

Installation Guide

Case/room controller
Type **AK-CC25 Pro** and **AK-CC25 Pro BT**

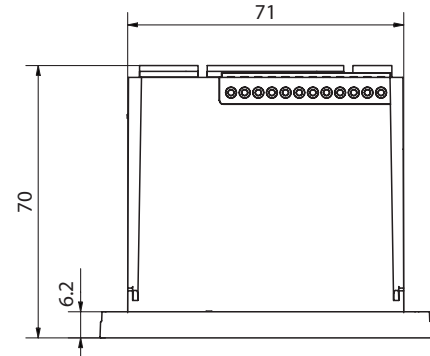
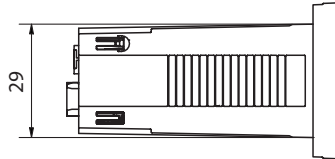
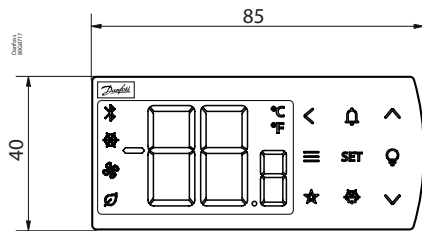
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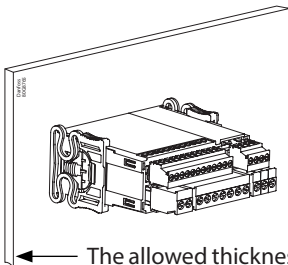
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Identification & Dimensions (in mm)

AK-CC25 Pro : 084B4022
AK-CC25 Pro BT : 084B4023



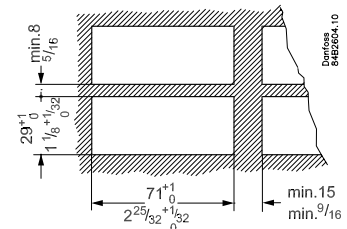
Panel mounting



To guarantee IP65 protection, the controller must be fixated with the mounting brackets pushed tight on to the mounting plate (Force: min. 245 nm per bracket).

Maximum deviation between the edges of the rectangular mounting hole from flat surface: ≤ 0.5 mm (0,02 in)

Maximum roughness of the surface where the gasket is applied: ≤ 120 μ m.



The allowed thickness of the mounting plate are min. 0.8 mm (0.03 inch) and max. 18 mm (0.70 inch).

Display operation



The values will be shown with three digits, and with a setting you can determine whether the temperature is to be shown in °C or in °F

Icons	Name	Description
	ECO mode	Lights up when in night/ECO mode
	Cooling	Lights up when cooling
	Fan	Lights when evaporator fans are running
Navigation buttons		
	Back	Navigates back to previous menu
	Up	Navigates up in menu structure Increase value when in setting mode
	Down	Navigates down in menu structure Increase value when in setting mode
	Info menu	Navigates to the controller info menu

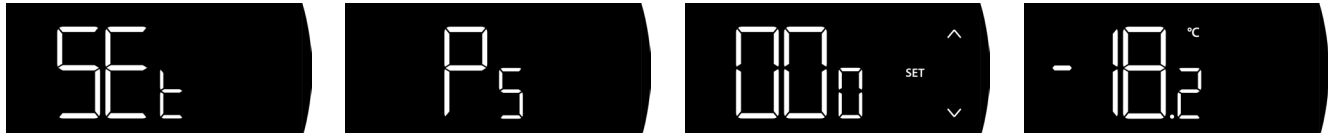
Code	Description
Err	The temperature cannot be displayed due to a sensor error
---	Three dashes shown in top - Max. value range has been reached
---	Three dashes shown in middle - Parameter is protected by main switch and cannot be changed until "r12 Main switch" is set in OFF position
---	Three dashes shown in bottom - Min. value range has been reached
Loc	The button operation is locked. Unlock by swiping from left to right across the buttons placed in the middle
UnL	The button operation is unlocked

