ENGINEERING
TOMORROW

Danfoss

User Guide

Controller for appliance control
AK-CC55

ADAP-KOOL® Refrigeration control systems

Contents

Introduction

Application
Complete refrigeration appliance control with great flexibility to adapt to refrigeration appliances and cold storage rooms.

Advantages
- Allows the suction pressure to be raised several degrees
- Energy optimization of the whole refrigeration appliance
- Adaptive Minimum Stable Superheat (MSS) control is performed with lowest possible superheat
- Adaptive Liquid Control (ALC) can be performed with superheat down to 0 degrees on transcritical CO_2 systems with liquid ejectors
- One controller for several different refrigeration appliances
- Quick set-up with predefined settings
- Easy configuration and service using a mobile app with Bluetooth

Principle
The temperature in the appliance is registered by one or two temperature sensors which are located in the air flow before the evaporator (S3) or after the evaporator (S4) respectively. A setting for thermostat, alarm thermostat and display reading determines the influence the two sensor values should have for each individual function.

In addition, product sensor S6, which can be optionally placed in the appliance, can be used for registration and alarming of the temperature near the food items.

The temperature of the evaporator is registered with the S5 sensor which can be used as a defrosting sensor.

In addition to the output to the electronic AKV injection valve, the controller has relay outputs which are defined by the application setting.

Functions
- Day/night thermostat with ON/OFF or modulating principle
- Product sensor S6 with separate alarm limits
- Switch between thermostat settings via digital input
- Adaptive control of superheat
- Adaptive defrosting based on diagnostics
- Start of defrost via schedule, digital input or network
- Natural, electric or hot gas defrost
- Stop of defrost on time and/or temperature
- Coordination of defrosting among several controls
- Pulsing or speed control of fans when thermostat is satisfied
- Appliance cleaning function for documentation of HACCP procedure

- Rail heat control via day/night load or dew point
- Humidity control in cold storage rooms
- Door function
- Control of two compressors
- Control of night blinds
- Light control
- Heat thermostat
- High accuracy inputs will guarantee a better measuring accuracy than stated in the standard EN ISO 23953-2 without subsequent calibration (Pt 1000 ohm sensor)
- Integrated MODBUS communication with the option of mounting a LonWorks communication card
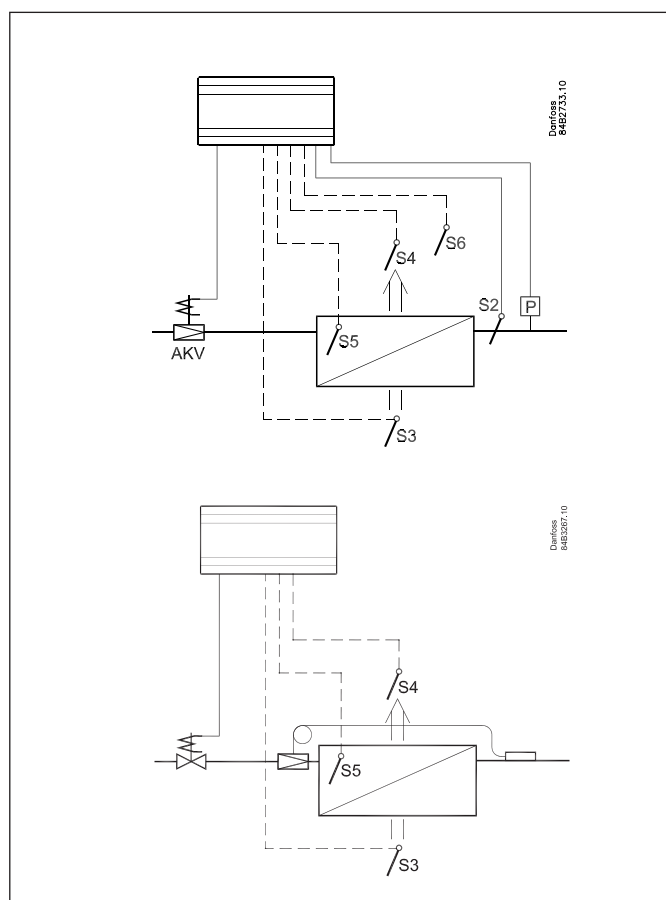
Applications

Here you can find application examples:

- Standard display case
- Cases with one valve, one evaporator and two refrigeration sections
- Cases with one valve, two evaporators and two refrigeration sections
- Cold rooms

An application setting will configure inputs and outputs so that the controller's operation interface is reflecting the selected application.
On page 6 you will see an overview of input and output functions and associated settings.
On page 7 and subsequent pages, the electrical connections are shown.

Some of the relay outputs are optional. Here you can define what the relay will be used for, e.g.:

- Controlling two compressors
- Controlling the night blind
- Controlling the heat function
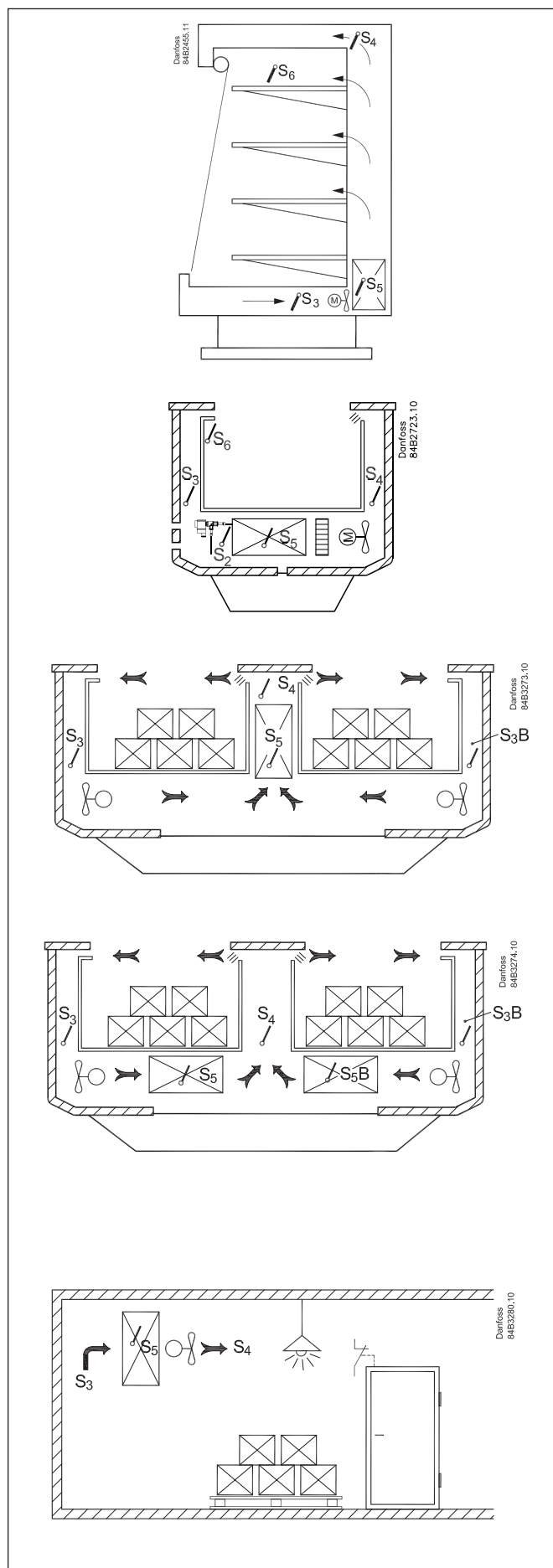
Programme overview

AK-CC55 Compact
Compact version for controlling one evaporator. A setting will configure inputs and outputs for the desired use. There are nine applications to choose from:
Regulation can be performed using an AKV expansion valve or regulation with a solenoid valve together with a thermostatic expansion valve or a compressor.

The compact version is not available with built-in display.
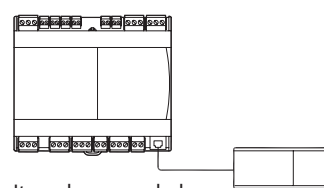
It can be expanded with an external display.

AK-CC55 Single Coil
Controlling one evaporator.
A setting will configure inputs and outputs for the desired use. There are nine applications to choose from:
Regulation is performed using an AKV expansion valve.
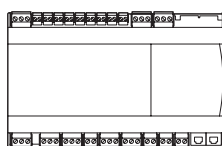
Standard enclosure. Typically used for display cases where the controller is mounted in a tray.
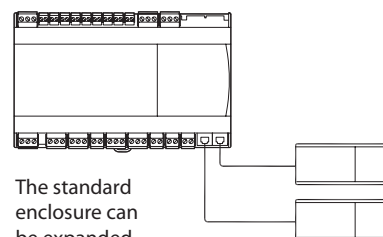
The standard enclosure can be expanded with one or two external displays.

AK-CC55 Single Coil UI
Single Coil controller with built-in display. Same functionalities as AK-CC55 Single Coil.
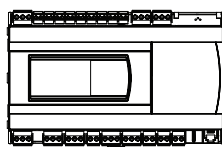
Enclosure with built-in display. Typically used for cold rooms.
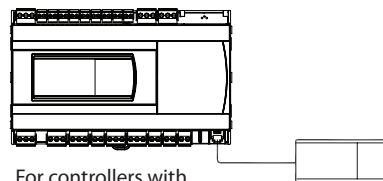
For controllers with built-in, only one external display can be connected.

AK-CC55 Multi Coil
Controlling one, two or three evaporators. Other software and applications are available for this. The enclosure is equipped with additional connections. There are five applications to choose from.
Regulation is performed using AKV expansion valves.

Standard enclosure. Typically used for display cases where the controller is mounted in a tray.
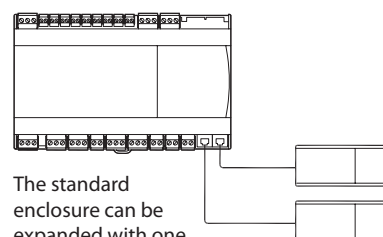
The standard enclosure can be expanded with one or two external displays.

External display
There are three versions available with different functions.
The connection must be performed using a cable with an RJ12 plug.

AK-UI55 Info
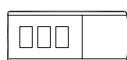
Temperature display

AK-UI55 Set

Display for control buttons on the front and temperature display.

AK-UI55 Bluetooth
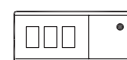
Display for Bluetooth controls and temperature display.
Use app: AK-CC Connect

Data communication other than MODBUS
If there is a need for a different form of data communication than the built-in MODBUS, a module can be installed in the controller, but this is possible only with the standard enclosure. The module can be supplied with Lon.
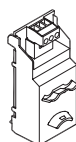
Primary function differences between the three controllers

| Application	Compact	Single Coil	Multi Coil
EEV - application (electrically operated expansion valve)	x	x	x
TEV - application (thermostatic expansion valve + solenoid valve or compressor)	x		
Remote hot gas - application		x	
One valve, one evaporator, one refrigeration section	x	x	x
One valve, one evaporator, two refrigeration sections		x	
One valve and two evaporators, two refrigeration sections		x	
Two valves and two evaporators (same refrigeration section)			x
Three valves and three evaporators (same refrigeration section)			x
Custom configuration of relay outputs	x	x	
Two compressors	x	x	
Heating function	x	x	
Control of air humidity		x	x
Adaptive superheat	x	x	x
Adaptive liquid control (zero superheat control for transcritical CO_2 systems with liquid ejectors)	x	x	x
Adaptive defrosting		x	
Product sensor		x	
RS485 Lon, option		x	x

Applications

Here is an overview of the controller's application options.

An application setting will configure the relay outputs so that the controller's IO configuration is aimed at the selected application.

Wiring diagrams can be seen on the following pages.
These are followed by the settings for the different controller variants:

Compact

Application	DO1	DO2	DO3	DO4		AO1	AI1	AI2	AI3	AI4		AI5/DI1	DI2
1	compressor	alarm	fan	defrost		●		S3	S4	S5		●	●
2	compressor	light	fan	defrost		●		S3	S4	S5		●	●
3	compressor	heat	fan	defrost		●		S3	S4	S5		●	●
4	compressor	●¹⁾	●¹⁾	●¹⁾		●		S3	S4	S5		●	●
5	valve	compressor	fan	defrost		●	Pe	S2	S3	S4		S5	●
6	valve	alarm	fan	defrost		●	Pe	S2	S3	S4		S5	●
7	valve	light	fan	defrost		●	Pe	S2	S3	S4		S5	●
8	valve	heat	fan	defrost		●	Pe	S2	S3	S4		S5	●
9	valve	●¹⁾	●¹⁾	●¹⁾		●	Pe	S2	S3	S4		S5	●

Single Coil

Application	DO1	DO2	DO3	DO4	DO5	DO6		AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1	valve	alarm	compressor	defrost	light	fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
2	valve	heat	compressor	defrost	light	fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
3	valve	alarm	compressor	defrost	heat	fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
4	valve	alarm	heat	defrost	light	fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
5	valve	suction	drain	hotgas	light	fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
6	valve	alarm	heat	defrost	light	fan		●	Pe	S2	S3	S4	S5	S3B	●	●	●
7	valve	alarm	defrost B	defrost A	light	fan		●	Pe	S2	S3	S4	S5	S3B	S5B	●	●
8	valve	alarm	humidity	defrost	light	fan		●	Pe	S2	S3	S4	S5	S6	RH%	●	●
9	valve	●¹⁾	●¹⁾	●¹⁾	●¹⁾			●	Pe	S2	S3	S4	S5	S6	●	●	●

Multi Coil

Application	DO1	DO2	DO3	DO4	DO5	DO6	DO7	AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1	valve A	alarm	heat	defrost A	light	fan		●	Pe	S2A	S4A	S5A			●	●	●
2	valve A	heat	valve B	defrost A	light	fan	defrost B	●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●
3	valve A	alarm	valve B	heat	light	fan	valve C	●	Pe	S2A	S4A	S2B	S4B	S2C	S4C	●	●
4	valve A	alarm	valve B	humidity	light	fan	heat	●	Pe	S2A	S4A	S2B	S4B	RH%		●	●
5	valve A	alarm	valve B	defrost A	light	fan	defrost B	●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●

● = Optional

●¹⁾ Custom set-up of relays

Compact

Control of one evaporator + different combinations of light, rail heat and alarm relays.

The most important variations are:

1-4: TEV applications
    Control of compressor or solenoid valve, alarm relay, lights, rail heat
      4: Configurable outputs, e.g.: Dual compressor operation, heat function, night blind, ECO fan

5-9: EEV applications
    Control of AKV valve, compressor, alarm relay, light, rail heat.
      9: Configurable outputs, e.g.: Dual compressor operation, heat function, night blind, ECO fan

The functions can be seen in the menu overview on page 20.
Description of the connections, page 66.

1.

2.

3.

4.

0-10V/
PWM

4

40	41	42	43	44	45	46	47	48	49	50		60	61	70	71		83	84	85

S3   S4   S5   AI5
DI1

DI2   AO1

B⁻   A+
MODBUS

Danfoss
84B3260.10

115 - 230V AC				Comp.			DO2			DO3		DO4		
L	N	⏚	⏚											
1	2	**3**	**7**	8	9	10	11	12	13	14	15	16	17	

Custom set-up

5.

P
1 3 2

0-10V/
PWM

5

40	41	42	43	44	45	46	47	48	49	50		60	61	70	71		83	84	85

5V   s   ⏚
Pe   S2   S3   S4   S5   AI5

DI2   AO1

B⁻   A+
MODBUS

Danfoss
84B3261.10

115 - 230V AC			AKV			Comp.			Fan		Defrost		
L	N	⏚	⏚										
1	2	**3**	**7**	8	9	10	11	12	13	14	15	16	17

6.

P
1 3 2

0-10V/
PWM

6

40	41	42	43	44	45	46	47	48	49	50		60	61	70	71		83	84	85

5V   s   ⏚
Pe   S2   S3   S4   S5   AI5

DI2   AO1

B⁻   A+
MODBUS

Danfoss
84B3262.10

115 - 230V AC			AKV			Alarm			Fan		Defrost		
L	N	⏚	⏚										
1	2	**3**	**7**	8	9	10	11	12	13	14	15	16	17

7.

Danfoss 84B3263.10

| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | 60 | 61 | 70 | 71 | | 83 | 84 | 85 |
5V   s   Pe   S2   S3   S4   S5   DI2   AO1   B⁻   A⁺
AI5   MODBUS

| 115 - 230V AC | | | | AKV | | Light | | | Fan | | Defrost | | |
L   N   ⊕   ⊙
| 1 | 2 | 3 | | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

8.

Danfoss 84B3264.10

| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | 60 | 61 | 70 | 71 | | 83 | 84 | 85 |
5V   s   Pe   S2   S3   S4   S5   DI2   AO1   B⁻   A⁺
AI5   MODBUS

| 115 - 230V AC | | | | AKV | | Railheat | | | Fan | | Defrost | | |
L   N   ⊕   ⊙
| 1 | 2 | 3 | | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

9.

Danfoss 84B3265.10

| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | 60 | 61 | 70 | 71 | | 83 | 84 | 85 |
5V   s   Pe   S2   S3   S4   S5   DI2   AO1   B⁻   A⁺
AI5   MODBUS

| 115 - 230V AC | | | | AKV | | DO2 | | | DO3 | | DO4 | | |
L   N   ⊕   ⊙
| 1 | 2 | 3 | | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

Custom set-up

Single Coil

Control of one expansion valve + different combinations of light, rail heat and alarm relays.

The controller covers the following nine applications:

1-3: Plugin cabinets with different output combinations of alarm, rail heat and light
4: Remote cabinet including light, alarm and light besides defrost and fan
5: Remote hot gas defrost with drain, suction and hot gas valve
6: Back to back cabinet with one evaporator
7: Back to back cabinet with two evaporators
8: Cold storage room with air heater and simple humidity control
9: Custom control application, where the outputs can be configured according to custom requirements
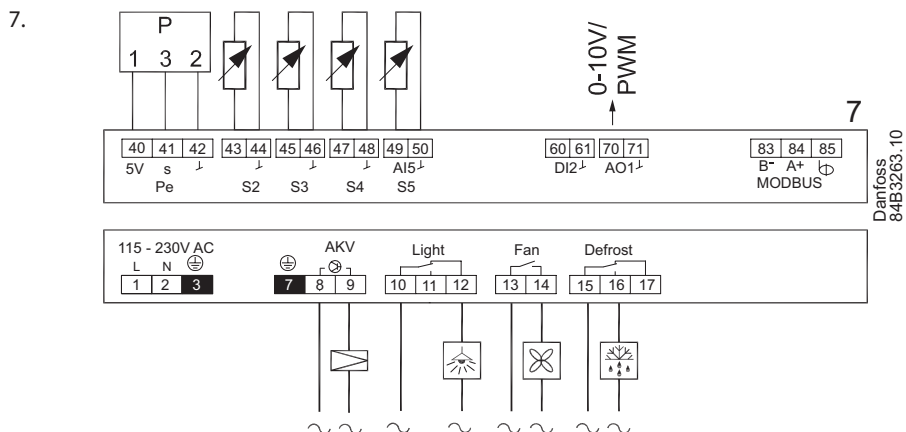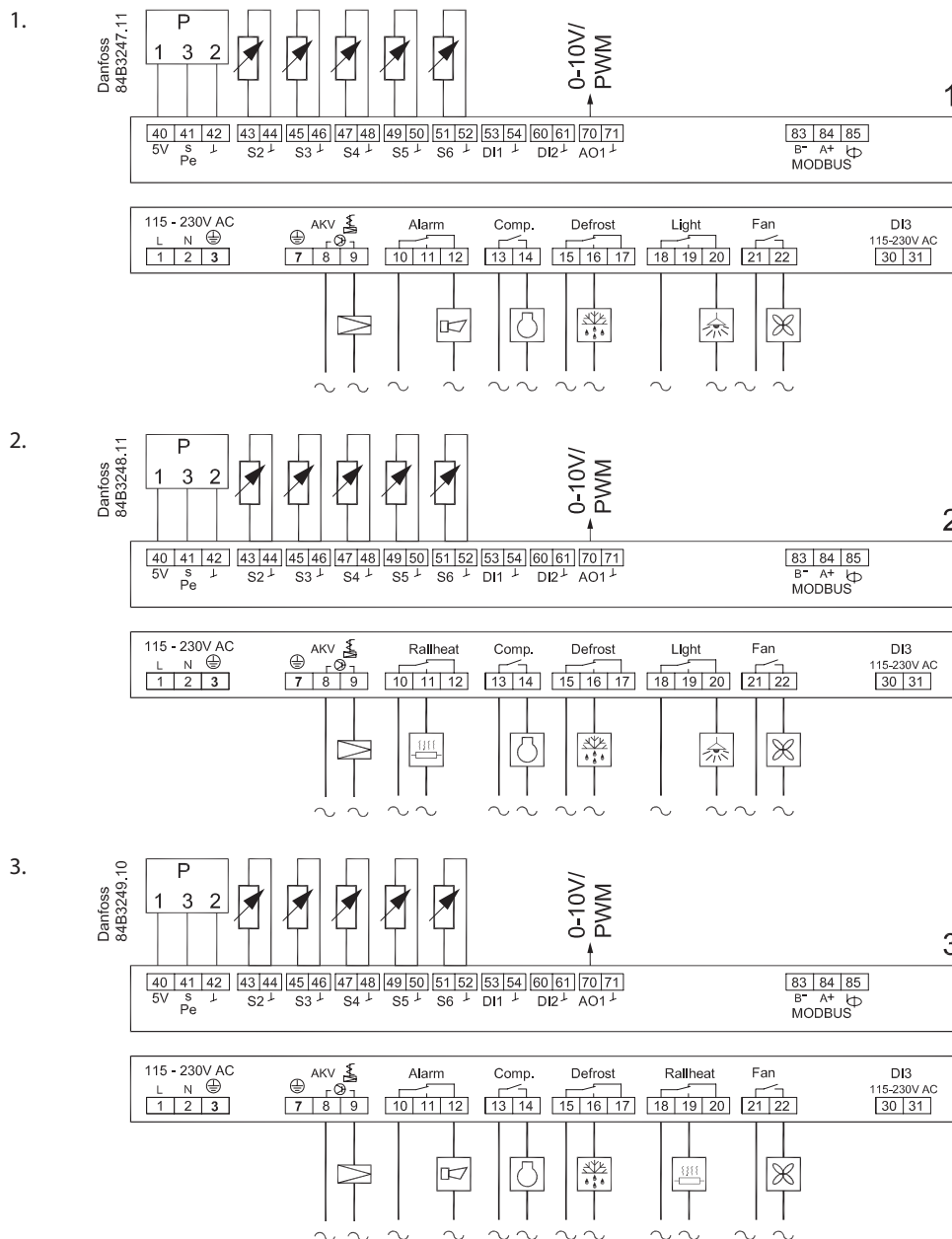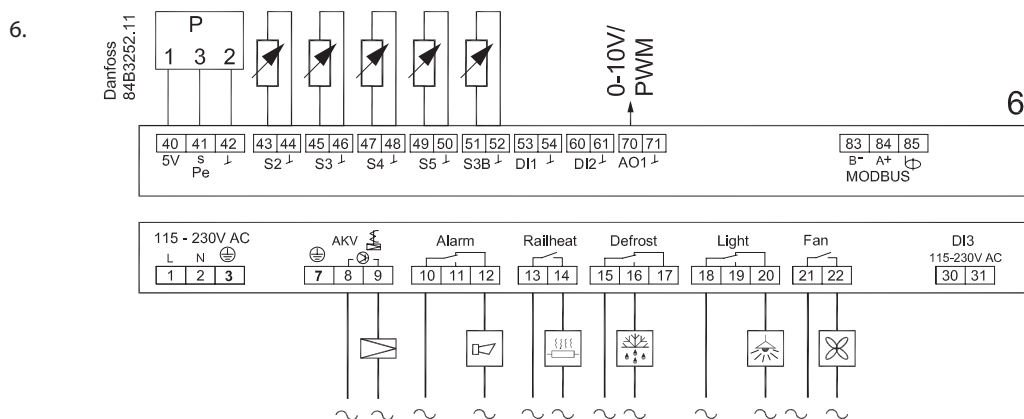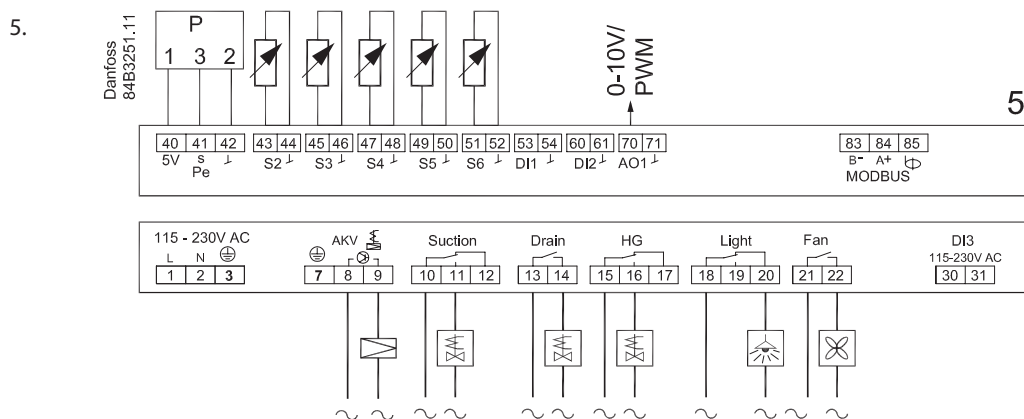
The functions can be seen in the menu overview on page 26. Description of the connections, page 66.

