

# EV3H24

Stand alone controller for fan coil



**EPoCA**  
compatible



**PLEASE READ  
CAREFULLY**  
and save this document

**CONSIDER THE ENVIRONMENT**

**Important**

Read this manual carefully before installation and before using the devices and take all the prescribed precautions. Keep this manual with the devices for future consultation.

Only use the devices in the ways described in this manual. Do not use these devices as safety devices.

**Disposal**




The devices must be disposed of according to local regulations governing the collection of electrical and electronic waste.

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# 1 User interface














## 1.1 Key functions

Key	Name	Function
	On/stand-by	A short press cancels editing and returns to the menus. A long press switches the device on or off.
SET	set	A short press confirms editing, from the main page it permits entry to the quick menu. A long press permits access to the parameter settings menu (password protected).
	up	A short press enables navigation around the menus. A long press from the main page allows the fan speed to be increased.
	down	A short press enables navigation around the menus. A long press from the main page allows the fan speed to be decreased.


A long press on any of the keys unlocks the keypad.  
The alarm buzzer can be silenced by pressing any key.

## 1.2 Display



	Heating/cooling ICONS According to the value of the C21 parameter, the following activation modes apply: C21=0 → icon  active in Cooling mode and icon  active in Heating mode C21=1 → icon  active in Heating mode and icon  active in Cooling mode
	Fan ICON - ON if the fan is switched on - OFF if the fan is switched off
	Settings ICON - ON if in the settings or parameters menu - otherwise it is OFF
	Always off
	Alarm ICON - ON if an alarm is in progress - OFF if no alarm is in progress
	Unit of measurement ICON of the value shown on the display when the variable displayed is a temperature in °C (C59)
	Unit of measurement ICON of the value shown on the display when the variable displayed is a temperature in °F (C59)
	Unit of measurement ICON of the value shown on the display when the variable displayed is the fan speed.
	On/stand-by ICON - ON if the controller is switched off (stand-by) - OFF if the controller is switched on

### 1.3 List of pages

When the machine is switched on the main page displays the regulation temperature or the current setpoint (C20). When the machine is switched off the main page displays just the icon .

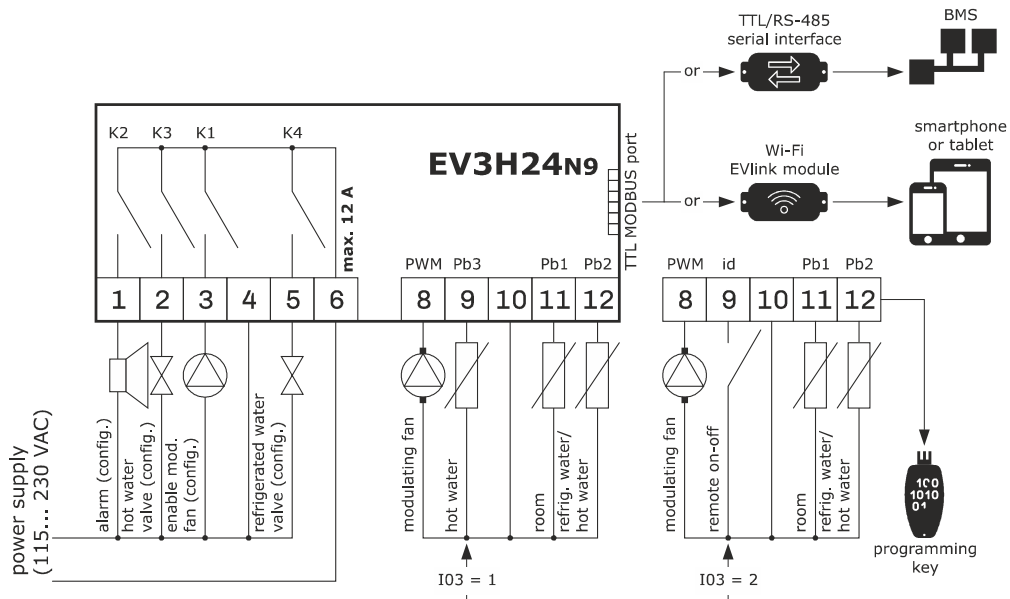
When the set key is pressed, even with the machine switched off, the quick menu opens. The up and down arrow keys can be used to scroll through the pages.