Icons	Name	Description
Direct action buttons		
	SET	Short press: Change thermostat setpoint Long press: Navigate to parameter menu
	Alarm	Short press: Navigates to list of active alarms Long press: Manual reset of alarms Long press while in menu: Reset of alarms
	Light	Long press: Switches light status
	Defrost	Long press: Start/stop of a defrost cycles
	Bluetooth	Long press: Initiate/Terminate Bluetooth connection
	Star	Not in use

PS	A higher-level access code is required for performing action
Fan	A case cleaning procedure is ongoing. The fans are running
OFF	r12 Main switch has been set in OFF position. A case cleaning procedure is ongoing - All outputs are in standby mode
SEr	r12 Main switch has been set in service mode position for override of outputs
d	Defrost is in progress
FAC	The reset to OEM factory procedure has been initiated - select Yes to confirm or No to abort
OP1	Operation mode 1 has been selected
OP2	Operation mode 2 has been selected

Set access codes at first power up

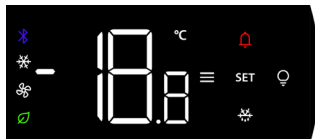
At first power up, the user will be prompted to set an access code, please refer to the screen flow below:



If access codes have not been set, the display will flash between the two first screens "SEt" and "P5" to indicate that the access codes must be set. By pressing the "SET" key, the access code values can be set in screen 3. Be aware, all access codes will be set at this value. Once the access codes are set, the display returns to the normal temperature read out.

Authentication

The user will always be prompted for selecting a user level (L1/L2/L3) and the corresponding access code, when performing an action that requires a certain access level - please refer to the example below.



User performs a long press on SET to enter parameter menu.



The display indicates that authentication is required by showing "P5" for 2 sec.



The user selects the access level and presses SET.



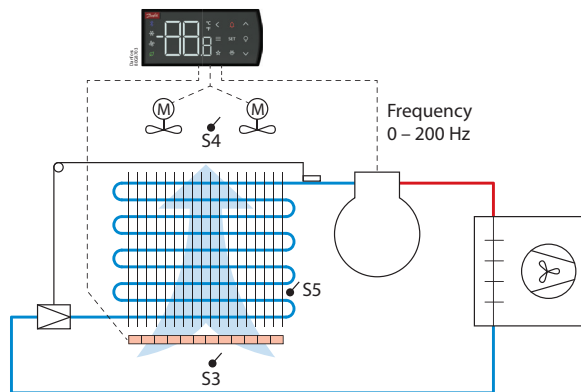
The user set the value of the corresponding access code and presses SET.



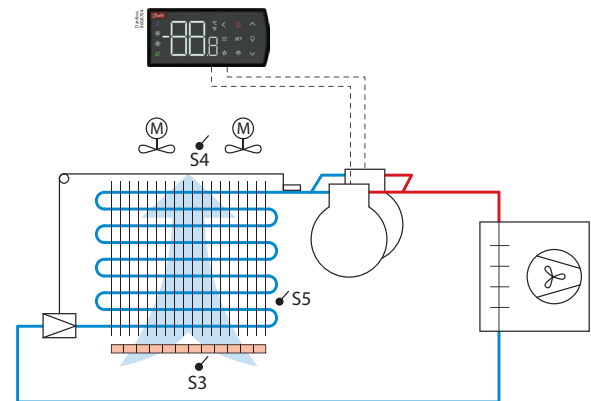
If the provided access code is correct the action that initiated the authentication is carried out.

