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Danfoss AK-RC 204B-AK-RC 205C Temperature Controller for Walk in Coolers and Freezers Installation Guide

ENGINEERING TOMORROW
Installation Guide
Temperature controller for walk-in coolers and freezers,
Type AK-RC 204B and AK-RC 205C

Contents

AK-RC 204B-AK-RC 205C Temperature Controller for Walk in Coolers and Freezers

⚠️ **Warnings**

- Using the unit without observing the manufacturer's instructions may alter the appliance's safety requirements. Only probes supplied by Danfoss should be used for the unit to operate correctly.
- From -40 – +20 °C, if the NTC probe is extended to 1000 m with at least 0.5 mm2 cable, the maximum deviation will be 0.25 °C
- It should be installed in a place protected from vibrations, water and corrosive gases, where the ambient temperature does not exceed the value indicated in the technical data.
- For the reading to be correct, the probe should be used in a place without heat infiuences apart from the temperature you want to measure or control.
- IP65 protection degree is only valid with the protection cover closed.
- IP65 protection degree is only valid if the cables enter the device using a tube for electric conductions + gland with IP65 or above. The size of the glands should be suitable for the diameter of the tube used.
- Do not spray the unit directly with high-pressure hoses, as this could cause damage.

IMPORTANT:

- Before starting the installation, you must take the advice of local regulations in force.
- The AUXILIARY relays are programmable, and their operation depends on the configuration.
- The function of the digital inputs depends on the configuration.
- The recommended currents and powers are the maximum working currents and powers.

⚠️ **Wiring**

Always disconnect the power supply to do the wiring.
The probes and their cables should NEVER be installed in a conduit together with power, control or power supply cables.
For disconnection, the power supply circuit must be equipped with a switch of at least 2 A, 230 V, located near the device. The power supply cable will be H05VV-F or NYM 1×16/3. The section to be used will depend on the local standard in force, but must never beless than 2.5 mm2.
Cables for relay or contactor outputs should have a section of 2.5 mm2 , allow working temperatures equal to or over 70 °C and be installed with as few bends as possible.
The 120/230 V~ wiring must be kept clear of any other external element.
The wiring to be done depends on the type of installation. Use the appropriate diagram based on the option selected in the wizard. Check the available options on the diagrams included in the controller's packaging.
Wizard refers to a built in tool to guide the user through the set up process.

Maintenance

- Clean the surface of the unit with a soft cloth, water and soap.
- Do not use abrasive detergents, petrol, alcohol or solvents, as this might damage the unit.

Keypad

ESC	Pressing it for 3 seconds activates/deactivates Stand-by mode. In this mode, regulation is paused and the ⏻ icon is displayed. In the programming menu, this exits the parameter without saving changes, returns to previous level or exits programming.
▲	Pressing once displays the temperature of probe S2 for 10 seconds (If it is enabled). Pressing it for 3 seconds starts/stops the defrost. In the programming menu, this allows scrolling around the difierent levels, or, during the setting of a parameter, changing its value.
▼	Pressing it for 3 seconds activates/deactivates continuous cycle mode. In the programming menu, this allows scrolling around the difierent levels, or, during the setting of a parameter, changing its value.
SET	Pressing once activates/deactivates the cold room light. Pressing it for 3 seconds accesses the condensed programming menu. Pressing it for 6 seconds accesses the expanded programming menu. In the programming menu, this accesses the level shown on the display or, during the setting of a parameter, accepts the new value.
SP	Pressing once displays the current effiective value of the Set Point, taking into consideration temporary modifications by other parameters (C10 or C12). When an alarm is underway, pressing once mutes the acoustic alarm. Pressing for 3 seconds accesses the Set Point setting.

Indicators

⏻	**Fixed:** Stand-by mode activated. Regulation is paused. **Flashing:** Controlled shutdown process for the regulation underway.
🚪	**Fixed:** Cold room door open. **Flashing:** The door has been open for a greater time than has been defined in parameter A1 2.
⚠	There is an active alarm, but not an active HACCP alarm.
HACCP	**Fixed:** HACCP alarm active. **Flashing:** HACCP alarm registered and unconfirmed. Press the key to confirm an HACCP al arm.
🌀	**Fixed:** Evaporator fans active. **Flashing:** The evaporator fans should be active but a delay is preventing this.
❄	**Fixed:** The cold solenoid is active. **Flashing:** The solenoid should be active but a delay or protection is preventing this.
⊞	**Fixed:** Compressor active. **Flashing:** The compressor should be active but a delay or protection is preventing this.
❄	Defrost relay active.
↻	Continuous cycle mode active.
☀	Cold room light active.
🔇	Alarm underway muted.
°F °C	Temperature displayed in ° Fahrenheit / ° Centigrade.
PRG	Programming mode active.