- SP: enables either the *Temperature Setpoint in Heating Mode* (P07) or the *Temperature Setpoint in Cooling Mode* (P08) to be displayed and edited depending on the active operating mode.
- MOD: displays the machine's operating mode (AUT, HEA, COO) and if possible (C11 other than 2) allows it to be edited (variable S17 *Set Operating mode*).
- FAn: if the fan is in automatic operation (C63 = 1) it displays the current speed: variable S07 *Fan Speed* if modulating fan or S98 *Fan Steps* (V1, V2, V3) if step fan. During manual operation (C63 = 0) it displays the parameter *Fan Speed Setpoint* (P12) if modulating fan or the relative number of steps (V1, V2, V3) if step fan. It is possible to modify the value by a quantity equal to C12 for the modulating fan or by one step at a time for step fan.
- TrE: displays the room temperature (regulation probe)
- TH1: displays the water temperature of the first coil (only if enabled: I02=1)
- TH2: displays the water temperature of the second coil (only if enabled: I03=1)
- EU1: displays the status of the water valve of the first coil, if configured (see parameter I78)
- EU2: displays the status of the water valve of the second coil, if both valves are configured (see parameter I78) and C33=0
- EU: displays the percentage by which the three-point valve is open, if both valves are configured (see parameter I78) and C33>0
- CH: the number of hours the power has been ON since the last time the filter was replaced
- rCH: resets the filter hours (entering password 149), also resetting the filter hours alarm.

From these menus, if permitted, it is possible to edit the mode by pressing the Set key, change the value using the "up arrow" and "down arrow" keys and confirm by pressing the Set key. Pressing the ON/OFF key will exit without confirming.

## 2 Inputs and outputs

### 2.1 Electrical connections



### 2.2 Configuring inputs

The inputs are as follows:

Probe 1: Room temperature probe

Probe 2: Water temperature probe of the first coil (parameter *I02*)

Probe 3: Water temperature probe of the second coil / remote ON-OFF (parameter *I03*)

### 2.3 Configuring outputs

The controller is capable of managing fan coils with the following characteristics:

- From 1 to 3 fan speeds with ON/OFF control or small step modulation of the fan speed with PWM control
- 1 or 2 ON/OFF valves (for 2 or 4 tube units, respectively) or one three-point valve for 2 tube units.

The outputs are set by the *I78* parameter in accordance with the table:

<i>I78</i>	OUT1	OUT2	OUT3	OUT4	PWM fan
0	Speed 1	Alarm	X	X	NO
1	Speed 1	Speed 2	Alarm	X	NO
2	Speed 1	Speed 2	Speed 3	Alarm	NO
3	Speed 1	Alarm	X	Valve	NO
4	Speed 1	Speed 2	Alarm	Valve	NO
5	Speed 1	Speed 2	Speed 3	Valve	NO
6	Speed 1	Alarm	Valve 2	Valve 1	NO
7	Speed 1	Speed 2	Valve 2	Valve 1	NO
8	Speed 1	Alarm	X	X	YES
9	Speed 1	Alarm	X	Valve	YES
10	Speed 1	Alarm	Valve 2	Valve 1	YES

Where the following are meant

Valve: the only ON/OFF valve in the circuit

Valve 1:

- if parameter *C33* = 0: ON/OFF valve of the first coil
- if parameter *C33* > 0: three-point valve opening relay

Valve 2:

- if parameter *C33* = 0: ON/OFF valve of the second coil
- if parameter *C33* > 0: three-point valve closing relay

