EV3B54

Controllers for highly energy-saving refrigerated cabinets, capable of managing Embraco and Secop variable speed compressors

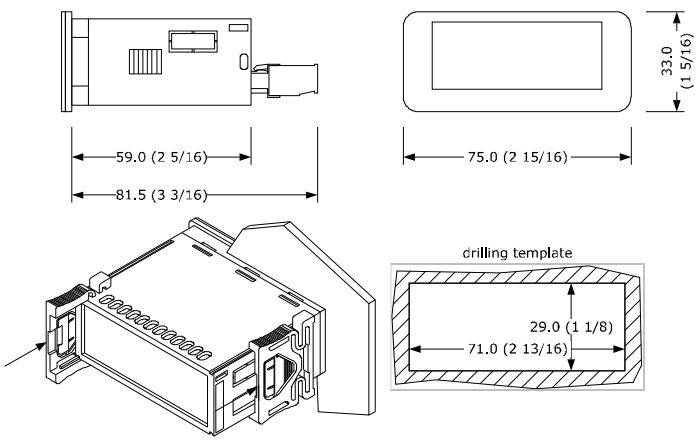
PLEASE READ CAREFULLY and save this document
CONSIDER THE ENVIRONMENT

E ENGLISH

- Controllers for low temperature units.
- Power supply 115... 230 VAC.
- Cabinet probe, evaporator probe and condenser probe (PTC/NTC).
- Door switch input.
- Capable of managing Embraco, Secop and Tecumseh VTC variable speed compressors.
- Alarm buzzer.
- Cooling or heating operation.
- Operation with programming key.

1 MEASUREMENTS AND INSTALLATION

Measurements in mm (inches). To be fitted to a panel, snap-in brackets provided.



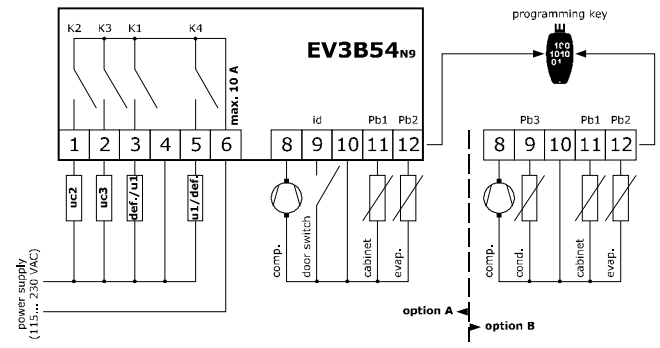
INSTALLATION PRECAUTIONS

- The thickness of the panel must be between 0.8 and 2.0 mm (1/32 and 1/16 in)
- Ensure that the working conditions are within the limits stated in the *TECHNICAL SPECIFICATIONS* section.
- Do not install the device close to heat sources, equipment with a strong magnetic field, in places subject to direct sunlight, rain, damp, excessive dust, mechanical vibrations or shocks.
- In compliance with safety regulations, the device must be installed properly to ensure adequate protection from contact with electrical parts. All protective parts must be fixed in such a way as to need the aid of a tool to remove them.

2 ELECTRICAL CONNECTION

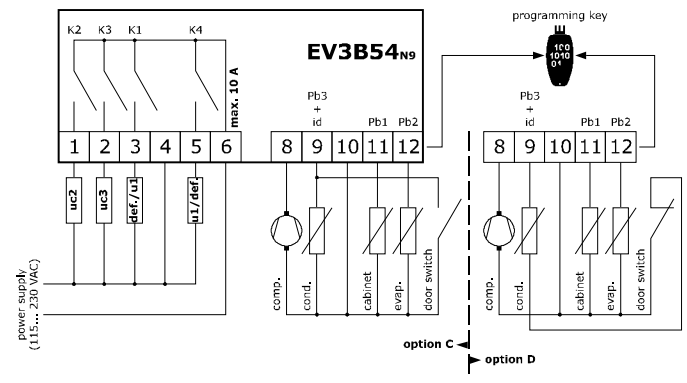
N.B.
- Use cables of an adequate section for the current running through them.
- To reduce any electromagnetic interference connect the power cables as far away as possible from the signal cables.