⚠ STAND-BY

If the temperature regulation cannot be instantly stopped due to its configuration, a controlled stop process starts and the icon flashes. To stop the controlled stop process and force the step to Stand-by, press the Stand-by key again for 3 seconds.

Initial configuration

The first time the unit receives the power supply, it will enter into ASSISTANT mode. The display will show the message flashing with 0.
Step 1: Select the most suitable InI option based on the type of installation to be carried out and press SET. The available options will be shown in the following table:

Inl	Type of installation				Parameters										Diagram to be used
	Cold regulation	Pump Down	Defrost	Evap. fans	Pd	o00	I00	I10	I11	I20	I21	d1	d7	F3	
0	Demo Mode: it displays the temperature but does not regulate the temperature or activate relays														
1	Solenoid	No	Electric	Yes	0	*	2	0	0	0	0	20	0	0	A
2	Solenoid + compressor	Yes	Electric	Yes	1	1	2	7	1	0	0	20	0	0	B
3	Solenoid + compressor	No	Electric	Yes	0	1	2	0	0	0	0	20	0	0	B
4	Solenoid	No	Air	Yes	0	*	1	0	0	0	0	20	1	1	A
5	Solenoid + compressor	Yes	Air	Yes	1	1	1	7	1	0	0	20	1	1	B
6	Solenoid + compressor	No	Air	Yes	0	1	1	0	0	0	0	20	1	1	B
7	Solenoid + compressor	Yes	Hot gas	Yes	1	1	2	7	1	9	1	5	2	0	C
8	Solenoid + compressor	No	Hot gas	Yes	0	1	2	0	0	9	1	5	2	0	C
9	Solenoid + compressor	Yes	Reversed cycle	Yes	1	1	2	7	1	0	0	5	3	0	D
10	Solenoid + compressor	No	Reversed cycle	Yes	0	1	2	0	0	0	0	5	3	0	D
11	Solenoid	No	Static	No	0	*	1	0	0	0	0	20	1	-	A
12	Solenoid + compressor	Yes	Static	No	1	1	1	7	1	0	0	20	1	-	B
13	Solenoid + compressor	No	Static	No	0	1	1	0	0	0	0	20	1	-	B

* o00=2 in AK-RC 204B, o00=0 in AK-RC 205C

Note: If options 2, 5, 7, 9 or 12 are chosen, check the configuration of parameter I11 according to the pressure switch type used. (See diagram included with the device).

Step 2:
Use keys ▲ and ▼ to enter the desired Temperature Set Point value and press SET. The wizard has flnished. The unit will begin to regulate the temperature.
If this is not the first time you use the wizard, after completing the last step the display will show the message dFp (default parameters). You may choose between two options:

0: Only changing the parameters which afiect the wizard. The other parameters will remain the same.
1: All parameters return to their factory setting except those which have been modified by the wizard.
Important: The wizard will not reactivate. To enter the wizard mode, initiate Stand-by mode by pressing the key for 3 seconds and wait until the unit completely halts the temperature regulation (the indicator will light up permanently) and press the following keys in sequence one after the other, ▼, ▲, SET.

Warning: If the pump down function is active, a certain amount of time may elapse between starting the stand-by function and the controller stopping.

Configuration

Condensed programming menu
Enables the rapid configuration of the most frequently-used parameters (SP, C1, d0, d1, d4, F3, A1 and A2). Press the SET key for 3 seconds to access it.
Extended programming menu
Use the extended programming menu to configure all of the unit's parameters in order to adapt it to installation requirements. Press the SET key for 6 seconds to access it.
Important:

- If the function of the password has been configured as a keypad block (b10=2), or as an access block to parameters (b10=1), you will be requested to enter the access code programmed in PAS when attempting to access either of the two functions. If the entered password is not correct, the unit will go back to showing the temperature.
- Certain parameters or menus may not be visible depending on the configuration of the rest of the parameters.