### 3 Operation

#### 3.1 Switching the machine on and off

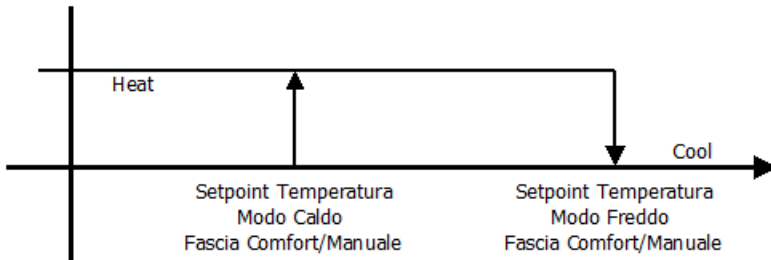
The machine can be switched on and off by holding down the ON-OFF key and remotely by using the status variable *S01 Unit Status*. If, on the other hand, the remote ON-OFF digital input is configured, it has priority and decides the status of the machine.

#### 3.2 Changeover

In machines enabled for both Heating and Cooling mode operation (parameter *C62 = 2*) it is possible to change the operating mode either automatically or manually.

If parameter *C11 = 0*, the changeover will take place only by setting the operating mode from the menu.

If parameter *C11 = 3*, the changeover will only take place automatically based on the room temperature: if the temperature remains higher than *P08* for the time *C24* the machine works in cooling mode; if the room temperature is lower than *P07* for the time *C24* the machine works in heating mode.



If parameter *C11 = 2*, the operating mode or the automatic changeover can be set from the keypad (*S17* status variable *Set Operating Mode*).

#### 3.3 Regulation in the incremental neutral zone

The working parameters for regulation in the neutral zone consist of a setpoint (*P07* or *P08*), a neutral zone (*C37* or *C38*), a reaction time (*C13*) and an incremental step (*C12*).

The regulation temperature is the room temperature.

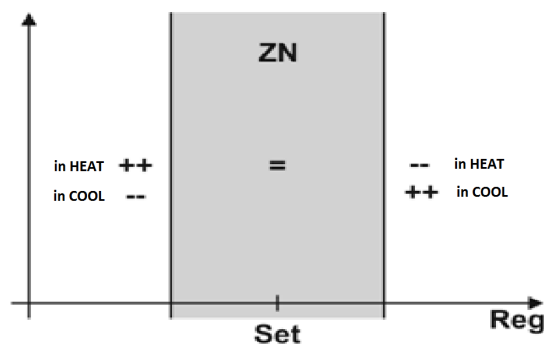
The controlled output is the status variable *S95 Regulation Percentage*.

Because this system is extremely easy and intuitive to operate it provides excellent results, allowing precise regulation.

The neutral zone is between the setpoint:

- 1) When the value of the room temperature is within the neutral zone, the value of the controlled output remains unchanged.
- 2A) When the room temperature falls below the neutral zone, the value of the controlled output increases (in heating mode) or decreases (in cooling mode) by a percentage equal to the value expressed by the relevant parameter (incremental step) without delay.
- 2b) If the room temperature is not within the neutral zone - following the action described in the previous point - by the time set by the relevant parameter (reaction time), point 2a above is repeated until the maximum/minimum possible value of the output value is reached.
- 3) The operation is specular to that described in points 2a and 2b above if the room temperature rises above the neutral zone.

The diagram below is a graphic representation of the operating mode.



### 3.4 Temperature regulation

The temperature is regulated by properly operating the valves that control the flow of water in the tubes. The possible configurations of valves are determined by the parameters *I78* and *C33* and they are:

- 1 - If parameter *I78* is such as to configure two valves and parameter *C33* > 0: 1 three-point valve with opening command on OUT4 and closing command on OUT3.
- 2 - If parameter *I78* is such as to configure two valves and parameter *C33* = 0: 1 chilled water valve on OUT4 and 1 hot water valve on OUT3.
- 3 - If parameter *I78* is such as to configure one valve: 1 chilled/hot water valve on OUT4.