Option A: electrical connection with cabinet probe, evaporator probe and door switch input (P4 = 0) active with contact closed (i1 = 0, default).
Option B: electrical connection with cabinet probe, evaporator probe and condenser probe (P4 = 1).



Option C: electrical connection with cabinet probe, evaporator probe, condenser probe + door switch input (P4 = 2, default) active with contact closed (i1 = 0, default).
Option D: electrical connection with cabinet probe, evaporator probe, condenser probe + door switch input (P4 = 2, default) active with contact open (i1 = 1).

During the door opening the high condensation warning and the high condensation alarm are disabled.
A door opening can be interpreted as a condenser probe alarm.



Default:
- K1 = condenser fan
- K2 = evaporator fan
- K3 = cabinet light
- K4 = defrost.

PRECAUTIONS FOR ELECTRICAL CONNECTION

- If using an electrical or pneumatic screwdriver, adjust the tightening torque.
- If the device has been moved from a cold to a warm place, the humidity may have caused condensation to form inside. Wait about an hour before switching on the power.
- Make sure that the supply voltage, electrical frequency and power are within the set limits. See the section *TECHNICAL SPECIFICATIONS*.
- Disconnect the power supply before doing any type of maintenance.
- Do not use the device as safety device.
- For repairs and for further information, contact the EVCO sales network.

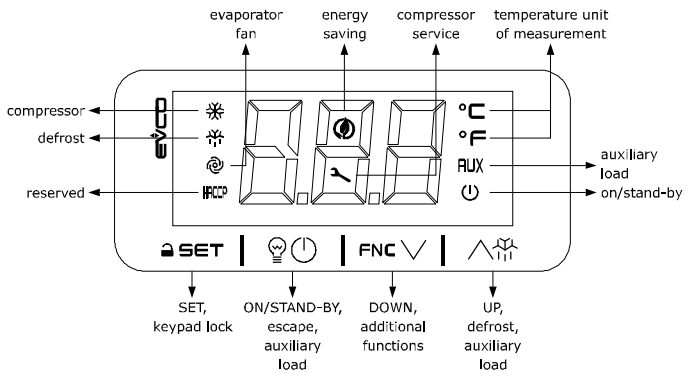
3 FIRST-TIME

1. Install following the instructions given in the section *MEASUREMENTS AND INSTALLATION*.
2. Power up the device as shown in the section *ELECTRICAL CONNECTION* and an internal test will be run.
   The test normally takes a few seconds, when it is finished the display will switch off.
3. Configure the device as shown in the section *Setting configuration parameters*.
   Recommended configuration parameters for first-time use.

PAR.	DEF.	PARAMETER	MIN... MAX.
SP	**0.0**	setpoint	r1... r2
P0	**1**	probe type	0 = PTC 1 = NTC
P2	**0**	temperature unit of measurement	0 = °C 1 = °F
d1	**0**	defrost type	0 = electric 1 = hot gas 2 = compressor stopped
r15	**1**	compressor type	1 = Embraco VEM 2 = Embraco VEG 3 = Embraco VNEK e VNEU 4 = Secop VNL 50... 150 Hz (25 Hz in off) 5 = Secop 33... 133 Hz 6 = Tecumseh VTC

Then check that the remaining settings are appropriate; see the section *CONFIGURATION PARAMETERS*.
4. Disconnect the device from the mains.
5. Make the electrical connection as shown in the section *ELECTRICAL CONNECTION* without powering up the device.
6. Power up the device.

4 USER INTERFACE AND MAIN FUNCTIONS



4.1 Switching the device on/off

1.	ON/STAND-BY	If POF = 1 (default), touch the ON/STAND-BY key for 4 s.

If the device is switched on, the display will show the P5 value ("cabinet temperature" default); if the display shows an alarm code, see the section *ALARMS*.

