EV3221 & EV3231

Controllers for refrigerated cabinets, undercounters and islands, with energy-saving strategies

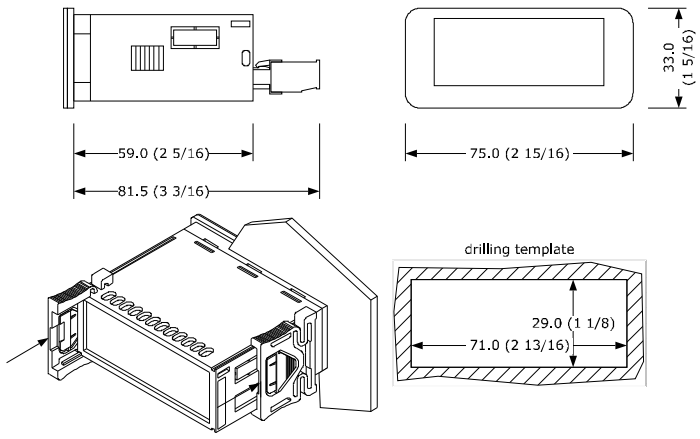
PLEASE READ CAREFULLY
and save this document
CONSIDER THE ENVIRONMENT

E ENGLISH

- Controllers for normal temperature units.
- Power supply 230 VAC, 115 VAC or 12-24 VAC/DC (according to the model).
- Incorporated clock (according to the model).
- Cabinet probe (PTC/NTC).
- Door switch/multi-purpose input.
- Compressor relay 16 A res. @ 250 VAC or 30 A res. @ 250 VAC (according to the model).
- Alarm buzzer.
- TTL or RS-485 MODBUS slave port for BMS (according to the model).
- Cooling or heating operation.

1 MEASUREMENTS AND INSTALLATION

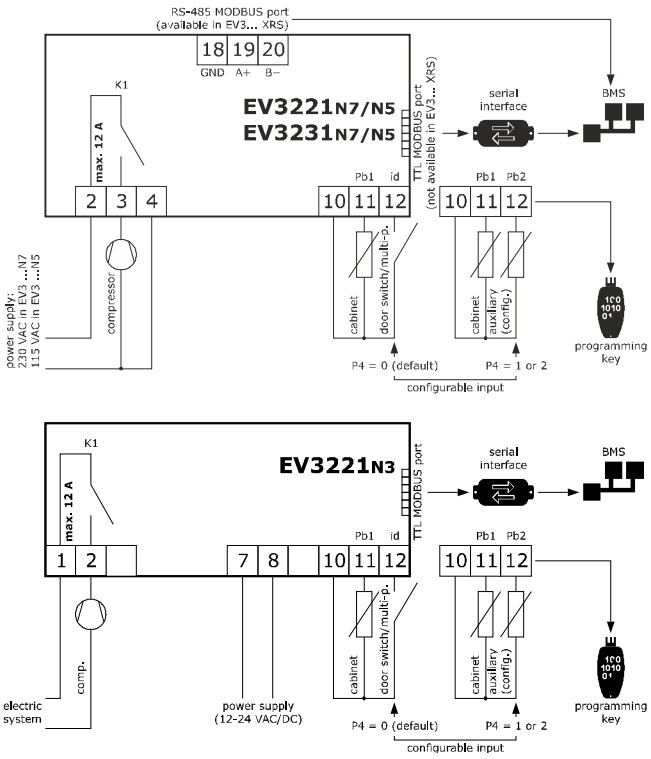
Measurements in mm (inches). To be fitted to a panel, snap-in brackets provided.



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.



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.