The regulation is made on the basis of the value of the status variable *S95 Regulation Percentage*: if only ON/OFF valves are used, when heat regulation is requested the valve relating to the the operating mode is opened; if instead a three-point valve is configured, its opening will be set according to *S95 Regulation Percentage*.

If the three-point valve is configured, the synchronisation will occur when the device is switched on and at every *C34* closure.

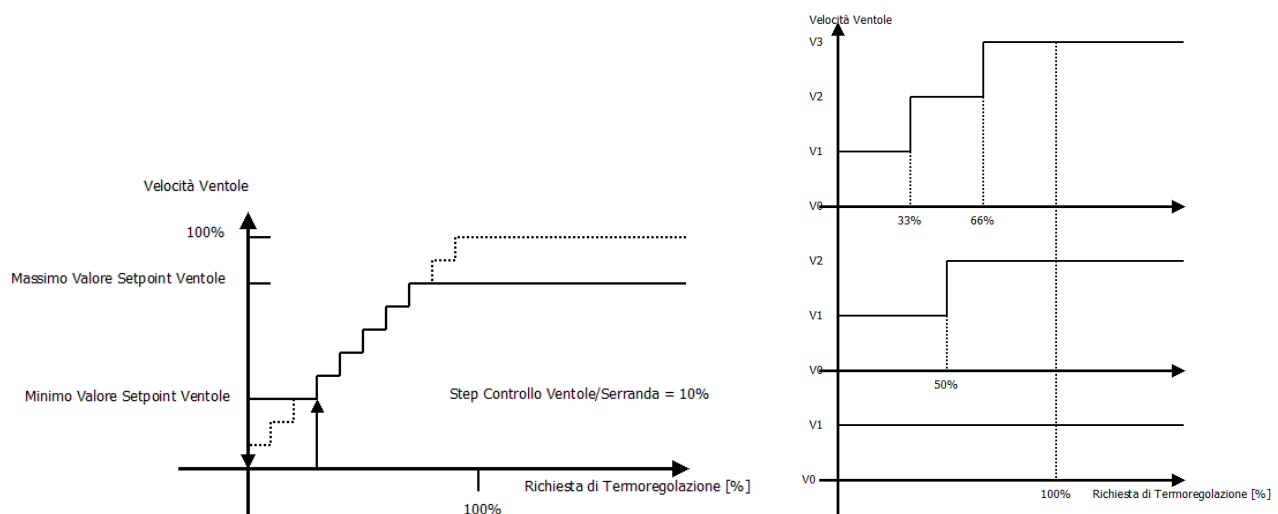
### 3.5 Fan regulation

The choice of fan speed depends on parameter *C63*: if the automatic control is enabled, the speed will be equal to *S95 Regulation Percentage*, calculated by the regulation algorithm in the incremental neutral zone (similarly to the opening of the water valve). Otherwise the *P12* speed is applied.

If the fan is modulating, the maximum speed value can be *C05 Maximum fan setpoint value* and a hysteresis is applied between 0 and *C06*.

If the fan is ON/OFF, a discretisation is carried out based on the number of configured speeds: parameter *P12* is automatically set to 100%, 33%, 66% or 50% depending on the number of steps chosen, and *C06* is set to 1% and *C05* to 100%.

In case of manual speed, when the machine is on and the "up arrow" key is held down, the speed will be increased by an amount equal to *C12* in the case of a modulating fan or by a step for an ON/OFF fan. Holding down the "down arrow" key will decrease the speed by the same amount. The speed set will be shown briefly on the display.







### 3.6 Parameters

The parameter menu is accessed by pressing the set key for 4 s and entering the password.