LED	ON	OFF	FLASHING
❄	compressor on	compressor off	- compressor protection active - setpoint setting active
❄	defrost or pre-dripping active	-	- defrost delay active - dripping active
	evaporator fan on	evaporator fan off	evaporator fan stop active
	- energy saving active - low consumption active	-	-
	request for compressor service	-	- settings active - access to additional functions active
°C/°F	view temperature	-	overcooling or overheating active
AUX	auxiliary load on	auxiliary load off	- auxiliary load on by digital input - auxiliary load delay active
	device off	device on	device on/off active

If 30 s have elapsed without the keys being pressed, the display will show the "**Loc**" label and the keypad will lock automatically.

4.2 Unlock keypad

Touch a key for 1 s: the display will show the label "**UnL**".

4.3 Set the setpoint

Check that the keypad is not locked.

1.	SET	Touch the SET key.
2.	FNC	Touch the UP or DOWN key within 15 s to set the value within the limits r1 and r2 (default "-40... 50")
3.	SET	Touch the SET key (or do not operate for 15 s).

4.4 Activate manual defrost (if r5 = 0, default)

Check that the keypad is not locked and that overcooling is not active.

1.		Touch the UP key for 2 s.

If P3 = 1 (default), defrost is activated provided that the evaporator temperature is lower than the d2 threshold.

4.5 Cabinet light on/off (if u1 = cabinet light, default and if uc3 = cabinet light)

1.	ON/STAND-BY	Touch the ON/STAND-BY key.

- if u1 = 1, the **demisting** switches on for the u6 duration.
- if u1 = 2 and the keypad is not locked, the **button-operated load** switches on/off.

4.6 Demisting on for the u6 duration (if u1 = cabinet light or button-operated load and uc3 = demisting and if u1 = demisting and uc3 = cabinet light)

1.		Touch the UP key.

4.7 Button-operated load on/off (if u1 = button-operated load and uc3 = cabinet light)

1.		Touch the UP key.

4.8 Silence buzzer

Touch a key.
If u1 = 3 (relay K4 configuration = alarm) and u4 = 1 (enable alarm output off silencing the buzzer = yes) , the alarm output switches off.

5 ADDITIONAL FUNCTIONS

5.1 Activate/deactivate overcooling, overheating and manual energy saving

Check that the keypad is not locked.

1.	FNC	Touch the DOWN key.

FUNCTION	CONDITION	CONSEQUENCE
overcooling	r5 = 0, r8 = 1 and defrost not active	the setpoint becomes "setpoint - r6", for the r7 duration
overheating	r5 and r8 = 1	the setpoint becomes "setpoint + r6", for the r7 duration
energy saving	r5 = 0 and r8 = 2	the setpoint becomes "setpoint + r4", at maximum for HE2 duration

5.2 View/delete compressor functioning hours

Check that the keypad is not locked.

1.	FNC	Touch the DOWN key for 4 s.
2.	FNC	Touch the UP or DOWN key within 15 s to select a label.

LAB.	DESCRIPTION
CH	view compressor functioning hours
rCH	delete compressor functioning hours

3.	SET	Touch the SET key.
4.	FNC	Touch the UP or DOWN key to set "**149**" (when label "**rCH**" is selected).
5.	SET	Touch the SET key.
6.	ON/STAND-BY	Touch the ON/STAND-BY key (or do not operate for 60 s) to exit the procedure.

5.3 View the temperature detected by the probes

Check that the keypad is not locked.

1.	FNC	Touch the DOWN key for 4 s.
2.	FNC	Touch the UP or DOWN key within 15 s to select a label.

LAB.	DESCRIPTION
Pb1	cabinet temperature
Pb2	evaporator temperature (if P3 = 1 or 2)
Pb3	condenser temperature (if P4 = 1 or 2)

3.	SET	Touch the SET key.
4.	ON/STAND-BY	Touch the ON/STAND-BY key (or do not operate for 60 s) to exit the procedure.

5.4 View the percentage of the supplied PWM signal

Assicurarsi che la tastiera non sia bloccata.

1.	FNC	Touch the DOWN key for 4 s.
2.	FNC	Touch the UP or DOWN key within 15 s to select "**PoU**".
3.	SET	Touch the SET key.
4.	ON/STAND-BY	Touch the ON/STAND-BY key (or do not operate for 60 s) to exit the procedure.