Regulation and control

Level 1	Level 2	Description	Values	Min.	Def.	Max.
rE	SP	Temperature setting (Set Point)	°C/°F	-50	0.0	99
	C0	Probe 1 calibration (Offset)	°C/°F	-20.0	0.0	20.0
	C1	Probe 1 differential (Hysteresis)	°C/°F	0.1	2.0	20.0
	C2	Set Point top locking (it cannot be set above this value)	°C/°F	C3	99	99
	C3	Set Point bottom locking (it cannot be set below this value)	°C/°F	-50	-50	C2
	C4	Type of delay for the protection of the compressor: **0**=Minimum time of compressor in OFF **1**=Minimum time of compressor in OFF and in ON in each cycle		0	0	1
	C5	Protection delay time (Value of the option selected in parameter C4)	Min.	0	0	120
	C6	COOL relay status with fault in probe 1: **0**=OFF; **1**=ON; **2**=Average according to last 24 h prior to probe error **3**=ON-OFF according to prog. C7 and C8		0	2	3
	C7	Relay time in ON in the event of probe 1 failure (If C7=0 and C8≠0, the relay will always be disconnected in OFF)	Min.	0	10	120
	C8	Relay time in OFF in the event of probe 1 failure (If C8=0 and C7≠0, the relay will always be connected in ON)	Min.	0	5	120
	C9	Maximum duration of the continuous cycle mode. (**0**=deactivated)	H.	0	0	48
	C10	Variation of the Set Point (SP) in continuous cycle mode. When it reaches this point (SP+C10), it reverts to the normal mode. (SP+C10 ≥ C3). The value of this parameter is always negative, unless it is 0. (**0**=OFF)	°C/°F	0	-50	C3-SP
	C12	Variation of the Set Point (SP) when the change Set Point function is active. (SP+C12 ≤ C2) (**0**= deactivated)	°C/°F	C3-SP	0.0	C2-SP
	C19	Maximum start time from Pump Down (Values between 1 and 9 seconds will not be accepted) (**0**=deactivated)	Sec.	0	0	120
	C20	Maximum time for pump down (**0**= deactivated)	Min.	0	0	15
	C21	Probe to be displayed: **0**=All probes (sequential) **1**=Probe 1 (Cold Room), **2**=Probe 2 (Evaporator), **3**=Probe 3 (According to I20)		0	1	3
	C22	Stop fans and compressor on opening door **0**=No, **1**=Yes		0	0	1

	C23	Start-up delay for fans and compressor with door open	Min.	0	0	999
	C27	Probe 3 calibration (Offset)	°C/°F	-20.0	0.0	20.0
	EP	Exit to level 1				

	d0	Defrost frequency (Time between 2 starts)	H.	0	6	96
	d1	Maximum defrost duration (**0**=defrost deactivated)	Min.	0	*	255
	d2	Type of message during the defrost: **0**=Displays the real temperature; **1**=Displays the temperature at the start of the defrost; **2**=Displays the dEF message		0	2	2
	d3	Maximum duration of the message (Time added at the end of the defrost process)	Min.	0	5	255
	d4	Final defrost temperature (by probe) (If I00 ≠ 1)	°C/°F	-50	8.0	50
dEF	d5	Defrost on connecting the unit: **0**=NO First defrost according to d0; **1**=YES, First defrost according to d6		0	0	1
	d6	Delay of the defrost start on connecting the unit	Min.	0	0	255
	d71)	Type of defrost: **0**=Resistors; **1**=Air/fans, **2**=Hot gas; **3**=Reversal of cycle		0	*	3
	d8	Count of time between defrost periods: **0**=Total real time, **1** =Sum of compressor connected time		0	0	1
	d9	Drip time when completing defrost (Shutdown of compressor and fans)	Min.	0	1	255
	EP	Exit to level 1				

* According to wizard.
1) It can only be modified using the configuration wizard (InI).

Evaporator fans

Level 1	Level 2	Description	Values	Min.	Def.	Max.
FAn	F0	Shutdown temperature of fans	°C/°F	-50	45	50
	F1	Probe 2 differential if fans are shut down	°C/°F	0.1	2.0	20.0
	F2	Status of fans during compressor off cycle; **0**=Shut down, **1**=Running, **2**=Cycling		0	0	2
	F3	Status of the fans during the defrost: **0**=Shut down; **1**=Running		0	0	1
	F4	Delay of start-up after defrost (If F3=0) It will only actuate if it is higher than **d9**	Min.	0	2	99
	F5	Fan stop evaporator temperature	°C / °F	-50	50	50
	F6	Fan ON Cycle	Min.	0	2	15
	F7	Fan OFF Cycle	Min.	0	2	15
	EP	Exit to level 1				