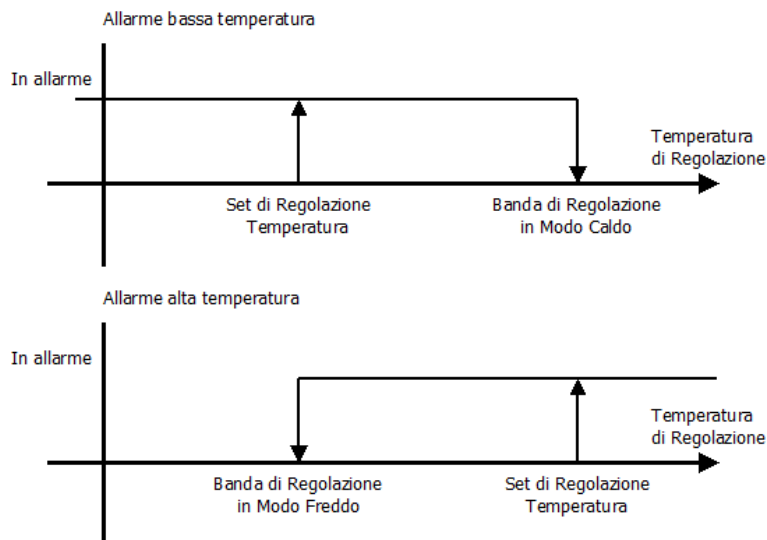
Below is a list of parameters:

n	lab	def	min	max	um	description
	TBD					Time Band Parameters
000	t01	0	0	0		Time Band Mode 0: OFF
	SP					Setpoint Parameters
001	P07	21.0	C02	C01	°C-°F	Temperature Setpoint in Heating Mode
002	P08	25.0	C04	C03	°C-°F	Temperature Setpoint in Cooling Mode
003	P12	50	C06	C05	%	Fan Speed Setpoint
	CNF					Configuration Parameters
004	C01	26.0	P07	99.0	°C-°F	Maximum Temperature Setpoint Value in Heating Mode
005	C02	8.0	0.0	P07	°C-°F	Minimum Temperature Setpoint Value in Heating Mode
006	C03	30.0	P08	99.0	°C-°F	Maximum Temperature Setpoint Value in Cooling Mode
007	C04	16.0	-99.0	P08	°C-°F	Minimum Temperature Setpoint Value in Cooling Mode
008	C05	100	C06	100	%	Maximum Fan Setpoint Value
009	C06	20	0	C05	%	Minimum Fan Setpoint Value
010	C09	0	0	1		Enable RTC 0: OFF 1: ON
011	C11	1	0	2		Changeover mode <input type="checkbox"/> 0: Manual: 1: Manual + Automatic 2: Automatic
012	C12	5	0	100	%	Fan Control Step
013	C13	20	1	250	s	Fan Control Delay
014	C20	0	0	1		Value displayed 0: Room Temperature 1: Setpoint
015	C21	0	0	1		Sun icon meaning  0: Heating 1: Cooling  N.B. The meaning of the snowflake icon  will change accordingly
016	C22	247	1	247		MODBUS address
017	C24	8	0	250	h	Changeover Mode-Change Delay
018	C33	60	0	250	s	Three-point Water Valve Running Time
019	C34	20	0	100		Maximum Number of three-point Water Valve Closures for Re-synchronisation
020	C37	2.0	0.0	18.0	°C-°F	Neutral zone in Heating Mode
021	C38	2.0	0.0	18.0	°C-°F	Neutral zone in Cooling Mode
022	C59	0	0	1		Temperature Measurement Unit 0: °C 1: °F
023	C60	2	0	3		MODBUS baud rate 0: 2400 1: 4800 2: 9600 3: 19200
024	C61	0	0	1		Activate Bluetooth 0: NO 1: YES
025	C62	2	0	2		Enable operating mode 0: Cooling only 1: Heating only 2: both Reversible
026	C63	1	0	1		Fan Control 0: Manual: 1: Automatic
027	C64	1	0	1		Enable alarm buzzer 0: OFF 1: ON
028	C65	-19	-99	999		Password
029	C66	15	0	240		Datalogger Sampling Interval
	ALM					Alarm Parameters
030	A01	0	0	999	h*10	Maximum Fan Hour Limit <input type="checkbox"/> 0: Disabled
031	A13	60	0	250	s	Correct Temperature Bypass Time from Valve Activation 0: Disabled
032	A14	30	0	250	s	Antifreeze Alarm Bypass Time 0: Disabled
033	A15	3.0	-10.0	10.0	°C-°F	Antifreeze Alarm Setpoint
034	A16	2.0	0.0	25.0	°C-°F	Antifreeze Alarm Hysteresis
	I-O					I/O Configuration Parameters
035	I02	0	0	1		IN2 Input Function Configuration 0: Disabled 1: First coil Water Probe
036	I03	0	0	2		IN3 Input Function Configuration