1.

2.

3.

4.

Danfoss 84B3250.11

P
1 3 2

0-10V/ PWM

4

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2 ⊥		S3 ⊥		S4 ⊥		S5 ⊥		S6 ⊥		DI1 ⊥		DI2 ⊥		AO1 ⊥			B⁻	A+	

MODBUS

115 - 230V AC   AKV   Alarm   Railheat   Defrost   Light   Fan   DI3 115-230V AC

L	N	⊕	⊕																115-230V AC
1	2	**3**	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

5.

Danfoss 84B3251.11

P
1 3 2

0-10V/ PWM

5

| 40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2 ⊥		S3 ⊥		S4 ⊥		S5 ⊥		S6 ⊥		DI1 ⊥		DI2 ⊥		AO1 ⊥			B⁻	A+	

MODBUS

115 - 230V AC   AKV   Suction   Drain   HG   Light   Fan   DI3 115-230V AC

L	N	⊕	⊕																115-230V AC
1	2	**3**	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

6.

Danfoss 84B3252.11

P
1 3 2

0-10V/ PWM

6

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2 ⊥		S3 ⊥		S4 ⊥		S5 ⊥		S3B ⊥		DI1 ⊥		DI2 ⊥		AO1 ⊥			B⁻	A+	

MODBUS

115 - 230V AC   AKV   Alarm   Railheat   Defrost   Light   Fan   DI3 115-230V AC

L	N	⊕	⊕																115-230V AC
1	2	**3**	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

7.

Danfoss 84B3253.12

P		
1	3	2

0-10V/ PWM

7

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2	⊥	S3	⊥	S4	⊥	S5	⊥	S3B	⊥	S5B	⊥	DI2	⊥	AO1	⊥		B⁻	A+	

MODBUS

115 - 230V AC				AKV			Alarm			Defrost B		Defrost A			Light			Fan		DI3 115-230V AC	
L	N	⊕		⊕																	
1	2	**3**		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

B   A

8.

Danfoss 84B3254.12

P		
1	3	2

RH
0→10

U

0-10V/ PWM

8

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2	⊥	S3	⊥	S4	⊥	S5	⊥	S6	⊥	DI1/ A17		DI2	⊥	AO1	⊥		B⁻	A+	

MODBUS

115 - 230V AC				AKV			Alarm			Humidity		Defrost			Light			Fan		DI3 115-230V AC	
L	N	⊕		⊕																	
1	2	**3**		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

9.

P		
1	3	2

0-10V/ PWM

9

Danfoss 84B3266.10

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	60	61	70	71		83	84	85
5V	s	Pe	S2	⊥	S3	⊥	S4	⊥	S5	⊥	S6	⊥	DI1	⊥	DI2	⊥	AO1	⊥		B⁻	A+	

MODBUS

| 115 - 230V AC				AKV			DO2			DO3		DO4			DO5			DO6		DI3 115-230V AC	
L	N	⊕		⊕																	
1	2	**3**		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31

Custom set-up

Multi Coil

Control of one to three expansion valves, lights and different
combinations of rail heat and alarm relays.

The most important variations are:
1-3: Control of one, two and three evaporators.
4: Control of high temperature cold rooms with two evaporators.
5: Control of low temperature cold rooms with two evaporators.

The functions can be seen in the menu overview on page 33.
Description of the connections on page 67.

1.

2.

3.

4.

5.
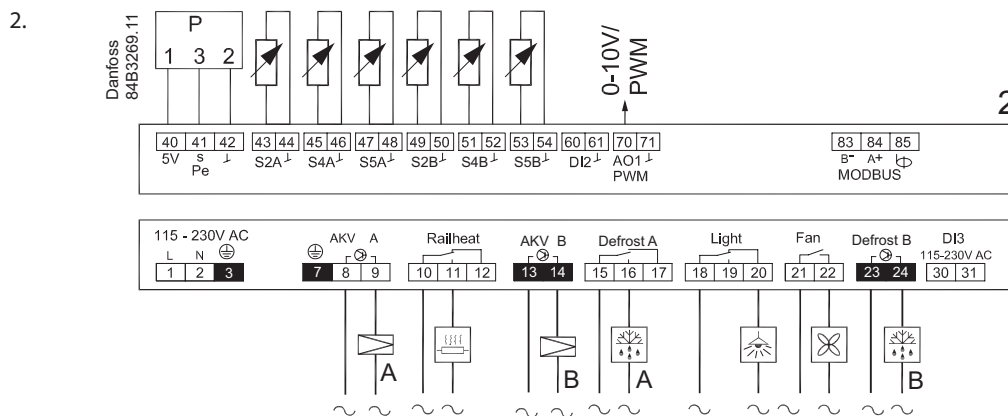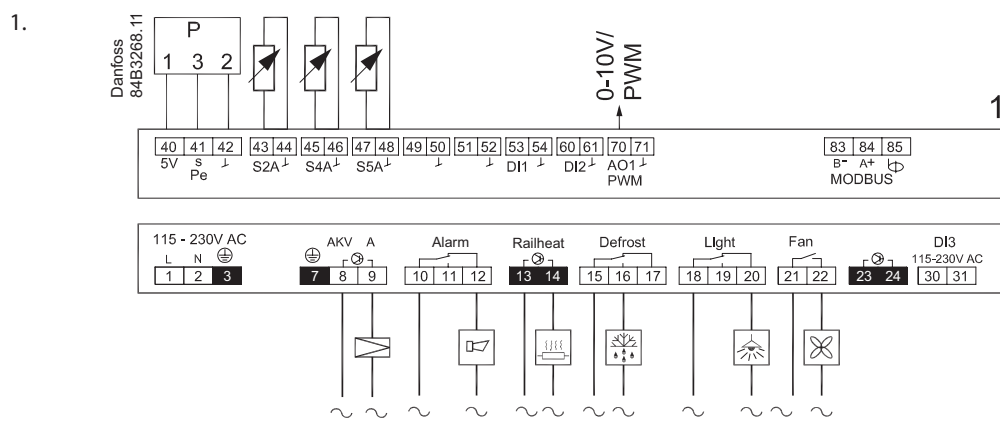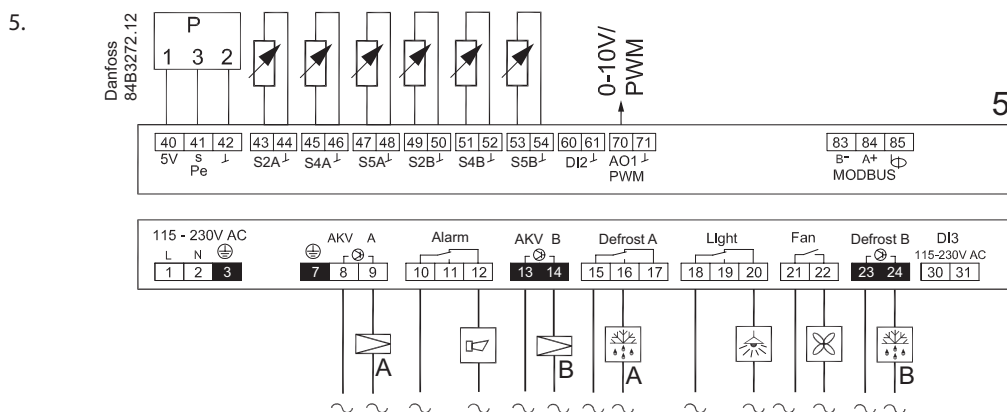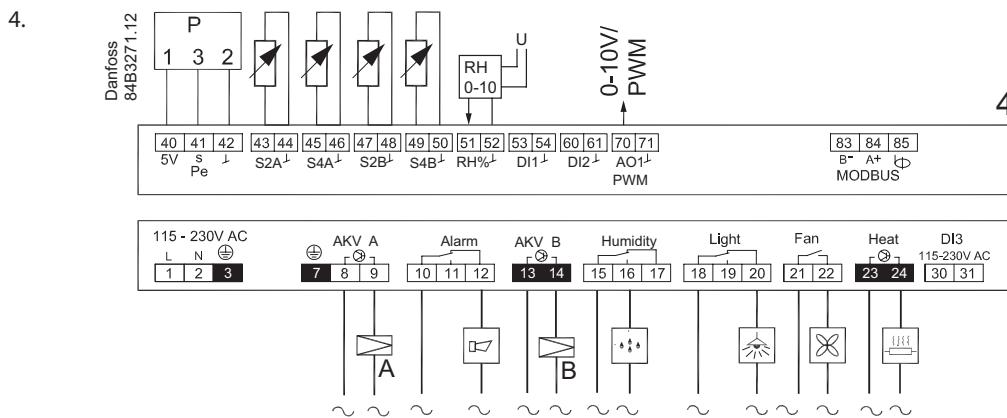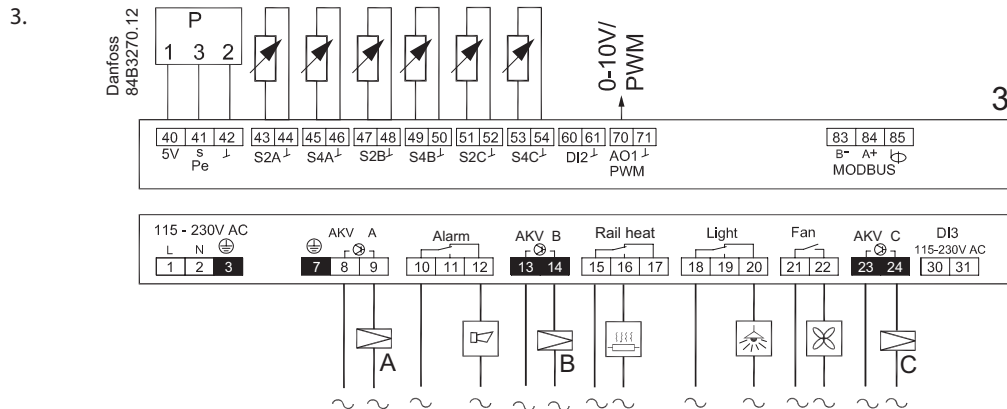
Connection labels

The controller is provided with labels from the factory, indicating a generic application. When selecting the required application, specific labels are provided so that you can mount the relevant one.

The application number is indicated on the left-hand side of the labels. Use the label fitting the selected application.
Some of the labels are applicable to multiple application options.
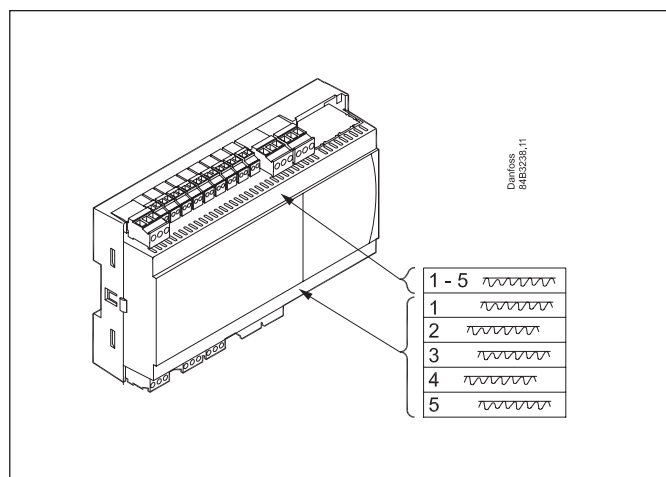
Operation

The controller can be operated in different ways depending on the user interface.
The following options are available:

Direct

Menu buttons on display front
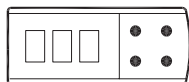
Operation via menu system. See subsequent pages.
The display can be located on the front of the controller or at a
distance of up to 100 metres from the controller.

Smart phone and app
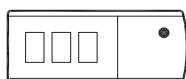
There is an app available - "AK-CC55 connect". It can be
downloaded freely to a compatible iOS/Android smartphone
device. The functions can be seen later in this document.
The display can be placed at a distance of up to 100 metres
from the controller. Menu operation is established by activating
Bluetooth communication to the app.

Via data commmunication

Via system unit's display

All controllers can be operated from a central location
e.g. AK-SM 800.
Data communication is to take place via MODBUS or Lon.

Via system unit and service tool

Operation can also be performed from a central location via the PC
software "Service Tool".
Data communication is to take place via MODBUS or Lon to system
manager AK-SM720.

Programming via interface MMIMYK
and PC software type KoolProg®

Configuration of the controller can be performed via the PC
software KoolProg®. Data communication is to take place using the
display outputs and interface type MMIMYK.

AK-UI55 Bluetooth
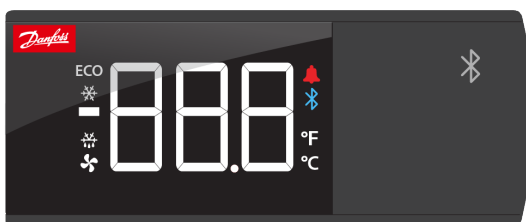
Access to parameters via Bluetooth and app
1. App can be downloaded from App Store and Google Play.
   Name = AK-CC55 Connect
   Start the app.
2. Click on the display's Bluetooth button for 3 seconds.
   The Bluetooth light will then flash while display is showing
   the controller's address.
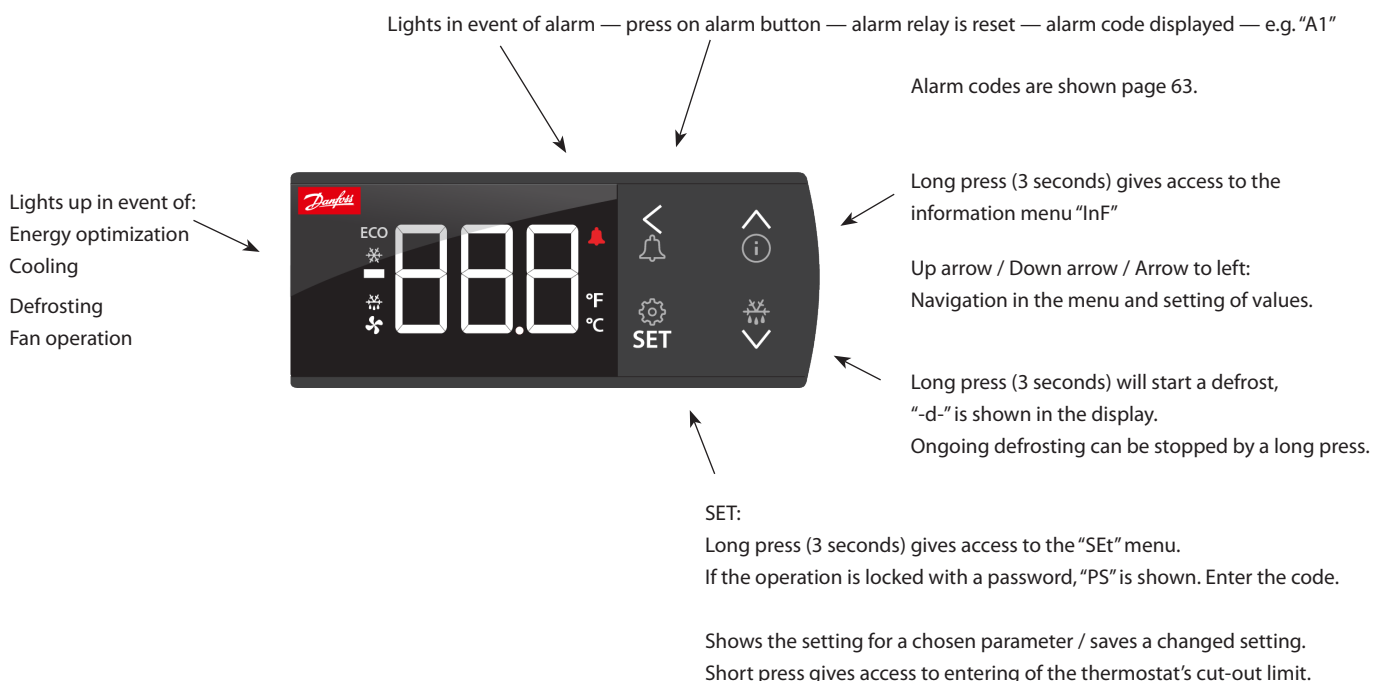3. Connect to the controller from the app.

Displayinfo:

Loc
The operation is locked and cannot be operated via
Bluetooth.

Unlock from the system device.
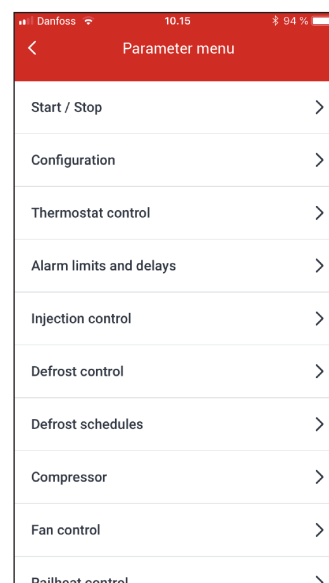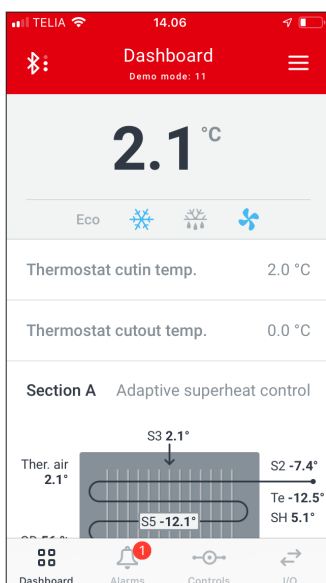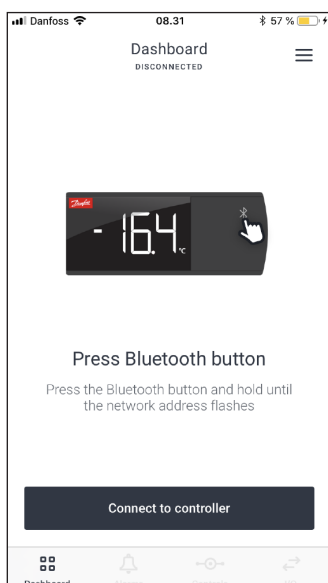
The functions are described on page 47-59.

Display AK-UI55 Set
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.

Lights in event of alarm — press on alarm button — alarm relay is reset — alarm code displayed — e.g. "A1"

Alarm codes are shown page 63.

Long press (3 seconds) gives access to the information menu "InF"

Up arrow / Down arrow / Arrow to left:
Navigation in the menu and setting of values.

Lights up in event of:
Energy optimization
Cooling

Defrosting
Fan operation

Long press (3 seconds) will start a defrost,
"-d-" is shown in the display.
Ongoing defrosting can be stopped by a long press.

SET:
Long press (3 seconds) gives access to the "SEt" menu.
If the operation is locked with a password, "PS" is shown. Enter the code.

Shows the setting for a chosen parameter / saves a changed setting.
Short press gives access to entering of the thermostat's cut-out limit.

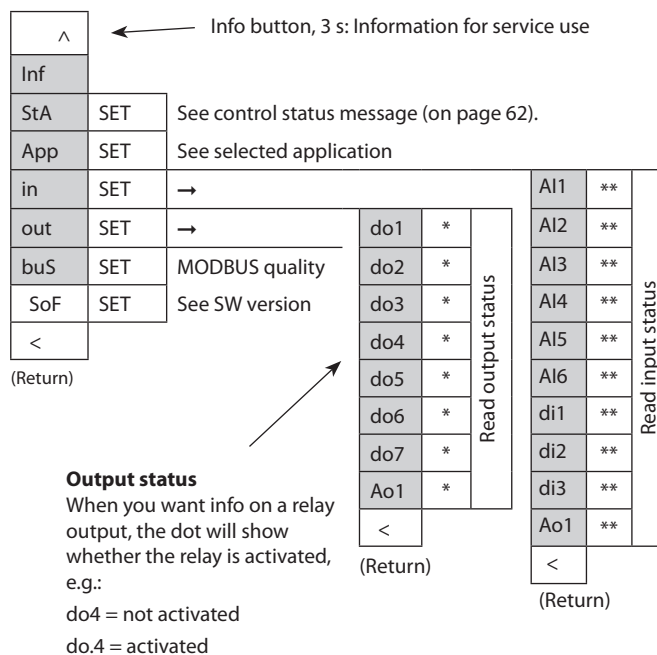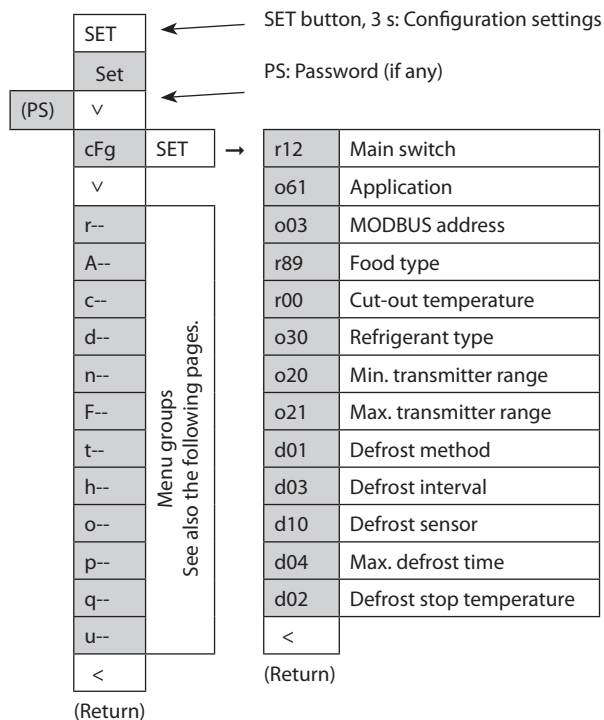The display can give the following messages:
-d-	Defrost is in progress.
Err	The temperature cannot be displayed due to a sensor error.
Err	The display cannot load data from the controller. Disconnect and then reconnect the display.
ALA	The alarm button is activated. The first alarm code is then shown.
- - -	At top position of the menu or when max. value has been reached, the three dashes are shown in the top of the display.
- - -	At bottom position of menu or when min. value has been reached, the three dashes are shown in the bottom of the display.
Loc	The configuration is locked. Unlock by pressing (for 3 seconds) on the 'up arrow' and 'down arrow' simultaneously.
UnL	The configuration is unlocked.
- - -	The parameter has reached min. or max. limit.
PS	A password is required for access to the menu.
Fan	Appliance cleaning has been initiated via a contact. The fans are running.
OFF	Appliance cleaning is activated and the appliance can now be cleaned.
OFF	The main switch is set to Off.
SEr	The main switch is set to service / manual operation.
CO_2	Flashes: Will display in event of a refrigerant leakage alarm, but only if the refrigerant is set up for CO_2.

Factory setting
If you need to return to the factory-set values, do the following:
- Cut off the supply voltage to the controller.
- Keep up "∧" and down "∨" arrow buttons depressed at the same time as you reconnect the supply voltage.
- When FAc is shown in the display, select "yes".

Parameter grouping at display operation

SET	← SET button, 3 s: Configuration settings
Set	
(PS) ∨	← PS: Password (if any)

cFg	SET →	r12	Main switch
∨		o61	Application
r--		o03	MODBUS address
A--		r89	Food type
c--		r00	Cut-out temperature
d--		o30	Refrigerant type
n--	Menu groups	o20	Min. transmitter range
F--	See also the following pages.	o21	Max. transmitter range
t--		d01	Defrost method
h--		d03	Defrost interval
o--		d10	Defrost sensor
p--		d04	Max. defrost time
q--		d02	Defrost stop temperature
u--		<	
<		(Return)	
(Return)			

^	← Info button, 3 s: Information for service use
Inf	

StA	SET	See control status message (on page 62).
App	SET	See selected application
in	SET →	
out	SET →	
buS	SET	MODBUS quality
SoF	SET	See SW version
<		
(Return)		

do1	*
do2	*
do3	*
do4	*
do5	*
do6	*
do7	*
Ao1	*
<	
(Return)	

Read output status

AI1	**
AI2	**
AI3	**
AI4	**
AI5	**
AI6	**
di1	**
di2	**
di3	**
Ao1	**
<	
(Return)	

Read input status

Output status
When you want info on a relay output, the dot will show whether the relay is activated, 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. Select application based on the wiring diagrams on page 7-14
3. Open parameter o61 and set the application number
4. For network. Set the address in o03
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 presettings. The few selected settings will now be transferred to the menu
7. Set the desired cut-out temperature r00
8. Select refrigerant via parameter o30
9. Set the pressure transmitter min. and max. range via parameter o20 and o21
10. Set the desired defrost method in d01
11. Set the interval time between defrost starts in d03
12. Set the desired defrost sensor in d10
13. Set the maximum defrost time in d04
14. Set the defrost stop temperature in d02
15. Open parameter r12 and start the regulation
16. Go through the parameter list and change the factory values where needed.
17. Get the controller up and running on network:
    • MODBUS: Activate scan function in system unit
    • If another data communication card is used in the controller:
        – Lon RS485: Activate the function o04

Food type

Setting of presettings (r89). After setting 1-5, setting is returned to 0. Food type =	1 Vegetables	2 Milk	3 Meat/fish	4 Frozen food	5 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

Can only be set when r12=0.

