EV3221 & EV3231

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

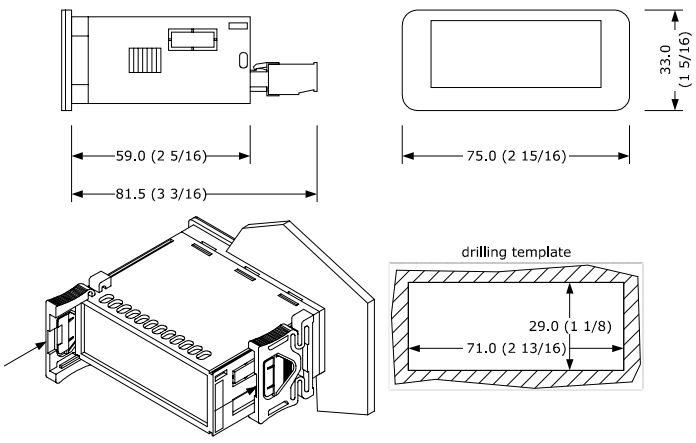
PLEASE READ CAREFULLY and save this document
CONSIDER THE ENVIRONMENT

E ENGLISH

- controllers for normal temperature units
- power supply 230 VAC
- cabinet probe (PTC/NTC)
- compressor relay 16 A res. @ 250 VAC or 30 A res. @ 250 VAC (according to the model)
- TTL MODBUS slave port for BMS
- cooling or heating operation.

1 MEASUREMENTS AND INSTALLATION

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

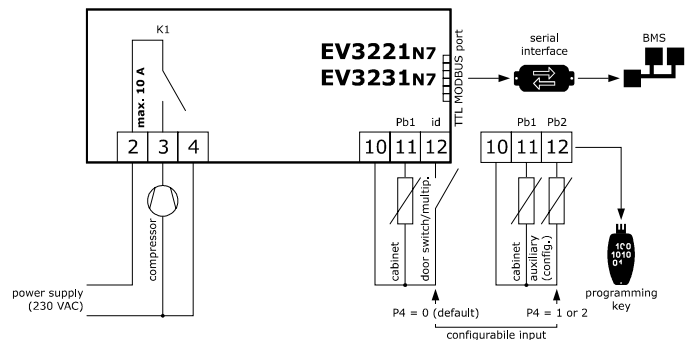


INSTALLATION PRECAUTIONS

- 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.

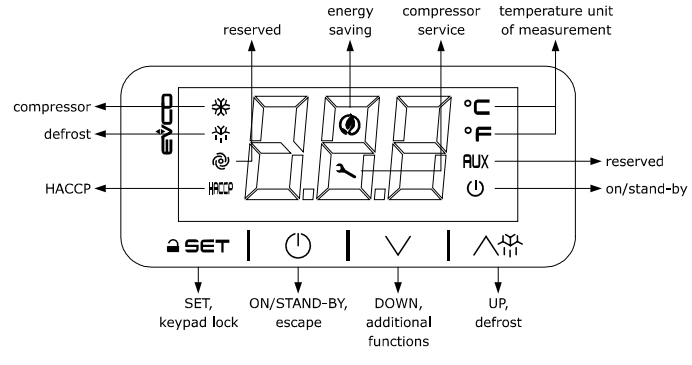
3 FIRST-TIME

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; 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 2 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

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 present and 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 (only 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	(only 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 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 Set the date, time and day of the week (only 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 15s 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; see r0

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 = digital input (door switch/multipurpose input) 1... 2 = analogue input (auxiliary probe)	0 = door switch/multipurpose input 1 = evaporator probe 2 = condenser probe