						0: Disabled 1: Second coil Water Probe 2: Remote ON-OFF
037	I33	0.0	-25.0	25.0	°C-°F	IN1 Analogue Input Offset
038	I34	0.0	-25.0	25.0	°C-°F	IN2 Analogue Input Offset
039	I35	0.0	-25.0	25.0	°C-°F	IN3 Analogue Input Offset
040	I73	100	1	150	Hz	PWM Output Frequency
041	I76	1	0	1		Probe type 0: PTC 1: NTC
042	I77	0	0	1		Remote ON-OFF Digital Input Polarity 0: NO 1: NC
043	I78	5	0	10		Output Configuration 0: Fan 1 Speed 1: Fan 2 Speed 2: Fan 3 Speed 3: Fan 1 Speed + first coil Valve 4: Fan 2 Speed + first coil Valve 5: Fan 3 Speed + first coil Valve 6: Fan 1 Speed + 2 Water Valves 7: Fan 2 Speed + 2 Water Valves 8: 1 Modulating Fan 9: 1 Modulating Fan + first coil Valve 10: 1 Modulating Fan + 2 Water Valves
044	I79	0	0	1		Valve Polarity 0: NO 1: NC

## 4 Alarms

Code	Alarm description	Re-arm	Consequence	
Pr1	Regulation probe alarm	Auto	Closes valves Stops ventilation (if automatic)	
Pr2	First coil water probe alarm	Auto	Opens first coil water valve Stops ventilation	Only if probe configured ( <i>IN2 Input Function Configuration = 1</i> )
Pr3	Second coil water probe alarm	Auto	Opens seconds coil water valve Stops ventilation	Only if probe configured ( <i>IN3 Input Function Configuration = 1</i> )
Fr1	First coil water probe antifreeze alarm	Auto	Opens first coil water valve Stops ventilation	Only if probe configured ( <i>IN2 Input Function Configuration = 1</i> ) Parameters: <i>Antifreeze Alarm Bypass Time, Antifreeze Alarm Setpoint, Antifreeze Alarm Hysteresis</i>
Fr2	Second coil water probe antifreeze alarm	Auto	Opens seconds coil water valve Stops ventilation	Only if probe configured ( <i>IN3 Input Function Configuration = 1</i> ) Parameters: <i>Antifreeze Alarm Bypass Time, Antifreeze Alarm Setpoint, Antifreeze Alarm Hysteresis</i>
LoT	Low water temperature alarm	Auto	Closes valves Stops ventilation	Heating only Only if probe configured: - if <i>IN3 Input Function Configuration = 1</i> second coil water probe - otherwise if <i>IN2 Input Function Configuration = 1</i> first coil water probe Parameters: <i>Correct Temperature Bypass Time from Valve Activation, Status variable setpoint Temperature Regulation Setpoint, Neutral zone Hysteresis in Heating Mode</i>
HiT	High water temperature alarm	Auto	Closes valves	Cooling only Only if probe configured: - if <i>IN2 Input Function Configuration = 1</i> first coil water probe Parameters: <i>Correct Temperature Bypass Time from Valve Activation, Status variable setpoint Temperature Regulation Setpoint, Neutral zone Hysteresis in Heating Mode</i>
FIL	Filter replacement request	Auto	Signal only	



