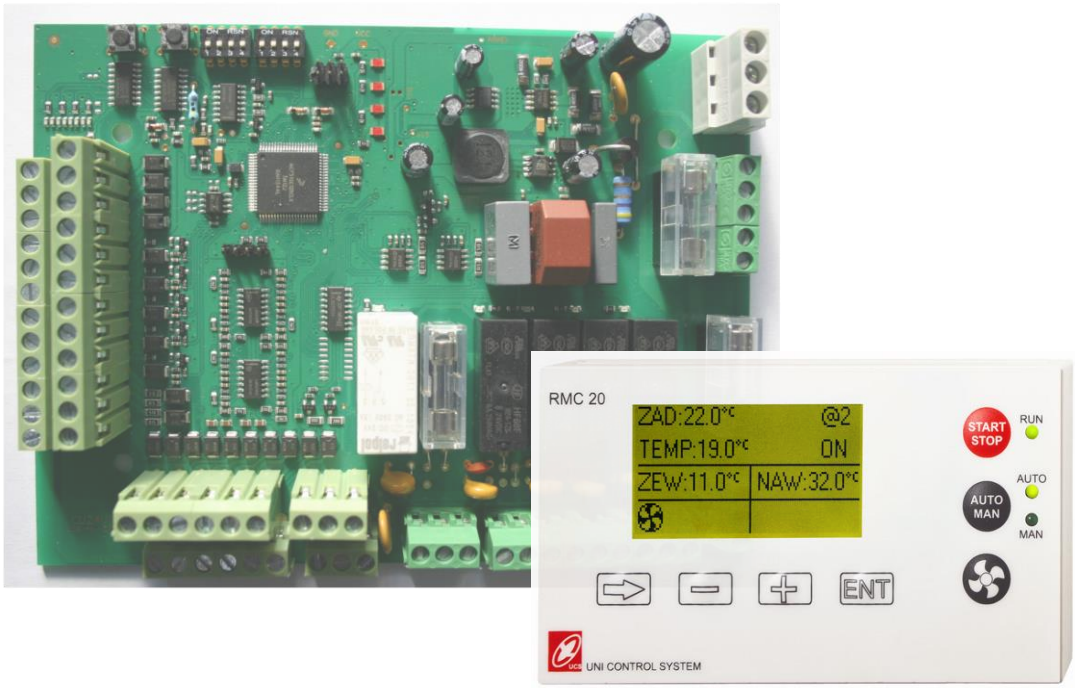
Operation instruction

Controller for air handling units CU24V1

WWW.VENTIAIR.COM

Software version from **6.2**



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The device is manufactured in accordance with the European standard EN1886, EN13053

This documentation must always be handed over to the customer!
In case of non-compliance with the conditions stated in this documentation, VentiAir s.r.o. reserves the right to refuse the warranty.

Version 02/2021

1 CONTENTS

2 CONTROLLER

2.1 APPLICATION

The controller is dedicated for inlet-outlet AHU with exchanger or without. The controller is delivered with a remote panel RMC20 with built-in graphic display.

2.2 FUNCTIONS

Temperature control

- Cascade control with min/max limit on supply air
- Supply air temperature control
- Water and electric heating control
- Water cooling and compressor control
- Preliminary heating function
- Water heater frost protection
- High temperature protection of electric heaters

Fans control

- Inlet and outlet fan control
- Inverter control
- Engine alarm

Heat recovery control

- Exchanger control
- Exchanger frost protection
- Exchanger protection by bypass damper or inlet fan speed modulation

Real time clock with week schedule

Alarms

- Alarms information's on the RMC20 panel
- Alarm clearing from the panel

BMS

- BMS facilities by RS485 serial communication
- MODBUS Communication protocol

2.3 BASIC PARAMETERS

	Type	Nr	Characteristic
Inputs	Resistive	4	PT1000 type, range -25 … +70 °C
	Analog	1	0-10V
	Digital	5	Free potential contact
Outputs	Analog	6	0-10V / 2mA
	Modulated	2	21V ±2VDC / 50mA
	Relay	5	250VAC, 3A / Resistive load
Communication	RS485 serial port: 2 ports		
	Distance: up to 50m		
	Communication protocol MODBUS		

2.4 STANDARD CONTROLLER INPUTS AND OUTPUTS

G0, G	Power supply: 24 VAC ± 10%, 50/60 Hz, input: 6VA (outputs P1, P2 unloaded)
M	System ground voltage
B1-B4	Resistance inputs PT1000
E1-E5	Potential-free resistance inputs
X1	Analog input 0-10V
Q1 - Q4	Relay output – normally open
DA	Relay output – 24 V
U1-U2	Relay output – 230 V
Y1-Y6	Voltage outputs 0-10 V DC
P1, P2	24 V DC modulated outputs; for continuous regulation of electric heaters. Controlled devices should be connected between P1 (+) and ground M (-), or P2 (+) and ground M (-)
A1, B1	Serial interface RS485 Nr. 1
A2, B2	Serial interface RS485 Nr. 2

Digital outputs		**When the system works properly**	**In an alarm condition**
E1	Water heater frost protection thermostat	closed	Freeze alarm
	Electric heater alarm	closed	Hi temperature
E2	Inlet and outlet filter pressure switch	open	
E3	Confirmation of supply fan operation, confirmation of exhaust fan operation, confirmation of rotary recuperator operation, supply fan pressure switch	closed	Engine alarm
E4	Cooling source alarm	open	Cooling source alarm
E5	Enable operation / Service switch	open	Disable operation
PP	EPS signal	closed	Disable operation