6 SETTINGS

6.1 Setting configuration parameters

1.	SET	Touch the SET key for 4 s: the display will show the label "**PA**".
2.	SET	Touch the SET key.
3.	FNC	Touch the UP or DOWN key within 15 s to set the PAS value (default "**-19**").
4.	SET	Touch the SET key (or do not operate for 15 s): the display will show the label "**SP**".
5.	FNC	Touch the UP or DOWN key to select a parameter.
6.	SET	Touch the SET key.
7.	FNC	Touch the UP or DOWN key within 15s to set the value.
8.	SET	Touch the SET key (or do not operate for 15 s).
9.	SET	Touch the SET key for 4 s (or do not operate for 60 s) to exit the procedure.

6.2 Restore the factory settings (default) and store customized settings as default

N.B.
- Check that the factory settings are appropriate; see the section *CONFIGURATION PARAMETERS*.
- The storing of customized settings overwrites the default.

1.	SET	Touch the SET key for 4 s: the display will show the label "**PA**".
2.	SET	Touch the SET key.
3.	FNC	Touch the UP or DOWN key within 15 s to set the value.

VAL.	DESCRIPTION
149	value to restore the factory settings (default)
161	value to store customized settings as default

4.	SET	Touch the SET key (or do not operate for 15 s): the display will show the label "**dEF**" (when value "**149**" is set) or the label "**MAP**" (when value "**161**" is set).
5.	SET	Touch the SET key.
6.	FNC	Touch the UP or DOWN key within 15 s to set "**4**".
7.	SET	Touch the SET key (or do not operate for 15 s): the display will show for 4 s "**- - -**" flashing, then the device will exit the procedure.
8.	Interrupt the power supply to the device.	
9.	SET	Touch the SET key 2 s before action 6. to exit the procedure beforehand.

7 CONFIGURATION PARAMETERS

N.	PAR.	DEF.	SETPOINT	MIN... MAX.
1	SP	**-20**	setpoint	r1... r2
N.	**PAR.**	**DEF.**	**ANALOGUE INPUTS**	**MIN... MAX.**
2	CA1	**0.0**	cabinet probe offset	-25... 25 °C/°F
3	CA2	**0.0**	evaporator probe offset	-25... 25 °C/°F
4	CA3	**0.0**	condenser probe offset	-25... 25 °C/°F
5	P0	**1**	probe type	0 = PTC 1 = NTC
6	P1	**0**	enable °C decimal point	0 = no 1 = yes
7	P2	**0**	temperature unit of measurement	0 = °C 1 = °F
8	P3	**1**	evaporator probe function	0 = disabled 1 = defrost + fan 2 = fan
9	P4	**2**	configurable input function	0 = door switch input 1 = condenser probe 2 = condenser probe + door switch input
10	P5	**0**	value displayed	0 = cabinet temperature 1 = setpoint 2 = evaporator temperature 3 = condenser temperature
11	P8	**0**	display refresh time	0... 250 s : 10
N.	**PAR.**	**DEF.**	**REGULATION**	**MIN... MAX.**
12	r0	**3.0**	setpoint differential	1... 15 °C/°F
13	r1	**-30**	minimum setpoint	-99 °C/°F... r2
14	r2	**-10**	maximum setpoint	r1... 199 °C/°F
15	r4	**0.0**	setpoint offset in energy saving	0... 99 °C/°F
16	r5	**0**	cooling or heating operation	0 = cooling 1 = heating
17	r6	**0.0**	setpoint offset in overcooling/overheating	0... 99 °C/°F
18	r7	**0**	overcooling/overheating duration	0... 240 min