Menu survey — Compact version

Overview of outputs and applications

Application	DO1	DO2	DO3	DO4		AO1	AI1	AI2	AI3	AI4		AI5/DI1	DI2
1	🔵	📣	✛	❄		●		S3	S4	S5		●	●
2	🔵	💡	✛	❄		●		S3	S4	S5		●	●
3	🔵	🔥	✛	❄		●		S3	S4	S5		●	●
4	🔵	●¹⁾	●¹⁾	●¹⁾		●		S3	S4	S5		●	●
5	🔧	🔵	✛	❄		●	Pe	S2	S3	S4		S5	●
6	🔧	📣	✛	❄		●	Pe	S2	S3	S4		S5	●
7	🔧	💡	✛	❄		●	Pe	S2	S3	S4		S5	●
8	🔧	🔥	✛	❄		●	Pe	S2	S3	S4		S5	●
9	🔧	●¹⁾	●¹⁾	●¹⁾		●	Pe	S2	S3	S4		S5	●

See also wiring diagrams earlier in the User Guide.

● = Optional

●¹⁾ Custom set-up of relays

Menu set via display

SW = 2.0x

Parameters				Wiring diagram pages 7-9											
Function	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Factory setting	Actual setting
Normal operation															
Temperature (setpoint)	0-0	r00	1	1	1	1	1	1	1	1	1	"r03"	"r02"	2	
Thermostat															
Differential	1-2	r01	1	1	1	1	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting	0-2	r02	1	1	1	1	1	1	1	1	1	"r03"	50 °C	50	
Min. limitation of setpoint setting	0-2	r03	1	1	1	1	1	1	1	1	1	-50 °C	"r02"	-50	
Temperature unit (°C/°F)	1-2	r05	1	1	1	1	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4	1-2	r09	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S3	1-2	r10	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
SEr: Manual control (-1), OFF: Stop control (0), ON: Sta<rt control (1)	0-2	r12	1	1	1	1	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation	1-2	r13	1	1	1	1	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Modulating	1-2	r14	1	1	1	1	1	1	1	1	1	1	2	1	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)	1-2	r15	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Time between melt periods	1-2	r16	1	1	1	1	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods	1-2	r17	1	1	1	1	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2. As differential use r01	0-2	r21	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	2	
Definition and weighting, if applicable, of thermostat sensors when night cover is on. (100%=S4, 0%=S3)	1-2	r61	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Heat function Neutral zone between refrigeration and heat function	1-2	r62				1					1	0 K	50 K	5	
Time delay when switching from refrigeration to heat function	1-2	r63				1					1	0 min.	240 min.	240	
Food type: use settings listed in table	1-2*	r89	1	1	1	1	1	1	1	1	1	0	5	0	
Min. limit for S4 temperature	1-2	r98	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-50	

R-W

If the operation is limited by a setting of one or more passwords, reading and setting the parameter will be limited to:

R: This setting can be seen with password no. _ or higher.

W: This setting can be performed with password no. _ or higher (3 is the highest level).

*)   In order to change this parameter the regulation must be stopped via the parameter r12 Main switch = OFF

**)   In order to change this parameter the parameter r12 Main switch must be set in position "SEr" allowing manual control of outputs.

Compact - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Alarms															
Delay for temperature alarm	1-2	A03	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm	1-2	A04	1	1	1	1	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost	1-2	A12	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1	1-2	A13	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	8	
Low alarm limit for thermostat 1	1-2	A14	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-30	
High alarm limit for thermostat 2	1-2	A20	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	8	
Low alarm limit for thermostat 2	1-2	A21	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-30	
Alarm time delay or signal on the DI1 input	1-2	A27	1	1	1							0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input	1-2	A28	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)	1-2	A36	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Compressor															
Min. ON-time	1-2	c01	1	1	1	1	1				1	0 min.	30 min.	0	
Min. OFF-time	1-2	c02	1	1	1	1	1				1	0 min.	30 min.	0	
Time delay for cut-in of comp. 2	1-2	c05				1					1	0 sec	999 sec	5	
Switch mode for 2 compressor operation. = 1 sequentially. = Cyclic 2	1-2	c08				1					1	1	2	2	
Defrost															
Defrost method: 0=No, 1= EL, 2= gAs. 3=brine, 4=air	1-3	d01	1	1	1	1	1	1	1	1	1	0/No	4/Air	1/EL	
Defrost stop temperature	1-2	d02	1	1	1	1	1	1	1	1	1	0 °C	50 °C	6	
Interval between defrost starts	1-2	d03	1	1	1	1	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration	1-2	d04	1	1	1	1	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cut-in of defrost at start-up	1-2	d05	1	1	1	1	1	1	1	1	1	0 min.	240 min.	0	
Drip off time	1-2	d06	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost	1-2	d07	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature	1-2	d08	1	1	1	1	1	1	1	1	1	-50 °C	10 °C	-5	
Fan cut-in during defrost 0: Stopped 1: Running 2: Running during pump down and defrost 3: Running but stops at the temperature set in d41	1-2	d09	1	1	1	1	1	1	1	1	1	0	3	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4	1-2	d10	1	1	1	1	1	1	1	1	1	0	2	0	
Pump down delay	1-2	d16	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts	1-2	d18	1	1	1	1	1	1	1	1	1	0 hrs	240 hrs	0/OFF	
Rail heat during defrost 0=off. 1=on. 2=Pulsating	1-2	d27	1	1	1	1	1	1	1	1	1	0	2	1	
Max. duration of -d- in display	1-2	d40	1	1	1	1	1	1	1	1	1	5 min.	240 min.	30 min.	
Temperature limit for fan stop during defrost when d09 is set to 3	1-2	d41	1	1	1	1	1	1	1	1	1	-20 °C	20 °C	0	
Injection control function															
Max. value of superheat reference	1-2	n09					1	1	1	1	1	"n10"	20 °C	12	
Min. value of superheat reference	1-2	n10					1	1	1	1	1	2 °C	"n09"	3	
MOP temperature. Off if MOP temp. = 15.0 °C	1-2	n11					1	1	1	1	1	-50 °C	15 °C	15	
Cycle time of AKV pulsation Only for trained personnel	1-2*	n13					1	1	1	1	1	3 sec	6 sec	6	
Cycle time at PWM pulse width modulating	1-2	n63	1	1	1	1						30 sec	900 sec	300	
Max. opening degree at PWM	1-2	n64	1	1	1	1						"n65"	100 %	100	
Min. opening degree at PWM	1-2	n65	1	1	1	1						0 %	"n64"	0	
Expert setting. Wind up at PWM	1-2	n66	1	1	1	1						0.2	1.0	1.0	
Expert setting. Kp at PWM	1-2	n67	1	1	1	1						0.5	10.0	4.0	
Expert setting. Tn at PWM	1-2	n68	1	1	1	1						60 sec	1800 sec	300	

Compact - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Fan															
Fan stop temperature (S5)	1-2	F04	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cut-outs only, 2= Only at thermostat cut-outs during night operation	1-2	F05	1	1	1	1	1	1	1	1	1	0	2	0	
Cycle time for fan pulsation (on-time + off-time)	1-2	F06	1	1	1	1	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of cycle time	1-2	F07	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Real time clock															
Defrost start via defrost schedule: 0/off=no. 1/on=yes	1-2	t00	1	1	1	1	1	1	1	1	1	0/off	1/on	0/off	
Six start times for defrost. Setting of hours. 0=OFF	1-2	t01 - t06	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF	1-2	t11 - t16	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours	0-1	t07	1	1	1	1	1	1	1	1	1	0 hr	23 hrs	0	
Clock - Setting of minutes	0-1	t08	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date	0-1	t45	1	1	1	1	1	1	1	1	1	1 day	31 days	1	
Clock - Setting of month	0-1	t46	1	1	1	1	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year	0-1	t47	1	1	1	1	1	1	1	1	1	0 years	99 years	0	
Defrost schedule for Mondays is active at On/1	1-2	t51	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Tuesdays is active at On/1	1-2	t52	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Wednesdays is active at On/1	1-2	t53	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Thursdays is active at On/1	1-2	t54	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Fridays is active at On/1	1-2	t55	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Saturdays is active at On/1	1-2	t56	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Sundays is active at On/1	1-2	t57	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Miscellaneous															
Delay of output signals after power failure	1-2	o01	1	1	1	1	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o02	1	1	1	1						0	20	0	
Network address	1-3*	o03	1	1	1	1	1	1	1	1	1	0	240	0	
Access code 3 (all settings)	3-3	o05	1	1	1	1	1	1	1	1	1	0	999	0	
Used sensor type: 0=Pt1000, 1=PTC1000, 2=Ntc5K, 3=Ntc10K. (S2 and S6 are not affected. They are always Pt1000 ohms)	1-3*	o06	1	1	1	1	1	1	1	1	1	0/Pt	3/N10	0/Pt	
Max. hold time after coordinated defrost	1-2	o16	1	1	1	1	1	1	1	1	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)	1-2	o17	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Pressure transmitter working range – min. value	1-3*	o20					1	1	1	1	1	-1 bar	5 bar	-1	
Pressure transmitter working range – max. value	1-3*	o21					1	1	1	1	1	6 bar	200 bar	12	

Compact - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Refrigerant setting: 1=User defined. 3-digits. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F. 38=R1234ze. 39=R1234yf. 40=R448A. 41=R449A. 42=R452A. 43=R450A. 45=R454B. 46=R1233zdE. 47=R1234zeZ. 48=R449B. 49=R407H	1-3*	o30					1	1	1	1	1	0	42	0	
Input signal on DI2. Function: 0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost). 12=Open night cover. 13=coordinated defrost).14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o37	1	1	1	1	1	1	1	1	1	0	21	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=The light is controlled with a door switch on a DI input, 4=As "2", but light switches on and night cover will open if the network cuts out for more than 15 minutes. 5=Light controlled via a DI input.	1-2	o38		1		1			1		1	1	5	1	
Activation of light relay (only if o38=2) On=light	1-2	o39		1		1			1		1	0/Off	1/On	0/Off	
Rail heat On time during day operations	1-2	o41	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Rail heat On time during night operations	1-2	o42	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Rail heat cycle time (On time + Off time)	1-2	o43			1	1				1	1	1 min.	60 min.	5	
Appliance cleaning. 0=no Appliance cleaning. 1=Fans only. 2=All output Off.	1-2	o46	1	1	1	1	1	1	1	1	1	0	2	0	
Selection of wiring diagram. See overview pages 7-9	1-3*	o61	1	1	1	1	1	1	1	1	1	1	9	1	
Access code 2 (partial access)	2-2	o64	1	1	1	1	1	1	1	1	1	0	999	0	
Replace the controller's factory settings with the present settings	3-3*	o67	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function A	1-2	o85	1	1	1	1	1	1	1	1	1	0	2	0	
Dew point value where the rail heat is minimum	1-2	o86	1	1	1	1	1	1	1	1	1	-10°C	"o87"	8	
Dew point value where the rail heat is 100% on	1-2	o87	1	1	1	1	1	1	1	1	1	"o86"	50 °C	17	
Lowest permitted rail heat effect in %	1-2	o88	1	1	1	1	1	1	1	1	1	0 %	100 %	30	
Time delay from "open door" until refrigeration is started	1-2	o89	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Fan operation at stopped cooling (forced closing): 0= Stopped (defrost allowed) 1= Running (defrost allowed) 2= Stopped (defrost not allowed) 3= Running (defrost not allowed)	1-2	o90	1	1	1	1	1	1	1	1	1	0	3	1	
Light and night blinds defined: 0: Light is switched off and night blind is opened when the main switch is off 1: Light and night blinds are independent of main switch	1-2	o98		1		1			1		1	0	1	0	

Compact - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Configuration of alarm relay: The alarm relay will be activated by an alarm in one or more of the following priorities. Setting: 0 = The relay is not activated by alarms 1 = Only high priority alarms 2 = High and medium priority alarms 3 = High, medium and low priority alarms	1-2	P41	1	1	1	1	1	1	1	1	1	0	3	2	
Max. opening time of night blinds after a manual override with DI activation.	1-2	P60				1					1	0 min.	60 min.	5	
Stop time for fans while the night blinds roll down	1-2	P65				1					1	0 sec.	300 sec.	0	
Cycle time for rail heat at PWM on AO1	1-2	P82	1	1	1	1	1	1	1	1	1	4 sec.	60 sec.	10	
User defined refrigerant 3-digit Rfg. factor K1	1-3*	P83				1	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K2	1-3*	P84				1	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K3	1-3*	P85				1	1	1	1	1	1	-999	999	300	
Max. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P86					1	1	1	1	1	"P87"	20°C	3	
Min. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P87					1	1	1	1	1	0°C	"P86"	1	
Access code 1 (simple access)	1-1	P88	1	1	1	1	1	1	1	1	1	0	999	0	
Locking of setting display 0 = display is never locked 1 = display is locked after 15 minutes of inactivity. Display must be unlocked by pressing up and down button simultaneously for 3 seconds.	1-2	P89	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Configuration of relay output DO2: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q02				1					1	0	10	0	
Configuration of relay output DO3: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q03				1					1	0	10	0	
Configuration of relay output DO4: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q04				1					1	0	10	0	
Configuration of analogue output AO1: 0=not used. 1=rail heat PWM	1-3*	q09	1	1	1	1	1	1	1	1	1	0	1	0	
Manual control of output: AKV valve 0-100%	1-2**	q11					1	1	1	1	1	0 %	100 %	0	
Manual control of output: Compressor1/LLSV	1-2**	q12	1	1	1	1	1				1	0/Off	1/On	0/Off	
Manual control of output: Fan	1-2**	q13	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Defrost	1-2**	q14	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Rail heat	1-2**	q15			1	1				1	1	0/Off	1/On	0/Off	
Manual control of output: Alarm	1-2**	q16	1			1		1			1	0/Off	1/On	0/Off	
Manual control of output: Light	1-2**	q17		1		1			1		1	0/Off	1/On	0/Off	
Manual control of output: Compressor 2	1-2**	q19				1					1	0/Off	1/On	0/Off	
Manual control of output: Night blinds	1-2**	q21				1					1	0/Off	1/On	0/Off	
Manual control of output: Heating element	1-2**	q23				1					1	0/Off	1/On	0/Off	
Manual control of output: Fan Eco	1-2**	q24				1					1	0/Off	1/On	0/Off	
Manual control of output: Rail heat PWM	1-2**	q27	1	1	1	1	1	1	1	1	1	0 %	100 %	0	
Define which food temperature measurement to display in U72: 1=thermostat temperature, 2=alarm temperature, 3=S3	1-2*	q39	1	1	1	1	1	1	1	1	1	1	3	2	
Service															
Control mode	0-0	u00	1	1	1	1	1	1	1	1	1				
Temperature measured with S5 sensor	0-0	u09	1	1	1	1	1	1	1	1	1				
Status on DI1 input. on/1=closed	0-0	u10	1	1	1	1									
Actual defrost time (minutes)	0-0	u11	1	1	1	1	1	1	1	1	1				
Temperature measured with S3 sensor	0-0	u12	1	1	1	1	1	1	1	1	1				

Compact - continued	R-W	Code	1	2	3	4	5	6	7	8	9
Status on night operation (on or off) 1=on	0-0	u13	1	1	1	1	1	1	1	1	1
Temperature measured with S4 sensor	0-0	u16	1	1	1	1	1	1	1	1	1
Thermostat temperature	0-0	u17	1	1	1	1	1	1	1	1	1
Run time of thermostat (cooling time) in minutes	0-0	u18	1	1	1	1	1	1	1	1	1
Temperature of S2 evaporator outlet temp.	0-0	u20					1	1	1	1	1
Superheat across evaporator	0-0	u21					1	1	1	1	1
Reference of superheat control	0-0	u22					1	1	1	1	1
Opening degree of AKV valve	0-0	u23					1	1	1	1	1
Evaporating pressure Po (relative)	0-0	u25					1	1	1	1	1
Evaporator temperature To (Calculated)	0-0	u26					1	1	1	1	1
Status on DI2 input. on/1=closed	0-0	u37	1	1	1	1	1	1	1	1	1
Readout display 1 value	0-0	u56	1	1	1	1	1	1	1	1	1
Readout of alarm air temp. Section A	0-0	u57	1	1	1	1	1	1	1	1	1
Status on relay for compressor/solenoid valve	0-0	u58	1	1	1	1	1				1
Status on relay for fan	0-0	u59	1	1	1	1	1	1	1	1	1
Status on relay for defrost	0-0	u60	1	1	1	1	1	1	1	1	1
Status on relay for rail heat	0-0	u61			1	1				1	1
Status on relay for alarm	0-0	u62	1			1		1			1
Status on relay for light	0-0	u63		1		1			1		1
Status on relay for compressor 2	0-0	u67				1					1
Status on relay for night blinds	0-0	u82				1					1
Status on relay for heat function	0-0	u84				1					1
Readout of the actual rail heat effect via relay	0-0	u85	1	1	1	1	1	1	1	1	1
1: Thermostat 1 operating, 2: Thermostat 2 operating	0-0	u86	1	1	1	1	1	1	1	1	1
Readout of thermostat band in use	0-0	u90	1	1	1	1	1	1	1	1	1
Readout of thermostat's actual cut-out value	0-0	u91	1	1	1	1	1	1	1	1	1
Status of relay for ECO fan	0-0	U37				1					1
Readout of signal quality for MODBUS communication	0-0	U45	1	1	1	1	1	1	1	1	1
Readout of rail heat effect via AO1 in %	0-0	U59	1	1	1	1	1	1	1	1	1
Readout of measured product temperature (defined in q39)	0-0	U72	1	1	1	1	1	1	1	1	1
Readout of measured defrost stop temperature (defined in d10)	0-0	U73	1	1	1	1	1	1	1	1	1

Factory setting
If you need to return to the factory-set values, it can be done in this way:
- Cut off the supply voltage to the controller.
- Keep up "∧" and down "∨" arrow buttons depressed at the same time as you reconnect the supply voltage.
- When FAc is shown in the display, select "yes".

Menu survey — Single Coil version

Overview of outputs and applications

Application	DO1	DO2	DO3	DO4	DO5	DO6		AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1	⚡valve	📢alarm	🔵fan	❄defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
2	⚡valve	heater	🔵fan	❄defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
3	⚡valve	📢alarm	🔵fan	❄defrost	heater	✦fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
4	⚡valve	📢alarm	heater	❄defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
5	⚡valve	suction	drain	hotgas	💡light	✦fan		●	Pe	S2	S3	S4	S5	S6	●	●	●
6	⚡valve	📢alarm	heater	❄defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S3B	●	●	●
7	⚡valve	📢alarm	❄B fan	❄A defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S3B	S5B	●	●
8	⚡valve	📢alarm	humidity	❄defrost	💡light	✦fan		●	Pe	S2	S3	S4	S5	S6	RH%	●	●
9	⚡valve	●¹⁾	●¹⁾	●¹⁾	●¹⁾	●¹⁾		●	Pe	S2	S3	S4	S5	S6	●	●	●

See also wiring diagrams earlier in the User Guide.

● = Optional

●¹⁾ Custom set-up of relays

Menu set via display
<div align="right">SW = 2.0x</div>

Parameter Function	R-W	Code	_Wiring diagram pages 10-12_ 1	2	3	4	5	6	7	8	9	Min. value	Max. value	Factory setting	Actual setting
Normal operation															
Temperature (setpoint)	0-0	r00	1	1	1	1	1	1	1	1	1	"r03"	"r02"	2	
Thermostat															
Differential	1-2	r01	1	1	1	1	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting	0-2	r02	1	1	1	1	1	1	1	1	1	"r03"	50 °C	50	
Min. limitation of setpoint setting	0-2	r03	1	1	1	1	1	1	1	1	1	-50 °C	"r02"	-50	
Temperature unit (°C/°F)	1-2	r05	1	1	1	1	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4	1-2	r09	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S3	1-2	r10	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)	0-2	r12	1	1	1	1	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation	1-2	r13	1	1	1	1	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Modulating	1-2	r14	1	1	1	1	1	1	1	1	1	1	2	1	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)	1-2	r15	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Time between melt periods	1-2	r16	1	1	1	1	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods	1-2	r17	1	1	1	1	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential use r01	0-2	r21	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	2	
Correction of the signal from S3B	1-2	r53						1	1			-10 K	10 K	0	
Correction of the signal from S6	1-2	r59	1	1	1	1	1			1	1	-10 K	10 K	0	
Definition and weighting, if applicable, of thermostat sensors when night cover is on. (100%=S4, 0%=S3)	1-2	r61	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Heat function Neutral zone between refrigeration and heat function	1-2	r62									1	0 K	50 K	5	
Time delay at switch between refrigeration and heat function	1-2	r63									1	0 min.	240 min.	240	
Food type: use settings listed in table.	1-2*	r89	1	1	1	1	1	1	1	1	1	0	5	0	
Min. limit for S4 temperature	1-2	r98	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-50	

R-W

If the operation is limited by a setting of one or more passwords, reading and setting the parameter will be limited to:

R: This setting can be seen with password no. _ or higher.

W: This setting can be performed with password no. _ or higher (3 is the highest level).