Alarms

Level 1	Level 2	Description	Values	Min.	Def.	Max.
AL	A0	Configuration of the temperature alarms: **0**=Relative to SP, **1**=Absolute		0	1	1
	A1	Alarm for maximum in probe 1 (It should be higher than the SP)	°C/°F	A2	99	99
	A2	Alarm for minimum in probe 1 (It should be lower than the SP)	°C/°F	-50	-50	A1
	A3	Delay of temperature alarms in the start-up	Min.	0	0	120
	A4	Delay of temperature alarms from the end of a defrost	Min.	0	0	99
	A5	Delay of temperature alarms from when the **A1** or **A2** value is reached		0	30	99
	A6	Delay of the external alarm/Severe external alarm on receiving a signal in digital input (**I10** or **I20** = 2 or 3)	Min.	0	0	120
	A7	Delay of external alarm deactivation/Severe external alarm deactivation when the signal in digital input disappears (**I10** or **I20** = 2 or 3)	Min.	0	0	120
	A8	Show warning if the defrost ends for maximum time: **0**=No, **1**=Yes		0	0	1
	A9	Relay alarm polarity **0**= Relay ON in alarm (OFF without alarm); **1**= Relay OFF in alarm (ON without alarm)		0	0	1
	A10	Differential of temperature alarms (**A1** and **A2**)	°C/°F	0.1	1.0	20.0
	A12	Delay of open door alarm (If **I10** or **I20**=1)	Min.	0	10	120
	EP	Exit to level 1				

Basic configuration

Level 1	Level 2	Description	Values	Min.	Def.	Max.
bcn	b00	Delay of all functions on receiving power supply	Min.	0	0	255
	b01	Cold room light timing	Min.	0	0	999
	b10	Function of password **0**=Inactive, **1**=Block access to parameters, **2**=Block key pad		0	0	2
	PAS	Access code (Password)		0	0	99
	b20	MODBUS address		0	1	247
	b21	Communication speed: **0**=9600 bps, **1**=19200 bps, **2**=38400 bps, **3**=57600 bps	bps	0	1	3
	b22	Acoustic alarm enabled: **0**= No, **1**=Yes		0	1	1
	Unt	Work units: **0**=°C, **1**=°F		0	1	1
	EP	Exit to level 1				

Inputs and outputs

Level 1	Level 2	Description	Values	Min.	Def.	Max.
In0	I00	Connected probes **1**=Probe 1 (Cold room), **2**=Probe 1 (Cold room) + Probe 2 (Evaporator)		1	2	2
	I10[1]	Configuration of digital input 1 **0**= Deactivated, **1**=Door contact, **2**=External alarm, **3**=Severe external alarm, **4**=Change of SP, **5**=Remote defrost, **6**=Defrost block, **7**= Low pressure switch, **8**=Remote Stand-by		0	*	8
	I11	Polarity of the digital input 1 **0**=Activates on closing contact; **1**=Activates on opening contact		0	*	1
	I20	Configuration of digital input 2 **0**= Deactivated, **1**=Door contact, **2**=External alarm, **3**=Severe external alarm, **4**=Change of SP, **5**=Remote defrost, **6**=Defrost block, **7**=Register probe, **8**=Probe 2° evaporator[2], **9**=High pressure switch for Hot Gas, **10**=Remote Stand-by		0	0	10
	I21	Polarity of the digital input 2 **0**=Activates on closing contact; **1**=Activates on opening contact		0	0	1
	o00[1]	Configuration of relay AUX1 **0**=Deactivated, **1**=Compressor/Resistor sump, **2**=Light, **3**=Virtual control, **4**=Alarm[3]		0	*	4
	o10	Configuration of relay AUX2[2] **0**=Deactivated, **1**=Alarm, **2**=Light, **3**=Virtual control, **4**=Door frame resistance, **5**=Defrost 2° evaporator, **6**=Same as solenoid status, **7**=Same as unit status		0	2	7
	EP	Exit to level 1				

* According to wizard.

1. It can only be modified using the configuration wizard (InI).

2. Not available in AK-RC 204B

3. Available in AK-RC 204B only

HACCP alarm

Level 1	Level 2	Description	Values	Min.	Def.	Max.
HCP	h1	Maximum temperature of HACCP alarm	°C/°F	-50	99	99
	h2	Maximum permitted time for activation of the HACCP alarm (**0**=Disabled)	H.	0	0	255
	EP	Exit to level 1				

	InI	Option chosen in the configuration wizard				
	Pd1)	Pump down active? **0**=No, **1**=Yes				
	PU	Program version				
	Pr	Program revision				
tid	bU	Bootloader version				
	br	Bootloader revision				
	PAr	Parameter map revision				
	EP	Exit to level 1				