19	r8	**0**	DOWN key additional function	0 = disabled 1 = overcooling/overheating 2 = energy saving
20	r13	**25.0**	proportional band (relative to setpoint)	0... 99 °C/°F setpoint + r13
21	r14	**10**	integral action time	0... 99 min
22	r15	**3**	tipo di compressore	1 = Embraco VEM 2 = Embraco VEG 3 = Embraco VNEK e VNEU 4 = Secop VNL 50... 150 Hz (40 Hz in off) 5 = Secop 33... 133 Hz 6 = Tecumseh VTC
N.	PAR.	DEF.	COMPRESSOR	MIN... MAX.
23	CP0	**0**	time compressor at 85 Hz after power-on	0... 100 s x 10
24	C0	**1**	compressor on delay after power-on	0... 240 min
25	C2	**3**	compressor off minimum time	0... 240 min
26	C3	**0**	compressor on minimum time (minimum speed)	0... 240 s
27	C4	**5**	compressor off time during cabinet probe alarm	0... 240 min
28	C5	**10**	compressor on time (maximum speed) during cabinet probe alarm	0... 240 min
29	C6	**55.0**	threshold for high condensation warning	0... 199 °C/°F differential = 2 °C/4 °F
30	C7	**60.0**	threshold for high condensation alarm	0... 199 °C/°F
31	C8	**1**	high condensation alarm delay	0... 15 min
32	C9	**5**	consecutive time cabinet temperature in proportional band for compressor at maximum speed	0... 99 h 0 = disabled until cabinet temperature < setpoint
33	C10	**0**	compressor hours for service	0... 999 h x 10 0 = disabled
N.	PAR.	DEF.	DEFROST (if r5 = 0)	MIN... MAX.
34	d0	**12**	automatic defrost interval	0... 99 h 0 = only manual if d8 = 3, maximum interval
35	d1	**1**	defrost type	0 = electric 1 = hot gas 2 = compressor stopped
36	d2	**6.0**	threshold for defrost end	-99... 99 °C/°F
37	d3	**30**	defrost duration	0... 99 min se P3 = 1, maximum duration
38	d4	**0**	enable defrost at power-on	0 = no 1 = yes
39	d5	**0**	defrost dealy after power-on	0... 99 min
40	d6	**1**	value displayed during defrost	0 = cabinet temperature 1 = display locked 2 = dEF label
41	d7	**3**	dripping time	0... 15 min
42	d8	**0**	defrost interval counting mode	0 = device on hours 1 = compressor on hours 2 = hours evaporator temperature < d9 3 = adaptive
43	d9	**0.0**	evaporation threshold for automatic defrost interval counting	-99... 99 °C/°F
44	d11	**1**	enable defrost timeout alarm	0 = no 1 = yes
45	d15	**0**	compressor on consecutive time for hot gas defrost	-20... 99 min if negative values, dripping heaters on duration
46	d16	**0**	pre-dripping time for hot gas defrost	0... 99 min
47	d18	**0**	adaptive defrost interval	0... 999 min if compressor on + evaporator temperature < d22 0 = only manual
48	d19	**0.0**	threshold for adaptive defrost (relative to optimal evaporation temperature)	0... 40 °C/°F optimal evaporation temperature - d19
49	d20	**0**	compressor on consecutive time for defrost	0... 999 min 0 = disabled
50	d21	**0**	compressor on consecutive time for defrost after power-on and overcooling	0... 500 min if (regulation temperature - setpoint) > 10°C/20 °F 0 = disabled
51	d22	**0.0**	evaporation threshold for adaptive defrost interval counting (relative to optimal evaporation temperature)	-10... 10 °C/°F optimal evaporation temperature + d22
N.	PAR.	DEF.	ALARMS	MIN... MAX.
52	A1	**0.0**	threshold for low temperature alarm (relative to setpoint)	0... 99 °C/°F 0 = disabled cabinet temperature - A1
53	A4	**50.0**	threshold for high temperature alarm (relative to setpoint)	0... 99 °C/°F 0 = disabled cabinet temperature + A4
54	A6	**12**	high temperature alarm delay after power-on	0... 99 min x 10
55	A7	**15**	high/low temperature alarms delay	0... 240 min
56	A8	**15**	high temperature alarm delay after defrost	0... 240 min
57	A9	**15**	high temperature alarm delay after door closing	0... 240 min