*) Always required that the regulating is stopped, r12=0

**) Always required that the regulating is stopped and set to manual service, r12= -1

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Alarms															
Delay for temperature alarm	1-2	A03	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm	1-2	A04	1	1	1	1	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost	1-2	A12	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1	1-2	A13	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	8	
Low alarm limit for thermostat 1	1-2	A14	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-30	
High alarm limit for thermostat 2	1-2	A20	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	8	
Low alarm limit for thermostat 2	1-2	A21	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	-30	
High alarm limit for sensor S6 at thermostat 1	1-2	A22	1	1	1	1	1			1	1	-50 °C	50 °C	8	
Low alarm limit for sensor S6 at thermostat 1	1-2	A23	1	1	1	1	1			1	1	-50 °C	50 °C	-30	
High alarm limit for sensor S6 at thermostat 2	1-2	A24	1	1	1	1	1			1	1	-50 °C	50 °C	8	
Low alarm limit for sensor S6 at thermostat 2	1-2	A25	1	1	1	1	1			1	1	-50 °C	50 °C	-30	
S6 alarm time delay With setting = 240 the S6 alarm will be omitted	1-2	A26	1	1	1	1	1			1	1	0 min.	240 min.	60	
Alarm time delay or signal on the DI1 input	1-2	A27	1	1	1	1	1	1			1	0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input	1-2	A28	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)	1-2	A36	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Delay for S6 (product sensor alarm) after defrost	1-2	A52	1	1	1	1	1			1	1	0 min.	240 min.	90	
Delay for temperature alarm, section B	1-2	A53						1	1			0 min.	240 min.	30	
Product sensor S6 function	1-2*	a01	1	1	1	1	1			1	1	0/Off	1/On	0/Off	
Compressor															
Min. ON-time	1-2	c01	1	1	1						1	0 min.	30 min.	0	
Min. OFF-time	1-2	c02	1	1	1						1	0 min.	30 min.	0	
Time delay for cut-in of comp. 2	1-2	c05									1	0 sec	999 sec	5	
Switch mode for 2 compressor operation. = 1 sequentially. = Cyclic 2	1-2	c08									1	1	2	2	
Defrost															
Defrost method: 0=No, 1= EL, 2= gAs. 4=air	1-3	d01	1	1	1	1	1	1	1	1	1	0/No	4/Air	1/EL	
Defrost stop temperature	1-2	d02	1	1	1	1	1	1	1	1	1	0 °C	50 °C	6	
Interval between defrost starts	1-2	d03	1	1	1	1	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration	1-2	d04	1	1	1	1	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cut-in of defrost at start-up	1-2	d05	1	1	1	1	1	1	1	1	1	0 min.	240 min.	0	
Drip off time	1-2	d06	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost	1-2	d07	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature	1-2	d08	1	1	1	1	1	1	1	1	1	-50 °C	10 °C	-5	
Fan cut-in during defrost 0: Stopped 1: Running 2: Running during pump down and defrost 3: Running but stops at the temperature set in d41	1-2	d09	1	1	1	1	1	1	1	1	1	0	3	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4	1-2	d10	1	1	1	1	1	1	1	1	1	0	2	0	
Pump down delay	1-2	d16	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Drain delay (used at hot gas defrost only)	1-2	d17					1					0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts	1-2	d18	1	1	1	1	1	1	1	1	1	0 hrs	240 hrs	0/OFF	
Adaptive defrost: 0=not active, 1=monitoring only, 2=skip allowed day, 3=skip allowed both day and night, 4=full adaptive+ all schedules	1-2*	d21	1	1	1	1	1	1	1	1	1	0	4	0	
Time delay before opening of hot gas valve	1-2	d23					1					0 min.	60 min.	0	
Rail heat during defrost 0=off. 1=on. 2=Pulsating	1-2	d27	1	1	1	1	1	1	1	1	1	0	2	1	
Max. duration of -d- in display	1-2	d40	1	1	1	1	1	1	1	1	1	5 min.	240 min.	30 min.	
Temperature limit for fan stop during defrost when d09 is set to 3	1-2	d41	1	1	1	1	1	1	1	1	1	-20 °C	20 °C	0	

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Injection control function															
Max. value of superheat reference	1-2	n09	1	1	1	1	1	1	1	1	1	"n10"	20 °C	12	
Min. value of superheat reference	1-2	n10	1	1	1	1	1	1	1	1	1	2 °C	"n09"	3	
MOP temperature. Off if MOP temp. = 15.0 °C	1-2	n11	1	1	1	1	1	1	1	1	1	-50 °C	15 °C	15	
Cycle time of AKV pulsation Only for trained personnel	1-2*	n13	1	1	1	1	1	1	1	1	1	3 sec	6 sec	6	
Fan															
Fan stop temperature (S5)	1-2	F04	1	1	1	1	1	1	1	1	1	-50 °C	50 °C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cut-outs only, 2= Only at thermostat cut-outs during night operation	1-2	F05	1	1	1	1	1	1	1	1	1	0	2	0	
Cycle time for fan pulsation (on-time + off-time)	1-2	F06	1	1	1	1	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of cycle time	1-2	F07	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Real time clock															
Defrost start via defrost schedule: 0/off=no. 1/on=yes	1-2	t00	1	1	1	1	1	1	1	1	1	0/off	1/on	0/off	
Six start times for defrost. Setting of hours. 0=OFF	1-2	t01 - t06	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF	1-2	t11 - t16	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours	0-1	t07	1	1	1	1	1	1	1	1	1	0 hr	23 hrs	0	
Clock - Setting of minutes	0-1	t08	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date	0-1	t45	1	1	1	1	1	1	1	1	1	1 day	31 days	1	
Clock - Setting of month	0-1	t46	1	1	1	1	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year	0-1	t47	1	1	1	1	1	1	1	1	1	0 years	99 years	0	
Defrost schedule for Mondays is active at On/1	1-2	t51	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Tuesdays is active at On/1	1-2	t52	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Wednesdays is active at On/1	1-2	t53	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Thursdays is active at On/1	1-2	t54	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Fridays is active at On/1	1-2	t55	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Saturdays is active at On/1	1-2	t56	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Sundays is active at On/1	1-2	t57	1	1	1	1	1	1	1	1	1	0/Off	1/On	1/On	
Humidity															
Setpoint for cut-in of humidity function	0-2	h23								1		0 %	100 %	70	
Difference for humidity function	1-2	h24								1		1 %	30 %	5	
Alarm limit for high humidity (too damp)	1-2	h25								1		0 %	100 %	100	
Alarm limit for low humidity (too dry)	1-2	h26								1		0 %	100 %	0	
Delay time for a humidity alarm	1-2	h27								1		0 min.	240 min.	60	
Humidity function during defrosting	1-2	h28								1		0/Off	1/On	0/Off	
Setpoint for RH% at input signal on 0 V	1-2*	h29								1		0 %	"h30"	0	
Setpoint for RH% at input signal on 10 V	1-2*	h30								1		"h29"	100 %	100	
Use humidity control	1-2*	h31								1		0/Off	1/On	0/Off	

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Miscellaneous															
Delay of output signals after power failure	1-2	o01	1	1	1	1	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o02	1	1	1	1	1	1			1	0	21	0	
Network address	1-3*	o03	1	1	1	1	1	1	1	1	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at Lon 485)	1-2	o04	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Access code 3 (all settings)	3-3	o05	1	1	1	1	1	1	1	1	1	0	999	0	
Used sensor type: 0=Pt1000, 1=PTC1000, 2=Ntc5K, 3=Ntc10K. (S2 and S6 are not affected. They are always Pt1000 ohms)	1-3*	o06	1	1	1	1	1	1	1	1	1	0/Pt	3/N10	0/Pt	
Max. hold time after coordinated defrost	1-2	o16	1	1	1	1	1	1	1	1	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)	1-2	o17	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Pressure transmitter working range – min. value	1-3*	o20	1	1	1	1	1	1	1	1	1	-1 bar	5 bar	-1	
Pressure transmitter working range – max. value	1-3*	o21	1	1	1	1	1	1	1	1	1	6 bar	200 bar	12	
Refrigerant setting: 1=User defined. 3-digits. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F. 38=R1234ze. 39=R1234yf. 40=R448A. 41=R449A. 42=R452A. 43=R450A. 45=R454B. 46=R1233zdE. 47=R1234zeZ. 48=R449B. 49=R407H	1-3*	o30	1	1	1	1	1	1	1	1	1	0	42	0	
Input signal on DI2. Function: 0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 13=coordinated defrost.14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o37	1	1	1	1	1	1	1	1	1	0	21	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=The light is controlled with a door switch on a DI input, 4=As "2", but light switches on and night cover will open if the network cuts out for more than 15 minutes, 5=Light controlled via a DI input.	1-2	o38	1	1		1	1	1	1	1	1	1	5	1	
Activation of light relay (only if o38=2) On=light	1-2	o39	1	1		1	1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat On time during day operations	1-2	o41	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Rail heat On time during night operations	1-2	o42	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Rail heat cycle time (On time + Off time)	1-2	o43	1	1	1	1	1	1	1	1	1	1 min.	60 min.	5	
Appliance cleaning. 0=no Appliance cleaning. 1=Fans only. 2=All output Off.	1-2	o46	1	1	1	1	1	1	1	1	1	0	2	0	
Selection of wiring diagram. See overview pages 10-12	1-3*	o61	1	1	1	1	1	1	1	1	1	1	9	1	

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Access code 2 (partial access)	2-2	o64	1	1	1	1	1	1	1	1	1	0	999	0	
Replace the controller's factory settings with the present settings	3-3*	o67	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Input signal on DI3. Function: (high voltage input) 0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=Not used. 9=Not used. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 13=Not used. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o84	1	1	1	1	1	1	1	1	1	0	21	0	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function A	1-2	o85	1	1	1	1	1	1	1	1	1	0	2	0	
Dew point value where the rail heat is minimum	1-2	o86	1	1	1	1	1	1	1	1	1	-10°C	"o87"	8	
Dew point value where the rail heat is 100% on	1-2	o87	1	1	1	1	1	1	1	1	1	"o86"	50 °C	17	
Lowest permitted rail heat effect in %	1-2	o88	1	1	1	1	1	1	1	1	1	0 %	100 %	30	
Time delay from "open door" refrigeration is started	1-2	o89	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Fan operation at stopped cooling (forced closing): 0= Stopped (defrost allowed) 1= Running (defrost allowed) 2= Stopped (defrost not allowed) 3= Running (defrost not allowed)	1-2	o90	1	1	1	1	1	1	1	1	1	0	3	1	
Readout of temperature value shown in display 1 1= u56 air temperature 2= u36 product temperature	1-2	o97	1	1	1	1	1	1	1	1	1	1	2	1	
Light and night blinds defined: 0: Light is switched off and night blind is opened when the main switch is off 1: Light and night blind is independent of main switch	1-2	o98	1	1		1	1	1	1	1	1	0	1	0	
Configuration of alarm relay: The alarm relay will be activated by an alarm in one or more of the following priorities. Setting: 0 = The relay is not activated by alarms 1 = Only high priority alarms 2 = High priority and intermediate priority alarms 3 = High priority, intermediate priority and low priority	1-2	P41	1		1	1		1	1	1	1	0	3	2	
Max. opening time of night blinds after a manual override with DI activation.	1-2	P60									1	0 min.	60 min.	5	
Stop time for fans while the night blinds roll down	1-2	P65									1	0 sec	300 sec	0	
Cycle time for rail heat at PWM on AO1	1-2	P82	1	1	1	1	1	1	1	1	1	4 sec	60 sec	10	
User defined refrigerant 3-digit Rfg. factor K1	1-3*	P83	1	1	1	1	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K2	1-3*	P84	1	1	1	1	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K3	1-3*	P85	1	1	1	1	1	1	1	1	1	-999	999	300	
Max. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P86	1	1	1	1	1	1	1	1	1	"P87"	20°C	3	
Min. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P87	1	1	1	1	1	1	1	1	1	0°C	"P86"	1	
Access code 1 (simple access)	1-1	P88	1	1	1	1	1	1	1	1	1	0	999	0	
Locking the display control. 0/Off=operation. 1/On=locked	1-2	P89	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Configuration of relay output DO2: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q02									1	0	10	5	

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Configuration of relay output DO3: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q03									1	0	10	8	
Configuration of relay output DO4: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q04									1	0	10	9	
Configuration of relay output DO5: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q05									1	0	10	3	
Configuration of relay output DO6: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=light, 7=night blinds, 8=compressor, 9=compressor 2, 10=heating element	1-3*	q06									1	0	10	1	
Configuration of analogue output AO1: 0=not used. 1=rail heat PWM	1-3*	q09	1	1	1	1	1	1	1	1	1	0	1	0	
Manual control of output: AKV valve 0-100%	1-2**	q11	1	1	1	1	1	1	1	1	1	0 %	100 %	0	
Manual control of output: Compressor1/LLSV	1-2**	q12	1	1	1						1	0/Off	1/On	0/Off	
Manual control of output: Fan	1-2**	q13	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Defrost	1-2**	q14	1	1	1	1		1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Rail heat	1-2**	q15		1	1	1		1			1	0/Off	1/On	0/Off	
Manual control of output: Alarm	1-2**	q16	1		1	1		1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Light	1-2**	q17	1	1		1	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Valve in suction line	1-2**	q18					1					0/Off	1/On	0/Off	
Manual control of output: Compressor 2	1-2**	q19									1	0/Off	1/On	0/Off	
Manual control of output: Hot gas valve	1-2**	q20					1					0/Off	1/On	0/Off	
Manual control of output: Night blinds	1-2**	q21									1	0/Off	1/On	0/Off	
Manual control of output: Defrost 2	1-2**	q22							1			0/Off	1/On	0/Off	
Manual control of output: Heating element	1-2**	q23									1	0/Off	1/On	0/Off	
Manual control of output: Fan Eco	1-2**	q24									1	0/Off	1/On	0/Off	
Manual control of output: Drain	1-2**	q25					1					0/Off	1/On	0/Off	
Manual control of output: Humidity	1-2**	q26								1		0/Off	1/On	0/Off	
Manual control of output: Rail heat PWM	1-2**	q27	1	1	1	1	1	1	1	1	1	0 %	100 %	0	
Define which food temperature measurement to display in U72: 1=thermostat temperature, 2=alarm temperature, 3=S3, 4=S6	1-2*	q39	1	1	1	1	1	1	1	1	1	1	4	2	
Service															
Control mode	0-0	u00	1	1	1	1	1	1	1	1	1				
Temperature measured with S5 sensor	0-0	u09	1	1	1	1	1	1	1	1	1				
Status on DI1 input. on/1=closed	0-0	u10	1	1	1	1	1	1			1				
Actual defrost time (minutes)	0-0	u11	1	1	1	1	1	1	1	1	1				
Temperature measured with S3 sensor	0-0	u12	1	1	1	1	1	1	1	1	1				
Status on night operation (on or off) 1=on	0-0	u13	1	1	1	1	1	1	1	1	1				
Temperature measured with S4 sensor	0-0	u16	1	1	1	1	1	1	1	1	1				
Thermostat temperature	0-0	u17	1	1	1	1	1	1	1	1	1				
Runtime of thermostat (cooling time) in minutes	0-0	u18	1	1	1	1	1	1	1	1	1				
Temperature of S2 evaporator outlet temp.	0-0	u20	1	1	1	1	1	1	1	1	1				
Superheat across evaporator	0-0	u21	1	1	1	1	1	1	1	1	1				
Reference of superheat control	0-0	u22	1	1	1	1	1	1	1	1	1				
Opening degree of AKV valve	0-0	u23	1	1	1	1	1	1	1	1	1				
Evaporating pressure Po (relative)	0-0	u25	1	1	1	1	1	1	1	1	1				
Evaporator temperature To (Calculated)	0-0	u26	1	1	1	1	1	1	1	1	1				
Temperature measured with S6 sensor (product temperature)	0-0	u36	1	1	1	1	1			1	1				
Status on DI2 input. on/1=closed	0-0	u37	1	1	1	1	1	1	1	1	1				
Air temperature . Weighted S3 and S4	0-0	u56	1	1	1	1	1	1	1	1	1				
Measured temperature for alarm thermostat	0-0	u57	1	1	1	1	1	1	1	1	1				

Single Coil - continued	R-W	Code	1	2	3	4	5	6	7	8	9
Status on relay for compressor/solenoid valve	0-0	u58	1	1	1						1
Status on relay for fan	0-0	u59	1	1	1	1	1	1	1	1	1
Status on relay for defrost	0-0	u60	1	1	1	1		1	1	1	1
Status on relay for rail heat	0-0	u61		1	1	1		1			1
Status on relay for alarm	0-0	u62	1		1	1		1	1	1	1
Status on relay for light	0-0	u63	1	1		1	1	1	1	1	1
Status on relay for valve in suction line	0-0	u64					1				
Status on relay for compressor 2	0-0	u67									1
Temperature measured with S5B sensor	0-0	u75							1		
Temperature measured with S3B sensor	0-0	u76						1	1		
Status on relay for hot gas / drain valve	0-0	u80					1				
Status on relay for night blinds	0-0	u82									1
Status on relay for defrost B	0-0	u83							1		
Status on relay for heat function	0-0	u84									1
Readout of the actual rail heat effect via relay	0-0	u85	1	1	1	1	1	1	1	1	1
1: Thermostat 1 operating, 2: Thermostat 2 operating	0-0	u86	1	1	1	1	1	1	1	1	1
Status on high voltage input DI3	0-0	u87	1	1	1	1	1	1	1	1	1
Readout of thermostat band in use	0-0	u90	1	1	1	1	1	1	1	1	1
Readout of thermostat's actual cut-out value	0-0	u91	1	1	1	1	1	1	1	1	1
Readout of status on the adaptive defrost 0: Off. Function is not activated and are zero-set 1: Sensor error or S3/S4 are reversed 2: Tuning is in progress 3: Normal 4: Light build-up of ice 5: Medium build-up of ice 6: Heavy build-up of ice	0-0	U01	1	1	1	1	1	1	1	1	1
Number of defrosts carried out since the initial power up or since the resetting of the function	0-0	U10	1	1	1	1	1	1	1	1	1
Number of defrosts skipped since the initial power up or since the resetting of the function	0-0	U11	1	1	1	1	1	1	1	1	1
Readout of alarm air temp. Section B	0-0	U34						1	1		
Readout of display 2 value	0-0	U35						1	1		
Status of relay for ECO fan	0-0	U37									1
Readout of signal quality for MODBUS communication	0-0	U45	1	1	1	1	1	1	1	1	1
Status of relay to drain valve	0-0	U55					1				
Readout of measured humidity in %	0-0	U57								1	
Status of relay for humidity	0-0	U58								1	
Readout of rail heat effect via AO1 i %	0-0	U59	1	1	1	1	1	1	1	1	1
Readout of measured food temperature (defined in q39)	0-0	U72	1	1	1	1	1	1	1	1	1
Readout of measured defrost stop temperature (defined in d10)	0-0	U73	1	1	1	1	1	1	1	1	1

Factory setting
If you need to return to the factory-set values, it can be done in this way:
- Cut off the supply voltage to the controller.
- Keep up "∧" and down "∨" arrow buttons depressed at the same time as you reconnect the supply voltage.
- When FAc is shown in the display, select "yes".

Menu survey — Multi Coil version

Overview of outputs and applications

Application	DO1	DO2	DO3	DO4	DO5	DO6	DO7	AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1	A			A				●	Pe	S2A	S4A	S5A			●	●	●
2	A		B	A			B	●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●
3	A		B				C	●	Pe	S2A	S4A	S2B	S4B	S2C	S4C	●	●
4	A		B	humidity			heat	●	Pe	S2A	S4A	S2B	S4B	RH%	●	●	●
5	A		B	A			B	●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●

See also wiring diagrams earlier in the User Guide.
● = Optional
●¹) Custom set-up of relays

Menu set via display

SW = 2.0x

Parameter			Wiring diagram pages 13-14					Min. value	Max. value	Factory setting	Actual setting
Function	R-W	Code	1	2	3	4	5				
Normal operation											
Temperature (setpoint)	0-0	r00	1	1	1	1	1	"r03"	"r02"	2	
Thermostat											
Differential	1-2	r01	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting	0-2	r02	1	1	1	1	1	"r03"	50 °C	50	
Min. limitation of setpoint setting	0-2	r03	1	1	1	1	1	-50 °C	"r02"	-50	
Temperature unit (°C/°F)	1-2	r05	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4	1-2	r09	1	1	1	1	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)	0-2	r12	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation	1-2	r13	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Modulating, ON/OFF common	1-2	r14	1	1	1	1	1	1	3	1	
Time between melt periods	1-2	r16	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods	1-2	r17	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential use r01	0-2	r21	1	1	1	1	1	-50 °C	50 °C	2	
Heat function Neutral zone between refrigeration and heat function	1-2	r62				1		0 K	50 K	5	
Time delay at switch between refrigeration and heat function	1-2	r63				1		0 min.	240 min.	240	
Food type: use settings listed in table	1-2**	r89	1	1	1	1	1	0	5	0	
Min. limit for S4 temperature	1-2	r98	1	1	1	1	1	-50 °C	50 °C	-50	
Select temperature signal for common thermostat (only if r14=3) 1=air temperature section A, 2=median of all thermostat sensors, 3= maximum of all thermostat sensors	1-2*	r99		1	1	1	1	1	3	1	
Alarms											
Delay for temperature alarm	1-2	A03	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm	1-2	A04	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost	1-2	A12	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1	1-2	A13	1	1	1	1	1	-50 °C	50 °C	8	
Low alarm limit for thermostat 1	1-2	A14	1	1	1	1	1	-50 °C	50 °C	-30	
High alarm limit for thermostat 2	1-2	A20	1	1	1	1	1	-50 °C	50 °C	8	

R-W
If the operation is limited by a setting of one or more passwords, reading and setting the parameter will be limited to:
R: This setting can be seen with password no. _ or higher.
W: This setting can be performed with password no. _ or higher (3 is the highest level).
*) Always required that the regulating is stopped, r12=0)
**) Always required that the regulating is stopped and set to manual service, r12= -1)

Multi Coil - continued	R-W	Code	1	2	3	4	5	Min.	Max.	Fac.	Actual
Low alarm limit for thermostat 2	1-2	A21	1	1	1	1	1	-50 °C	50 °C	-30	
Alarm time delay or signal on the DI1 input	1-2	A27	1			1		0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input	1-2	A28	1	1	1	1	1	0 min.	240 min.	30	
Defrost											
Defrost method: 0=No, 1= EL, 4=air	1-3	d01	1	1	1	1	1	0/No	4/Air	1/EL	
Defrost stop temperature	1-2	d02	1	1	1	1	1	0°C	50°C	6	
Interval between defrost starts	1-2	d03	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration	1-2	d04	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cut-in of defrost at start-up	1-2	d05	1	1	1	1	1	0 min.	240 min.	0	
Drip off time	1-2	d06	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost	1-2	d07	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature	1-2	d08	1	1	1	1	1	-50 °C	10 °C	-5	
Fan cut-in during defrost 0: Stopped 1: Running 2: Running during pump down and defrost 3: Running but stops at the temperature set in d41	1-2	d09	1	1	1	1	1	0	3	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4	1-2	d10	1	1	1	1	1	0	2	0	
Pump down delay	1-2	d16	1	1	1	1	1	0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts	1-2	d18	1	1	1	1	1	0 hrs	240 hrs	0/OFF	
Rail heat during defrost 0=off. 1=on. 2=Pulsating	1-2	d27	1	1	1	1	1	0	2	1	
Max. duration of -d- in display	1-2	d40	1	1	1	1	1	5 min.	240 min.	30 min.	
Temperature limit for fan stop during defrost when d09 is set to 3	1-2	d41	1	1	1	1	1	-20 °C	20 °C	0	
Injection control function											
Max. value of superheat reference	1-2	n09	1	1	1	1	1	"n10"	20 °C	12	
Min. value of superheat reference	1-2	n10	1	1	1	1	1	2 °C	"n09"	3	
MOP temperature. Off if MOP temp. = 15.0 °C	1-2	n11	1	1	1	1	1	-50 °C	15 °C	15	
Cycle time of AKV pulsation Only for trained personnel	1-2*	n13	1	1	1	1	1	3 sec	6 sec	6	
Fan											
Fan stop temperature (S5)	1-2	F04	1	1	1	1	1	-50 °C	50 °C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cut-outs only, 2= Only at thermostat cut-outs during night operation	1-2	F05	1	1	1	1	1	0	2	0	
Cycle time for fan pulsation (on-time + off-time)	1-2	F06	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of cycle time	1-2	F07	1	1	1	1	1	0 %	100 %	100	
Real time clock											
Defrost start via defrost schedule: 0/off=no. 1/on=yes	1-2	t00	1	1	1	1	1	0/off	1/on	0/off	
Six start times for defrost. Setting of hours. 0=OFF	1-2	t01 - t06	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF	1-2	t11 - t16	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours	0-1	t07	1	1	1	1	1	0 hr	23 hrs	0	
Clock - Setting of minutes	0-1	t08	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date	0-1	t45	1	1	1	1	1	1 day	31 days	1	
Clock - Setting of month	0-1	t46	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year	0-1	t47	1	1	1	1	1	0 years	99 years	0	
Defrost schedule for Mondays is active at On/1	1-2	t51	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Tuesdays is active at On/1	1-2	t52	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Wednesdays is active at On/1	1-2	t53	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Thursdays is active at On/1	1-2	t54	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Fridays is active at On/1	1-2	t55	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Saturdays is active at On/1	1-2	t56	1	1	1	1	1	0/Off	1/On	1/On	
Defrost schedule for Sundays is active at On/1	1-2	t57	1	1	1	1	1	0/Off	1/On	1/On	

Multi Coil - continued	R-W	Code	1	2	3	4	5	Min.	Max.	Fac.	Actual
Humidity											
Setpoint for cut-in of humidity function	0-2	h23				1		0 %	100 %	70	
Difference for humidity function	1-2	h24				1		1 %	30 %	5	
Alarm limit for high humidity (too damp)	1-2	h25				1		0 %	100 %	100	
Alarm limit for low humidity (too dry)	1-2	h26				1		0 %	100 %	0	
Delay time for a humidity alarm	1-2	h27				1		0 min.	240 min.	60	
Humidity function during defrosting	1-2	h28				1		0/Off	1/On	0/Off	
Setpoint for RH% at input signal on 0 V	1-2*	h29				1		0 %	"h30"	0	
Setpoint for RH% at input signal on 10 V	1-2*	h30				1		"h29"	100 %	100	
Use humidity control	1-2*	h31				1		0/Off	1/On	0/Off	
Miscellaneous											
Delay of output signals after power failure	1-2	o01	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21=adaptive liquid control when short-circuited.	1-2*	o02	1			1		0	21	0	
Network address	1-3*	o03	1	1	1	1	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at Lon 485)	1-2	o04	1	1	1	1	1	0/Off	1/On	0/Off	
Access code 3 (all settings)	3-3	o05	1	1	1	1	1	0	999	0	
Used sensor type: 0=Pt1000, 1=PTC1000, 2=Ntc5K, 3=Ntc10K. (S2 is not affected. It is always Pt1000 ohms)	1-3*	o06	1	1	1	1	1	0/Pt	3/N10	0/Pt	
Max. hold time after coordinated defrost	1-2	o16	1	1	1	1	1	0 min.	360 min.	20	
Pressure transmitter working range – min. value	1-3*	o20	1	1	1	1	1	-1 bar	5 bar	-1	
Pressure transmitter working range – max. value	1-3*	o21	1	1	1	1	1	6 bar	200 bar	12	
Refrigerant setting: 1=User defined. 3-digits. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F. 38=R1234ze. 39=R1234yf. 40=R448A. 41=R449A. 42=R452A. 43=R450A. 45=R454B. 46=R1233zdE. 47=R1234zeZ. 48=R449B. 49=R407H	1-3*	o30	1	1	1	1	1	0	42	0	
Input signal on DI2. Function: 0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse signal). 5=ext. main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 13=coordinated defrost. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o37	1	1	1	1	1	0	21	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=The light is controlled with a door switch on a DI input, 4=As "2", but light switches on and night cover will open if the network cuts out for more than 15 minutes, 5=Light controlled via a DI input.	1-2	o38	1	1	1	1	1	1	5	1	
Activation of light relay (only if o38=2) On=light	1-2	o39	1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat On time during day operations	1-2	o41	1	1	1	1	1	0 %	100 %	100	
Rail heat On time during night operations	1-2	o42	1	1	1	1	1	0 %	100 %	100	
Rail heat cycle time (On time + Off time)	1-2	o43	1	1	1	1	1	1 min.	60 min.	5	