1) It can only be modified using the configuration wizard (InI).
Messages

Messages		A	R
Pd	Pump down malfunction error (Shutdown)		
LP	Pump down malfunction error (Start-up)		
E1/E2/E3	Probe 1/2/3 failure (Open circuit, crossed circuit or temperature outside the limits of the probe) (Equivalent limits in °F)	Ÿ	Ÿ
Ad0	Open door alarm. Only if the door stays open for a greater time than is indicated in parameter **A12**	Ÿ	Ÿ
AH	Maximum temperature alarm in control probe. The temperature value programmed in **A1** has been reached	Ÿ	Ÿ
AL	Minimum temperature alarm in control probe. The temperature value programmed in **A2** has been reached	Ÿ	Ÿ
AE	External alarm activated (by digital input)	Ÿ	Ÿ
AES	Severe external alarm activated (by digital input)	Ÿ	Ÿ
Adt	Defrost alarm concluded due to time-out. The time established in **d1** has been exceeded		
HCP	HACCP alarm. The temperature has reached the value of parameter **h1** during a longer period than has been established in **h2**	Ÿ	Ÿ
hCP + PF	HACCP alarm due to a fault in the power supply. The temperature established in **h1** has been reached following a fault in the power supply	Ÿ	Ÿ
dEF	Indicates that a defrost is being performed		
PAS	Access code (Password) request. See parameters **b10** and **PAS**		
S1 – S2	**Shown sequentially with the temperature:** The controller is in demo mode, the configuration has not been made.		

A: Activates the acoustic alarm
R: Activates the alarm relay

Technical specifications

Features		Specifications
Power supply		230 V~ ± 10%, 50 Hz ± 5%
Maximum input power in the operation		6.3 VA
Maximum nominal current		15 A
Relay SSV / DEFROST – SPDT – 20 A	NO	EN60730-1: 15 (15) A 250 V~
	NC	EN60730-1: 15 (13) A 250 V~
Relay FAN – SPST – 16 A		EN60730-1: 12 (9) A 250 V~
Relay COOL – SPST – 16 A		EN60730-1: 12 (9) A 250 V~
Relay AUX 1 – SPDT – 20	NO	EN60730-1: 15 (15) A 250 V~

A	NC	EN60730-1: 15 (13) A 250 V~
Relay AUX 2 – SPDT – 16 A	NO	EN60730-1: 12 (9) A 250 V~
	NC	EN60730-1: 10 (8) A 250 V~
No. of relay operations		EN60730-1:100.000 operations
Probe temperature range		-50.0 – +99.9 °C
Resolution, setting and differential		0.1 °C
Thermometric precision		±1 °C
Loading tolerance of the NTC probe at 25 °C		±0.4 °C
Working ambient temperature	AK-RC 20 4B	-10 – +50 °C
	AK-RC 20 5C	-10 – +45 °C
Storage ambient temperature		-30 – +60 °C
Protection degree		IP 65
Installation category		II s/ EN 60730-1
Pollution degree		II s/ EN 60730-1
Control device classification		Built-in assembly, with Type 1.B automatic operation action feature, for use in clean situations, logical support (Software) class A and continuous operation. Degree of contamination 2 acc. to UNE-EN 60730-1.Double isolation between power supply, secondary circuit and relay output.
Temperature during ball-pressure test		Accessible parts: 75 °C Parts which position active elements: 125 °C
Current of radio jamming suppression tests		270 mA
Voltage and current as per EMC tests		207 V, 17 mA
Type of assembly		Fixed internal
MODBUS address		Shown on label
Dimensions		290 mm (W) x 141 mm (H) x 84.4 mm (D)
Internal buzzer		Yes

Ordering

Controller

Model	Description	Comments	Code no.
AK-RC 204 B	AK-RC 204B Gen. 2,5 O/P, Single phase	Includes: • 1 x 1.5 m, NTC 10K sensor • 1 x 3 m, NTC 10K sensor	080Z5001
AK-RC 205 C	AK-RC 205C Gen. 2,5 O/P, Single phase		080Z5002

Accessories (for spares and replacement purposes):

Name	Features	Qty	Code no.
3.5 m, NTC 10K Sensor	Thermo plastic rubber probe	1	084N3210
8.5 m, NTC 10K sensor	Thermo plastic rubber probe	50	084N3208
1.5 m, NTC 10K sensor	Stainless steel probe	150	084N3200

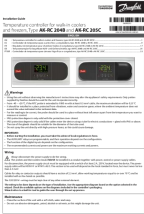http://scn.by/krzp87a5z2akq1
: For more details, see full User Manual and other information, scan the QR code.
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Documents / Resources

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References

- **User Manual**