## 5 Complete tables

n	lab	def	min	max	um	description	MODBUS address	AC	
	TBD					Time Band Parameters			
000	t01	0	0	0		Time Band Mode 0: OFF	1538	0x0601	RW
	SP					Setpoint Parameters			
001	P07	21.0	C02	C01	°C-°F	Temperature Setpoint in Heating Mode	1539	0x0602	RW
002	P08	25.0	C04	C03	°C-°F	Temperature Setpoint in Cooling Mode	1540	0x0603	RW
003	P12	50	C06	C05	%	Fan Speed Setpoint	1541	0x0604	RW
	CNF					Configuration Parameters			
004	C01	26.0	P07	99.0	°C-°F	Maximum Temperature Setpoint Value in Heating Mode	1542	0x0605	RW
005	C02	8.0	0.0	P07	°C-°F	Minimum Temperature Setpoint Value in Heating Mode	1543	0x0606	RW
006	C03	30.0	P08	99.0	°C-°F	Maximum Temperature Setpoint Value in Cooling Mode	1544	0x0607	RW
007	C04	16.0	-99.0	P08	°C-°F	Minimum Temperature Setpoint Value in Cooling Mode	1545	0x0608	RW
008	C05	100	C06	100	%	Maximum Fan Setpoint Value	1546	0x0609	RW
009	C06	20	0	C05	%	Minimum Fan Setpoint Value	1547	0x060A	RW
010	C09	0	0	1		Enable RTC 0: OFF 1: ON	1548	0x060B	RW
011	C11	1	0	2		Changeover mode <input type="checkbox"/> 0: Manual: 1: Manual + Automatic 2: Automatic	1549	0x060C	RW
012	C12	5	0	100	%	Fan Control Step	1550	0x060D	RW
013	C13	20	1	250	s	Fan Control Delay	1551	0x060E	RW
014	C20	0	0	1		Value displayed 0: Room Temperature 1: Setpoint	1552	0x060F	RW
015	C21	0	0	1		Sun icon meaning  0: Heating 1: Cooling N.B. The meaning of the snowflake icon  will change accordingly	1553	0x0610	RW
016	C22	247	1	247		MODBUS address	1554	0x0611	RW
017	C24	8	0	250	h	Changeover Mode Change Delay	1555	0x0612	RW
018	C33	60	0	250	s	Three-point Water Valve Running Time	1556	0x0613	RW
019	C34	20	0	100		Maximum Number of three-point Water Valve Closures for Re-synchronisation	1557	0x0614	RW
020	C37	2.0	0.0	18.0	°C-°F	Neutral zone in Heating Mode	1558	0x0615	RW
021	C38	2.0	0.0	18.0	°C-°F	Neutral zone in Cooling Mode	1559	0x0616	RW
022	C59	0	0	1		Temperature Measurement Unit 0: °C 1: °F	1560	0x0617	RW
023	C60	2	0	3		MODBUS baud rate 0: 2400 1: 4800 2: 9600 3: 19200	1561	0x0618	RW
024	C61	0	0	1		Activate Bluetooth 0: NO 1: YES	1562	0x0619	RW
025	C62	2	0	2		Enable operating mode 0: Cooling only 1: Heating only 2: both	1563	0x061A	RW
026	C63	1	0	1		Fan Control 0: Manual: 1: Automatic	1564	0x061B	RW
027	C64	1	0	1		Enable alarm buzzer 0: OFF 1: ON	1565	0x061C	RW
028	C65	-19	-99	999		Password	1566	0x061D	RW
029	C66	15	0	240		DataLogger Sampling Interval	1567	0x061E	RW
	ALM					Alarm Parameters			
030	A01	0	0	999	h*10	Maximum Fan Hour Limit <input type="checkbox"/> 0: Disabled	1568	0x061F	RW
031	A13	60	0	250	s	Correct Temperature Bypass Time from Valve Activation 0: Disabled	1569	0x0620	RW
032	A14	30	0	250	s	Antifreeze Alarm Bypass Time 0: Disabled	1570	0x0621	RW
033	A15	3.0	-10.0	10.0	°C-°F	Antifreeze Alarm Setpoint	1571	0x0622	RW
034	A16	2.0	0.0	25.0	°C-°F	Antifreeze Alarm Hysteresis	1572	0x0623	RW