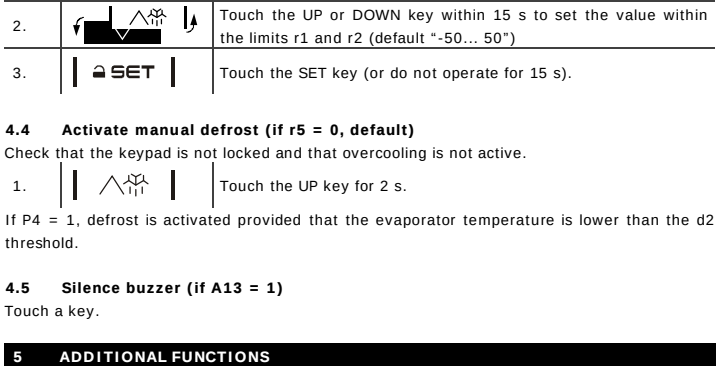
3 FIRST-TIME

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

   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. For the connection in an RS-485 network connect the interface EVIF22TSX or EVIF23TSX, to activate real time functions connect the module EVIF23TSX (or use EV3... XRS); see the relevant instruction sheets.
7. Power up the device.

4 USER INTERFACE AND MAIN FUNCTIONS



4.1 Switching the device on / off

1.	ON/STAND-BY	If POF = 1, 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 active	-	dripping active
HACCP	saved HACCP alarm	-	new HACCP alarm saved
	energy saving active	-	-
	request for compressor service	-	- settings active - access to additional functions active
°C/°F	view temperature	-	overcooling or overheating 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.	UP / DOWN	Touch the UP or DOWN key within 15 s to set the value within the limits r1 and r2 (default "-50... 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.	UP	Touch the UP key for 2 s.

If P4 = 1, defrost is activated provided that the evaporator temperature is lower than the d2 threshold.

4.5 Silence buzzer (if A13 = 1)

Touch a key.

5 ADDITIONAL FUNCTIONS

5.1 Activate / deactivate overcooling, overheating and manual energy saving

Check that the keypad is not locked.

1.	DOWN	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 HACCP alarm information

Check that the keypad is not locked.

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

LAB.	DESCRIPTION
LS	view HACCP alarm information
rLS	delete HACCP alarm information

3.	SET	Touch the SET key.
4.	UP / DOWN	Touch the UP or DOWN key to select an alarm code (when label "**LS**" is selected) or to set "**149**" (when label "**rLS**" is selected).

COD.	DESCRIPTION
AL	low temperature alarm
AH	high temperature alarm
id	door switch alarm
PF	power failure alarm (available in EV3... XRS or if module EVIF23TSX is connected)

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.

Example of alarm information (e.g. a high temperature alarm).

8.0		critical value (cabinet/ calculated product temperature) was 8.0 °C/°F
Sta		(available in EV3... XRS or if module EVIF23TSX is connected)
	y15	alarm signalled in 2015
	n03	alarm signalled in March
	d26	alarm signalled on 26 March 2015
	h16	alarm signalled at 16:00
	n30	alarm signalled at 16:30
dur		
	h01	alarm lasted 1h
	n15	alarm lasted 1h 15 min

5.3 View / delete compressor functioning hours and view compressor start-up number

Check that the keypad is not locked.

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

LAB.	DESCRIPTION
CH	view compressor functioning hours (hundreds)
rCH	delete compressor functioning hours
nS1	compressor start-up number (thousands)

3.	SET	Touch the SET key.
4.	UP / DOWN	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.

5.4 View the temperature detected by the probes

Check that the keypad is not locked.

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

LAB.	DESCRIPTION
Pb1	cabinet temperature
Pb2	auxiliary 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.

5.5 View the project number and the firmware revision

Check that the keypad is not locked.

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

LAB.	DESCRIPTION
PrJ	view the project number
rEU	view the firmware revison

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.	UP / DOWN	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.	UP / DOWN	Touch the UP or DOWN key to select a parameter.
6.	SET	Touch the SET key.
7.	UP / DOWN	Touch the UP or DOWN key within 15 s 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 Set the date, time and day of the week (available in EV3... XRS or if module EVIF23TSX is connected)

N.B.
Do not disconnect the device from the mains within two minutes since the setting of the time and day of the week.

Check that the keypad is not locked.

