

TC3B23

Basic controller for refrigerated cabinets, with energy-saving strategies

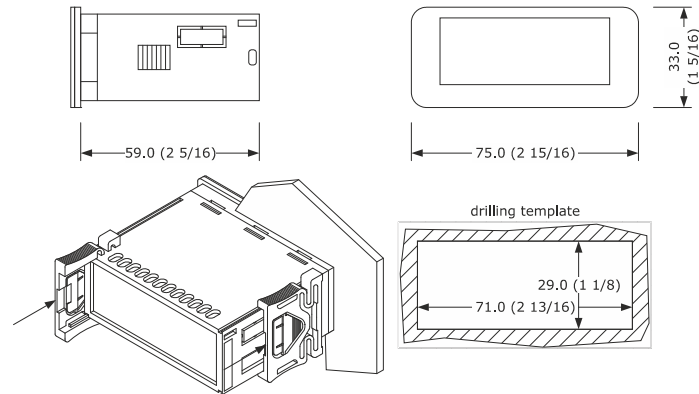


E ENGLISH

- Controller for low temperature units.
- Power supply for TC3B23N5V: 115 VAC.
- Power supply for TC3B23N7V: 230 VAC.
- Cabinet probe and auxiliary probe (NTC).
- Door switch/multi-purpose input.
- Cooling or heating operation.

1 MEASUREMENTS AND INSTALLATION

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

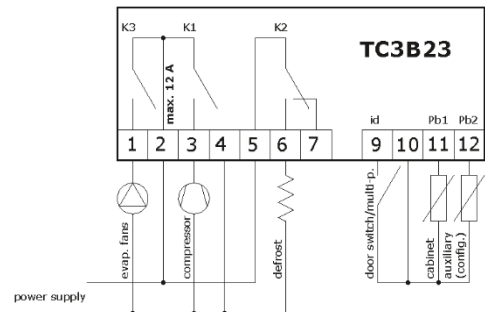


INSTALLATION PRECAUTIONS

- 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

- Important**
- Use cables of an adequate wire gauge for the current running through them.
 - To reduce any electromagnetic interference connect the power cables as far away as possible from the signal cables.



- Power supply for TC3B23N5V: 115 VAC.
- Power supply for TC3B23N7V: 230 VAC.

PRECAUTIONS FOR ELECTRICAL CONNECTION

- If you use an electrical or pneumatic screwdriver, adjust the torque to a maximum of 0.5 N•m (4 in. lb).
- If the device was 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 PENN sales network.

3 FIRST-TIME

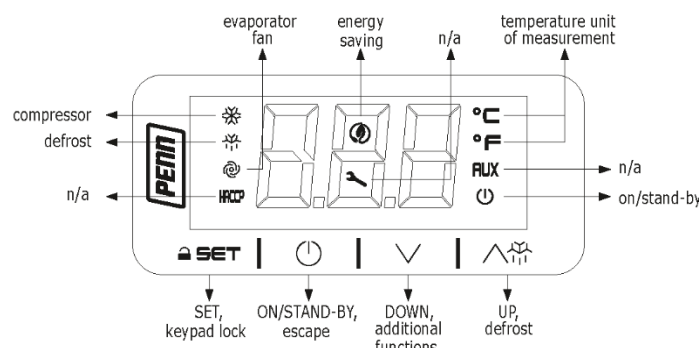
1. Install following the instructions given in the section *MEASUREMENTS AND INSTALLATION*.
2. Power up the device as shown in the section *ELECTRICAL CONNECTION* and an internal test will be run. The test normally takes a few seconds, when it is finished the display will switch off.
3. Configure the device as shown in Table 6.1 in the section *SETTINGS*. Recommended configuration parameters for first-time use.

PAR.	DEF.	PARAMETER	MIN... MAX.
SP	0.0	setpoint	r1... r2
P2	0	temperature unit of measurement	0 = °C 1 = °F
d1	0	defrost type	0 = electric 1 = hot gas 2 = compressor stopped

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. 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 or pre-dripping active	-	- defrost delay active - dripping active
🌀	evaporator fan on	evaporator fan off	evaporator fan stop active
⚡	- if device on, energy saving active - if device off, low consumption active	-	-
°C/°F	view temperature	-	-
🔌	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 any key for 1 s: the display will show the label "UnL".

4.3 Set the setpoint

Check that the keypad is not locked.

1. Touch the SET key.
2. Touch the UP or DOWN key within 15 s to set the value within the limits r1 and r2 (default "-40... 50°").
3. 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.

1. Touch the UP key for 2 s.

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

5 ADDITIONAL FUNCTIONS

5.1 View/delete compressor functioning hours

Check that the keypad is not locked.

1. Touch the DOWN key for 4 s.
2. 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

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

5.2 View the temperature detected by the probes

Check that the keypad is not locked.