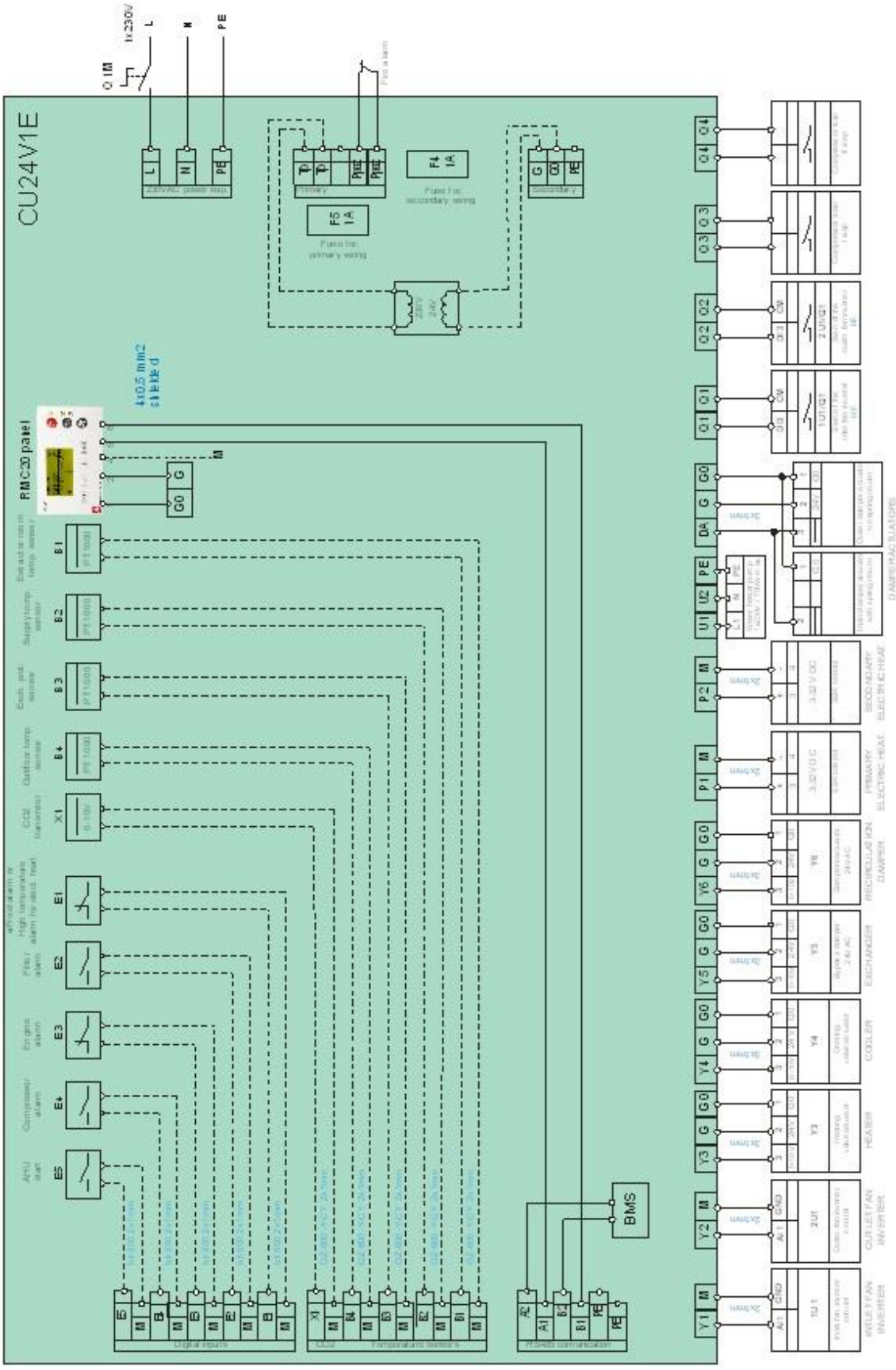
Analog inputs (0-10VDC signal inputs)	
X1	Sensor CO_2 (optional)

Temperature sensor PT1000	
B1	Exhaust
B2	Supply
B3	Exhaust behind the recuperator
B4	Outdoor

Digital outputs		
U1/U2	Heating water pump	Relay (230VAC)
	Electric heater	Relay (230VAC)
DA	Inlet/outlet flap	Relay (24VAC)
Q1	Supply fan	Relay
Q2	Exhaust fan	Relay
Q3	Cooling water pump / Cooling water source operation signal	Relay
	1st cooling source / Condensing unit operation signal	Relay
Q4	2st cooling source / Heating/cooling signal for condensing unit	Relay

Analog outputs (0-10VDC, PWM signal outputs)	
Y1	Supply fan control
Y2	Exhaust fan control
Y3	Heater (water or electric) / Heat pump
Y4	Water cooler
Y5	Heat / cold recovery (plate / rotary recuperator)
Y6	Mixing flap (10-0V), inlet / outlet flap (0-10V)

3 WIRING DIAGRAM OF THE CONTROLLER



4 CONTROLLER PARAMETERS

4.1 UNIT EQUIPMENT

Setting a program to the CU24V1 controller is done remotely using the RMC20 panel. Before setting a program, the unit should be switch off (In the display the message "UNIT IS OFF" should be displayed). You can choose from a ready-made application or user application that allows you to manually configure the application by editing individual options.

