type="checkbox"/>
I - action time (TN)	50s	<input checked="" type="checkbox"/>
Min. output (MIN) [0-100%]	0%	<input checked="" type="checkbox"/>
Max. output (MAX) [0-100%]	100%	<input checked="" type="checkbox"/>

Note: = This parameter will be displayed on the controller
 = This parameter will NOT be displayed on the controller

Auxiliary Application Diagram:

Parameter Setting 3 (PS 3) -- Auxiliary Function

No parameter in this PS

Parameter Setting 2 (PS 2) -- Defining Unit X1 and X2

Unit setting: °C

Universal Input X1

Sensing type	L & S Ni 1000 ohm	<input checked="" type="checkbox"/>
Calibration offset ΔX1	0K	<input checked="" type="checkbox"/>
Sensor range low end, preset	-50°C	<input checked="" type="checkbox"/>
Sensor range high end, preset	150°C	<input checked="" type="checkbox"/>

Input / Output	Part No.	Description	Data Sheet No.
D1	LORZJ	Kontakti pøepnuti útlumu z LORZJ	
X1	NS 120	Regulaèni èdlo NS 120 - Sensit	
Y1	SUMX	Regulace vodního uzlu SUMX	

Operation, maintenance and service

was reached (comfort, attenuation). In case fans delay is not set, fans are started and symbols of arrows flash. During start up, the symbols of arrows representing fans operation (air flow) in top left corner are changeless.

Start of VCB can be initiated in two ways according to set control method in parameters setting:

- using keyboard (if the internal control is selected) by pressing simultaneously (+) and (-), following selection of item "MODE" and next by selecting "MANUAL" or "PROGRAM";
- using external controller (if the external control is selected);
- can be caused by reconnection of power supply after a blackout (if the automatic restart is enabled) or by confirming new start (if the automatic restart is not enabled).

9 - Device (air handling unit) AFTER-RUNNING

this state is indicated by three pairs of flashing vertical lines (in top left corner on basic display) and state "STOP" is displayed. It is transition state when the dampers are being closed, mixing set valves are adjusted so that they were ready for another operation (for water version), the fans are after-running. After the after-running period has expired, the three pairs of vertical lines are constantly lighted.

10 - FAILURE (Alarm ON)

The unit signalling of failure is visual and acoustic. Control system responds to the failure according to failure priority.

Return to basic display is performed by buttons (+) and (-), or automatically in 20 s, if there's no attendance interference.

The user is only allowed to change temperature parameters, other settings may only be performed by service technician.

Operation, maintenance, service

Unit operation - operation regulations

Before putting device in permanent operation the supplier of device (mounting company) must issue operation regulations according to draftsman and corresponding with valid regulations. Following structure is recommended:

- composition, specification and description of air handling device operation in all modes and working states;
- description of all safety and protective elements and device functions;
- principles of health protection and rules of safety operation and attendance of air handling device;
- requirements for eligibility and training of attendant personnel, list of workers who are authorized to operate the device;
- detailed instructions for attendance, attendance actions during emergency and failure states;
- list of operation specialties in different climatic areas (summer and winter operation);

- schedule of revisions, checks and maintenance, including list of checks and method of recording. Air handling unit can only be operated according to operation regulations. Service staff must satisfy all requirements provided by operation regulations or requirements provided by producer (authorization of some service actions).

Service inspections must be performed at least twice a year (during transition to season operation - summer/winter). Preventive checks and check procedures including record of recognized and measured parameters are described in service book.

On top of it also extra checks are performed for example after device failure or after natural disaster and after emergency situations.

Maintenance is only tied down to regular cleaning. System parts placed inside of switch box must be in given dates cleaned of dust and other impurities.

In case of need, clean the front side of the box with soft, humid (not wet) rag. Standard cleaners or neutral cleaners can be used.

During transition to summer operation and heating shut-down, the attendance must switch-off disconnection of mixing set pump. Switch-off is performed by switching the switch to position "Off". During transition to winter operation the pump must be switched to active state by reversed advance.

Content of regular inspection

Check of overall state

Cleaning all dirty parts of unit.

Safety policy

Condition of error-free and safety operation of control unit is right mounting, installation and putting in operation as well as right operating.

Devices with water heater must be equipped with control and anti-freeze sensor on side of air NS120 placed after the heater - for inlet air temperature measuring. May not be placed in the room.

Sensor of anti-freeze protection on side of water NS 130R must be placed in return water from the water heater so that it was runaround by water. Heating water circuit must provide all required functions for control and safety of water heater (providing hot water and water passage or filling with anti-freeze mixture).