58	A11	**2.0**	high/low temperature alarms reset differential	1... 15 °C/°F
N.	PAR.	DEF.	FANS	MIN... MAX.
59	F0	**1**	evaporator fan mode during normal operation	0 = off 1 = on 2 = according to F15 and F16 if compressor off, on if compressor on 3 = thermoregulated (with F1) 4 = thermoregulated (with F1) if compressor on
60	F1	**0.1**	threshold for evaporator fan operation	1... 15 °C/°F
61	F2	**0**	evaporator fan mode during defrost and dripping	0 = off 1 = on 2 = according to F0
62	F3	**2**	evaporator fan stop maximum duration	0... 15 min
63	F4	**30**	evaporator fan off time during energy saving	0... 240 s x 10
64	F5	**30**	evaporator fan on time during energy saving	0... 240 s x 10
65	F6	**30**	evaporator fan on time after compressor on	0... 240 s x 10 if F0 = 3 or 4
66	F7	**20.0**	threshold for evaporator fan on after dripping (relative to setpoint)	-99... 99 °C/°F setpoint + F7
67	F8	**2.0**	threshold for evaporator fan operation differential	1... 15 °C/°F
68	F9	**10**	evaporator fan off delay after compressor off	0... 240 s if F0 = 2
69	F10	**0**	evaporator fan and condenser fan off minimum time	0... 240 s
70	F11	**10.0**	threshold for condenser fan on	0... 99 °C/°F
71	F12	**0**	condenser fan off delay after compressor off	0... 240 s if P4 = 0
72	F13	**2.0**	threshold for condenser fan on differential	1... 15 °C/°F
73	F14	**0**	condenser fan mode	0 = thermoregulated (with F11) 1 = thermoregulated (with F11) if compressor on
74	F15	**60**	evaporator fan off time with compressor off	0... 240 s if F0 = 2
75	F16	**10**	evaporator fan on time with compressor off	0... 240 s if F0 = 2
N.	PAR.	DEF.	DIGITAL INPUTS	MIN... MAX.
76	i0	**2**	door switch input function	0 = disabled 1 = compressor + evaporator fan off 2 = evaporator fan off 3 = cabinet light on 4 = compressor + evaporator fan off, cabinet light on 5 = evaporator fan off + cabinet light on
77	i1	**1**	door switch input activation	0 = with contact closed 1 = with contact open
78	i2	**0**	open door alarm delay	-1... 120 min -1 = disabled
79	i3	**-1**	regulation inhibition maximum time with door open	-1... 120 min -1 = until the closing
80	i10	**0**	door closed consecutive time for energy saving	0... 999 min after regulation temperature < SP 0 = disabled
81	i13	**0**	number of door openings for defrost	0... 240 0 = disabled
82	i14	**0**	door open consecutive time for defrost	0... 240 min 0 = disabled
N.	PAR.	DEF.	DIGITAL OUTPUTS	MIN... MAX.
83	uc	**1**	enable relay K1 and relay K4 inversion	0 = no 1 = yes
84	uc2	**0**	relay K2 configuration	0 = evaporator fan 1 = dripping heaters
85	uc3	**1**	relay K3 configuration	0 = condenser fan 1 = cabinet light 2 = demisting 3 = on/stand-by 4 = compressor
86	u1	**6**	relay K4 configuration	0 = cabinet light 1 = demisting 2 = button-operated load 3 = alarm 4 = door heaters 5 = heater for neutral zone 6 = condenser fan 7 = on/stand-by
87	u2	**1**	enable cabinet light and button-operated load in stand-by	0 = no 1 = yes manual
88	u4	**0**	enable alarm output off silencing the buzzer	0 = no 1 = yes
89	u5	**-1.0**	threshold for door heaters on	-99... 99 °C/°F differential = 2 °C/4 °F
90	u6	**5**	demisting on duration	1... 100 min x 10
91	u7	**-5.0**	neutral zone threshold for heating (relative to setpoint)	-99... 99 °C/°F differential = 2 °C/4 °F setpoint + u7
N.	PAR.	DEF.	ENERGY SAVING (if r5 = 0)	MIN... MAX.
92	HE2	**0**	energy saving maximum duration	0... 999 min -1 = until the door opening
93	HE3	**0**	consecutive time without operating on keys for low consumption	0... 240 min
N.	PAR.	DEF.	SAFETIES	MIN... MAX.
94	POF	**1**	enable ON/STAND-BY key	0 = no 1 = yes
95	PAS	**-19**	password	-99... 999