Name	Default value	Options	Descriptions
AP	USER	USER	User application: Manual adjustments by users
		W-001 ÷ E-012	Application for supply-extraction units

4.1.1 SELECTING THE TYPE OF HEATING AND COOLING

Beware:

The bellow settings are valid when the heat pump mode at page **#11** of the menu is off, it means the following setting is done: **Heat pump: No**

Heating:

- **water**: Water coil heater with control signal at Y3 output
- **electr**: Electric heater with control signal at PWM output P2
- **none**: No heater

Outputs Y3 and P2 of the CU24V1 controller work independently of the type of heater, while the E1 input, depending on the type of heater, functions as an anti-freeze alarm or a high temperature alarm..

Heating	CU24V1 outputs			CU24V1 input
	Y3	P2	U1-U2	E1
water	0-10V: heating control	PWM output for electric heater	230 VAC: Pump start.	Frost alarm of water heating coil
electr	0-10V: heating control	PWM output for electric heater	230 VAC: Enable working for electric heaters.	Hi temperature alarm of electric heater

Cooler:

- **Water**: Water coil cooling with smooth control in PI integration mode.
- **agregat-1**: Single stage cooling unit with ON/OFF control
- **agregat-2**: Two-stage cooling unit with control outputs at Q3 and Q4 in PI integration mode
- **None**: No cooler

The Y4 output of the CU24V1 is active regardless of the type of cooling (water, chiller-1, or chiller-2) and can be used to control the valve or chiller. On the other hand, the output Q3 is used to control the pump or the first stage of the chiller depending on the selection, and Q4 confirms the cooling mode or controls the second stage of the chiller.

Below the table illustrating the possible situation.

Cooler	CU24V1 outputs		
	Y4	**Q3**	**Q4**
water *(PI control)*	0-10V: valve or chiller control	Pump or chiller start	Signalling of operating mode - *closed: cooling mode* - *open: heating mode*
agregat-1 *(ON/OFF contr.)*	0-10V: valve or chiller control	Chiller start	Signalling of operating mode - *closed: cooling mode* - *open: heating mode*
agregat-2 *(PI control)*	0-10V: valve or chiller control	Chiller start – first stage	Chiller start – second stage

4.1.2 CONTROL TYPE

- **Cascade**: Cascade control with main sensor at B1 input and limit sensor at B2 input
- **Supply**: Supply air temperature control with supply sensor at B2 input.

4.1.3 RECOVERY TYPE

- **BY-PASS**: Plate heat exchanger with by-pass or rotary heat exchanger with 0-10V control at Y5 output of the CU24V1 controller
- **PLATE**: Plate heat exchanger without by-pass with inlet fan speed control
- **DAMPER**: Recirculation (mixing chamber) with 0-10V control at Y6 output of the controller
- **EXC+DAMPER**: Plate heat exchanger with by-pass or rotary heat exchanger + recirculation (mixing chamber). 0-10V control outputs of the CU24V1 controller are respectively Y5 for the exchanger and Y6 for the mixing chamber.

Type of exchanger protection

- **B3**: Temperature sensor at input B3
- **E5**: Presostat control at input E5.

4.1.4 TYPE OF FAN

Select between inverter control or 1-2 gear AC fan control.

4.1.5 HEAT PUMP CONTROL

For systems with a heat pump where the device performs winter heating and summer cooling, it is possible to program the controller to control these systems. Set the heat pump mode by setting the following parameters:

- **Heat pump: Yes**
- **Heating: water**
- **Cooling: water**

After this setting, signal Y3 controls the heating or cooling power from 0 to 10V, while for some units with other control logic, signal Y4 controls the heating power from 5 to 10V and the cooling power from 5V to 0V. Output Q3 works as the start of the unit while Q4 determines the heating or cooling mode.

Below is a description of the outputs in the table.

Operating mode	Outputs CU24V1			
	Y3	Y4	Q3	Q4
Heating	0-10V: Heating control	5-10V: Heating control	Unit start	Operating mode select *Open: heating*
Cooling	0-10V: Cooling control	5-0V: Cooling control	Unit start	Operating mode select *Closed: cooling*

4.2 PARAMETER VALUES

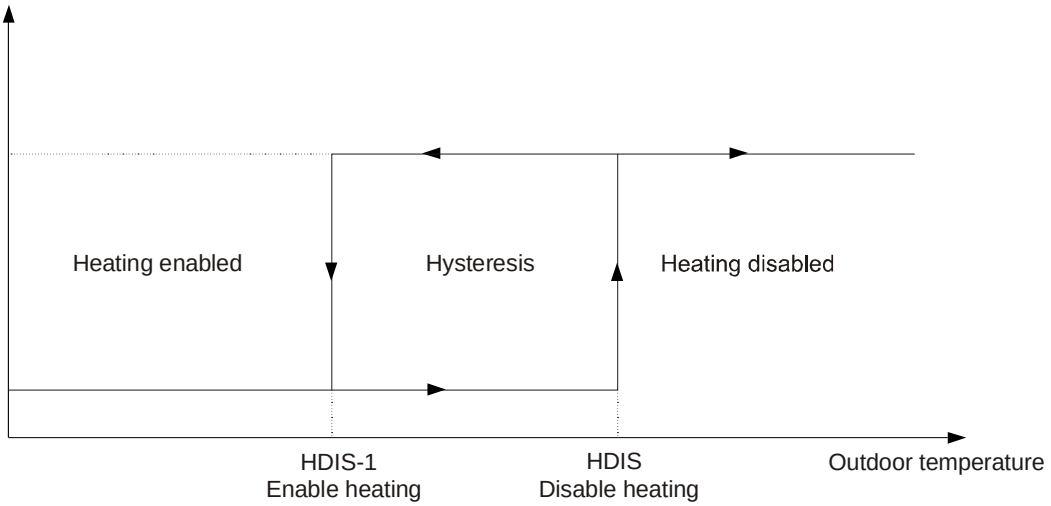
4.2.1 SUPPLY AIR PARAMETERS

Name	Default value	Range	Description
MIN	15°C	0 ÷ 66°C	Minimum temperature of air supply
MAX	35°C	5 ÷ 70°C	Maximum temperature of air supply