Multi Coil - continued	R-W	Code	1	2	3	4	5	Min.	Max.	Fac.	Actual
Appliance cleaning. 0=no Appliance cleaning. 1=Fans only. 2=All output Off.	1-2	o46	1	1	1	1	1	0	2	0	
Selection of wiring diagram. See overview on pages 13-14	1-3*	o61	1	1	1	1	1	1	9	1	
Access code 2 (partial access)	2-2	o64	1	1	1	1	1	0	999	0	
Replace the controller's factory settings with the present settings	3-3*	o67	1	1	1	1	1	0/Off	1/On	0/Off	
Input signal on DI3. Function: (high voltage input) 0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse signal). 5=ext. main switch. 6=night operation. 7=thermostat band changeover (activate r21). 8=Not used. 9=Not used. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost. 12=Open night cover. 13=Not used. 14=Refrigeration stopped (forced closing). 15=case shutdown. 16=light. 20=Refrigerant alarm. 21= adaptive liquid control when short-circuited.	1-2*	o84	1	1	1	1	1	0	21	0	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function A	1-2	o85	1	1	1	1	1	0	2	0	
Dew point value where the rail heat is minimum	1-2	o86	1	1	1	1	1	-10 °C	""o87	8	
Dew point value where the rail heat is 100% on	1-2	o87	1	1	1	1	1	"o86"	50 °C	17	
Lowest permitted rail heat effect in %	1-2	o88	1	1	1	1	1	0 %	100 %	30	
Time delay from "open door" refrigeration is started	1-2	o89	1	1	1	1	1	0 min.	240 min.	30	
Fan operation at stopped cooling (forced closing): 0 = Stopped (defrost allowed) 1 = Running (defrost allowed) 2 = Stopped (defrost not allowed) 3 = Running (defrost not allowed)	1-2	o90	1	1	1	1	1	0	3	1	
Display of temperature 1 = Thermostat air 2 = Average all 3 = Maximum all	1-2	o97	1	1	1	1	1	1	3	1	
Light and night blinds defined: 0: Light is switched off and night blind is opened when the main switch is off 1: Light and night blind is independent of main switch	1-2	o98	1	1		1	1	0	1	0	
Configuration of alarm relay: The alarm relay will be activated by an alarm in one or more of the following priorities. Setting: 0 = The relay is not activated by alarms 1 = Only high priority alarms 2 = High priority and intermediate priority alarms 3 = High priority, intermediate priority and low priority	1-2	P41	1	1	1	1	1	0	3	2	
Cycle time for rail heat at PWM on AO1	1-2	P82	1	1	1	1	1	4 sec	60 sec	10	
User defined refrigerant 3-digit Rfg. factor K1	1-3*	P83	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K2	1-3*	P84	1	1	1	1	1	-999	999	300	
User defined refrigerant 3-digit Rfg. factor K3	1-3*	P85	1	1	1	1	1	-999	999	300	
Max. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P86	1	1	1	1	1	"P87"	20°C	3	
Min. limitation of the superheat reference when regulated with liquid-filled evaporator	1-2	P87	1	1	1	1	1	0°C	"P86"	1	
Access code 1 (simple access)	1-1	P88	1	1	1	1	1	0	999	0	
Locking the display control. 0/Off=operation. 1/On=locked	1-2	P89	1	1	1	1	1	0/Off	1/On	0/Off	
Configuration of analogue output AO1: 0=not used. 1=rail heat PWM	1-3*	q09	1	1	1	1	1	0	1	0	
Manual control of output: AKV valve 0-100%	1-2**	q11	1	1	1	1	1	0 %	100 %	0	
Manual control of output: Fan	1-2**	q13	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Defrost A	1-2**	q14	1	1			1	0/Off	1/On	0/Off	
Manual control of output: Rail heat	1-2**	q15	1	1	1			0/Off	1/On	0/Off	
Manual control of output: Alarm	1-2**	q16	1		1	1	1	0/Off	1/On	0/Off	
Manual control of output: Light	1-2**	q17	1	1	1	1	1	0/Off	1/On	0/Off	
Manual control of output: Defrost B	1-2**	q22		1			1	0/Off	1/On	0/Off	
Manual control of output: Heating element	1-2**	q23				1		0/Off	1/On	0/Off	
Manual control of output: Humidity	1-2**	q26				1		0/Off	1/On	0/Off	
Manual control of output: Rail heat PWM	1-2**	q27	1	1	1	1	1	0 %	100 %	0	

Multi Coil - continued	R-W	Code	1	2	3	4	5	Min.	Max.	Fac.	Actual
Define which food temperature measurement to display in U72: 1 = Air temperature section A 2 = Average air temperature of all sections 3 = The highest air temperature of all sections	1-2*	q39	1	1	1	1	1	1	3	2	
AKV OD % B	1-2**	q41		1	1	1	1	0 %	100 %	0	
AKV OD % C	1-2**	q42			1			0 %	100 %	0	
Correction of signal from S4B	1-2	q43			1	1		-10 K	10 K	0	
Correction of signal from S4C	1-2	q44			1	1	1	-10 K	10 K	0	
Service											
Control mode section A	0-0	u00	1	1	1	1	1				
Temperature measured with S5 sensor	0-0	u09	1	1	1	1	1				
Status on DI1 input. on/1=closed	0-0	u10	1			1					
Actual defrost time (minutes)	0-0	u11	1	1	1	1	1				
Status on night operation (on or off) 1=on	0-0	u13	1	1	1	1	1				
Temperature measured with S4 sensor	0-0	u16	1	1	1	1	1				
Thermostat temperature	0-0	u17	1	1	1	1	1				
Runtime of thermostat (cooling time) in minutes	0-0	u18	1	1	1	1	1				
Temperature of S2 evaporator outlet temp.	0-0	u20	1	1	1	1	1				
Superheat across evaporator	0-0	u21	1	1	1	1	1				
Reference of superheat control	0-0	u22	1	1	1	1	1				
Opening degree of AKV valve	0-0	u23	1	1	1	1	1				
Evaporating pressure Po (relative)	0-0	u25	1	1	1	1	1				
Evaporator temperature To (Calculated)	0-0	u26	1	1	1	1	1				
Status on DI2 input. on/1=closed	0-0	u37	1	1	1	1	1				
Readout display 1 value	0-0	u56	1	1	1	1	1				
Readout of alarm air temp. Section A	0-0	u57	1	1	1	1	1				
Status on relay for fan	0-0	u59	1	1	1	1					
Status on relay for defrost	0-0	u60	1	1			1				
Status on relay for rail heat	0-0	u61	1	1	1						
Status on relay for alarm	0-0	u62	1		1	1	1				
Status on relay for light	0-0	u63	1	1	1	1	1				
Temperature measured with S5B sensor	0-0	u75		1			1				
Status on relay for defrost B	0-0	u83		1			1				
Status on relay for heat function	0-0	u84				1					
Readout of the actual rail heat effect via relay	0-0	u85	1	1	1	1	1				
1: Thermostat 1 operating, 2: Thermostat 2 operating	0-W	u86	1	1	1	1	1				
Status on high voltage input DI3	0-0	u87	1	1	1	1	1				
Readout of thermostat band in use	0-0	u90	1	1	1	1	1				
Readout of thermostat's actual cut-out value	0-0	u91	1	1	1	1	1				
Readout of alarm air temp. Section B	0-0	U34		1	1	1	1				
Readout of display 2 value	0-0	U35		1	1	1	1				
Readout of signal quality for MODBUS communication	0-0	U45	1	1	1	1	1				
Readout of measured humidity in %	0-0	U57				1					
Status of relay for humidity	0-0	U58				1					
Readout of rail heat effect via AO1 in %	0-0	U59	1	1	1	1	1				
Readout of measured food temperature (defined in q39)	0-0	U72	1	1	1	1	1				
Readout of measured defrost stop temperature (defined in d10)	0-0	U73	1	1	1	1	1				
Control mode section B	0-0	U74		1	1	1	1				
Actual defrost time (minutes) section B	0-0	U75		1	1	1	1				
Actual S4 temperature section B	0-0	U76		1	1	1	1				
Thermostat temperature section B	0-0	U77		1	1	1	1				
Runtime of thermostat (cooling time) in minutes section B	0-0	U78		1	1	1	1				
Temperature of evaporator outlet temp. section B	0-0	U79		1	1	1	1				
Superheat across evaporator section B	0-0	U80		1	1	1	1				
Reference of superheat control section B	0-0	U81		1	1	1	1				
Opening degree of AKV valve section B	0-0	U82	1	1	1	1					
Control mode section C	0-0	U83			1						

Multi Coil - continued	R-W	Code	1	2	3	4	5
Actual defrost time (minutes) section C	0-0	U84			1		
Actual S4 temperature section C	0-0	U85			1		
Thermostat temperature section C	0-0	U86			1		
Runtime of thermostat (cooling time) in minutes section C	0-0	U87			1		
Temperature of evaporator outlet temp. section C	0-0	U88			1		
Superheat across evaporator section C	0-0	U89			1		
Reference of superheat control section C	0-0	U90			1		
Opening degree of AKV valve section C	0-0	U91			1		
Readout of alarm air temp. section C	0-0	U92			1		
Defrost stop temperature section B	0-0	U93		1	1	1	1
Defrost stop temperature section C	0-0	U94			1		

Factory setting
If you need to return to the factory-set values, it can be done in this way:
- Cut off the supply voltage to the controller.
- Keep up "∧" and down "∨" arrow buttons depressed at the same time as you reconnect the supply voltage.
- When FAc is shown in the display, select "yes".

Functions

Liquid injection

Liquid injection in the evaporator is controlled by an electronic injection valve of the type AKV. The valve operates as both expansion valve and solenoid valve. The controller opens and closes the valve based on sensor readings.

The function contains an adaptive algorithm which independently adjusts the valve's opening so that the evaporator constantly supplies optimum amount of refrigerant.

Superheat is measured via:

Pressure sensor Pe and temperature sensor S2.

By using a pressure sensor and temperature sensor a correct measurement of superheat is achieved under all conditions which ensures a very robust and precise control.

The signal from one pressure transmitter can be shared by several controllers, but only if there is no significant pressure difference between the evaporators in question.

There are two parallel settings for superheat:

1. Dry expansion, which does not allow liquid flow on the outlet of the evaporator.
2. Adaptive liquid control, which allows liquid flow. This type of control requires that the controller receives an on/off signal from (for example) a suction accumulator in the suction line. A level switch in the tank will register when the liquid level exceeds the max. level. When this happens, the controller will switch to dry expansion, and then back to liquid control when the liquid level has dropped. The function is defined in setting o02, o37 or o84. The function can also be activated via data communication from a system unit.

Thermostatic expansion valve control

In the compact version the refrigeration (injection) can be controlled either by starting/stopping a compressor or by opening/closing a solenoid valve in the liquid line.
Modulating temperature regulation is used in brine systems.

Temperature control

The temperature in the appliance is registered by one or two temperature sensors which are located in the return air before the evaporator (S3) or after the evaporator (S4) respectively. A setting for the thermostat, night thermostat, alarm thermostat and display reading determines how much the two sensor values should influence each individual function, e.g. 50% of S4 will produce an equal value from both sensors.

The actual temperature control can take place in two ways: as an ordinary ON/OFF regulation with a differential, or as a modulating control where the temperature variation will not be nearly as great as in ON/OFF control. There is, however, a limit to the use of a modulating control as it can only be used in remote cabinets. In applications with one evaporator and one compressor the thermostat function with ON/OFF control should be selected. In remote cabinets, the thermostat function may either be selected for ON/OFF control or modulating control.

For the Multi Coil version, regulation can also be performed using a shared on/off thermostat for all sections. The thermostat sensor must be either: S4A, average of all S4 sensors or the S4 sensor for which the highest temperature is recorded.

Warning
Accidental actuation may allow liquid throughput to the compressor.
It is the installer's responsibility to ensure that signal loss to the controller will not result in liquid throughput to the compressor.
Danfoss accepts no responsibility for damage resulting from inadequate installation.
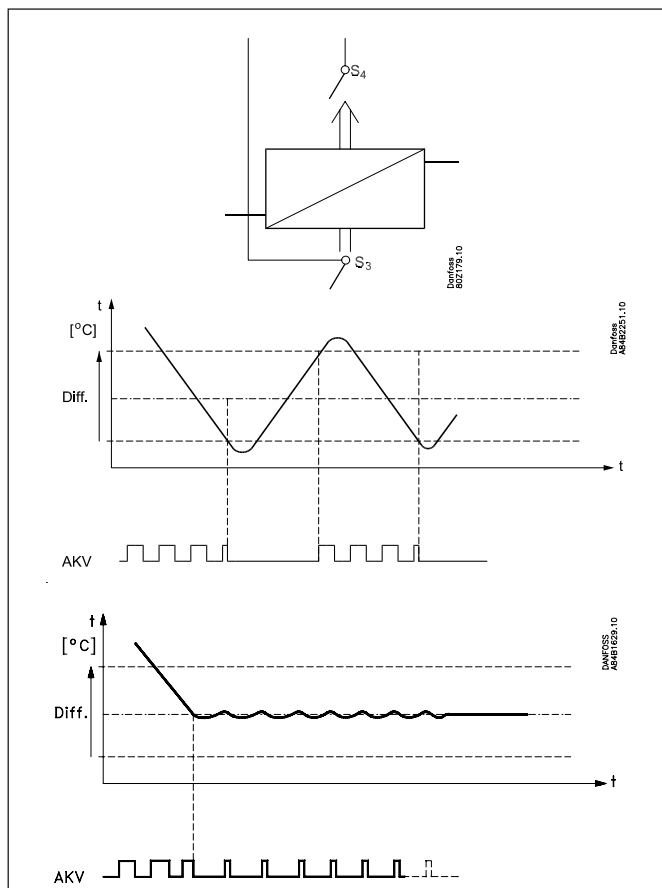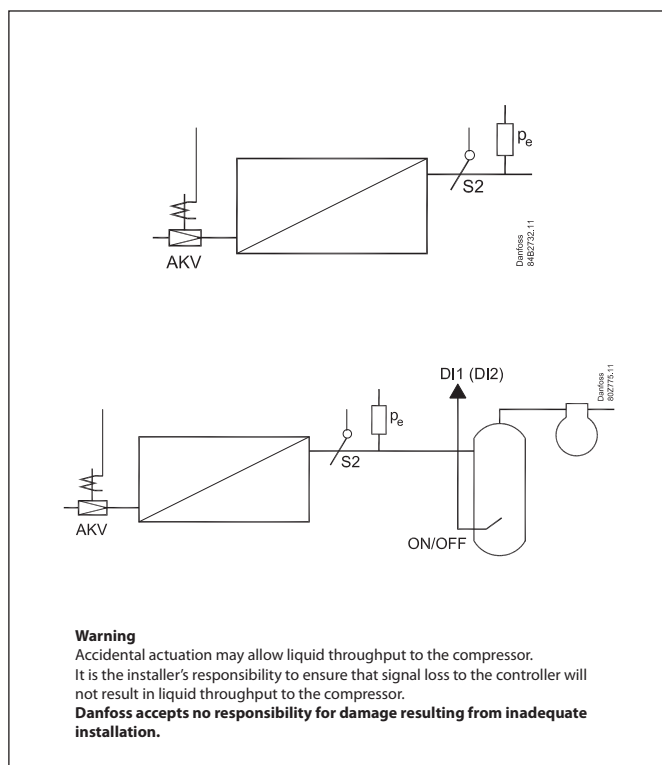
Temperature monitoring

Just as is possible for the thermostat, the alarm monitoring can be set with a weighting between S3 and S4 so that you can decide how much the two sensor values should influence the alarm monitoring. Minimum and maximum limits can be set for alarm temperature and time delays. A longer time delay can be set for high temperature alarm. This time delay is active after defrosting, appliance cleaning and start-up.

For the Multi Coil version, only the S4 sensor will be used for each section.

Thermostat bands

Thermostat bands can be used beneficially for appliances where different product types are stored, which requires different temperature conditions. It is possible to change between the two different thermostat bands via a contact signal on a digital input. Separate thermostat and alarm limits can be set for each thermostat band – also for the product sensor.
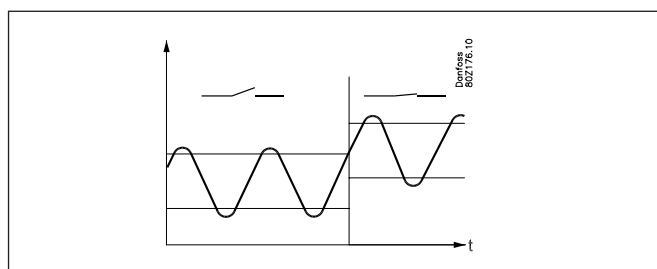
Night setback of thermostat value

In refrigeration appliances there may be big load differences between the shop's opening and closing hours, especially if night lids/blinds are used. The thermostat reference may be raised here without it having any effect on the product temperature. Change-over between day and night operation can take place as follows:
• via an external switch connected to a digital input.
• via a signal from the data communication system.
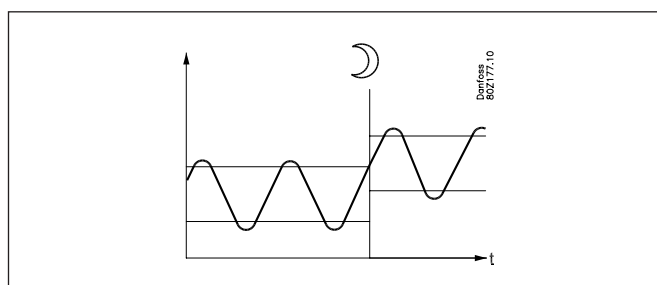
Food temperature sensor (only in Single Coil version)

A separate optional product sensor S6, which may be placed in the appliance, can also be used and can register and monitor the food temperature in the appliance. There are separate alarm limits and time delays for the product sensor.

Appliance cleaning

This function makes it easy for the shop's staff to carry out a cleaning of the appliance according to a standard procedure. Appliance cleaning is activated via a pulse signal – as a rule via a key switch placed on the appliance.

Appliance cleaning is carried out via three phases:

1. At the first activation the refrigeration is stopped, but the fans keep on operating in order to defrost the evaporators. "Fan" is shown on the display.
2. At the second activation the fans are also stopped and the appliance can now be cleaned. "OFF" is shown on the display.
3. At the third activation refrigeration is recommenced. The display will show the actual appliance temperature, (o97 setting).

When appliance cleaning is activated, a cleaning alarm is transmitted to the normal alarm recipient. A later processing of these alarms will document that the appliance has been cleaned as often as planned.

Alarm monitoring

There are no temperature alarms during appliance cleaning.

Appliance shutdown

The function closes the AKV valve and all outputs are switched off. The cooling appliance is stopped like the "Main switch", but this happens without an "A45 standby alarm".

The function can be enabled by a switch on the DI input or via a setting through data communication.

E	❄	✿	℃
-	+	+	℃
1	÷	+	Fan
2	÷	÷	Off
3	+	+	℃

Defrost
Depending on the application, you may choose between the following defrost methods:
Natural: Here the fans are kept operating during the defrost
Electric: The heating element is activated
Hot gas: Here the solenoid valves are controlled so that the hot gas can flow through the evaporator. Simple hot gas can also be used, in which the compressor units will operate during defrosting (simple hot gas can also be used in the compact version).
The compact version has defrosting with brine.

Hot gas defrost (only for application 5 in the Single Coil version)
This type of connection can be used on systems with hot gas defrost, but only in small systems, e.g. supermarkets – the functional content has **not** been adapted to industrial systems with large charges.
Relay 2 is used for the suction valve
Relay 3 is used for the bypass valve
Relay 4 is used for the hot gas valve
If the valves PMLX and GPLX are used, the delay time "d23" will have to be properly set.
It is not possible to start a manual hot gas defrost via the display or the app.

Start of defrost
A defrost can be started in different ways:

Interval:
Defrost is started at fixed time intervals like e.g. every eighth hour. An interval must ALWAYS be set to a "higher" value than the period set between two defrostings when a schedule or network signal is used.

Week schedule:
Here defrost can be started at fixed times of the day and night. However, max. 6 times.

Contact:
Defrost is started with a contact signal on a digital input.

Network:
The signal for defrost is received from a system unit via the data communication.

Adaptive defrost:
Here defrosting is started based on intelligent registering of evaporator performance.

Max. thermostat runtime:
When the aggregate time has passed a preset value, a defrost will be initiated.

Manual:
An extra defrost can be activated from the defrost button (though, not with application 6) or via a parameter setting.

All the mentioned methods can be used randomly – if just one of them is activated a defrost will be started.

Stop of defrost
Defrosting can be stopped by either:
• Time
• Temperature (with time as safety).

Compressor
If the defrosting method is set to "Gas," the compressor will be "On" during the defrost cycle. (Only for application situations that include a compressor output).

Fans
The fans can be stopped or operated during defrosting. They can also run and then be stopped at a set temperature. The temperature signal is obtained from the defrost stop sensor.

Defrost sequence
1) Pump down
2) Defrost
3) Waiting position after defrost
4) Draining (drain delay. Hot gas only)
5) Drip off
6) Delay of fan

Hot gas application
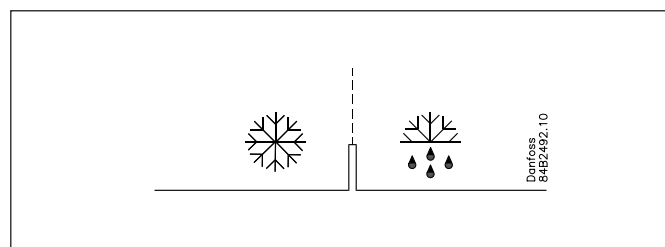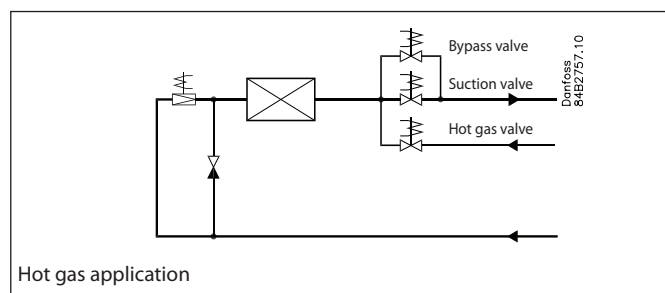
Real-time clock
The controller has a built-in real-time clock which can be used to start defrosts. This clock has a power reserve of four days.
If the controller is equipped with data communication, the clock will automatically be updated from the system unit.

Coordinated defrost
There are two ways in which coordinated defrost can be arranged. Either with wire connections between the controllers or via data communication:

Wire connections
The digital input DI2 must be configured for coordinated defrost and wiring must be connected between the relevant controllers. When one controller starts a defrost, all the other controllers will follow suit and likewise start a defrost. After the defrost the individual controllers will move into waiting position. When all are in waiting position there will be a change-over to refrigeration.

Coordination via data communication
Here the system manager handles the coordination.
The controllers are gathered in defrosting groups and the system manager ensures that defrosting is started in the group according to a weekly schedule.
When a controller has completed defrosting, it sends a message to the system unit and then goes into a waiting position. When every controller in the group is in a waiting position, refrigeration is again permitted in all the individual controllers.
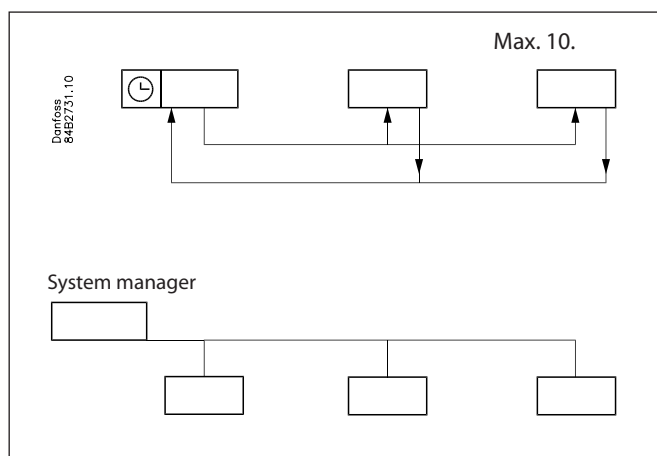
Adaptive defrosting
The Danfoss adaptive defrost algorithm detects the amount of ice build-up and cancels a scheduled defrost, or it can be set up to only perform defrost if the evaporator air flow is getting interrupted by frost or ice.