	8	P5	**0**	value displayed in normal operation	0 = cabinet T 1 = SP 2 = auxiliary T; see P4
	9	P8	**5**	display refresh time	0... 250 s : 10
	N.	PAR.	DEF.	MAIN REGULATOR	MIN... MAX.
	10	r0	**2.0**	setpoint differential	0,1 °C/1 °F... 15 °C/°F; see r12
	11	r1	**-50**	minimum setpoint	-99 °C/°F... r2
	12	r2	**50.0**	maximum setpoint	r1... 199 °C/°F
	13	r4	**0.0**	if r5 = 0, setpoint offset in energy saving	0... 99 °C/°F; see HE2
	14	r5	**0**	cooling or heating operation	0 = cooling 1 = heating
	15	r6	**0.0**	if r5 = 0, setpoint offset in overcooling; if r5 = 1, setpoint offset in overheating	0... 99 °C/°F; see r7
	16	r7	**30**	if r5 = 0, overcooling duration; if r5 = 1 overheating duration	0... 240 min; see r6
	17	r8	**0**	DOWN key additional function	0 = none 1 = if r5 = 0, overcooling; if r5 = 1, overheating 2 = energy saving
	18	r12	**0**	type of setpoint differential r0	0 = asymmetrical 1 = symmetrical
	N.	PAR.	DEF.	COMPRESSOR PROTECTIONS	MIN... MAX.
	19	C0	**0**	compressor ON delay after power-on	0... 240 min
	20	C2	**3**	compressor ON delay after compressor ON	0... 240 min
	21	C3	**0**	compressor ON minimum time	0... 240 s
	22	C4	**10**	compressor OFF time in cabinet probe alarm	0... 240 min; see C5
	23	C5	**10**	compressor ON time in cabinet probe alarm	0... 240 min; see C4
	24	C6	**80.0**	high condensing warning threshold	0... 199 °C/°F differential = 2 °C/4 °F
	25	C7	**90.0**	high condensing alarm threshold	0... 199 °C/°F
	26	C8	**1**	high condensing alarm delay	0... 15 min
	27	C10	**0**	compressor functioning hours for service	0... 999 h x 100 0 = absent
	N.	PAR.	DEF.	DEFROST (se r5 = 0)	MIN... MAX.
	28	d0	**8**	if d8 = 0... 2, defrost interval; if d8 = 3 maximum defrost interval	0... 99 h 0 = only manual
	29	d2	**8.0**	threshold for defrost end	-99... 99 °C/°F; see d3
	30	d3	**30**	if P4 ≠ 1, defrost duration; if P4 = 1, maximum defrost duration	0... 99 min; see d2
	31	d4	**0**	se d8 = 0... 3, enable defrost after power-on	0 = NO 1 = YES
	32	d5	**0**	se d4 = 1, defrost dealy after power-on	0... 99 min
	33	d6	**2**	if P5 = 0, value displayed in defrost	0 = cabinet T 1 = at maximum "SP + r0" or cabinet T at defrost activation 2 = code "**dEF**"
	34	d7	**0**	dripping duration	0... 15 min
	35	d8	**0**	defrost interval d0 counting mode	0 = device ON 1 = compressor ON 2 = evaporator T < d9 3 = adaptive 4 = real time
	36	d9	**0.0**	if d8 = 2, evaporator temperature threshold for defrost interval d0 counting	-99... 99 °C/°F
	37	d11	**0**	enable defrost time-out alarm	0 = NO 1 = YES
	38	d18	**40**	if d8 = 3, defrost interval	0... 999 min; see d0 if compressor ON and evaporator T < d22 0 = only manual
	39	d19	**3.0**	if d8 = 3, threshold relative to optimal evaporator temperature for defrost	0... 40 °C/°F "optimal T - d19"
	40	d20	**180**	consecutive compressor ON time for defrost	0... 999 min 0 = absent
	41	d21	**200**	consecutive compressor ON time after power-on and after overcooling for defrost	0... 500 min if "(cabinet T - SP) > 10°C/20 °F" 0 = absent
	42	d22	**-2.0**	if d8 = 3, threshold relative to optimal evaporator temperature for defrost interval d18 counting	-10... 10 °C/°F "optimal T + d22"
	N.	PAR.	DEF.	TEMPERATURE ALARMS	MIN... MAX.
	43	AA	**0**	temperature selection for high and low temperature alarm	0 = cabinet T 1 = auxiliary T; see P4 see A1 and A4
	44	A1	**-10.0**	low temperature alarm threshold	-99... 99 °C/°F; see AA, A2 and A11
	45	A2	**1**	low temperature alarm type	0 = absent 1 = relat. to SP ("SP - A1") 2 = absolute (A1)
	46	A4	**10.0**	high temperature alarm threshold	-99... 99 °C/°F; see AA, A5 and A11
	47	A5	**1**	high temperature alarm type	0 = absent 1 = relat. to SP ("SP + A4") 2 = assoluto (A4)
	48	A6	**12**	high temperature alarm delay after power-on	0... 99 min x 10
	49	A7	**15**	high and low temperature alarms delay	0... 240 min
	50	A8	**15**	high temperature alarm delay after defrost end	0... 240 min
	51	A9	**15**	high temperature alarm delay after door closing	0... 240 min
	52	A10	**10**	power failure duration for power failure alarm storing	0... 240 min