4.2.2 HEATING PARAMETERS

Name	Default value	Range	Description
PBAND	30.0°C	0 ÷ 999.9°C	Proportional band. Setting PBAND = 0 means ON / OFF operation with hysteresis and the entered HYS parameter.
INT	100 sec	0 ÷ 6000 sec	Integral time
HYS	1.5°C	0.5 ÷ 10.0°C	Hysteresis for two-position control. If the PBAND = 0, hysteresis determines the HYS parameter Operation ON/OFF
HDIS	18°C	10 ± 22°C	Outside temperature above which the heating is turned off (the SUMMER mode)
PREHEAT (preheating - only water heating)	ON	ON, OFF	Preliminary heating: Before the fans start the heater is warm up.
FOVER	MAN	AUTO, MAN	Frost alarm clearing: MAN – Manual start of the unit after clearing alarm manually. AUTO – Automatic alarm reset and unit start after the alarm signal disappears.

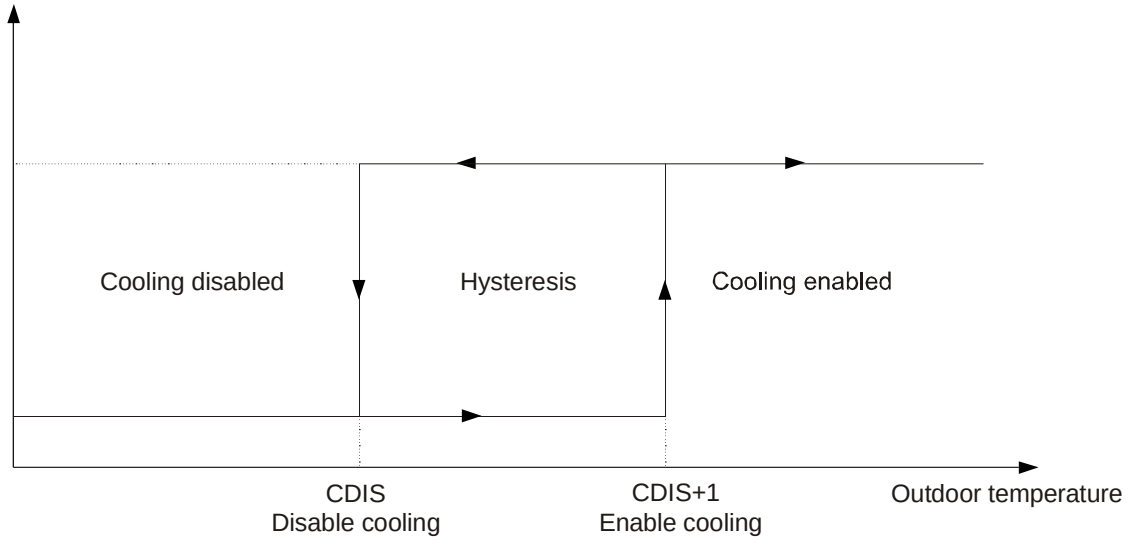
HDIS parameter operation scheme



4.2.3 COOLING PARAMETERS

Name	Default value	Range	Description
PBAND	30.0°C	0 ÷ 999.9°C	Proportional band. Setting PBAND = 0 means ON / OFF operation with hysteresis and the entered HYS parameter.
INT	100 sec	0 ÷ 6000 sec	Integral time
HYS	1.5°C	0.5 ÷ 10.0°C	Hysteresis for two-position control. If the PBAND = 0, hysteresis determines the HYS parameter Operation ON/OFF
CDIS	15°C	10 ± 22°C	Outside temperature below which the cooling is turned off (the WINTER mode).