Principle

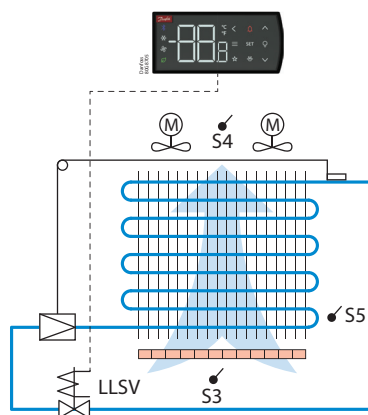
Application 1-4



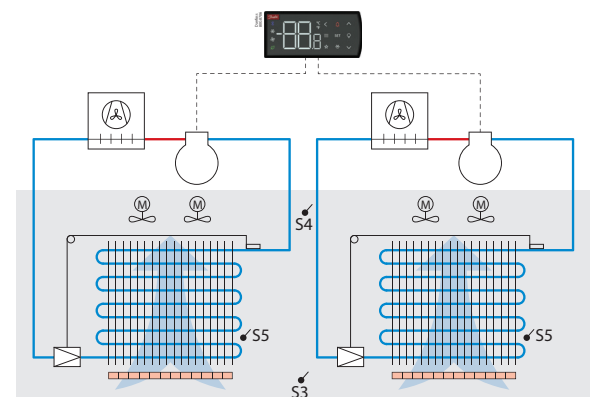
Application 5-8 (single circuit)



Application 1-4

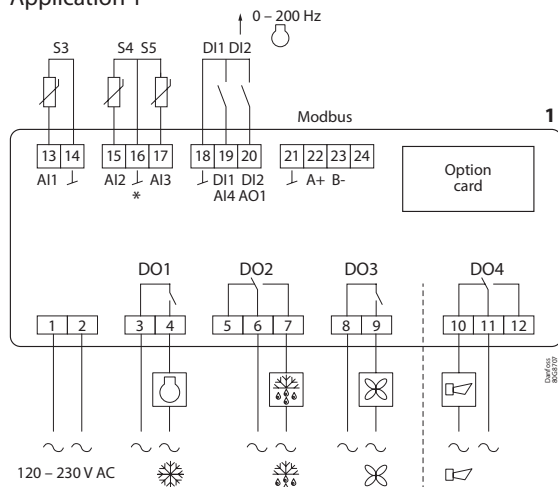


Application 5-8 (dual circuits)



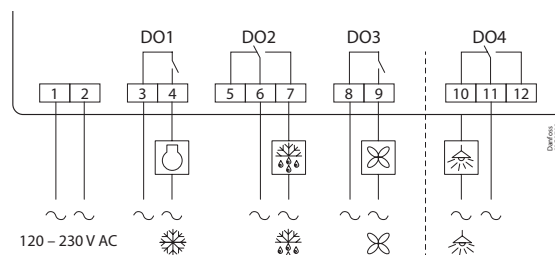
Wiring

Application 1

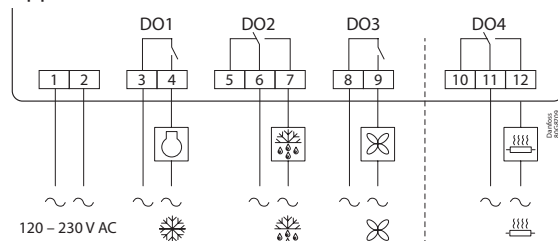


*Note: Each AI/DI/AO signal must have a separate ground wire.