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

LAB.	DESCRIPTION
Pb1	cabinet temperature
Pb2	auxiliary temperature

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

- Important**
- Check that the factory settings are appropriate; see the section *CONFIGURATION PARAMETERS*.
 - When you store customized settings, you overwrite the default.

1. Touch the SET key for 4 s: the display will show the label "PA".
 2. Touch the SET key.
 3. 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. 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. Touch the SET key.
 6. Touch the UP or DOWN key within 15 s to set "4".
 7. 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. 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
ANALOG INPUTS				
2	CA1	0.0	cabinet probe offset	-25... 25 °F/°C
3	CA2	0.0	auxiliary probe offset	-25... 25 °F/°C
4	P0	1	probe type	0 = n/a 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	1	auxiliary probe function	0 = disabled 1 = evaporator probe (defrost + fan) 2 = evaporator probe (fan) 3 = 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
CONTROL				
10	r0	2.0	setpoint differential	1... 15 °F/°C
11	r1	-40	minimum setpoint	-99 °F/°C... r2
12	r2	50.0	maximum setpoint	r1... 199 °F/°C
13	r4	0.0	setpoint offset in energy saving	0... 99 °F/°C
14	r5	0	cooling or heating operation	0 = cooling 1 = heating
15	r12	1	position of the r0 differential	0 = asymmetric 1 = symmetric
COMPRESSOR				
16	C0	0	compressor on delay after power-on	0... 240 min
17	C2	3	compressor off minimum time	0... 240 min
18	C3	0	compressor on minimum time	0... 240 s
19	C4	0	compressor off time during cabinet probe alarm	0... 240 min
20	C5	10	compressor on time during cabinet probe alarm	0... 240 min
21	C6	80.0	threshold for high condenser temperature warning	0... 199 °F/°C differential = 4 °F/2 °C
22	C7	90.0	threshold for high condenser temperature alarm	0... 199 °F/°C
23	C8	1	high condenser temperature alarm delay	0... 15 min
DEFROST (if r5 = 0)				
24	d0	8	automatic defrost interval	0... 99 h 0 = only manual if d8 = 3, maximum interval
25	d1	0	defrost type	0 = electric 1 = hot gas 2 = compressor stopped
26	d2	2.0	threshold for defrost end	-99... 99 °F/°C
27	d3	30	defrost duration	0... 99 min if P3 = 1, maximum duration
28	d4	0	enable defrost at power-on	0 = no 1 = yes
29	d5	0	defrost delay after power-on	0... 99 min
30	d6	1	value displayed during defrost	0 = cabinet temperature 1 = display locked 2 = dEF label
31	d7	2	dripping time	0... 15 min
32	d8	0	defrost interval counting mode	0 = device on hours 1 = compressor on hours 2 = hours evaporator temperature < d9 3 = adaptive
33	d9	0.0	evaporation threshold for automatic defrost interval counting	-99... 99 °F/°C
34	d11	0	enable defrost timeout alarm	0 = no 1 = yes
35	d15	0	compressor on consecutive time for hot gas defrost	0... 99 min
36	d18	40	adaptive defrost interval	0... 999 min if compressor on + evaporator temperature < d22 0 = only manual
37	d19	3.0	threshold for adaptive defrost (relative to optimal evaporation temperature)	0... 40 °F/°C optimal evaporation temperature - d19
38	d20	180	compressor on consecutive time for defrost	0... 999 min 0 = disabled
39	d22	2.0	evaporation threshold for adaptive defrost interval counting (relative to optimal evaporation temperature)	0... 19 °F/°C optimal evaporation temperature + d22
ALARMS				
40	A1	10.0	threshold for low temperature alarm (relative to setpoint)	0... 99 °F/°C SP - A1 0 = disabled
41	A4	10.0	threshold for high temperature alarm (relative to setpoint)	0... 99 °F/°C SP + A4 0 = disabled
42	A6	12	high temperature alarm delay after power-on	0... 99 min x 10
43	A7	15	high/low temperature alarms delay	0... 240 min
44	A8	15	high temperature alarm delay after defrost	0... 240 min
45	A9	15	high temperature alarm delay after door closing	0... 240 min
46	A11	2.0	high/low temperature alarms reset differential	1... 15 °F/°C
FANS				
47	F0	3	evaporator fan mode during normal operation	0 = off 1 = on 2 = on if compressor on 3 = thermoregulated (with F1) 4 = thermoregulated (with F1) if compressor on
48	F1	-1.0	threshold for evaporator fan operation	-99... 99 °F/°C differential = 2 °F/1 °C
49	F2	0	evaporator fan mode during defrost and dripping	0 = off 1 = on 2 = according to F0
50	F3	2	evaporator fan off maximum time	0... 15 min
51	F4	30	evaporator fan off time during energy saving	0... 240 s x 10
52	F5	30	evaporator fan on time during energy saving	0... 240 s x 10