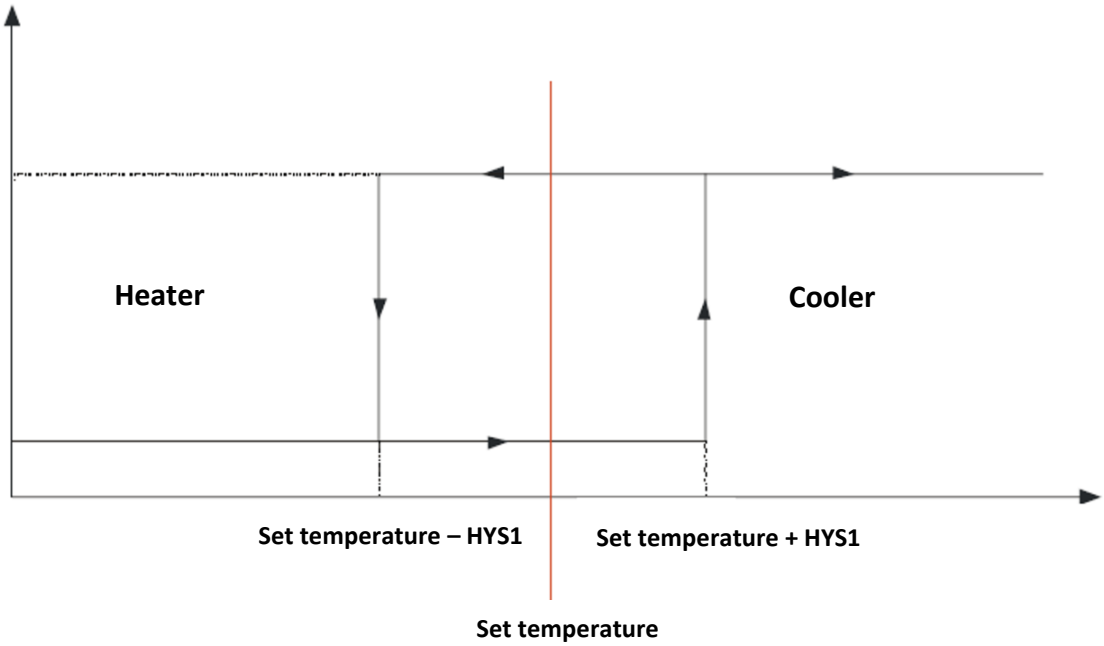
CDIS parameter operation scheme



4.2.4 HEATING – COOLING HYSTERESIS

Switching from heating to cooling takes place after the heating is switched off and the temperature rises by HYS1 above the set temperature. Switching from cooling mode to heating mode takes place after cooling is switched off and the temperature drops by HYS1 below the set temperature.

Name	Default value	Range	Description
HYS1	2.0°C	0.5 ÷ 9.9°C	Dead zone between heating and cooling.



4.2.5 PRE-HEATING (IF INCLUDED)

The pre-heater is installed before the heat exchanger. The temperature is measured by a sensor located at the outlet of the heat exchanger. The set temperature is marked "T set". "T measured" indicates the current temperature on the heat exchanger.

Name	Default value	Range	Description
t set	8,0°C	-10 ± 30°C	Required temperature for preheater

4.2.6 COMPRESSOR

Name	Default value	Range	Description
CPOFF	180 sec	30 ÷ 300 sec	Compressor shutdown time: Minimum time between switching the compressor off and on again.
CPON	30 sec	5 ÷ 100 sec	Inactive alert time: Time during which the low pressure switch is inactive after starting the compressor

4.2.7 HEAT EXCHANGER PARAMETERS

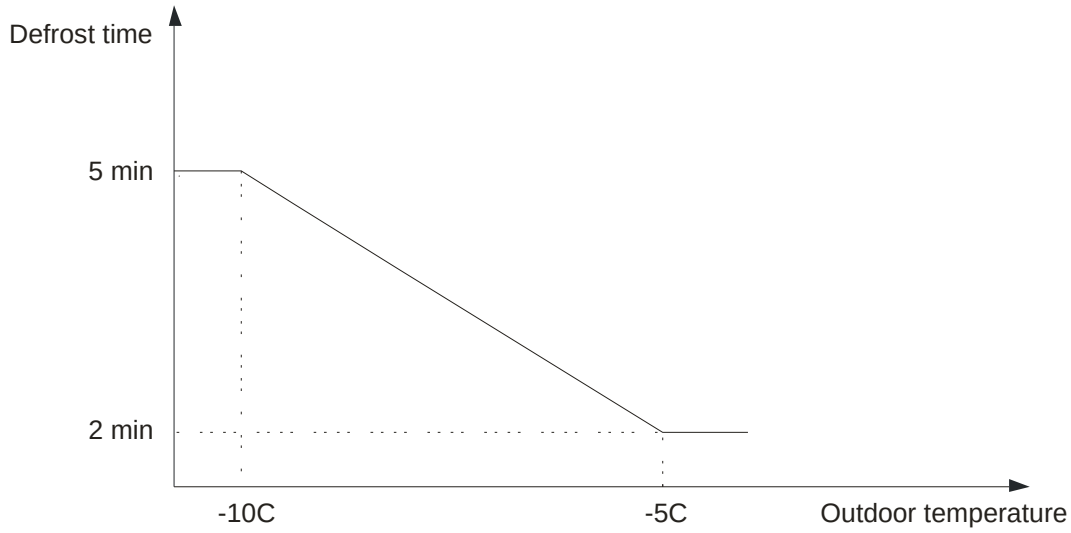
The **ELIM** parameter specifies the minimum allowed temperature on the heat exchanger outlet. When the temperature is below this threshold, the heat exchanger alarm is switched on, the air supply fan is switched off and the system starts the heat exchanger defrosting cycle.

Name	Default value	Range	Description
ELIM	5°C	-10 ÷ +10°C	Alarm temperature for the heat exchanger

4.2.8 EXCHANGER DEFROST

Defrosting the exchanger is done by running the extract fan at the highest speed for a period of two to five minutes (depending on the outside temperature), while the inlet fan is stopped. After the defrost time has elapsed, the extract fan returns to the programmed speed for 20 minutes and the inlet fan remains off unless the frost alarm goes off.
If after 20 minutes the heat exchanger temperature is still lower than the alarm level, the defrost procedure will be restarted.
The defrosting procedure ends when the temperature at the exchanger outlet rises above the alarm level.