1.	DOWN	Touch the DOWN key for 4 s.
2.	UP / DOWN	Touch the UP or DOWN key within 15 s to select the label "**rtc**".
3.	SET	Touch the SET key: the display will show the label "**yy**" followed by the last two figures of the year.
4.	UP / DOWN	Touch the UP or DOWN key within 15 s to set the year.
5.	Repeat actions 3. and 4. to set the next labels.	

LAB.	DESCRIPTION OF THE NUMBERS FOLLOWING THE LABEL
n	month (01... 12)
d	day (01... 31)
h	time (00... 23)
n	minute (00... 59)

6.	SET	Touch the SET key: the display will show the label for the day of the week.
7.	UP / DOWN	Touch the UP or DOWN key within 15 s to set the day of the week.

LAB.	DESCRIPTION
Mon	Monday
tuE	Tuesday
UEd	Wednesday
thu	Thursday
Fri	Friday
Sat	Saturday
Sun	Sunday

8.	SET	Touch the SET key: the device will exit the procedure.
9.	ON/STAND-BY	Touch the ON/STAND-BY key to exit the procedure beforehand.

6.3 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.	UP / DOWN	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.	UP / DOWN	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	**0.0**	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**	auxiliary probe offset	-25... 25 °C/°F
4	P0	**1**	probe type	0 = PTC 1 = NTC
5	P1	**1**	enable °C decimal point	0 = no 1 = yes
6	P2	**0**	temperature unit of measurement	0 = °C 1 = °F
7	P4	**0**	configurable input function	0 = door switch/multi-purpose input 1 = evaporator probe 2 = condenser probe
8	P5	**0**	value displayed	0 = cabinet temperature 1 = setpoint 2 = auxiliary temperature
9	P8	**5**	display refresh time	0... 250 s : 10
N.	**PAR.**	**DEF.**	**REGULATION**	**MIN... MAX.**
10	r0	**2.0**	setpoint differential	1... 15 °C/°F
11	r1	**-50**	minimum setpoint	-99 °C/°F... r2
12	r2	**50.0**	maximum setpoint	r1... 199 °C/°F
13	r4	**0.0**	setpoint offset in energy saving	0... 99 °C/°F
14	r5	**0**	cooling or heating operation	0 = cooling 1 = heating
15	r6	**0.0**	setpoint offset in overcooling/overheating	0... 99 °C/°F
16	r7	**30**	overcooling/overheating duration	0... 240 min
17	r8	**0**	DOWN key additional function	0 = disabled 1 = overcooling/overheating 2 = energy saving
18	r12	**0**	position of the r0 differential	0 = asymmetric 1 = symmetric
N.	**PAR.**	**DEF.**	**COMPRESSOR**	**MIN... MAX.**
19	C0	**0**	compressor on delay after power-on	0... 240 min
20	C2	**3**	compressor off minimum time	0... 240 min
21	C3	**0**	compressor on minimum time	0... 240 s
22	C4	**10**	compressor off time during cabinet probe alarm	0... 240 min
23	C5	**10**	compressor on time during cabinet probe alarm	0... 240 min
24	C6	**80.0**	threshold for high condensation warning	0... 199 °C/°F differential = 2 °C/4 °F
25	C7	**90.0**	threshold for high condensation alarm	0... 199 °C/°F
26	C8	**1**	high condensation alarm delay	0... 15 min
27	C10	**0**	compressor hours for service	0... 999 h x 100 0 = disabled
N.	**PAR.**	**DEF.**	**DEFROST (if r5 = 0)**	**MIN... MAX.**
28	d0	**8**	automatic defrost interval	0... 99 h 0 = only manual if d8 = 3, maximum interval
29	d2	**8.0**	threshold for defrost end	-99... 99 °C/°F
30	d3	**30**	defrost duration	0... 99 min se P4 = 1, maximum duration
31	d4	**0**	enable defrost at power-on	0 = no 1 = yes
32	d5	**0**	defrost dealy after power-on	0... 99 min
33	d6	**2**	value displayed during defrost	0 = cabinet temperature 1 = display locked 2 = dEF label
34	d7	**0**	dripping time	0... 15 min
35	d8	**0**	defrost interval counting mode	0 = device on hours 1 = compressor on hours 2 = hours evaporator temperature < d9 3 = adaptive 4 = real time
36	d9	**0.0**	evaporation threshold for automatic defrost interval counting	-99... 99 °C/°F
37	d11	**0**	enable defrost timeout alarm	0 = no 1 = yes