N.	PAR.	DEF.	DIGITAL INPUTS	MIN... MAX.
53	i0	1	door switch/multi-purpose input function	0 = disabled 1 = compressor + evaporator fan off 2 = evaporator fan off 3 = energy saving 4 = iA alarm 5 = iA alarm + compressor off
54	i1	0	door switch/multi-purpose input activation	0 = with contact closed 1 = with contact open
55	i2	30	open door alarm delay	-1... 120 min if i0 = 3, multi-purpose input alarm delay if i0 = 4, compressor on delay after alarm reset -1 = disabled
56	i3	15	regulation inhibition maximum time with door open	-1... 120 min -1 = until the closing
57	i10	0	door closed consecutive time for energy saving	0... 999 min after regulation temperature < SP 0 = disabled
58	i13	180	number of door openings for defrost	0... 240 0 = disabled
59	i14	32	door open consecutive time for defrost	0... 240 min 0 = disabled
N.	PAR.	DEF.	ENERGY SAVING (if r5 = 0)	MIN... MAX.
60	HE2	0	energy saving maximum duration	0... 999 min 0 = until the door opening
61	HE3	2	no operation on the keyboard consecutive time for low consumption	0... 240 min 0 = disabled
N.	PAR.	DEF.	SAFETIES	MIN... MAX.
62	POF	0	enable ON/STAND-BY key	0 = no 1 = yes
63	PAS	-19	password	-99... 999

8 ALARMS

COD.	DESCRIPTION	RESET	REMEDIES
Pr1	cabinet probe alarm	automatic	- check P0
Pr2	auxiliary probe alarm	automatic	- check probe integrity - check electrical connection
AL	low temperature alarm	automatic	check A1
AH	high temperature alarm	automatic	check A4
id	open door alarm	automatic	check i0 e i1
COH	high condenser temperature warning	automatic	check C6
CSd	high condenser temperature alarm	manual	- switch the device off and on - check C7
IA	multi-purpose input alarm	automatic	check i0 and i1
dFd	defrost timeout alarm	manual	- touch any key - check d2, d3 and d11

9 ELECTRICAL RATINGS

Output	Units	cULus (UL 60730)		CE (EN 60730)
		120 VAC	240 VAC	240 VAC
K1 compressor relay	Resistive amperes	12	12	10
	Inductive amperes	—	—	2
	Full load amperes	10	10	—
	Locked rotor amperes	60	60	—
K2 relay	Resistive amperes	8	8	5
	Inductive amperes	—	—	2
	Full load amperes	4.4	2.9	—
	Locked rotor amperes	26.4	17.4	—
K3 evaporator fan relay	Resistive amperes	5	5	5
	Inductive amperes	—	—	1
	Full load amperes	1.5	1.5	—
	Locked rotor amperes	9	9	—

10 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)	
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 mm ²	
Maximum permitted length for connection cables		
Power supply: 10 m (32.8 ft)	Analog inputs: 10 m (32.8 ft)	
Digital inputs: 10 m (32.8 ft)	Digital outputs: 10 m (32.8 ft)	
Operating temperature	From 32 to 131 °F (from 0 to 55 °C)	
Storage temperature	From -13 to 158 °F (from -25 to 70 °C)	
Operating humidity	Relative humidity without condensate from 10 to 90%	
Pollution status of the control device	2	
Compliance		
Europe	JCI declares product compliance meets requirements of EMC, LVD, and RoHS Directives.	
USA	UL Recognized Component, SDFY2.SA516; FCC Part 15 Subpart B Class A	
Canada	UL Recognized Component, SDFY8.SA516; ICES-003 Class A	
Power supply	TC3B23N5V 115 VAC (+10% -15%), 50/60 Hz (+/- 3Hz), max. 2 VA TC3B23N7V 230 VAC (+10% -15%), 50/60 Hz (+/- 3Hz), max. 2 VA	
Grounding methods for the control device	None	
Rated impulse-withstand voltage	4 KV	
Over-voltage category	III	
Software class and structure	A	
Analog inputs	2 for NTC probes (cabinet probe and auxiliary probe)	
NTC probes	Sensor type	B3435 (10 KΩ @ 77 °F, 25 °C)
	Measurement field	From -40 to 221 °F (from -40 to 105 °C)
	Resolution	1 °F (0.1 °C)
Digital inputs	1 dry contact (door switch/multi-purpose)	
Dry contact	Contact type	5 VDC, 1.5 mA
	Power supply	None
	Protection	None
Digital outputs	3 electro-mechanical relays (compressor, defrost and evaporator fan)	
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	

11 PRODUCT WARRANTY

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty

12 SOFTWARE TERMS

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

13 SINGLE POINT OF CONTACT

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

14 CONTACT INFORMATION

Contact your local branch office:
www.johnsoncontrols.com/locations
Contact Johnson Controls:
www.johnsoncontrols.com/contact-us

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

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