The curve representing the defrost time as a function of the outdoor temperature:



4.2.9 RECIRCULATION DAMPERS CONTROL (MIXING CHAMBER)

After setting the type of recovery (MENU page #10), you can define at page #23 the damper control by setting the parameter DAMP:

- Auto – damper control as a function of outdoor temperature according to the curve defined at MENU pages #24 and #25
- OFF, 10%, 20%, ... 100% - manual control of the dampers

Name	Default value	Range	Description
DAMP	OFF	OFF, 10%,20%,…100%, AUTO	Type of damper control
ODT1	0 °C	-25 ÷ 30°C	Outdoor temperature low range value.
ODT2	0 °C	-25 ÷ 30°C	Outdoor temperature high range value.
DACO1	0 %	0 ÷ 100 %	Damper control low range value
DACO2	0 %	0 ÷ 100 %	Damper control high range value

4.2.10 BY-PASS AND EARTH EXCHANGER SETTINGS (NOT A STANDARD)

- **AUTO**: Bypass is controlled depending on the outdoor and the outlet/indoor temperatures.
- **ON**: Switch on Bypass
- **OFF**: Switch off Bypass

4.2.11 FAN PARAMETERS

- **FCOEF**: Programming separate speeds of the air supply and air exhaust fans
  It is possible to set separate speeds for both air supply and air exhaust fans. The FCOEF parameter defines the dependency between the fan speeds according to the following formula:
  Air exhaust fan speed = air supply fan speed x FCOEF
- **START:** Delayed start - After the system switched on, the shut-off dampers open, the fans start only after the set interval has elapsed.
- **STOP**: Delayed stop - After the system switched off, all devices will switch off while the fans continue to run for the time specified by the STOP parameter. For air handling units with electric heaters, it is necessary to set a delayed switch-off of the fans always to ensure sufficient cooling of the heater.
- **FMOD**: This mode disables / enables the supply fan safety modulation function. The FMOD parameter determines the temperature behind the heat recovery heat exchanger on the extract air duct. If the FMOD parameter is OFF, the supply fan is not modulated in this mode. If the extract air temperature behind the recuperator falls below the FMOD value, the system reduces the supply fan speed as required up to the value given by the FMIN parameter.
- **FMIN**: Minimum fan speed on the supply air duct. The speed of the supply fan is modulated in order to protect the heat exchanger against freezing. The FMIN parameter determines the minimum speed of the supply fan during modulation.

Name	Default value	Range	Description
FCOEF	1.00	0,5 ± 2	Exhaust/supply ratio: Exhaust fan speed ratio to supply fan. Exhaust = FCOEF x Supply
FMIN	10%	10 ± 25%	Fan minimum speed: The speed below which the fan cannot go down during speed modulation
FMOD	7°C	-10 ± 10°C	Fan modulation start: Defines when the supply fan starts modulating to protect the exchanger. This is the number of degree C above the exchanger protection value ELIM.
START	0 sec	0 ÷ 100 sec	Start delay
STOP	0 or 30 sec (according to the heating type)	0 ± 100 sec	Stop delay (for units with el. Heating min. 30s)

4.2.12 CO_2 CONTROL

The CU24V1 controller has the ability to control CO2. The CO2 control is performed automatically after the CO2 detector has been detected in the X1 input of CU24V1. CO2 regulation is achieved either by adjusting the fan speed or by adjusting the dampers. If the damper parameter is set **DAMP = AUTO**, the damper is adjusted. If **DAMP** has a value other than **AUTO** then the regulation is controlled by fan speed.

4.2.13 PROGRAMMING THE FAN GEARS

Name	**Default value**	**Range**	**Description**
SPD1	25%	10 ± 100%	Fan speed for gear 1
SPD2	50%	10 ± 100%	Fan speed for gear 2
SPD3	75%	10 ± 100%	Fan speed for gear 3
SPD4	100%	10 ± 100%	Fan speed for gear 4

4.2.14 PUMP PARAMETERS

Name	**Default value**	**Range**	**Description**
PUMPON	0°C	-25 ± 15°C	Outdoor temperature below witch the heater pump is switched on

4.2.15 USER FUNCTIONS E4, E5

With the ERC20 control unit, specific operation functions can be configured at input E4. If the input is used, then you can use the RMC20 panel to select one of the following functions, which will be performed by the control after the signal is started at the E4 input.

Mode	Function
OFF	The user is denied access, at input E4 is no signal
1	The supply fan is at maximum speed The exhaust fan is at maximum speed
2	The supply fan runs at first speed The exhaust fan is at maximum speed
3	The supply fan is off The exhaust fan is at maximum speed
4	The supply fan is at minimum speed The exhaust fan is at minimum speed
5	The supply fan is at maximum speed The exhaust fan runs at first speed
6	The supply fan is at maximum speed The exhaust fan is off

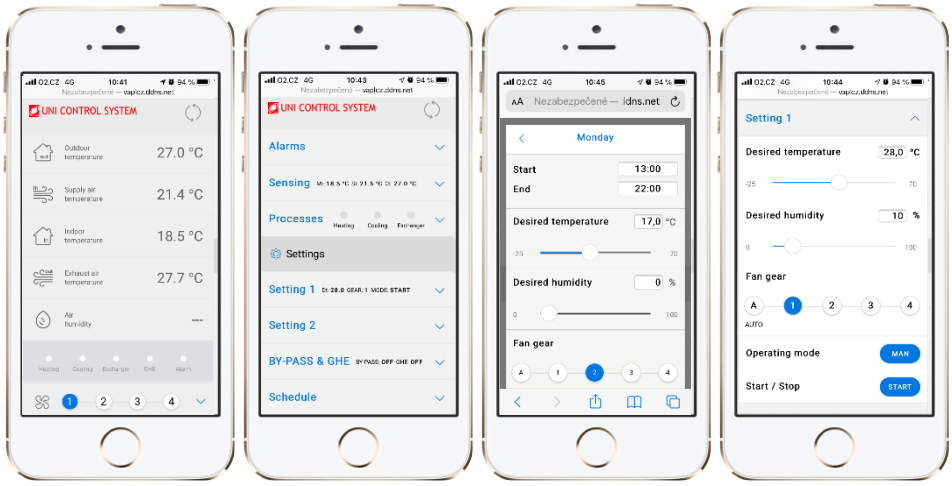
For example, a humidity sensor or any other device that will perform the required function can be connected to input E4. An example of use can be a button on the toilet as well.