The overall concept is based on comparison of the energy uptake on the refrigerant flow side with the energy emission on the air flow side. When the evaporator is clean an energy balance is assumed, while a growing imbalance can be identified when ice formation is build up on the evaporator surface ending up with blocked airflow.

4 different adaptive defrost modes are available:

0 Off

1. Monitoring:
Can be set up in parallel to other defrost methods and generate an alarm in case of blocked air flow / ice-up of the evaporator. If flash gas issues are detected on the refrigerant flow side, a flash gas alarm is generated.

2. Adaptive skip day:
Allows the controller to cancel (skip) defrosts scheduled within day time. Defrosts scheduled at night operation will be carried through and not skipped. Only defrosts that are set up via a schedule in the frontend using master control functions or set up via the internal defrost schedule in the controller can be skipped.

3. Adaptive skip day and night:
With this set-up, the controller can allow to cancel (skip) defrosts scheduled both within day time and within night time.

For safety reasons max. 3 consecutive defrosts can be skipped, where after the 4th scheduled defrost will be performed even if only little ice should be present.

4 Full adaptive:
Full Adaptive mode is ideal for applications where defrost is not requested to be performed at a certain time, but can be performed whenever ice is starting to interrupt the airflow. It makes sense to combine this mode with the defrost interval timer as a safety timer.

Adaptive defrosting requires the following connections:
- Expansion valve type AKV
- Pe evaporator pressure and S2 gas out temperature
- Temperature signal from both S3 and S4. Sensors must be placed in the airflow/channel immediately before / after the evaporator.
- Condensing pressure Pc and temperature Tc is distributed via the network from the system manager. If Pc and Tc is not received by the case controller, the adaptive defrost function is disabled.

Note:
Adaptive parameters will be reset after a defrost has been initiated or at main switch in stopped or service mode. At start up with a warm evaporator (measured with S2 sensor), the evaporator is presumed clean. If the evaporator temperature is measured below 0.1 °C, adaptive defrost will request a defrost start to secure a clean evaporator.

Min. time between defrosts
There is a preset 2 hours minimum time between defrosts. This avoids that planned defrosts in accordance with the weekly schedule are carried out immediately after an adaptive defrost has been carried out. The time applies from when an adaptive defrost has been completed to when a planned defrost is again permitted. The adaptive defrost will not start defrosting with a shorter interval than the 2 hours either.

Melt function
This function will prevent the air flow in the evaporator from being reduced by frost created by uninterrupted operation for a long time.
The function is activated if the thermostat temperature has remained in the range between -5°C and +10°C for a longer period than the set melting interval. The refrigeration will then be stopped during the set melting period. The frost will be melted so that the air flow and hence the evaporator's capacity will be greatly improved.

Control of two compressors
The two compressors must be of the same size.
They can run cyclically or sequentially.
When the controller demands refrigeration, it will first cut in the compressor with the shortest operating time. After the time delay, the second compressor will be cut in.

Cyclic control
When the temperature has dropped to "the middle of the differential", the compressor with the longest operation time will be cut out.
The running compressor will continue until the temperature has reached the cut-out value. Then it will cut out. When the temperature again reaches the middle of the differential, a compressor will again be started.
If one compressor cannot maintain the temperature within the differential, the second compressor will also be started.
If one of the compressors has run on its own for two hours, the compressors will be changed over so that operational time is balanced.
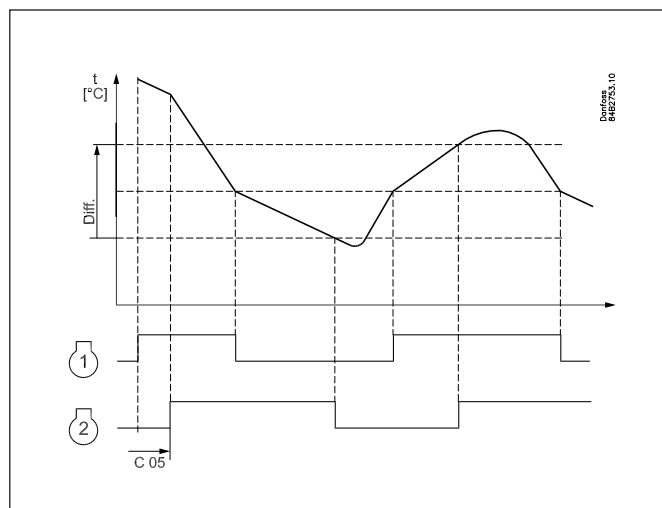
The two compressors must be of a type that can start up against a high pressure.
The compressor's settings for "Min. On time" and "Min. Off time" will always have top priority during normal regulation. But if one of the override functions is activated, the "Min. On time" will be disregarded.

Rail heat
It is possible to pulse-control the power to the rail heat in order to save energy. Pulse control can either be controlled according to day/night load or dew point.

Relay or analogue output
A relay output can be used when long cycle times are permitted. If fast pulsing is required, the AO1/PWM output can be used. The output must be connected to an external power solid state relay. The cycle time must be configured for the relay output in o43 or for analogue output in P82.

Pulse control according to day and night
Various ON periods can be set for day and night operation.
A cycle time is set as well as the percentage part of the period in which the rail heat is ON.

Pulse control according to dew point
In order to use this function, a system manager of the type AK-SM is required which can measure dew point and distribute to the appliance controllers. For this the rail heat's ON period is controlled according to the distributed dew point.
Two dew point values are set in the appliance control:
• One where the effect must be max. i.e.100%. (o87)
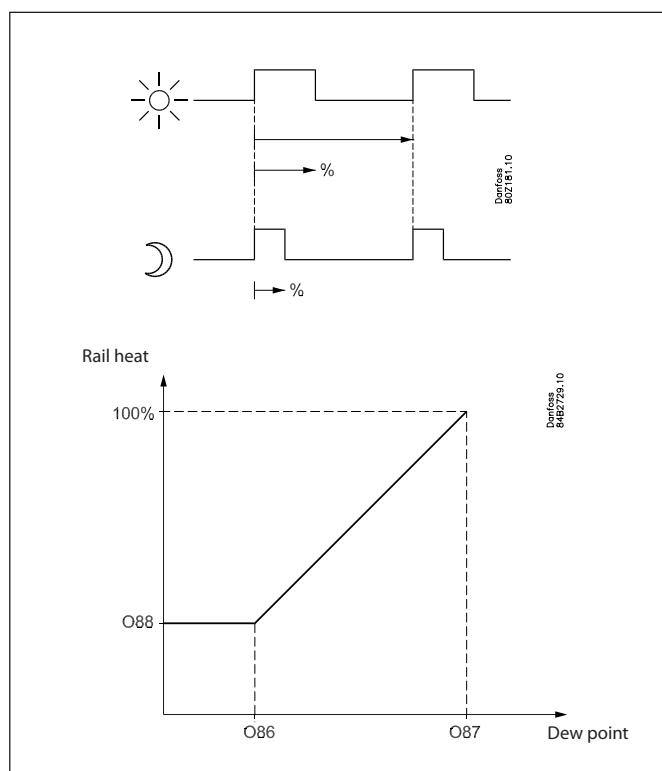
• One where the effect must be min. (o86).
At a dew point which is equal to or lower than the value in 086, the effect will be the value indicated in o88.
In the area between the two dew point values, the controller will manage the power to be supplied to the rail heat.

During defrosting
During defrosting rail heat will be active, as selected in setting d27.

Fan

Pulse control
To obtain energy savings it is possible to pulse control the power supply to the evaporator fans.
Pulse control can be accomplished in one of the following ways:
- during the thermostat's cut-out period (cold room)
- during night operation and during the thermostat's cut-out period (appliance with night lid)
(The function is not actual when r14=2, i.e. modulating regulation).
A period of time is set as well as the percentage of this period of time where the fans have to be operating.
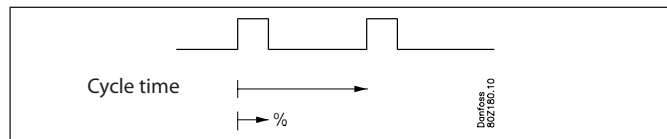
Cut-out of fans during plant breakdowns
If the refrigeration in a breakdown situation stops, the temperature in the cold room may rise quickly as a result of the emission of heat from large fans. In order to prevent this situation, the controller can stop the fans if the temperature at S5 exceeds a set limit value. (The function can also be used as a type of MOP function. Here the load on the compressors is limited until the S5 temperature has fallen below the configured value).

Eco operations (only with custom application)
Reduced fan speed is permitted when the night blind is down. (Fan with changeover between two speeds).
Eco operation is not permitted if the heat function is activated.

Light function

The function can be used for controlling the light in a refrigeration appliance or in a cold room. It can also be used for controlling a motorised night blind.

The light function can be defined in several ways:
- the light is controlled via a signal from a door contact.
  The light is kept on for a set time after the door has been closed.
- the light is controlled via the day/night function.
- the light is controlled via a DI input or remote light control from system unit.
- the light is controlled via the data communication from a system unit.
Here there are two operational options if data communication should fail:
  - The light can go ON.
  - The light can stay in its current mode.

The light load must be connected to the NC terminals on the relay. This ensures that the light remains on in the appliance if power to the controller should fail.
A setting defines how light is controlled when regulation is stopped via r12 Main switch = OFF (see o98). The light is switched off when the appliance cleaning function is activated (only with custom set-up and when light relay is configured).

Night blind

Motorised night blinds can be controlled automatically from the controller. The night blinds will follow the status of the light function. When the light is switched on, the night blinds open and when the light is switched off, the night blinds close again. When the night blinds are closed, it is possible to open them using a switch signal on the digital input. If this pulse signal is activated, the night blinds will open and the refrigeration appliance can be filled with new products. If the pulse signal is activated again, the blinds close again.
When the night blind function is used, the thermostat function can control with different weighting between the S3 and S4 sensors. A weighting during day operation and another when the blind is closed.
A night blind is opened when the appliance cleaning function is activated.
A setting can define that the night blind is opened when "r12" (Main switch) is set to off (see o98).
When the night blind rolls down, the fan will be stopped for the set time. The night blind can thereby roll down to the correct position.

Humidity control

The controller measures the humidity via a 0 – 10 V signal from a humidity sensor. The humidity control works as a simple on/off signal to a humidifier.
If the humidity gets below the set cut-in value, humidification is started via a DO signal to a humidifier.
If the humidity increases to set cut-in value + differential humidification is stopped.
Alarm at too low or too high humidity values after a set alarm delay.
Option for disabling humidity control during defrost cycle.
If the measured air temperature used for the temperature control is getting below 2 degrees Celsius, the humidification is disabled. The air temperature must increase 1 degree Celsius in order to re-enable humidification again.

Digital inputs

There are two digital inputs, DI1 and DI2, with dry contact function, and one digital input DI3 with high voltage signal. They can be used for the following functions:
- status readout of input signal (no action)
- door contact function with alarm
- starting a defrost
- main switch - start/stop of cooling
- night setback
- thermostat band's switch
- general alarm monitoring (DI1 and DI2 only)
- appliance cleaning
- case shutdown
- forced cooling
- override of night blinds
- allow operation with adaptive liquid control (ALC)
- coordinated defrost (DI2 only)
- forced closing of valve
- monitoring of refrigerant leakage

Forced closing

The AKV valves can be closed with an external signal ("Forced closing").

The function must be used in connection with the compressor's safety circuit, so that there will be no injection of liquid into the evaporator when the compressor is stopped by the safety controls and can't start again (However not at low pressure – LP).

Via a setting (see o90 Fan at forced closing) it is possible to define whether an on-going defrost is allowed to continue at forced closing or whether the defrost is put in standby position for a period of up 10 minutes before it is cancelled - this feature can be used to in CO_2 systems to eliminate excessive heating while compressors cannot run.

The signal can be received from the DI3-input or via the data communication. During a forced closing, the fans can be defined to be stopped or in operation.

Door contact

The door contact function can via the digital inputs be defined for two different applications:

Alarm monitoring:
The controller monitors the door contact and delivers an alarm message if the door has been opened for a longer period than the set alarm delay.

Alarm monitoring and stop of refrigeration:
When the door is opened, the refrigeration is stopped, i.e. the injection, the compressor and the fan are stopped and light switches on.
If the door remains open for a longer time than the set restart time, refrigeration will be resumed. This will ensure that refrigeration is maintained even if the door is left open or if the door contact should be defective. If the door remains open for a longer period than the set alarm delay, an alarm will also be triggered.

Heating function (only with custom setup)

The heating function is used to prevent the temperature from becoming too low, e.g. in a cold room, etc. The limit for when the heating function cuts off is set as an offset value below the current cut-out limit for the refrigeration thermostat. This ensures that refrigeration and heating do not occur simultaneously. The difference for the heating thermostat has the same value as for the refrigeration thermostat. To prevent that the heating thermostat cuts in during short-term drops in air temperature, a time delay can be set for when to change from refrigeration to heating.

Function	Input / Settings menu			Setting
	DI1	DI2	DI3	
	o02	o37	o84	
Not used	+	+	+	0
Follow DI status	+	+	+	1
Door contact function	+	+	+	2
Door alarm	+	+	+	3
Start defrost	+	+	+	4
Main switch	+	+	+	5
Night operation	+	+	+	6
Thermostat band	+	+	+	7
DI Alarm at closed	+	+		8
DI Alarm at open	+	+		9
Appliance cleaning	+	+	+	10
Forced cooling	+	+	+	11
Night blinds	+	+	+	12
Coordinated defrost		+		13
Forced closing	+	+	+	14
Appliance shutdown	+	+	+	15
Light	+	+	+	16
Refrigerant alarm	+	+	+	20
Allow fluid flow at short-circuit	+	+	+	21

Example
If DI1 is to be used to start a defrost, o02 must be set to 4.
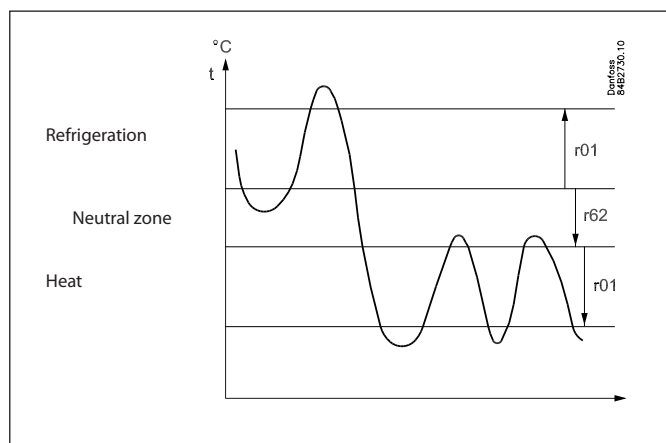
Data communication

The controller has built-in MODBUS data communication.

If there is a requirement for a different form of data communication, a Lon RS 485 module can be inserted in the controller.
The connection must then be to the module.
(This option is not available in the compact version).
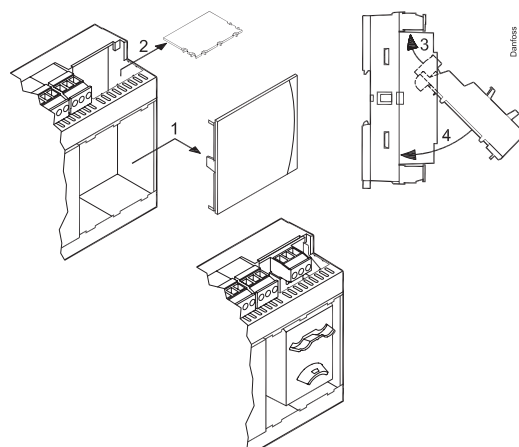
Display

The controller has one or two plugs for an external display. One of the following display types can be connected to a plug:
• AK-UI55 Info (temperature display)
• AK-UI55 Set (temperature display and operation)
• AK-UI55 Bluetooth (temperature display and app operation).
The connection between the display and the controller must be made using an AK-UI55 cable.
The distance between the controller and the display must not exceed 100 m.
If there are two external displays, it will be the sum of the two distances that cannot exceed 100 m.
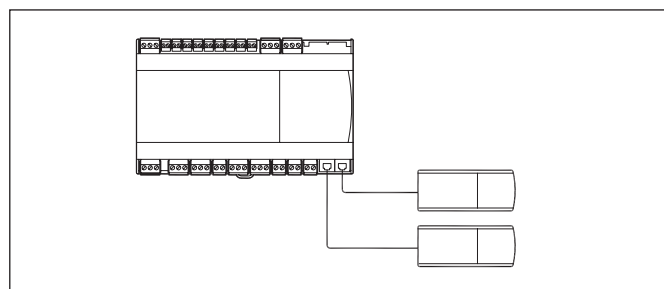
Override

The controller contains a number of functions which can be used together with the override function in the master gateway/system manager:

Function via data communication	Function in gateway/system manager	Used parameters in the controller
Start of defrosting	Defrost control / Time schedule / Defrost group	--- Def start
Coordinated defrost	Defrost control / Defrost group	--- HoldAfterDef / - - - DefrostState
Prevent defrost start		--- Disable Def
Day/Night schedule	Day/Night control / Time schedule / Light zone	--- Night setback
Light control	Day/Night control / Time schedule	O39 light Remote
Forced closing	Forced Close / Injection ON / AKC ON	--- Forced close
Forced cooling		--- Forced cool
Rail heat link to dew point	/ Enhanced rail heat	--- Act.DewPoint
P0 optimization	P0 Optimization	The controller supports P0 optimization
Adaptive defrost	/ Adaptive defrost. System manager only	- - - Tc TempMean, MC Def.start
Adaptive liquid control where fluid flow is allowed	Customized control in AK-SM 8xx On/off + Boolian logic function in AK-SM 720	- - - MC Liq. Ctrl
Case shutdown		- - - Case shutdown
Locking operation via bluetooth	Customized control in AK-SM 8xx + Boolian logic function in AK-SM 720	- - - BT lock

Survey of functions

Function	Para-meter	Parameter by operation via data communication
Normal display		
Normally the temperature value from one of the two thermostat sensors S3 or S4 or a mixture of the two measurements is displayed. In o17 the ratio is determined.		Display air (u56)
Thermostat		**Thermostat control**
Setpoint Regulation is based on the set value plus a displacement, if applicable. The value is set via a push on the centre button. The set value can be locked or limited to a range with the settings in r02 and r03. The reference at any time can be seen in "u91 Cut-out temp".	r00	Cutout °C
Differential When the temperature is higher than the reference + the set differential, the compressor relay will be cut in. It will cut out again when the temperature comes down to the set reference. Ref. Dif.	r01	Differential
Setpoint limitation The controller's setting range for the setpoint may be narrowed down, so that much too high or much too low values are not set accidentally - with resulting damages.		
To avoid a too high setting of the setpoint, the max. allowable reference value may be lowered.	r02	Max. cut-out °C
To avoid a too low setting of the setpoint, the min. allowable reference value may be increased.	r03	Min. cut-out °C
Temperature unit Set here if the controller is to show temperature values in °C or in °F.	r05	Temp. unit °C=0. / °F=1 (Only °C on AKM, whatever the setting)
Correction of signal from S4 Compensation possibility due to long sensor cable	r09	Adjust S4
Correction of signal from S3 Compensation possibility due to long sensor cable	r10	Adjust S3
Start / stop of refrigeration With this setting, refrigeration can be started, stopped or a manual override of the outputs can be allowed. (For manual control the value is set at -1.) Start / stop of refrigeration can also be accomplished with the external switch function connected to a DI input. Stopped refrigeration will give a "Standby alarm".	r12	Main Switch 1: Start 0: Stop -1: Manual control of outputs allowed
Night setback value The thermostat's reference will be the setpoint plus this value when the controller changes over to night operation. (Select a negative value if there is to be cold accumulation.)	r13	Night offset
Thermostat function Here it is defined how the thermostat is to operate. Either as an ordinary ON/OFF thermostat or as a modulating thermostat. 1: ON/OFF thermostat 2: Modulating **3:** (Multi Coil only) = shared on/off thermostat for all sections. See also r99 When operation is "modulating", the AKV valve will limit the flow of refrigerant so that the temperature variation will be less than for the ON/OFF thermostat. The differential (r01) must not be set lower than 2K for "modulating" when controlled using S3 sensors. For S4 sensors it must be even higher, e.g. 4 K. In systems with 1 compressor and 1 evaporator you must select the ON/OFF thermostat setting.	r14	Therm. mode
Selection of thermostat sensor during day operation Here you define the thermostat sensor for day operation - S3, S4, or a combination of them. With the setting 0%, only S3 is used (Sin). With 100%, only S4.	r15	Ther. S4 %

Melt function Only for control of refrigeration (-5 to +10°C). The function ensures that the evaporator will not be blocked by frost. Here you set how often the function is to stop the refrigeration and hence transform the frost to water (or ice if there is too much frost).	r16	MeltInterval
Melt period Here you set how long an on-going melt function is to last.	r17	Melt period
Setpoint 2 The thermostat's cut-out value when the thermostat band 2 is activated via a digital input.	r21	Cutout2 temp
Correction of signal from S3B Compensation possibility due to long sensor cable	r53	Adjust S3B
Correction of signal from S6 Compensation possibility due to long sensor cable	r59	Adjust S6
Selection of thermostat sensor S4% during night operation Here you define the thermostat sensor for night operation - S3, S4, or a combination of them. With the setting 0%, only S3 is used (Sin). With 100%, only S4.	r61	Ther.S4% Ngt
Heat function Set the size of the Neutral Zone for changeover from cooling to heating	r62	Heat NZ
Time delay on transition from refrigeration phase to heating phase. (there is no time delay on transition from heating phase to refrigeration phase).	r63	HeatStartDel
Food type This function configures the temperature reference and associated alarm limits: 1=Vegetables, 8 °C. 2=Milk, 0 °C. 3=Meat/fish, -2 °C. 4=Frost, -20 °C. 5=Ice, -24 °C. See overview on page 19. (After configuration the value will change back to 0).	r89	Food type
S4 Frost protection Refrigeration will stop if a lower temperature is recorded. Refrigeration will resume, when the S4 temperature has increased 2 K. Refrigeration will not stop if the threshold limit is configured to the thermostat cut-out value or higher.	r98	S4MinLimit
Select temperature signal for joint thermostat (Multi Coil and r14=3 only) 1=air temperature S4 in section A 2=average value of S4 sensors in all sections 3=highest S4 temperature of any section	r99	Ther. Sensor
		Night setbck (start of night signal. 0=Day, 1=Night)
Alarm		**Alarm settings**
The controller can give alarm in different situations. When there is an alarm, the red diode in the display is activated and the alarm relay is de-energized.		With data communication the importance of the individual alarms can be defined. Setting is carried out in the "Alarm destinations" menu via AKM.
Alarm delay (short alarm delay on air temperature) If the upper or the lower alarm limit values are exceeded, a timer function will commence. The alarm will not become active until the set time has been elapsed. The time delay is set in minutes.	A03	Alarm delay
Time delay for door alarm The time delay is set in minutes. The function is defined in o02 , o37 or in o84.	A04	DoorOpen del
Alarm delay during pulldown (long alarm delay) This time delay is used during start-up, during defrost, and after an appliance cleaning. There will be change-over to the normal time delay (A03) when the temperature has dropped below the set upper alarm limit. The time delay is set in minutes.	A12	Pulldown del
Upper alarm limit Here you set when the alarm for high temperature is to start. The limit value is set in °C (absolute value). The limit value will be raised during night operation. The value is the same as the one set for night setback, but will only be raised if the value is positive.	A13	HighLim Air

Lower alarm limit Here you set when the alarm for low temperature is to start. The limit value is set in °C (absolute value).	A14	LowLim Air
Upper alarm limit for thermostat 2 (Thermostat band 2) (Same function as for thermostat 1)	A20	HighLim2 Air
Lower alarm limit for thermostat 2 (Thermostat band 2) (Same function as for thermostat 1)	A21	LowLim2 Air
Upper alarm limit for S6 temperature at thermostat 1	A22	HighLim1 S6
Lower alarm limit for S6 temperature at thermostat 1	A23	LowLim1 S6
Upper alarm limit for S6 temperature at thermostat 2 (Thermostat band 2)	A24	HighLim2 S6
Lower alarm limit for S6 temperature at thermostat 2 (Thermostat band 2)	A25	LowLim2 S6
S6 temperature alarm delay The alarm is activated if one of the relevant alarm limits A22, A23, A24 or A25 is exceeded. The time delay is set in minutes. (Alarms will not activate when the setting is set to the maximum value.)	A26	Al. Delay S6
Delay of a DI1 alarm A cut-out/cut-in input will result in alarm when the time delay has been passed. The function is defined in o02.	A27	Al.Delay DI1
Delay of a DI2 alarm A cut-out/cut-in input will result in alarm when the time delay has been passed. The function is defined in o37.	A28	Al.Delay DI2
Signal to the alarm thermostat Here you have to define the ratio between the sensors which the alarm thermostat has to use. S3, S4 or a combination of the two. With setting 0% only S3 is used. With 100% only S4 is used.	A36	Alarm S4%
Time delay on S6 (product sensor) for pull-down (long alarm delay) This time delay is used for start-up, during defrost, immediately after a defrost and after an appliance cleaning. A change is carried out to standard time delay (A26) when the temperature has reached below the set upper alarm limit. The time delay is set in minutes.	A52	PullD del.S6
Alarm delay Short alarm delay on S3B air temperature. (The setting in A12 is used as long delay time)	A53	Al.Del.S3B
Product sensor S6 function S6 measurement, temperature display and alarm function is to be used/is not to be used.	a01	S6 function

Compressor		**Compressor control**
The compressor relay works in conjunction with the thermostat. When the thermostat calls for refrigeration, the compressor relay is activated.		
Running times To prevent irregular operation, values can be set for the time the compressor is to run once it has been started. And for how long it at least has to be stopped. The running times are not observed when defrosts start.		
Min. ON-time (in minutes)	c01	Min. On time
Min. OFF-time (in minutes)	c02	Min. Off time
Time delay for couplings of two compressors Settings indicate the time that has to elapse from the first relay cuts in and until the next relay has to cut in.	c05	Step delay
Choice of connection method for dual compressor operation: 1: Sequential (first in, last out) 2. Cyclical (equalisation of on-time)	c08	Step mode
The LED on the display front will show whether refrigeration is in progress.		u58 comp1/LLSV Here you can read the status of the compressor relay.