						I/O Configuration Parameters				
035	I02	0	0	1		IN2 Input Function Configuration 0: Disabled 1: First coil Water Probe	1573	0x0624	RW	
036	I03	0	0	2		IN3 Input Function Configuration 0: Disabled 1: Second coil Water Probe 2: Remote ON-OFF	1574	0x0625	RW	
037	I33	0.0	-25.0	25.0	°C-°F	IN1 Analogue Input Offset	1575	0x0626	RW	
038	I34	0.0	-25.0	25.0	°C-°F	IN2 Analogue Input Offset	1576	0x0627	RW	
039	I35	0.0	-25.0	25.0	°C-°F	IN3 Analogue Input Offset	1577	0x0628	RW	
040	I73	100	1	150	Hz	PWM Output Frequency	1578	0x0629	RW	
041	I76	1	0	1		Probe type 0: PTC 1: NTC	1579	0x062A	RW	
042	I77	0	0	1		Remote ON-OFF Digital Input Polarity 0: NO 1: NC	1580	0x062B	RW	
043	I78	5	0	10		Output Configuration 0: Fan 1 Speed 1: Fan 2 Speed 2: Fan 3 Speed 3: Fan 1 Speed + first coil Valve 4: Fan 2 Speed + first coil Valve 5: Fan 3 Speed + first coil Valve 6: Fan 1 Speed + 2 Water Valves 7: Fan 2 Speed + 2 Water Valves 8: 1 Modulating Fan 9: 1 Modulating Fan + first coil Valve 10: 1 Modulating Fan + 2 Water Valves	1581	0x062C	RW	
044	I79	0	0	1		Valve Polarity 0: NO 1: NC	1582	0x062D	RW	
STATUS						Internal status				
000	S01						Unit status 0: ON 1: Stand-by 2: --- 3: Stand-by from Digital Input	1361	0x0550	RW
001	S02						Time bands 0: OFF	1362	0x0551	RO
002	S03						Alarm in progress 0: OFF 1: ON	1363	0x0552	RO
003	S04						Operating mode 6: Manual:	1364	0x0553	RO
004	S19					°C-°F	Temperature Regulation Setpoint	1365	0x0554	RW
005	S16						Operating mode 0: Cooling 1: Heating 2: Auto+Cooling 3: Auto+Heating	1366	0x0555	RO
006	S17						Set operating mode 0: Cooling 1: Heating 2: Auto	1367	0x0556	RW
007	S21					°C-°F	Regulation probe -3276.8 = error	1368	0x0557	RO
008	S93					°C-°F	First Coil Probe -3276.8 = error -3276.4 = disabled	1369	0x0558	RO
009	S94					°C-°F	Hot Water Probe	1370	0x0559	RO

			-3276.8 = error -3276.4 = disabled			
010	S95	%	Regulation percentage	1371	0x055A	RO
011	S27	%	Valve Opening	1372	0x055B	RO
012	S96		First Coil Valve Status	1373	0x055C	RO
013	S97		Second Coil Water Valve Status	1374	0x055D	RO
014	S05	%	Fan Regulation Setpoint	1375	0x055E	RW
015	S07	%	Supply Fan Speed	1376	0x055F	RO
016	S98		Supply Fan Steps	1377	0x0560	RO
017	S37	h*10	Fan Operating Hours	1378	0x0561	RW

EV3H24

stand alone controller for fan coil

Application manual ver. 1.1

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