Input E5 is used for EPS signal, closed contact allows unit operation.

5 ETHERNET

uManager 10 is a converter with built-in http server, which enables remote management of air handling units controlled by Uni Control System controllers by mean of a smartphone, tablet or computer. Communication with the is done via a website with a graphic interface, so you can manage the unit from anywhere in the world if the network is available. You can connect from iOS and Android or Windows devices. The smart interface recognizes the type of terminal and adapts automatically to it. The site works under various Internet browsers like Firefox, Chrome, Safari etc ....

5.1 SAMPLE INTERFACE PAGES:



5.2 CONNECTION

Connect the converter from one side to the controller through the RS485 serial port (terminals A, B) and on the other hand to the Internet socket.

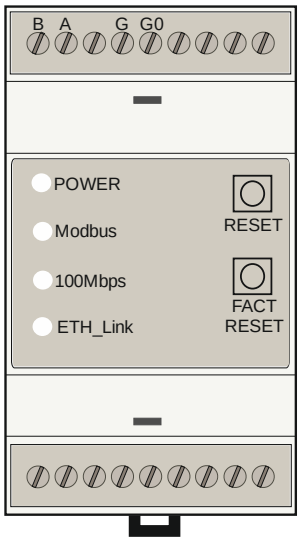
A 24VAC supply must be connected to the G0, G terminals

Descriptions of symbols:

- **G0, G**: 24 VAC power supply
- **A,B**: RS485 serial port

5.3 LED DESCRIPTION

- **POWER**: Power supply signalling
- **Modbus**: Modbus communication signalling Lights up when the transmission starts on Modbus. Goes off at the end of broadcasting
- **100Mbps**: LED lights up when the physical layer negotiates 100 MBps transfer rate. Goes off when the cable is disconnected
- **ETH_Link**: The LED lights up when the application has received the packet and is lit for 200 ms
- **RESET**: Device reset
- **FACT RESET**: Restore factory settings



5.4 CONVERTER CONNECTION

Enter the IP address of the device, the default values are:

- IP: **192.168.0.50**
- Address mask IP: 255.255.255.0
- TCP Port: 80
- Modbus: ASCII, 9600 baud, 8 bit data, 1 bit stop, No parity, address 1, delay 30

5.5 CONVERTER SETTINGS

After entering the converter's IP address, the login screen should appear in the browser. Enter your login and password there and click "Login". The default account is:

- Login: **admin**
- Password: **admin**

After logging in, select the option **Detail** at the bottom right of the screen.

In the subpage **Ethernet→Configuration**, you must replace the factory IP with your own and set the network settings.

In the subpage **Modbus→Configuration**, the communication parameters of the converter with the UCS controller must be set. The communication parameters must be identical to those set on the UCS controller.

For the ERC20 and CU24V1 controllers, you can find the communication parameters in the RMC20 panel menu.

For UCS controllers, the parameters can be found in the controller menu.

After entering new data, the converter is reset automatically and you must enter the new IP into the browser to connect to the converter.

6 MODBUS

6.1 CU24V CONTROLLER - LIST OF REGISTERS WITH ADDRESS (FUNCTION 03, 06)

- Protocol: MODBUS RTU (See information on the RMC20 display)
- Baud rate: 9600
- Bit number: 8
- Parity: No
- Stop bit: 1
- Slave address: 1

6.1.1 SETTING THE SLAVE ADDRESS OF THE CONTROLLER

S1				S2				Address
1	2	3	4	1	2	3	4	
□	□	□	□	□	□	□	□	1
■	□	□	□	□	□	□	□	2
□	■	□	□	□	□	□	□	3
■	■	□	□	□	□	□	□	4
■	■	■	■	■	■	■	□	255

6.1.2 LIST OF ADRESS

Warning:
MODBUS address is the address that is specified directly in the MODBUS protocol frame, Registers in the controller have double Modbus address. The second address is for use in the range from 0 to 9999 because not all software are able to use address above 9999. To have access to the second address just subtract the value 55536 from the address listed in the tables.

Items in red colour are not available.

Register Name	Register	MODBUS Address
PWM outputs P *NOTE:* *1. Control values are in w % with 1/10 precision. After reading the register value the dot should be placed artificially Ex.: Reading the value 257 should be treated as 25.7%* *2. The value **0x8000** means, the parameter is not available.*	0 – P1 1 - P2 … n - Pn	**65472** 65473 ... 65472+n
0-10V analog outputs *NOTE:* *1. Control values are in w % with 1/10 precision. After reading the register value the*	0 – Y1 1 – Y2 … n – Yn	**65408** 65409