	53	A11	**2.0**	A1 and A4 differential	0,1 °C/1 °F... 15 °C/°F
	54	A12	**2**	power failure alarm notification type	0 = HACCP LED 1 = alarm buzzer, code "**PF**" and HACCP LED 2 = alarm buzzer (if power failure duration > A10), code "**PF**" and HACCP LED
	55	A13	**0**	enable alarm buzzer	0 = NO 1 = YES
	N.	PAR.	DEF.	DIGITAL INPUTS	MIN... MAX.
	56	i0	**1**	door switch/multipurpose input function	0 = none 1 = compressor OFF 2 = reserved 3 = reserved 4 = reserved 5 = reserved 6 = reserved 7 = energy saving 8 = multipurpose input alarm 9 = device stand-by 10= compressor thermal protection alarm 11= global thermal protection alarm
	57	i1	**0**	door switch/multipurpose input contact type	0 = normally open 1 = normally closed
	58	i2	**30**	door open alarm delay	-1... 120 min -1 = absent
	59	i3	**15**	regulation by-pass maximum time with door open	-1... 120 min -1 = until the door closing
	60	i7	**0**	if i0 = 8, multipurpose input alarm delay; if i5 = 10 or 11, compressor ON delay after alarm end	-1... 120 min -1 = absent
	61	i10	**0**	closed door consecutive time for energy saving	0... 999 min; see HE2 after cabinet T < SP 0 = absent
	62	i13	**180**	number of door openings for defrost	0... 240 0 = absent
	63	i14	**32**	open door consecutive time for defrost	0... 240 min 0 = absent
	N.	PAR.	DEF.	ENERGY SAVING	MIN... MAX.
	64	HE2	**0**	maximum energy saving duration	0... 999 min; see i10 -1 = until the door opening
	N.	PAR.	DEF.	REAL TIME ENERGY SAVING	MIN... MAX.
	65	H01	**0**	energy saving time	0... 23 h; si veda H02
	66	H02	**0**	energy saving duration	0... 24 h; si veda H01
	67	HEd	**7**	closing day for energy saving 24 h	0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday 7 = absent
	N.	PAR.	DEF.	REAL TIME DEFROST (if d8 = 4)	MIN... MAX.
	68	Hd1	**h-**	first daily defrost time	h- = absent
	69	Hd2	**h-**	second daily defrost time	h- = absent
	70	Hd3	**h-**	third daily defrost time	h- = absent
	71	Hd4	**h-**	fourth daily defrost time	h- = absent
	72	Hd5	**h-**	fifth daily defrost time	h- = absent
	73	Hd6	**h-**	sixth daily defrost time	h- = absent
	N.	PAR.	DEF.	SAFETIES	MIN... MAX.
	74	POF	**0**	enable ON/STAND-BY key	0 = NO 1 = YES
	75	PAS	**-19**	configuration parameters settings password	-99... 999
	N.	PAR.	DEF.	REAL TIME CLOCK	MIN... MAX.
	76	Hr0	**0**	enable real time clock	0 = NO 1 = YES
	N.	PAR.	DEF.	MODBUS	MIN... MAX.
	77	LA	**247**	MODBUS address	1... 247
	78	Lb	**2**	MODBUS baud rate (no parity)	0 = 2,400 baud 1 = 4,800 baud 2 = 9,600 baud 3 = 19,200 baud

8 ALARMS

COD.	DESCRIPTION	RESET	REMEDIES
Pr1	cabinet probe alarm	automatic	- check P0 - check probe integrity - check electrical connection
Pr2	auxiliary probe alarm	automatic	
rtc	real time clock alarm	manual	set date, time and day of the week
AL	low temperature alarm	automatic	check A1
AH	high temperature alarm	automatic	check A4
id	door open alarm	automatic	check i0 e i1
PF	power failure alarm	manual	- touch a key - check electrical connection
COH	high condensing warning	automatic	check C6
CSd	high condensing alarm	manual	- switch the device off and on - check C7
iA	multipurpose input alarm	automatic	check i0 and i1
Cth	compressor thermal protection alarm	automatic	check i0 and i1
th	global thermal protection alarm	manual	- switch the device off and on - check i0 and i1
dFd	defrost time-out 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	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)
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
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		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 KΩ @ 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/multipurpose, 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
The device guarantees double insulation between each digital output connector and the rest of the components of the device.		
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		By request
Communication ports		1 TTL MODBUS slave port for BMS

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

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