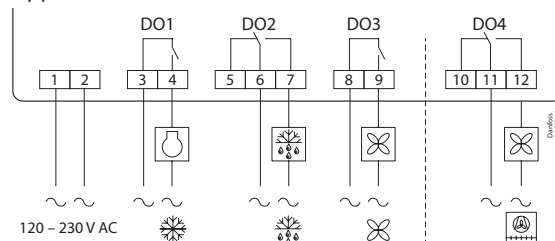
Application 2



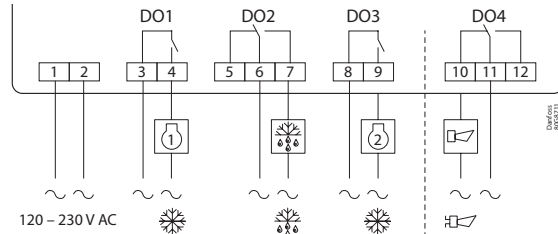
Application 3



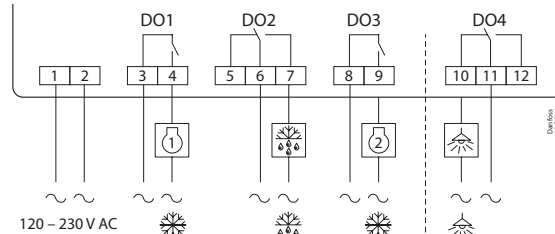
Application 4



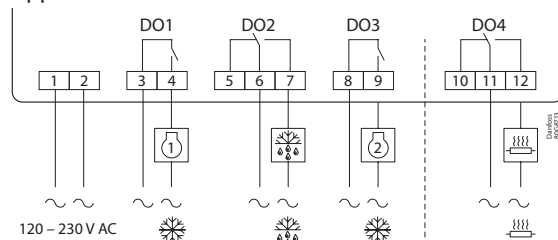
Application 5



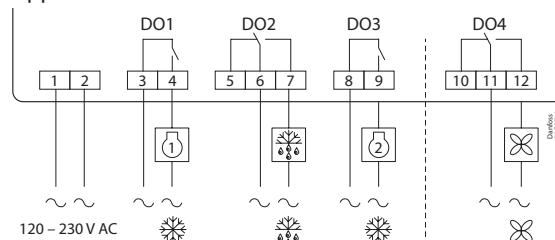
Application 6



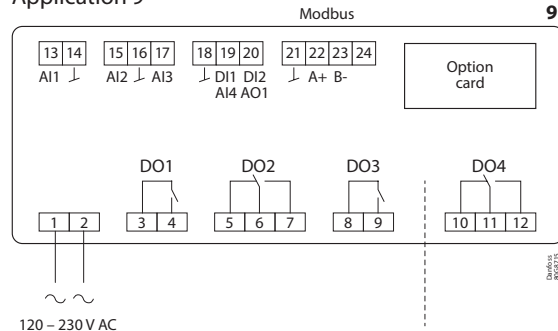
Application 7



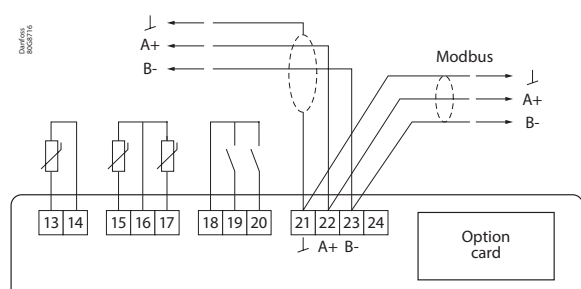
Application 8



Application 9



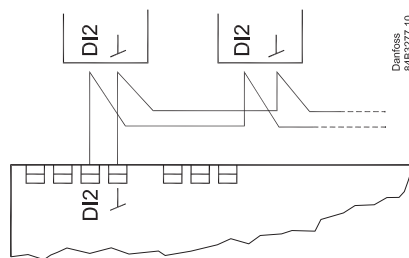
Data communication



It is important that the installation of data communication cable is performed correctly with sufficient distance to high voltage cables.

For more information, refer the Communications [Design Guide](#).

Coordinated defrost via cable connections



Max. 10

The following controllers can be connected in this way:
EKC 204A, AK-CC 210, AK-CC 250,
AK-CC 450, AK-CC 550 and AK-CC55.

Refrigeration is resumed at the same time when all controllers have terminated defrost.

Electric noise

Cables for sensors, low voltage DI inputs and data communication must be kept separate from other electric cables: - Use separate cable trays - Keep a distance between cables of at least 10 cm - Long cables at the low voltage DI input should be avoided

Installation considerations

Accidental damage, poor installation, or site conditions, can give rise to malfunctions of the control system, and ultimately lead to a plant breakdown. Every possible safeguard is incorporated into our products to prevent this. However, a wrong installation could still present problems. Electronic controls are no substitute for normal, good engineering practice. Danfoss will not be responsible for any goods, or plant components, damaged as a result of the above defects. It is the installer's responsibility to check the installation thoroughly, and to fit the necessary safety devices. Special reference is made to the necessity of signals to the controller when the compressor is stopped and to the need of liquid receivers before the compressors. Your local Danfoss agent will be pleased to assist with further advice, etc.

For security reasons the connection terminals and cable runs of the Modbus data communication cable shall be placed in physical restricted area, where only authorized personnel has access.