8 ALARMS

COD.	DESCRIPTION	RESET	REMEDIES
Pr1	cabinet probe alarm	automatic	- check P0
Pr2	evaporator probe alarm	automatic	- check probe integrity
Pr3	condenser probe alarm	automatic	- check electrical connection
AL	low temperature alarm	automatic	check A1
AH	high temperature alarm	automatic	check A4
id	open door alarm (condenser probe alarm if P4 = 2)	automatic	check i0 e i1
COH	high condensation warning	automatic	check C6
CSd	high condensation alarm	manual	- switch the device off and on - check C7
dFd	defrost timeout alarm	manual	- touch a key - check d2, d3 and d11

9 TECHNICAL SPECIFICATIONS

Purpose of the control device		Function controller
Construction of the control device		Built-in electronic device
Container		Black, self-extinguishing
Category of heat and fire resistance		D
Measurements		
75.0 x 33.0 x 59.0 mm (2 15/16 x 1 5/16 x 2 5/16 in) with fixed screw terminal blocks		75.0 x 33.0 x 81.5 mm (2 15/16 x 1 5/16 x 3 3/16 in) with removable screw terminal blocks
Mounting methods for the control device		To be fitted to a panel, snap-in brackets provided
Degree of protection provided by the covering		IP65 (front)
Connection method		
Fixed screw terminal blocks for wires up to 2,5 mm²		Removable screw terminal blocks for wires up to 2,5 mm²; by request
Maximum permitted length for connection cables		
Power supply: 10 m (32.8 ft)		Analogue inputs: 10 m (32.8 ft)
Digital inputs: 10 m (32.8 ft)		Analog outputs: 3 m (9.84 ft)
Digital outputs: 10 m (32.8 ft)		
Operating temperature		From 0 to 55 °C (from 32 to 131 °F)
Storage temperature		From -25 to 70 °C (from -13 to 158 °F)
Operating humidity		Relative humidity without condensate from 10 to 90%
Pollution status of the control device		2
Conformity		
RoHS 2011/65/CE	WEEE 2012/19/EU	REACH (EC) Regulation 1907/2006
EMC 2014/30/UE		LVD 2014/35/UE
Power supply		115... 230 VAC (+10% -15%), 50/60 Hz (±3 Hz), max. 3.2 VA
Earthing methods for the control device		None
Rated impulse-withstand voltage		2,5 KV
Over-voltage category		II
Software class and structure		A
Analogue inputs		2 for PTC or NTC probes (cabinet probe and evaporator probe)
PTC probes	Sensor type	KTY 81-121 (990 Ω @ 25 °C, 77 °F)
	Measurement field	From -50 to 150 °C (from -58 to 302 °F)
	Resolution	0.1 °C (1 °F)
NTC probes	Sensor type	ß3435 (10 K□Ω @ 25 °C, 77 °F)
	Measurement field	From -40 to 105 °C (from -40 to 221 °F)
	Resolution	0.1 °C (1 °F)
Other inputs		Input configurable for analogue input (condenser probe) or digital input (door switch input, dry contact)
Dry contact	Contact type	5 VDC, 1.5 mA
	Power supply	None
	Protection	None
Analog outputs		1 for PWM signal (compressor inverter)
PWM signal	Power supply	12 VDC (+16 % -25 %), 20 mA max.
	Frequency	0... 150 Hz
	Protection	None
Digital outputs		4 sealed electro-mechanical relays EN 60079-15 standard compliance
Relay K1		SPST, 8 A res. @ 250 VAC
Relay K2		SPST, 5 A res. @ 250 VAC
Relay K3		SPST, 16 A res. @ 250 VAC
Relay K4		SPST, 5 A res. @ 250 VAC
Type 1 or Type 2 Actions		Type 1
Additional features of Type 1 or Type 2 actions		C
Displays		3 digits custom display, with function icons
Alarm buzzer		Incorporated

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

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