38	d18	**40**	adaptive defrost interval	0... 999 min if compressor on + evaporator temperature < d22 0 = only manual
39	d19	**3.0**	threshold for adaptive defrost (relative to optimal evaporation temperature)	0... 40 °C/°F optimal evaporation temperature - d19
40	d20	**180**	compressor on consecutive time for defrost	0... 999 min 0 = disabled
41	d21	**200**	compressor on consecutive time for defrost after power-on and overcooling	0... 500 min if (cabinet temperature - setpoint) > 10°C/20 °F 0 = disabled
42	d22	**-2.0**	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.**
43	AA	**0**	select value for high/low temperature alarms	0 = cabinet temperature 1 = auxiliary temperature
44	A1	**-10.0**	threshold for low temperature alarm	-99... 99 °C/°F
45	A2	**1**	low temperature alarm type	0 = disabled 1 = relative to setpoint 2 = absolute
46	A4	**10.0**	threshold for high temperature alarm	-99... 99 °C/°F
47	A5	**1**	high temperature alarm type	0 = disabled 1 = relative to setpoint 2 = absolute
48	A6	**12**	high temperature alarm delay after power-on	0... 99 min x 10
49	A7	**15**	high/low temperature alarms delay	0... 240 min
50	A8	**15**	high temperature alarm delay after defrost	0... 240 min
51	A9	**15**	high temperature alarm delay after door closing	0... 240 min
52	A10	**10**	power failure duration for alarm recording	0... 240 min
53	A11	**2.0**	high/low temperature alarms reset differential	1... 15 °C/°F
54	A12	**2**	power failure alarm notification type	0 = HACCP LED 1 = HACCP LED + PF label + buzzer 2 = HACCP LED + PF label + buzzer (if duration > A10)
55	A13	**0**	enable alarm buzzer	0 = no 1 = yes
N.	**PAR.**	**DEF.**	**DIGITAL INPUTS**	**MIN... MAX.**
56	i0	**1**	door switch/multi-purpose input function	0 = none 1 = compressor off 2 = reserved 3 = reserved 4 = reserved 5 = reserved 6 = reserved 7 = energy saving 8 = iA alarm 9 = device on/off 10= Cth alarm 11= th alarm
57	i1	**0**	door switch/multi-purpose input activation	0 = with contact closed 1 = with contact open
58	i2	**30**	open door alarm delay	-1... 120 min -1 = disabled
59	i3	**15**	regulation inhibition maximum time with door open	-1... 120 min -1 = until the closing
60	i7	**0**	multi-purpose input alarm delay	-1... 120 min -1 = disabled if i0 = 10 or 11, compressor on delay after alarm reset
61	i10	**0**	door closed consecutive time for energy saving	0... 999 min after regulation temperature < SP 0 = disabled
62	i13	**180**	number of door openings for defrost	0... 240 0 = disabled
63	i14	**32**	door open consecutive time for defrost	0... 240 min 0 = disabled
N.	**PAR.**	**DEF.**	**ENERGY SAVING (if r5 = 0)**	**MIN... MAX.**
64	HE2	**0**	energy saving maximum duration	0... 999 min -1 = until the door opening
N.	**PAR.**	**DEF.**	**REAL TIME ENERGY SAVING (if r5 = 0)**	**MIN... MAX.**
65	H01	**0**	energy saving time	0... 23 h
66	H02	**0**	energy saving duration	0... 24 h
67	HEd	**7**	energy saving day	0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday 7 = none
N.	**PAR.**	**DEF.**	**REAL TIME DEFROST (if d8 = 4)**	**MIN... MAX.**
68	Hd1	**h-**	1st daily defrost time	h- = disabled
69	Hd2	**h-**	2nd daily defrost time	h- = disabled
70	Hd3	**h-**	3rd daily defrost time	h- = disabled
71	Hd4	**h-**	4th daily defrost time	h- = disabled
72	Hd5	**h-**	5th daily defrost time	h- = disabled
73	Hd6	**h-**	6th daily defrost time	h- = disabled
N.	**PAR.**	**DEF.**	**SAFETIES**	**MIN... MAX.**
74	POF	**0**	enable ON/STAND-BY key	0 = no 1 = yes
75	PAS	**-19**	password	-99... 999
N.	**PAR.**	**DEF.**	**REAL TIME CLOCK**	**MIN... MAX.**
76	Hr0	**0**	enable clock	0 = no 1 = yes
N.	**PAR.**	**DEF.**	**MODBUS**	**MIN... MAX.**
77	LA	**247**	MODBUS address	1... 247
78	Lb	**2**	MODBUS baud rate	0 = 2,400 baud 1 = 4,800 baud 2 = 9,600 baud 3 = 19,200 baud parity even