dot should be placed artificially Ex.: Reading the value 257 should be treated as 25.7% *2. The value **0x8000** means, the parameter is not available.*		…….
Alarms register bit alignment **Read and write** *Alarms register are 32-bit wide*	0 –…….. 1 – R1H: current alarm - High register …….. 2 – R1L: current alarm – Low register ……..	**65280** 65281 65282
Desired values: read/write	0 – Desired temperature for the main heating/cooling……. 2 – Desired value for CO2 control..... 3 – Fan gear …… **Writing**- 5 values: 0 – Gear according to the controller setting 1 – gear 1 2 – gear2 3 – gear3 4 – gear4 **Reading**- 4values: 0 – gear 1 1 – gear 2 2 – gear 3 3 – gear 4 4 – Running mode …….. **Writing** - 3 values: 0 – Running mode according to the controller setting 1 – AUTOMATIC 2 – MANUAL **Reading** - 2 values: 0 – AUTOMATIC 1 – MANUAL 5 – Desired temperature for preliminary heater …… 7 – Fan running speed ……..……....	**65216** 65218 65219 65220 65221 65223
Device operating state	0 – Register 1 1 – Register 2	65152 65153
Sensed values *1. The sensed values have 1/10 precision. After reading the sensed value it should be divided by 10.* *Ex: Reading the number 257 should be treated as 25.7* *2. Reading the value **0xFFFF** means that , the parameter does not exist*	0 – Indoor/exhaust temperature…….. 1 –CO2 sensed value…….. 3 – Supply temperature…… 6 – Outdoor temperature…… 8 – Exchanger exhaust air temperature…… 25-Ground Heating Exchanger temperature……	**64896** 64897 64899 64902 64904 64921
Start/Stop command and system operating state	Start/Stop command **Write**: Start=**0x00AA**, Stop=**0x0055** **Read**: System operating state 0 – system stopped by the operator 1 – system stopped by the ECO mode function 2 – system stopped by schedule 3 – 4 – 5 – System running	**64640**
Parameters – group 1	1 – **MIN**: Supply minimum temperature…… 2 – **MAX**: Supply maximum temperature …… 56 – **HDIS**: Heating disable outdoor temp. (Summer)…… 57 – **CDIS**: Cooling disable outdoor temp. (Winter)…… 59 – **FCOEF**: Exhaust/Supply fan speed ratio ……	63233 63234 63288 63289 63291
Parameters – group 2	19- **Temperature control type** …….. 0 – Cascade control 1 – Supply control	63187

6.2 OPERATING STATE REGISTER DESCRIPTION

6.2.1 REGISTER 1

Bit nr	Process	Availability
0		*No*
1		*No*
2		*No*
3		*No*
4		*No*
5		*No*
6	Delay at start of the unit	
7	Delay at stop of the unit	
8 - 10	Device state: 0 - system stopped by the operator 1 - system stopped by the ECO mode function 2 - system stopped by schedule 3 - 4 - 5 - System running	
11	*Valve setting before starting control*	*No*
12	*Pump testing*	*No*
13	Temperature control of the preliminary heater – heating process	
14	*Temperature control of the preliminary heater – cooling process*	*No*
15	Exchanger defrosting process	

6.2.2 REGISTER 2

Bit nr	Process	Availability
0	Primary heating (main heating) – Indoor temperature control	
1	*Secondary heating*	*No*
2	Cooling – Indoor temperature control	
3	Exchanger exhaust air temperature control - heating	
4		*No*
5	*Humidification process*	*No*
6	*Dehumidification process*	*No*
7	Exchanger	
8	*By-pass*	*No*
9	*GHE (Ground Heating Exchanger)*	*No*
10	Inlet fan	
11	Extract fan	
12	*FREE COOLING*	*No*
13	Preliminary heating	
14	*Fast heating*	*No*
15	*Fast cooling*	*No*

0 – off, 1 - on

6.3 ALARM REGISTER DESCRIPTION R1H, R1L

6.3.1 RH - REGISTER 1 (MOST SIGNIFICANT/HIGH REGISTER)

Nr bit	Alarm	Symbol	Availability
0		*RH+*	*No*
1		*RH-*	*No*
2		*A19*	*No*
3	Sensor break alarm	A20	
4	-		
5	Compressor low pressure	A22	
6	Compressor high pressure	A23	
7..15			

6.3.2 RL - REGISTER 2 (LEAST SIGNIFICANT/LOW REGISTER)

Nr bit	Alarm	Symbol	Availability
0	Water heating coil frost alarm	A1	
1	*Alarm fan (thermo)*	*A2*	*No*
2	Inlet fan pressure guard alarm	A3	
3	*Extract fan pressure guard alarm*	*A4*	*No*
4	*Fire alarm*	*A5*	*No*
5	High temperature alarm	A6	
6	Exchanger freezing alarm	A7	
7	*Alarm anti-freeze*	*A8*	*No*
8	*Pump alarm*	*A9*	*No*
9	Filter pressure guard alarm	A10	
10		*R1+*	*No*
11		*R1-*	*No*
12		*R2+*	*No*
13		*R2-*	*No*
14		*R3+*	*No*
15		*R3-*	*No*

6.4 INPUT REGISTERS: FUNCTION 04

Inputs	**Address MODBUS**
B1 – Exhaust sensor	0
B2 – Supply sensor	1
B3 – Exchanger sensor	2
B4 – Outdoor sensor	3
X1 –CO2 transmitter	256

6.5 COILS (DIGITAL OUTPUTS): FUNCTION 01

Outputs	U1-U2	DA	Q1	Q2	Q3	Q4
Function	Heating coil pump	Dampers	Supply fan inverter start	Exhaust fan inverter start	Compressor 1-level	Compressor 2-level
Address	0	1	2	3	4	5

6.6 DISCRET INPUTS (DIGITAL INPUTS): FUNCTION 02

Inputs	E1	E2	E3	E4	E5
Function	Frost thermostat or high temperature thermostat	Filter guard	Fan alarm	Compressor alarm	System start
Address	0	1	2	3	4