Conformity	
LVD directive and UL certification	IEC/EN/UL 60730-1, IEC/EN/UL 60730-2-9, IEC/EN 60335-1, IEC/EN 60335-2-89, IEC/EN 60335-2-24
EMC directive	IEC/EN 61000-6-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3, IEC/EN 61000-4
Flammable refrigerants <i>Approved for use in Zone 2 (gases Zone) as per 2014/34/EU ATEX directive</i>	Compliance with the following requirements of the IEC 60335 standards: - Components that produce sparks during the normal operation have been tested for enclosed break "dC" device as per IEC/EN 60079-1:2014 and for seal tight "nC" device tested according to IEC/EN 60079-15:2019, which meets requirement of Annex BB of EN 60335-2-89 and Annex CC of EN 60335-2-24. - Annex 101.DVL and clause 22.114DV D2 of UL60335-2-89. - IEC/EN/UL 60335-2-89 (Annex BB) for commercial refrigeration appliances. - IEC/EN/UL 60335-2-24 (Annex CC) for household refrigerator appliance - Complementary file LZGH2/8 (Flame Arrest-protected Components for Use in Refrigeration and Air-Conditioning Equipment Employing A2L Refrigerants).
Wireless	RED directive, FCC/IC 47 CFR Part 15, subsections B, C

EU Conformity Notice

Hereby, Danfoss A/S declares that the radio equipment type AK-CC25 Pro is in compliance with Directive 2014/53/EU.

Scan the QR code for the EU declaration of conformity:



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6430 Nordborg
Denmark

Technical data

Mechanical	
Enclosure	Self-extinguishing polycarbonate
Environmental conditions	
Ingress protection	Panel mounting with fixing mounting brackets: EN: Front IP65, Back IPX0; UL: Type 1
Operating temperature	-20 – 55 °C; 20 – 80 rH% (non-condensing humidity)
Storage temperature	-40 – 70 °C; 20 – 80 rH% (non-condensing humidity)
Electrical specifications	
Purpose of control	Electrical control device
Power supply	100 – 240 V AC
Power consum.	3 V A
Frequency	50/60 Hz
Terminal blocks	L, N, DO1, DO2, DO3, DO4: Removable male-female 12 – 24 AWG / 0.34 – 2.5 mm ² AI1 – AI3, DI1 – DI2 Removable male-female 16 – 28 AWG / 0.081 – 1.5 mm ² Modbus: Removable male-female 16 – 28 AWG / 0.081 – 1.5 mm ²
Rated impulse voltage	2500 V
Overvoltage category	II
Construction of control	Incorporated control
Environmental pollution class	2
User interface	
Display	3 digits, decimal point and multifunction icons
Keypad	10 backlit capacitive touch buttons
Status icons	3 backlit icons
Connectivity	
Bluetooth	Bluetooth Low Energy ver. 5.1, Max distance 10 m, variable according to the mobile device used
Fieldbus	RS485 Transceiver oktal load. (allows up to 256 units), Non isolated Speed: up to 115.2 kbps, Fail safe: means accept 0 V on bus line, Cable length: ≤1200 m
Analogue inputs (AI1 – AI4)	
Sensor types	Pt1000, (AKS 11, AKS 12, AKS 21) PTC 990 Ohm at 25 °C NTC 5K Ohm at 25 °C, (EKS 211) NTC 10K Ohm at 25 °C, (EKS 221) User defined type