The device can only be put in operation by qualified staff which is well trained by producer or authorized producer representative.

- Control unit VCB may only be operated by persons, who have been (by operator, producer or authorized representative) demonstrably trained according to valid operation regulations of air handling unit and who have been noticed about possible risks and danger.
- Removing, bridging or disconnection of safety devices, safety functions and protective devices is prohibited.
- Only error-free air handling components can be used. Failures which can affect safety of device must be immediately removed.

Failures and their removing

being opened, mixing set valve is being fully opened (for water version), the fans are being stopped. After two minutes the water exchanger is heated up and control valve is controlled by VCB unit so, that the set temperature ■ It is necessary to closely respect all precautions concerning accidents with electric current, and avoid all manipulations causing (even temporarily) function restrictions of safety and protective precautions.

■ Under any circumstances, it is not permitted to remove covers, boxes or other safety devices or to operate the device or its components if the safety devices are not efficient or if their efficiency is limited.

■ It is necessary to avoid actions which could cause restriction of specified safe low voltage separation.

■ When changing fuses, secure non-voltage state of control unit, only use specified fuses and protective elements.

■ Secure limitation of damaging effect of electromagnetic interference and overvoltage interaction with signal, control and power cables, which could cause starting of safety endangering actions and functions or eventually lead to destruction of electronic elements in separate parts.

■ Never work on connected device supplied with electric power !!! Before You start working on air handling unit switch off the power supply by main switch and lock its off position. Use protective and working instruments according to operation regulations and standards valid in country of installation.

■ If the separate technical groups of air handling unit are equipped with service switch and operation regulations, state and installation characteristics provide this option, then switch-on and off by appropriate service switch (for example electric switch, fan etc.) is sufficient.

■ Abrasive powdered cleaners or cleaners which dissolve plastics or acid and alkali solutions may not be used for cleaning in any case.

■ It is necessary to prevent water, stroke, impact and shock actions!

■ Separate components of air handling devices must be mounted and installed only according to appropriate installation instructions.

The producer recommends to pay attention to error free state and functions of all protective elements and precautions; after failure has been removed always check functionality of automatic protective and safety elements, examine the state of main and supplementary connection and earthing.

Possible causes of failures

Water freezing:

low water temperature in water exchanger circuit

- check source of heating water supply
- check (clean) the filter of SUMX mixing set
- check switch-on and operation of circulatory pump
- check functionality of three-way valve actuator
- check temperature sensor NS 130 in the piping

Heater failure:

low temperature of inlet air

- check water temperature in water exchanger circuit
- check (clean) filter of SUMX mixing set
- check operation of circulatory pump
- check functionality of three-way valve actuator
- check temperature sensor NS 120 in the duct
- check exchanger fouling
- check thermocontacts of electric heater
- check switching of electric heater

Fan failure:

- check connection of thermocontacts
- check state of motor breaker
- check the V-belt
- check free running of fan
- check connection and function of P33N pressure difference sensor
- check electric current of motor

Air flow failure:

- check state of V-belt
- check free running of fan
- check connection and function of pressure difference sensor
- check running and rotation direction of fan

External failure (fire dampers etc.):

- check state of connected external device

Clogged filters:

- check filter clogging, eventually change the filter
- check setting of P33N pressure sensor

Cooling failure:

- check state of connected cooling unit (with failure notification by VCB)

Functionless cooling - without failure notification:

- check switch-on and operation of circulatory pump of water cooler (when active signal of cooling is over 20% = 2 V)

Anti-freeze protection sensor failure:

- check temperature of heating water
- check connection of sensor NS 130R
- change the sensor

Directions for removing failures

During any manipulations with air handling device and when removing failures it is necessary to switch-off (using main switch) the power supply of the whole switchboard. During checks especially pay attention to places providing right function of protections (function of SUMX mixing set, motor thermocontacts, electric heater thermocontact). Check right function of evaluating, protecting and switching elements. Perform check of control signal. Check tightening of clamps on side of connected elements and on side of control unit.

Spare parts, service , disposal and recycling**Spare parts**

Spare parts are not delivered with the unit. In case of need they can be ordered at REMAK a.s. or at a regional distributor.

Service

Guarantee and after guarantee actions can be ordered either at REMAK a.s. or at a regional distributor. The producer can authorize with service trained service companies. Their list can be found at www.remak.cz.

Disposal and recycling

Control unit is composed of electronic parts and plastic box. After the service life of control unit is over it should be disposed and recycled according to national regulations of country of installation.

Abbreviations in text

AFP..... anti-freeze protection

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