8 ALARMS

COD.	DESCRIPTION	RESET	REMEDIES
Pr1	cabinet probe alarm	automatic	- check P0
Pr2	auxiliary probe alarm	automatic	- check probe integrity - check electrical connection
rtc	clock alarm	manual	set date, time and day of the week
AL	low temperature alarm	automatic	check AA, A1 and A2
AH	high temperature alarm	automatic	check AA, A4 and A5
id	open door alarm	automatic	check i0 e i1
PF	power failure alarm	manual	- touch a key - check electrical connection
COH	high condensation warning	automatic	check C6
CSd	high condensation alarm	manual	- switch the device off and on - check C7
iA	multi-purpose input alarm	automatic	check i0 and i1
Cth	compressor thermal switch alarm	automatic	check i0 and i1
th	global thermal switch alarm	manual	- switch the device off and on - check i0 and i1
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 73.0 mm (2 15/16 x 1 5/16 x 2 7/8 in) in EV3... XRS	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; 75.0 x 33.0 x 83.0 mm (2 15/16 x 1 5/16 x 3 1/4 in) in EV3... XRS	
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	Micro-MaTch connector
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)	Digital outputs: 10 m (32.8 ft)	
Operating temperature	From 0 to 55 °C (from 32 to 131 °F); from 0 to 50 °C (from 32 a 122 °F) in EV3... N3	
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		
230 VAC (+10% -15%), 50/60 Hz (±3 Hz), max. 2 VA insulated in EV3... N7		
115 VAC (+10% -15%), 50/60 Hz (±3 Hz), max. 2 VA insulated in EV3... N5		
12-24 VAC/DC (+10% -15%), 50/60 Hz (±3 Hz), max. 4 VA/2W in EV3... N3, provided by a SELV class 2 source		
Earthing methods for the control device	None	
Rated impulse-withstand voltage	4 KV	
Over-voltage category	III; II in EV3... N3	
Software class and structure	A	
Clock	Incorporated secondary lithium battery (available in EV3... XRS)	
Clock drift	≤ 60 s/month at 25 °C (77 °F)	
Clock battery autonomy in the absence of a power supply	> 24 h at 25 °C (77 °F)	
Clock battery charging time	24 h (the battery is charged by the power supply of the device)	
Analogue inputs	1 for PTC or NTC probes (cabinet 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 (auxiliary probe) or digital input (door switch/multi-purpose, dry contact)	
Dry contact	Contact type	5 VDC, 1.5 mA
	Power supply	None
	Protection	None
Digital outputs	1 electro-mechanical relay (compressor relay)	
Compressor relay (K1)	EV3221	SPST, 16 A res. @ 250 VAC
	EV3231	SPST, 30 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	
Communication ports		
1 TTL MODBUS slave port for BMS (not available in EV3... XRS)	1 RS-485 MODBUS slave port for BMS (available in EV3... XRS)	

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

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