Measuring range	Pt1000: -60 – 120 °C (±0.5 K) PTC1000: -60 – 80 °C (±0.5 K) NTC 5K: -40 – 80 °C (±0.5 K) NTC 10K: -40 – 120 °C (±0.5 K) User defined type: 400 – 200k ohm Note: Each AI/DI/AO signal must have a separate ground wire.		
Digital inputs (DI1 – DI2)			
DI1	Dry contact, Open loop. 3.3 V DC, Contact current. 2.2 mA		
DI2	Dry contact, Open loop. 12 V DC, Contact current. 3.5 mA OBS: Defrost co-ordination: Max. 5 Controllers in parallel, Max. 100 m cable total.		
Analogue output (AO1)			
AO1	Frequency: 0 – 200 Hz (Min. 0 V and Max. 12 V) Sink: 25 mA, cable length < 30 m		
Digital outputs (DO1 – DO4)			
Terminals / Action type	Load type	EN Ratings	UL ratings
DO1, 3-4 (NO) DO2, 5-6-7 (NO/NC) Type 1.B	Resistive	NC/NO: 10 A, 240 V AC	NC/NO: 10 A Resistive 240 V AC
	Motor Compressor	DO1: 10A (cos ϕ = 0.6), 240 V AC DO1/DO2: 3.5A (cos ϕ = 0.4), 240 V AC	NO: 1 1/2 HP or 10FLA/60LRA 240 V AC NC/NO: 1/2 HP 125 V AC NC/NO: 1HP 240 V AC
	Inductive	Not rated for this load type	NO: Pilot duty: B300
	Lamp Elect. Ballast	Not rated for this load type	DO1: NO: TV-5, 125 V AC DO2: NO: TV-5, 240 V AC
DO3, 8-9 (NO) DO4, 10-11-12 (NC/NO) Type 1.B	Resistive	NC/NO: 6A Resistive, 240 V AC	NC/NO: 6A Resistive, 240 V AC
	Motor Compressor	NC/NO: 3A (cos ϕ 0.4), 240 V AC	1/4 HP 125/240 V AC
	Inductive	NC/NO: 6(4), 240 V AC	NC/NO: Pilot duty: B300
	Lamp Elect. Ballast	Not rated for this load type	NO: TV-4, 120/240 V AC
Plugable connector		Max. 15 A	
Others			
5 V DC Supply Supply for external assecories		Total load from all external accessory: max. 50 mA, Cable length: ≤3 m	
Real time clock		Accuracy. Typ. 20 ppm, 10 min/year, Back-up time. 100 hours, 3 days	

Parameter grouping at display operation

SET	←	SET button, 3 s: Configuration settings
Set		
(PS) v	←	PS: Password (if any)
cFg	SET →	r12 Main switch
v		o61 Application
r--		c08 Step control mode
A--		o03 MODBUS address
c--		r05 Temperature unit
d--		o06 Sensor types
F--		r89 Food type
t--		r00 Cut-out temperature
o--		r15 Ther. sensor S4 %
p--		r61 Ther. sensor S4% night
q--		A36 Alarm sensor S4%
u--		d01 Defrost method
<		d03 Defrost interval
(Return)		d10 Defrost sensor
		d04 Max. defrost time
		d02 Defrost stop temperature
		<
		(Return)

^	←	Info button, 3 s: Information for service use
Inf		
StA	SET	See control state message
dir	SET →	
App	SET	See selected application
in	SET →	
out	SET →	do1 * Read output status
buS	SET	do2 * Read output status
SoF	SET	do3 * Read output status
<		do4 * Read output status
(Return)		AO1 * Read output status
		< (Return)
		AI1 S3 Read input status
		AI2 S4 Read input status
		AI3 S5 Read input status
		di1 ** Read input status
		di2 ** Read input status
		< (Return)

Output status

When you want info on a relay output, the dot will show whether the relay is activated (energized) for, e.g.:
do4 = not activated
do.4 = activated

*) The output's function (determined at configuration).

The DOs and AOs can also be forced controlled from this menu, when r12 Main switch has been set in position "service".
Forced control of a function can also be performed in codes q11 to q27.

**) The input's function (determined at configuration).

Get a good start

With the following procedure you can start regulation very quickly:

1. Open parameter r12 and stop the regulation (in a new and not previously set unit, r12 will already be set to 0 which means stopped regulation).
2. Open parameter o61 and select the application based on the wiring diagrams on page 3.
3. If an application with two compressors has been selected, please choose how the compressors are to be operated:
 - i. Both compressors on same circuit, sequential operation
 - ii. Both compressors on same circuit, cyclic operation
 - iii. Compressors on separate circuits
4. For network. Set the network address in o03
r05: Set temperature unit in display (°C / °F)
o06: Select sensor type:
Pt = Pt1000, Ptc= PTC 1000, n5= NTC 5k, n10 = NTC 10k
5. Then select a set of presets from the "Food type" help table
6. Open parameter r89 and set the number for the array of presets. The few selected settings will now be transferred to the menu.
7. Set the desired cut-out temperature r00
8. Set the weighted thermostat air temperature between S4 and S3 sensor r15.
9. Set the weighted thermostat air temperature between S4 and S3 during night operation r61.
10. Set the weighted alarm air temperature between S4 and S3 A36.