Defrost		Defrost control
The controller contains a timer function that is zero-set after each defrost start. The timer function will start a defrost if/when the interval time is passed. The timer function starts when voltage is connected to the controller, but it is displaced the first time by the setting in d05. If there is power failure, the timer value will be saved and continue from here when the power returns. This timer function can be used as a simple way of starting defrosts, but it will always act as safety defrost if one of the subsequent defrost starts is not received. The controller also contains a real-time clock. By means of settings of this clock and times for the required defrost times, defrost can be started at fixed times of the day. Defrost start can also be accomplished via data communication, via contact signals or manual start-up. All starting methods will function in the controller. The different functions have to be set, so that multiple defrosts are avoided. Defrost can be accomplished with electricity, hot gas or brine. The actual defrost will be stopped based on time or temperature with a signal from a temperature sensor.		
Defrost method Here you set whether defrost is to be accomplished with electricity, gas, or (none). During defrost the defrost relay will be cut in. 0 = No defrost, 1 = El, 2 = Gas, 3=Brine, 4=air circulation only	d01	Def. method
Defrost stop temperature The defrost is stopped at a given temperature which is measured with a sensor (the sensor is defined in d10). The temperature value is set.	d02	Def. Stop Temp
Interval between defrost starts The function is zero-set and will start the timer function at each defrost start. When the time has expired, the function will start a defrost. The function is used as a simple defrost start, or it may be used as a safeguard if the normal signal fails to appear. If master/slave defrosts without clock function or without data communication is used, the interval time will be used as max. time between defrosts. If a defrost start via data communication does not take place, the interval time will be used as max. time between defrosts. When there is defrost with clock function or data communication, the interval time must be set for a somewhat longer period of time than the planned one, as the interval time will otherwise start a defrost, which a little later will be followed by the planned one. In connection with power failure, the interval time will be maintained, and when the power returns, the interval time will continue from the maintained value. The interval time is not active when set to 0.	d03	Def Interval (0=off)
Max. defrost duration This setting is a safety time so that the defrost will be stopped if there has not already been a stop based on temperature or via coordinated defrost. (The setting is the defrost time if d10 is set to 0.)	d04	Max Def. time
Time staggering for defrost cut-ins during start-up The function is only relevant if you have several refrigeration appliances or groups where you want the defrost to be staggered in relation to one another. The function is furthermore only relevant if you have chosen defrost with interval start (d03). The function delays the interval time d03 by the set number of minutes, but it only does it once, and this at the very first defrost taking place when voltage is connected to the controller. The function will be active after each and every power failure.	d05	Time Stagg.
Drip-off time Here you set the time that is to elapse from a defrost and until the compressor is to start again. (The time when water drips off the evaporator).	d06	DripOff time

Delay of fan start after defrost Here you set the time that is to elapse from compressor start after a defrost and until the fan may start again. (The time when water is "tied" to the evaporator).	d07	FanStartDel
Fan start temperature The fan may also be started a little earlier than mentioned under "Delay of fan start after defrost", if the defrost sensor S5 registers a lower value than the one set here.	d08	FanStartTemp
Fan cut-in during defrost Here you can set whether fan is to operate during defrost. 0: Stopped (runs during pump down) 1: Running (stopped during "fan delay") 2: Running during pump down and defrost. After that stopped. 3: Running, but stops at the set d41 temperature	d09	FanDuringDef
Defrost sensor Here you define the defrost sensor. 0: None, defrost is based on time 1: S5 2: S4	d10	DefStopSens.
Pumpdown delay Set the time where the evaporator is emptied of refrigerant prior to the defrost.	d16	Pump dwn del.
Drain delay (only in connection with hot gas) Set the time where the evaporator is emptied of condensed refrigerant after the defrost.	d17	Drain del
Defrost on demand – aggregate refrigeration time Set here is the refrigeration time allowed without defrosts. If the time is passed, a defrost will be started. With setting = 0 the function is cut out.	d18	MaxTherRunT
Adaptive defrosting An adaptive defrosting is an extra defrost in addition to the scheduled defrosts or a cancellation of a scheduled defrost. Here the adaptive defrost is set for when it can come into operation if the need arises: 0: Never, 1: Never, but triggers an alarm in the case of icing up 2: Cancellation of day schedule is permitted. Night schedule is carried out. 3: Cancellation of day schedule is permitted. Cancellation of night schedule is permitted. 4: All schedules are carried out + extra if it is registered that it is required. (Reset: Temporary setting to 0 will reset the recorded values and start a new calculation of the evaporator airflow.)	d21	AD mode
Time delay before opening of hot gas valve, so a PMLX valve can close.	d23	HotGasInjDel
Rail heat during defrost 0: Off 1: On 2: Pulsating	d27	Railh. at def.
Max. duration of -d- in the display Controls the readout of "-d-" after defrost, thus "-d-" is shown until the temperature is OK, set delay has expired, or a temperature alarm will occur. The delay time starts when the fan delay time has expired.	d40	Disp. d del.
Fan stop temperature during defrosting When the defrost stop temperature reaches the set value, the fans will stop. (If d09 is set to 3.)	d41	Def fan stop
If you wish to see the temperature at the defrost sensor, push the controller's lowermost button. (May be changed to another function in o92.)		Defrost temp.
If you wish to start an extra defrost, push the controller's lowermost button for four seconds. You can stop an ongoing defrost in the same way		Def Start Here you can start a manual defrost
		Def. stop Here you can stop any ongoing defrost.
		Hold After Def Shows ON when the controller is operating with coordinated defrost.

			Disable def. All defrost starters will be blocked if ON is selected.
			MC def. start Use of external diagram. Adaptive start and cancellation of defrost is permitted.
			Defrost State Status on defrost On= pump down / defrost
			Tc temp. Air Median Tc temperature from system unit
Injection function			
Max. value for the superheat reference	n09	Max SH	
Min. value for the superheat reference	n10	Min SH	
MOP temperature If the MOP function is not desired, the setting must be set to OFF. The MOP feature can also be used to close AKV valve, if centralized compressor pack has stopped running.	n11	MOP temp A value of 15 will equal OFF	
AKV valve cycle time in seconds (Should only be configured to a lower value if the system is decentralised and the suction pressure varies significantly and in line with the opening of the AKV valve.	n13	AKV Period	
Period for pulse width modulation (PWM). Brine management Expert setting - The value should be changed **only** by specially trained personnel.	n63*	Pwm Period	
Max. opening degree for PWM	n64*	Pwm Max. OD	
Min. opening degree for PWM	n65*	Pwm Min. OD	
Wind up factor for PWM Expert setting - The value should be changed **only** by specially trained personnel.	n66*	PwmWindUpFac	
Ampflication factor for PWM Expert setting - The value should be changed **only** by specially trained personnel.	n67*	Pwm Kp fact.	
Integration time for PWM Expert setting - The value should be changed **only** by specially trained personnel.	n68*	Pwm Tn sec	
Info 1. Superheat regulation can be changed from adaptive regulation to load-defined superheating. Changes are to be made in menu n21 "For Danfoss only". 2. For regulation with "zero degree superheat" (adaptive liquid regulation), the setting values for superheating can be seen in P86 and P87.			
			Forced cool. (start of forced cooling)
			Forced close (forced stop of cooling)
Fan			**Fan control**
Fan stop temperature The function stops the fans in an error situation, so that they will not provide power to the appliance. If the defrost sensor registers a higher temperature than the one set here, the fans will be stopped. There will be re-start at 2 K below the setting. The function is not active during a defrost or start-up after a defrost. With setting +50°C the function is interrupted.	F04	FanStopTemp.	
Pulse operation of fan 0: No pulse operation 1: Pulse operation when the thermostat does not call for refrigeration 2: Pulse operation when the thermostat does not call for refrigeration, but only during night operation	F05	FanPulseMode	
Pulse operation period for fan Here the overall pulse time is set. The sum of ON-to and OFF time.	F06	Fan cycle	
ON time for fan Here the % part of the period the fans are to be in operation is set.	F07	Fan ON %	
The LED on the display front will indicate whether a defrost is going on.		u59 Fan Relay	

*Settings n63 - n68 are only used in compact version when a brine valve is used for modulating temperature control.

Internal defrosting schedule/clock function		
Start/stop of internal defrosting forms Off: The subsequent defrosting schedule is not used. A defrost start signal is issued by the system unit. On: The subsequent settings are used. Up to 6 individual times can be set for the defrost start throughout the day.	t00	Def. Schedule
Defrost start, hour setting	t01-t06	
Defrost start, minute setting (1 and 11 belong together, etc.) When all t01 to t16 equal 0 the clock will not start defrosts.	t11-t16	
Real-time clock: Setting the clock is only necessary when there is no data communication. In the event of a power failure of less than four hours, the clock function will be saved.		
Clock: Hour setting	t07	
Clock: Minute setting	t08	
Clock: Date setting	t45	
Clock: Month setting	t46	
Clock: Year setting	t47	
Defrost schedule for Mondays. Is active at On	t51	Mon Schedule
Defrost schedule for Tuesdays. Is active at On	t52	Tue Schedule
Defrost schedule for Wednesdays. Is active at On	t53	Wed Schedule
Defrost schedule for Thursdays. Is active at On	t54	Thu Schedule
Defrost schedule for Fridays. Is active at On	t55	Fri Schedule
Defrost schedule for Saturdays. Is active at On	t56	Sat Schedule
Defrost schedule for Sundays. Is active at On	t57	Sun Schedule
Humidity function		**Humidity control**
Setpoint for cut-in of humidity function. Here you can configure the lower humidity limit at which the humidifier function will be activated.	h23	RH Cutin SP
Difference for humidity function. When the relative humidity becomes higher than the configured setpoint + differential, the humidity function will be stopped.	h24	RH Diff.
Alarm limit for high humidity (too damp). If the measured value is higher than the configured value, an alarm will be issued.	h25	RH HighLimAl
Alarm limit for low humidity (too dry). If the measured value is lower than the configured value, an alarm will be issued.	h26	RH LowLimAl
Delay time for a humidity alarm. The alarm can be delayed by a number of minutes after the threshold value has been exceeded.	h27	RH AL. delay
Humidity function during defrosting. This is where you configure whether the humidifier function can be activated when defrost is ongoing.	h28	RH CtrlAtDef
RH% at input signal of 0 V. This is where you configure the humidity for which 0 V will be received from the humidity sensor.	h29	RH Min. Value
RH% at input signal of 10 V. This is where you configure the humidity for which 10 V will be received from the humidity sensor.	h30	RH Max. Value
This is where you configure whether humidity management is required.	h31	RH function
Miscellaneous		**Miscellaneous**
Delay of output signal after power failure By start-up after a power failure the controller's functions can be delayed so that overloading of the electricity supply network is avoided. Here you can set the time delay.	o01	DelayOfOutp.

Digital input signal - DI1 The controller has a digital input 1 which can be used for one of the following functions: Off: The input is not used 1) Status display of a contact function 2) Door function. When the input is open it signals that the door is open. The refrigeration and the fans are stopped and light switched on. When the time setting in "A04" is passed, an alarm will be given and refrigeration will be resumed (o89). 3) Door alarm. When the input is open, it signals that the door is open. When the time setting in "A04" is passed, there will be an alarm. 4) Defrost. The function is started with a pulse signal. The controller will register when the DI input is activated. The controller will then start a defrost cycle. 5) Main switch. Regulation is carried out when the input is short-circuited, and regulation is stopped when the input is put in pos. OFF. 6) Night operation. When the input is short-circuited, there will be regulation for night operation. 7) Thermostat band changeover. Switch to thermostat 2 (r21) when the input is short-circuited. 8) Separate alarm function. Alarm will be given when the input is short-circuited. 9) Separate alarm function. Alarm will be given when the input is opened. (For 8 and 9 the time delay is set in A27) 10) Appliance cleaning. The function is started with a pulse signal. See also description on page 40. 11) Forced refrigeration at hot gas defrost when the input is short-circuited. 12) Night blinds. When the input is short-circuited, the night blinds open. 13) Not used. 14) The cooling is stopped with the function "Forced closing" when the input is open 15) Case shutdown when the input is closed. 16) The light turns on when the input is closed (o38 must be set to "5") 20) Refrigerant leak alarm 21) Allow liquid flow in the evaporator when the input is short-circuited	o02	DI 1 Config. The definition happens with the number value shown to the left. (0 = off) DI state (Measurement) Here the current status of the DI input is shown. ON or OFF.
If the controller is built into a network with data communication, it must have an address, and the master gateway of the data communication must then know this address.		
The address is set between 0 and 240, depending on the system unit and the selected data communication. If the system unit is gateway type AKA 245, the version must be 6.20 or higher.	o03	
o04 is only used when the data communication is Lon 485. The address is sent to the gateway when the menu is set in pos. ON IMPORTANT: Before you set o04, you MUST set o61. Otherwise you will be transmitting incorrect data.	o04	
Access code 3 (Access to all settings) If the settings in the controller are to be protected with an access code, you can set a numerical value between 1 and 999. If no restrictions are desired, the setting must be 0.	o05	Acc. code 3
Sensor type for S3, S4, S5 Normally a Pt 1000 AKS11 sensor with great signal accuracy is used. But you can also use a PTC 1000 EKS111 sensor, Ntc5K EKS211 sensor or Ntc 10K EKS221 sensor with another signal accuracy. All the mounted sensors S3-S5 must be of the same type.	o06	SensorConfig Pt = 0 PTC = 1 Ntc 5K = 2 Ntc 10K = 3
Max. standby time after coordinated defrost When a controller has completed a defrost it will wait for a signal which tells that the refrigeration may be resumed. If this signal fails to appear for one reason or another, the controller will itself start the refrigeration when this standby time has elapsed.	o16	Max HoldTime
Select signal for the display S4% (Only Compact and Single Coil) Here you define the signal to be shown by the display. S3, S4, or a combination of the two. With setting 0% only S3 is used. With 100% only S4.	o17	Disp. S4%
Pe. working range for pressure transmitter - min. value	o20	MinTransPres
Pe. working range for pressure transmitter - max. value	o21	MaxTransPres

Refrigerant setting (only if "r12" = 0) Before refrigeration is started, the refrigerant must be defined. You may choose between the following refrigerants: 1=User defined with 3 digits, see P83-85. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined with 5 digits. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F. 38=R1234ze. 39=R1234yf. 40=R448A. 41=R449A. 42=R452A. 43=R450A. 45=R454B. 46=R1233zdE. 47=R1234zeZ. 48=R449B. 49=R407H *Warning: Wrong selection of refrigerant may cause damage to the compressor.* Other refrigerants: Choose setting 1 or 13 and configure three factors: P83, P84, P85 or -Ref.Fac A1, A2 and A3 - via the system unit or the app.	o30	Refrigerant
Digital input signal - D2 The controller has a digital input 2 which can be used for one of the following functions: Off: The input is not used. 1) Status display of a contact function. 2) Door function. When the input is open it signals that the door is open. The refrigeration and the fans are stopped. When the time setting in "A04" is passed, an alarm will be given and refrigeration resumed. (o89). 3) Door alarm. When the input is open it signals that the door is open. When the time setting in "A04" is passed an alarm will be given. 4) Defrost. The function is started with a pulse signal. The controller will register when the DI input is activated. The controller will then start a defrost cycle. If the signal is to be received by several controllers it is important that ALL connections are mounted the same way (DI to DI and GND to GND). 5) Main switch. Regulation is carried out when the input is short-circuited, and regulation is stopped when the input is put in pos. OFF. 6) Night operation. When the input is short-circuited, there will be regulation for night operation. 7) Thermostat band changeover. Switch to thermostat 2 (r21) when the input is short-circuited. 8) Separate alarm function. Alarm will be given when the input is short-circuited. 9) Separate alarm function. Alarm will be given when the input is opened. 10) Appliance cleaning. The function is started with a pulse signal. See also description on page 40. 11) Forced refrigeration at hot gas defrost when the input is short-circuited. 12) Night blinds. When the input is short-circuited the night blinds will be activated. 13) The input is used for coordinated defrost in conjunction with other controllers of the same type. 14) The cooling is stopped with the function "Forced closing" when the input is open. 15) Case shutdown when the input is closed. 16) The light turns on when the input is closed (o38 must be set to "5"). 20) Refrigerant leak alarm. 21) Allow liquid flow in the evaporator when the input is short-circuited.	o37	DI2 config.
Configuration of light function (If night blind is selected, it will be synchronised with the light function). 1) Light is controlled via day/night status. 2) Light is controlled via data communication and "Light remote o39". 3) Light is controlled by door contact, defined in either o02, o37 or o84 where the setting is selected to either 2 or 3. When the door is opened, the relay will cut in. When the door is closed again there will be a time delay of two minutes before the light is switched off. 4) As "2" but if there are any 15-minute network errors, the light will switch on and the night blind will open. 5) The light is controlled via a DI1-3 input.	o38	Light config
Activation of light relay The light relay can be activated here, but only if defined in o38 with setting 2 or 4.	o39	Light remote
Rail heat during day operation The ON period is set as a percentage of the time.	o41	Railh.ON day%
Rail heat during night operation The ON period is set as a percentage of the time.	o42	Railh.ON ngt%
Rail heat cycle when using a relay for the function The period of time for the aggregate ON time + OFF time is set in minutes (If the analogue output AO1 is used for the function, the period must be configured in P82).	o43	Railh. cycle

Appliance cleaning The status of the function can be followed here or the function can be started manually. 0 = Normal operation (no cleaning) 1 = Cleaning with fans operating. All other outputs are Off. 2 = Cleaning with stopped fans. All outputs are Off. If the function is controlled by a signal at the DI1, DI2 or DI3 input, the relevant status can be seen here in the menu.	o46	Case clean
Selection of application The controller can be defined in various ways. Here you set which of the applications is required. On page 6-14 you can see a survey of applications. *This menu can only be set when regulation is stopped, i.e. "r12" is set to 0.*	o61	Appl. Mode
Access code 2 (Access to adjustments) This code provides access to adjustment of most values but not configuration settings. If access is required to make adjustments, choose a numerical value between 1 and 999. If not, you can cancel the function with setting 0. If the function is used, access code 1 (o05) **must also** be used.	o64	Acc. code 2
Save as factory setting With this setting you save the controller's actual settings as a new basic setting (the earlier factory settings are overwritten).	o67	-
Digital input signal - DI3 (high voltage input) The controller has a digital input 3 which can be used for one of the following functions: Off: The input is not used. 1) Status display of 230 V signal 2) Door function. When the input is 0 V it signals that the door is open. The refrigeration and the fans are stopped. When the time setting in "A04" is passed, an alarm will be given and refrigeration resumed. (o89). 3) Door alarm. When the input is 0V it signals that the door is open. When the time setting in "A04" is passed, an alarm will be given. 4) Defrost. The function is started with a pulse signal (pulse on 230 V). 5) Main switch. Regulation is carried out when the input is 230 V and regulation is stopped when the input is 0 V. 6) Night operation. When the input is 230 V, there will be regulation for night operation. 7) Thermostat band changeover. Switch to thermostat 2 (r21) when the input is 230 V. 8) Not used. 9) Not used. 10) Appliance cleaning. The function is started with a pulse signal (pulse on 230 V). See also description on page 40. 11) Forced refrigeration at hot gas defrost when the input is 230 V. 12) Night blinds. When the input is 230 V the night blinds will be activated. 13) Not used. 14) The cooling is stopped with the function "Forced closing" when the input is open 15) Case shutdown when the input is 230 V. 16) The light turns on when the input is 230 V (o38 must be set to "5") 20) Refrigerant leak alarm 21) Allow liquid flow in the evaporator when the input is 230 V.	o84	DI3 config.
Rail heat control The rail heat can be controlled in several ways: 0: The function is not used. 1: Pulse control is used with a timer function following the day/night operation (o41 and o42). 2: Pulse control is used with a dew point function. This function requires that a signal is received about the dew point value. The value is measured by a system manager and sent to the controller via the data communication.	o85	Railh. mode
Dew point value where the rail heat is minimum This function is discussed earlier in the manual.	o86	DewP Min. lim
Dew point value where the rail heat is maximum This function is discussed earlier in the manual.	o87	DewP Max. lim
Lowest permitted rail heat effect This function is setting the minimum power to the rail heat independent of dew point.	o88	Rail Min. ON%
Start of refrigeration when door is open If the door has been left open, refrigeration must be started after a set time. That time can be set here.	o89	DoorInjStart

Defrosting and fan operation during forced closing You can set whether fans should be operational or stopped if the function "Forced closing" is activated here. 0: The fans will be stopped and defrosting will be permitted. 1: The fans will run and defrosting will be permitted. 2: The fans will be stopped and defrosting will not be permitted during a forced closing. 3: The fans will run and defrosting will not be permitted during a forced closing.	o90	Mode ForcedCl
Temperature display during normal operation *Single Coil:* 1= Air temperature 2= Food temperature *Multi Coil:* 1= Air temperature section A 2= Middle air temperature of all sections 3= The highest air temperature of all sections	o97	Disp. Ctrl.
Light and night blinds definition 0: Light is switched off and night blinds are opened when the main switch is off. 1: Light and night blinds are independent of main switch.	o98	Light MS = Off
Configuration of alarm relay Alarms are split into groups. For example, high temperature alarms, low temperature alarms, sensor failure, etc. Priority can be configured for each group. See alarms on page 63. The alarm relay in the controller must be activated in the event of an alarm in one or more of the following priorities: Setting: 0: The relay is not activated in the event of alarms 1: High priority alarms only 2: High and medium priority alarms 3: High, medium and low priority	P41	Al.Rel.Conf.
Max. opening time for the night blind after manual override using DI activation A timer function will start when activated. When the configured period has passed, the night blind will close again.	P60	BlindOpen Time
Stop time for fans while the night blind rolls down The fans can be stopped while the night blind is rolling down. This ensures correct positioning of the night blind. The time is configured in seconds.	P65	BlindFanStop
Rail heat cycle when the analogue output AO1 is used for the function The period of the overall On time + Off time must be configured in seconds (AO1 is defined in q09).	P82	RailCycle PWM
User-defined refrigerant Rfg. factor K1 (3 digits) Used only if the constant is to be configured via the display (o30 must be set to 1 for this setting to be active).	P83	RfgFac.K1
User-defined refrigerant Rfg. factor K2 (3 digits) Used only if the constant is to be configured via the display (o30 must be set to 1 for this setting to be active).	P84	RfgFac.K2
User-defined refrigerant Rfg. factor K3 (3 digits) Used only if the constant is to be configured via the display (o30 must be set to 1 for this setting to be active).	P85	RfgFac.K3
Max. value for the superheat reference when regulating using a liquid-filled evaporator	P86	SH Max Liq.
Min. value for the superheat reference when regulating using a liquid-filled evaporator	P87	SH Min Liq.
Access code 1 (simple operation) Gives access to simple adjustment of values. If operation is to be limited to simple operations, choose a numerical value between 1 and 999. Otherwise annul the function using the setting = 0. If the function to be used is access code 3, (o05) and 2(o64) **must also** be used.	P88	Acc. code 1
Display operation locking Setting = On will cancel settings via display buttons. Unlock by simultaneously pressing "arrow up" and "arrow down" for three seconds. Normal operation can then be performed again. Lock again by pressing the two buttons again. If the display is left unlocked, a timer function will automatically lock it after 15 minutes.	P89	LockDispKey