11. Set the desired defrost method in d01
12. Set the interval time between defrost starts in d03
13. Set the desired defrost sensor in d10
14. Set the maximum defrost time in d04
15. Set the defrost stop temperature in d02
16. Open parameter r12 and start the regulation
17. Go through the parameter list and change the factory values where needed.
18. Get the controller up and running on network:
 - MODBUS: Activate scan function in system unit

Food type

Setting of presets (r89). After setting 1-5, setting is returned to 0.	1	2	3	4	5
Food type =	Vege- tables	Milk	Meat/ fish	Frozen food	Ice cream
Temperature (r00)	8 °C	0 °C	-2 °C	-20 °C	-24 °C
Max. temp. setting (r02)	10 °C	4 °C	2 °C	-16 °C	-20 °C
Min. temp. setting (r03)	4 °C	-4 °C	-6 °C	-24 °C	-28 °C
Upper alarm limit (A13)	14 °C	8 °C	8 °C	-15 °C	-15 °C
Lower alarm limit (A14)	0 °C	-5 °C	-5 °C	-30 °C	-30 °C
Upper alarm limit for S6 (A22)	14 °C	8 °C	8 °C	-15 °C	-15 °C
Lower alarm limit for S6 (A23)	0 °C	-5 °C	-5 °C	-30 °C	-30 °C

Fault message

In an error situation the alarm LED on the front will be on and the alarm relay will be activated (depending on priority). If you push the alarm button for 2 seconds you can see the alarm reported in the display. (Alarm priorities can be changed. See the User Guide.) Here are the messages that may appear.

Code	Alarm text	Description
E01	Hardware failure	The controller has a hardware failure
E06	Clock lost time	Clock has lost valid time
E25	S3 Air ON evap. A - sensor error	Sensor signal is out of range. Please check the sensor wiring
E26	S4 Air OFF evap. A - sensor error	Sensor signal is out of range. Please check the sensor wiring
E27	S5 Evaporator A - sensor error	Sensor signal is out of range. Please check the sensor wiring
E28	S6 product temp. A - sensor error	Sensor signal is out of range. Please check the sensor wiring
E37	S5 Evaporator B - sensor error	Sensor signal is out of range. Please check the sensor wiring
E64	Sc condenser sensor error	Sensor signal is out of range. Please check the sensor wiring
A01	High temperature alarm A	The alarm temperature has been above the max alarm limit for a longer time period than the set alarm delay.
A02	Low temperature alarm A	The alarm temperature has been below the min alarm limit for a longer time period than the set alarm delay
A04	Door open alarm	The door has been open for a too long time
A05	Max defrost hold time exceeded	The controller has been waiting longer time than permitted after a co-ordinated defrost.
A15	DI alarm 1	Alarm signal from digital input signal
A16	DI alarm 2	Alarm signal from digital input signal
A19	Comp. safety	Compressor 1 is cut-out by safety signal on DI input
A45	Main switch set OFF	The controller main switch has been set to either Stop or Manual control. Alternatively a digital input set up for "main switch" function, has stopped control
A59	Case in cleaning mode	A case cleaning operation has been started on a case
A61	Cond. high temperature	Condenser temperature has exceeded the alarm limit – check the condenser air inlet for blockage/dirt
A80	Cond. block alarm	Condenser temperature has exceeded the block limit – check the condenser air inlet for blockage/dirt
AA3	Refrigerant leak detected	Refrigerant leak alarm via DI input
a04	Wrong IO configuration	The controller has an invalid configuration
Z01	Max defrost time exceeded	The last defrost cycle has stopped on time instead of set temperature
a12	Comp. safety 2	Compressor 2 is cut-out by safety signal on DI input
a13	Compressor safety lockout	Compressor operation has been blocked due to repeated safety cut-outs. Reset alarm manually by pressing alarm button for 2 seconds while being in the alarm menu

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