DO2-DO6 application: The following relay outputs can be dedicated to a specific function. But only for application 9 in Single coil and application 4 and 9 in Compact version: 0=not used, 1=fan, 2=fan Eco, 3=defrost, 4=rail heat, 5=alarm, 6=lights, 7=night blind, 8=compressor, 9=compressor 2, 10=heat element (However, there are some restrictions relating to the alarms that require safety distances and for lights that require an SPDT relay). **DO2 application:**	q02	DO2 Config.
DO3 application: (However, not for alarms and lights)	q03	DO3 Config.
DO4 application: (However, not for alarms)	q04	DO4 Config.
DO5 application: (However, not for alarms)	q05	DO5 Config.
DO6 application: (However, not for alarms and lights)	q06	DO6 Config.
AO1 application: PWM output The output can be used for rail heat controls if requiring a faster cycle time than the cycle time in the o43 function can provide. 0=No use, 1=rail heat	q09	AO1 Config.
Manual control of output (Main Switch=-1): AKV valve, 0-100%	q11	AKV OD%
Manual control of output (Main Switch=-1): Compressor1/LLSV, On/Off	q12	Compr1/LLSV
Manual control of output (Main Switch=-1): Fan, On/Off	q13	Fan relay
Manual control of output (Main Switch=-1): Defrost, On/Off	q14	Def. relay
Manual control of output (Main Switch=-1): Rail heat, On/Off	q15	Railh. relay
Manual control of output (Main Switch=-1): Alarm, On/Off	q16	Alarm relay
Manual control of output (Main Switch=-1): Light, On/Off	q17	Light relay
Manual control of output (Main Switch=-1): Valve in suction line, On/Off	q18	SuctionValve
Manual control of output (Main Switch=-1): Compressor 2, On/Off	q19	Compr2 relay
Manual control of output (Main Switch=-1): Hot gas valve, On/Off	q20	Hotgas valve
Manual control of output (Main Switch=-1): Night blinds, On/Off	q21	Blinds relay
Manual control of output (Main Switch=-1): Defrost 2, On/Off	q22	Def. relay2
Manual control of output (Main Switch=-1): Heat element, On/Off	q23	Heat relay
Manual control of output (Main Switch=-1): Fan Eco, On/Off	q24	Fan Eco
Manual control of output (Main Switch=-1): Drain, On/Off	q25	Drain valve
Manual control of output (Main Switch=-1): Humidity, On/Off	q26	RH relay
Manual control of output (Main Switch=-1): Rail heat PWM, 0-100%	q27	RailheatPWM
Alarm priority range All alarms have been split into groups from the factory. This grouping cannot be changed. (The individual alarms and groupings can be seen on page 63). Each group can be configured with a priority of 0-3, meaning the following: 0: No alarms in this group will be visible 1: All alarms in this group will be assigned the highest priority 2: All alarms in this group will be assigned medium priority 3: All alarms in this group will be assigned the lowest priority **Group 1**: High temperature alarms	q28	Hi Temp Prio
Group 2: Low temperature alarms	q29	Lo Temp Prio
Group 3: Sensor error	q30	Sensor Prio
Group 4: Alarm on a DI input	q31	DIAlarm Prio
Group 5: Alarm from the defrost function	q32	Defrost Prio
Group 6: Miscellaneous	q33	Misc Prio
Group 7: Alarm from the injection function	q34	Inject Prio
Group 8: Alarm about stopped regulation	q35	CtrlOFF Prio
Group 9: Alarm from a leak detector	q36	Leak Prio
Group 10: Alarm from the humidity function	q37	Humid Prio
The alarm relay is interrupted The function will stop a current alarm in the alarm relay (but allows for the next alarm to be issued).	q38	Mute Alarm

Food temperature Defines the temperature measurements that will be shown in U72: Compact : 1=thermostat temperature, 2=alarm temperature, 3=S3 Single Coil : 1=thermostat temperature, 2=alarm temperature, 3=S3, 4=S6 Multi Coil : 1=thermostat temperature section A, 2=average of all sections, 3=highest temperature of all sections	q39	Food sensor	
		Case shutdown	
		Dew point	

Service		Service
Operating status. Please refer to the overview on page 62	u00	Ctrl. state
Temperature measured with S5 sensor	u09	S5 temp.
Status on DI1 input. on/1=closed	u10	DI1 status
Read the duration of the ongoing defrost or the duration of the last completed defrost	u11	Defrost time
Temperature measured with S3 sensor	u12	S3 air temp
Status at the day-/night operation (night operation: on/off)	u13	Night Cond.
Temperature measured with S4 sensor	u16	S4 air temp
Thermostat temperature	u17	Ther. air
Read the ongoing cut-in time for the thermostat or the duration of the last completed cut-in	u18	Ther runtime
Read the temperature at the S2 evaporator outlet sensor	u20	S2 temp.
Read superheat	u21	Superheat
Read superheat reference	u22	SH ref.
Opening degree of AKV valve	u23	AKV OD %
Read the evaporating pressure	u25	Evap.press Pe
Read the evaporating temperature	u26	Evap.temp Te
Read the temperature at the S6 sensor	u36	S6 temp
Status on DI2 input. on/1=closed	u37	DI2 status
Readout display 1 value	u56	Display air
Readout of alarm air temp. Section A	u57	Alarm air
* Status on relay for compressor/solenoid valve	u58	Comp1/LLSV
* Status on relay for fan	u59	Fan relay
* Status on relay for defrost	u60	Def. relay
* Status on relay for rail heat	u61	Railh. relay
* Status on relay for alarm	u62	Alarm relay
* Status on relay for light	u63	Light relay
* Status on relay for valve in suction line	u64	SuctionValve
* Status on relay for compressor 2	u67	Comp2 relay
* Temperature measured with S5B sensor	u75	S5 temp. B
* Temperature measured with S3B sensor	u76	S3 temp. B
* Status on relay for hot gas	u80	Hotgas valve
* Status on relay for night blinds	u82	Blinds relay
* Status on relay for defrost B	u83	Def. relay B
* Status on relay for heat function	u84	Heat relay
* Readout of the actual rail heat effect in %	u85	Rail DutyC %
Readout of which thermostat used for regulation: 1= Thermostat 1, 2= Thermostat 2	u86	Ther. band
Status on input DI3 (on/1 = 230 V)	u87	DI3 status
Readout of thermostat band in use	u90	Cutin temp.
Readout of the actual cut-out value for the thermostat	u91	Cutout temp.
Status on function "Adaptive defrost" 0: Off. Function is not activated and is zero-set 1: Sensor error S3/S4 are reversed. 2: Tuning is in progress 3: Normal 4: Light build-up of ice 5: Medium build-up of ice 6: Heavy build-up of ice	U01	AD state
Readout of the current Brine PWM OD in %	U02	Pwm OD %
Number of defrosts carried out since the initial power up or since the resetting of the function	U10	Acc.defrost
Number of defrosts skipped since the initial power up or since the resetting of the function	U11	Acc.def.skip

*) Not all will be displayed. Only the function belonging to the selected application is displayed.

Readout of alarm air temp. Section B	U34	Alarm air B
Readout of display 2 value	U35	Display air2
Status of the relay for the Eco fan	U37	Fan Eco
Display of signal quality for the MODBUS communication	U45	Comm. Status
Status of the relay for the drain valve	U55	Drain valve
Display of measured humidity in %	U57	RH level %
Status of the humidity relay	U58	RH relay
Display of rail heat effect via AO1 in %	U59	RailheatPWM
DO1 - DO6 (Not shown in a display) A relay output can be defined for the following functions. The function is indicated by the number: 0=None, 1=AKV, 2=fan, 3=fan Eco, 4=defrost, 5=rail heat, 6=alarm, 7=lights, 8=night blind, 9=compressor, 10=compressor 2, 11=heat element, 12=drain valve, 13=suction valve, 14=hot gas valve, 15=defrost B, 16=humidity	U61	DO1 config
	U62	DO2 config
	U63	DO3 config
	U64	DO4 config
	U65	DO5 config
	U66	DO6 config
	U67	DO7 config
AO1 (Not shown in a display) The output can be defined for: 0=no function. 1=rail heat	U69	AO1 config
Display of measured food temperature (defined in q39)	U72	Food temp
Display of measured defrost stop temperature (defined in d10)	U73	Def.StopTemp
Operating status. Section B. Please refer to the overview on page 62	U74	Ctrl. State B
Read the duration of ongoing defrost or duration of the last completed defrost. Section B	U75	Def. Time B
Read the temperature at the S4B sensor	U76	S4 temp B
Thermostat temperature. Section B	U77	Ther. Air B
Read ongoing cut-in time for the thermostat or the duration of the last completed cut-in. Section B	U78	TherRuntimeB
Read the temperature at the S2B sensor	U79	S2 temp. B
Read superheat. Section B	U80	Superheat B
Read superheat reference. Section B	U81	SH Ref B
Opening degree of AKV valve. Section B	U82	AKV OD % B
Operating status. Section C. Please refer to the overview on page 62	U83	Ctrl. State C
Read the duration of the ongoing defrost or the duration of the last completed defrost. Section C	U84	Def. Time C
Read the temperature at the S4C sensor	U85	S4 temp C
Thermostat temperature. Section C	U86	Ther. Air C
Read ongoing cut-in time for the thermostat or the duration of the last completed cut-in. Section C	U87	TherRuntimeC
Read the temperature at the S2C sensor	U88	S2 temp. C
Read superheat. Section B	U89	Superheat C
Read superheat reference. Section C	U90	SH Ref C
Opening degree of AKV valve. Section C	U91	AKV OD %
Readout of alarm air temp. Section C	U92	Alarm air C
Display of measured defrost stop temperature (defined in d10). Section B	U93	Def.StopTemB
Display of measured defrost stop temperature (defined in d10). Section C	U94	Def.StopTemC

Operating status		(Measurement)
The controller goes through some regulating situations where it is just waiting for the next point of the regulation. To make these "why is nothing happening" situations visible, you can see an operating status on the display. Push the info button for 3 seconds to see status. If there is a status code, it will be shown on the display. The individual status codes have the following meanings:		Ctrl. state: (Appears in all menu images)
Normal regulation	S0	0
Waiting for end of the coordinated defrost	S1	1
When the compressor is operating, it must run for at least x minutes.	S2	2
When the compressor is stopped, it must remain stopped for at least x minutes.	S3	3
The evaporator drips off and waits for the time to run out	S4	4
Refrigeration stopped by main switch. Either with r12 or a DI-input	S10	10
Refrigeration stopped by thermostat	S11	11
Refrigeration has stopped due to low S4 temperature	S12	12
Defrost sequence. Defrost in progress	S14	14
Defrost sequence. Fan delay — water attaches to the evaporator	S15	15
Refrigeration stopped due to open ON input or stopped regulation	S16	16
Door is open. DI input is open	S17	17
Melt function in progress. Refrigeration is interrupted	S18	18
Modulating thermostat control	S19	19
Emergency cooling *)	S20	20
Adaptive control of superheat	S23	23
Start-up phase 1. Signal reliability from sensors is controlled	S24	24
Manual control of outputs	S25	25
No refrigerant selected	S26	26
Appliance cleaning	S29	29
Forced cooling	S30	30
Delay on outputs during start-up	S32	32
Heat function r36 is active	S33	33
Case shutdown	S45	45
Operation permitting liquid flow in the evaporator	S48	48
Other displays:		
Defrost in progress / first cooling after the defrost where the temperature is still above the thermostat band.	-d-	
Password required. Set password	PS	
Regulation is stopped via main switch	OFF	
The main switch is set to service/manual operation	SEr	

*) Emergency cooling will take effect when there is lack of signal from a defined S3 or S4 sensor or signal from the pressure transmitter is outside signal range. The regulation will continue with a registered average cut-in frequency. There are two registered values – one for day operation and one for night operation.

Fault message		
In an error situation the alarm LED on the front will flash and the alarm relay will be activated (depending on priority). If you push the top button for 3 seconds you can see the alarm report in the display. (Alarm priorities can be changed. See alarm priorities on page 58). Here are the messages that may appear:		
Code / Alarm text via data communication	**Description**	**The alarm has been placed in a group**
A1/--- High t. alarm	High temperature alarm section A	1
A2/--- Low t. alarm	Low temperature alarm section A	2
A4/--- Door alarm	Door alarm	4
A5/--- Max hold time	The "o16" function is activated during a coordinated defrost	5
A11/--- No Rfg. sel.	No refrigerant selected	7
A13/--- High temp S6	Temperature alarm. High S6	1
A14/--- Low temp S6	Temperature alarm. Low S6	2
A15/--- DI1 alarm	DI1 alarm	4
A16/--- DI2 alarm	DI2 alarm	4
A45/--- Standby mode	Standby position (stopped refrigeration via r12 or DI input)	8
A59/--- Case clean	Appliance cleaning. Signal from DI input	8
A70/--- High Temp. B	High temperature alarm section B	1
A71/--- Low Temp. B	Low temperature alarm section B	2
AA2/ ---Refrig Leak	A refrigerant leak detection signal is received	9
AA3/--- CO$_2$ alarm	A refrigerant leak detection signal is received and the selected refrigerant is CO$_2$	9
a02/--- HighHumidity	Too high humidity	10
a03/--- Low Humidity	Too low humidity	10
a04/--- Wrong IO cfg	Incorrect configuration of inputs and outputs	6
a05/--- High t. alarm C	High temperature alarm section C	1
a06/--- Low t. alarm C	Low temperature alarm section C	2
--- AD Iced	Evaporator is iced up. Reduction of air flow	5
--- AD flashgas	Flash gas is formed at the valve	5
--- Max Def. Time (A,B,C)	Defrost stopped based on time instead of, as wanted, on temperature. Section A / B / C	5
E1/--- Ctrl. error	Faults in the controller	6
E6/--- RTC error	Check clock	6
E20/--- Pe error	Error on pressure transmitter Pe	3
E24/--- S2 error	Error on S2 sensor	3
E25/--- S3 error	Error on S3 sensor	3
E26/--- S4 error	Error on S4 sensor	3
E27/--- S5 error	Error on S5 sensor	3
E28/--- S6 error	Error on S6 sensor	3
E34/--- S3 error B	Error on S3B sensor	3
E37/--- S5 error B	Error on S5B sensor	3
E59/---RH input err	Missing signal from humidity sensor	3
E60/--- S4 error B	Error on S4B sensor	3
E61/--- S4 error C	Error on S4C sensor	3
E62/--- S2 error B	Error on S2B sensor	3
E63/--- S2 error C	Error on S2C sensor	3

Data communication

The importance of individual alarms can be defined with a setting. The setting must be carried out in the group "Alarm destinations"
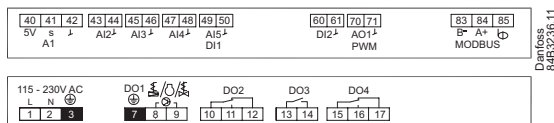
Settings from System manager	Settings from AKM (AKM destination)	Log	Alarm relay			Send via Network
			Non	High	Low-High	
High	1	X		X	X	X
Middle	2	X			X	X
Low	3	X			X	X
Log only		X				
Disabled						

Connections

Overview of outputs and applications.
See also electrical diagrams pages 7-14.

Compact

40 41 42	43 44	45 46	47 48	49 50		60 61	70 71		83 84 85	Danfoss
5V s ⊥	AI2⊥	AI3⊥	AI4⊥	AI5⊥		DI2⊥	AO1⊥		B⁻ A⁺ ⏚	84B3236.11
A1					DI1		PWM		MODBUS	

115 - 230V AC			DO1	DO2	DO3	DO4	
L N ⏚			⏚				
1 2 3			7 8 9	10 11 12	13 14	15 16 17	

Single Coil

40 41 42	43 44	45 46	47 48	49 50	51 52	53 54	60 61	70 71		83 84 85	Danfoss
5V s ⊥	AI2⊥	AI3⊥	AI4⊥	AI5⊥	AI6*⊥	DI1*⊥	DI2⊥	AO1⊥		B⁻ A⁺ ⏚	84B3234.11
AI1								PWM		MODBUS	

115 - 230V AC	AKV	DO2	DO3	DO4	DO5	DO6	DI3
L N ⏚							115-230V AC
1 2 3	7 8 9	10 11 12	13 14	15 16 17	18 19 20	21 22	30 31

Multi Coil

40 41 42	43 44	45 46	47 48	49 50	51 52	53 54	60 61	70 71		83 84 85	Danfoss
5V s ⊥	AI2⊥	AI3⊥	AI4⊥	AI5⊥	AI6*⊥	DI1*⊥	DI2⊥	AO1⊥		B⁻ A⁺ ⏚	84B3255.11
AI1								PWM		MODBUS	

115 - 230V AC	AKV	DO2	DO3	DO4	DO5	DO6	DO7	DI3
L N ⏚								115-230V AC
1 2 3	7 8 9	10 11 12	13 14	15 16 17	18 19 20	21 22	23 24	30 31

! Max. 0.5 A

Compact

Application	DO1	DO2	DO3	DO4		AO1	AI1	AI2	AI3	AI4		AI5/DI1	DI2
1						●		S3	S4	S5		●	●
2						●		S3	S4	S5		●	●
3						●		S3	S4	S5		●	●
4		●¹⁾	●¹⁾	●¹⁾		●		S3	S4	S5		●	●
5						●	Pe	S2	S3	S4		S5	●
6						●	Pe	S2	S3	S4		S5	●
7						●	Pe	S2	S3	S4		S5	●
8						●	Pe	S2	S3	S4		S5	●
9		●¹⁾	●¹⁾	●¹⁾		●	Pe	S2	S3	S4		S5	●

Single Coil

Application	DO1	DO2	DO3	DO4	DO5	DO6	AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1							●	Pe	S2	S3	S4	S5	S6	●	●	●
2							●	Pe	S2	S3	S4	S5	S6	●	●	●
3							●	Pe	S2	S3	S4	S5	S6	●	●	●
4							●	Pe	S2	S3	S4	S5	S6	●	●	●
5		suction	drain	hotgas			●	Pe	S2	S3	S4	S5	S6	●	●	●
6							●	Pe	S2	S3	S4	S5	S3B	●	●	●
7			B	A			●	Pe	S2	S3	S4	S5	S3B	S5B	●	●
8			humidity				●	Pe	S2	S3	S4	S5	S6	RH%	●	●
9		●¹⁾	●¹⁾	●¹⁾	●¹⁾	●¹⁾	●	Pe	S2	S3	S4	S5	S6	●	●	●

Multi Coil

Application	DO1	DO2	DO3	DO4	DO5	DO6	DO7	AO1	AI1	AI2	AI3	AI4	AI5	AI6	AI7/DI1	DI2	DI3
1	A			A				●	Pe	S2A	S4A	S5A			●	●	●
2	A		B	A			B	●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●
3	A		B				C	●	Pe	S2A	S4A	S2B	S4B	S2C	S4C	●	●
4	A		B	humidity			heat	●	Pe	S2A	S4A	S2B	S4B	RH%		●	●
5	A		B	A		B		●	Pe	S2A	S4A	S5A	S2B	S4B	S5B	●	●

● = Optional
●¹⁾ Custom set-up of relays

AI1
Pressure transmitter
AKS 32R
Connect to terminal 40, 41 and 42.
(Used cable 060G1034: Black=40, Brown=41, Blue=42)
The signal from one pressure transmitter can be received by up to 10 controllers. But only if there are no significant pressure drops between the evaporators to be controlled.
See drawing on page 39.
Please note: when replacing AK-CC550 with AK-CC55, S and ground must be switched.

AI2 - AI7
Primarily for temperature inputs
S2
    Pt 1000 ohm sensor AKS11, placed at the evaporator outlet
S3, S4, S5
    Pt 1000 AKS11, PTC 1000 EKS111, NTC5K EKS211 or NTC10K EKS221 sensor. All have to be of the same type.
S3, air sensor, placed in the warm air before the evaporator
S4, air sensor, placed in the cold air after the evaporator
    (the need for either S3 or S4 can be selected in the configuration)
S5, defrost sensor, placed in the evaporator
S6, Pt 1000 ohm sensor, food temperature sensor placed in-between the food products

(If the Di1 input is used for a temperature measurement, it will appear as AI7.) (AI5 by compact.)

DI1
Digital input signal.
The defined function is active when the input is short-circuited or opened depending on the function defined in o02.

DI2
Digital input signal.
The defined function is active when the input is short-circuited or opened depending on the function defined in o37.

AO1
Analogue output signal
Analogue 0-10 V (currently not used)
Pulse width modulated signal
    Can be used for fast control of rail heat via an external power solid state relay.

MODBUS
For data communication.
Terminal 83 = B-
Terminal 84 = A+
Terminal 85 = screen

It is <u>important</u> that the installation of the data communication cable is performed correctly.
See separate literature No. RC8AC902

Supply voltage
230 V AC or 115 V AC

DO1
AKV valve
Connection of expansion valve type AKV, AKVA, AKVH or AKVP. The coil must be a **230 V** or **115 V AC coil**.

Thermostatic Expansion Valve
Here the output is used to start cooling. Either by starting the compressor or by opening the solenoid valve.

DO2
Alarm
    There is a connection between terminal 10 and 12 in alarm situations and when the controller is without power.
Light
    There is connection between terminal 10 and 12 when the function is on.
Rail heat, Compressor, Night blind
    There is connection between terminal 10 and 11 when the function is on.
Suction line valve
    There is connection between terminal 10 and 11 when the suction line must be open.

DO3
Compressor, Rail heat, Defrost, Drain valve, Humidity
    There is connection between terminal 13 and 14 when the function must be active.

DO4
Defrost
    There is connection between terminal 15 and 16 when defrosting takes place.
Hot gas
    There is connection between terminal 15 and 16 when the hot gas valves must open.
Please note: when replacing AK-CC550 with AK-CC55, wires must be switched.

DO5
Light
    There is connection between terminal 18 and 20 when the function must be active.
Rail heat
    There is connection between terminal 18 and 19 when the rail heat must be on.

DO6
Fan
    There is connection between terminal 21 and 22 when the fan is on.

DO2-DO6 + AO1 and Application 9
    Here, the different outputs can be custom defined in q02-q09

DI3
Digital input signal.
The signal must have a voltage of 0 / 230 V AC (115 V AC)
The function is defined in o84.

Display (RJ12 plug)
If external readings/operation of the controller is required, a display can be connected. Two external displays can be connected to Single Coil and Multi Coil controllers that do not have displays on the front. One external display can be connected to Compact version.

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.

AKV info

230 V or 115 V
AC coil
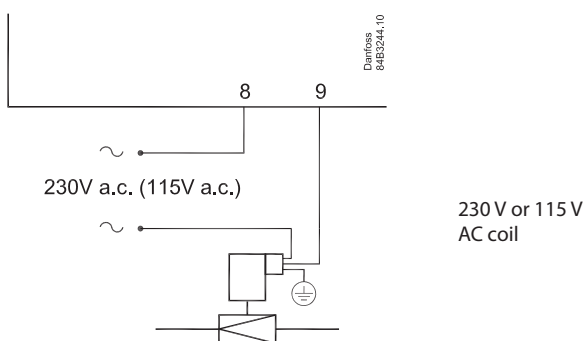
AKS 32R info
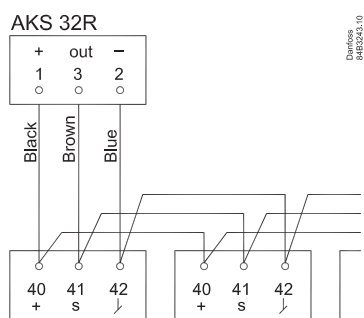
The signal from one pressure transmitter can be received by up to 10 controllers.
There must not be a significant pressure drop from the pressure transmitter's position in the suction line to the individual evaporators.

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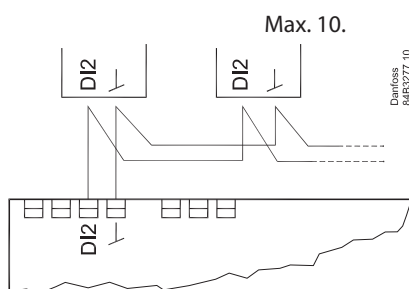
The following controllers can be connected in this way:
EKC 204A, AK-CC 210, AK-CC 250, AK-CC 450, AK-CC 550 and AK-CC55.

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

Data

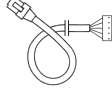|	
Supply voltage	115 / 230 V AC (85-265 V). 5 VA, 50/60 Hz Power: Green LED
Sensor S2, S6	Pt 1000
Sensor S3, S4, S5	Pt 1000 or PTC 1000 or Ntc5K or Ntc10K (All 3 must be of the same type)

Measuring of temperature	PT 1000: -60 – 120 °C. $\pm$0.5 K PTC1000: -60 – 80 °C. $\pm$0.5 K NTC 5K: -40 – 80 °C. $\pm$1.0 K NTC 10K: -40 – 120 °C. $\pm$1.0 K	
	Pt 1000 sensor	$\pm$0.3 K at 0 °C $\pm$0.005 K per degree
Measuring of Pe	Ratiometric pressure transmitter	10-90%
Measuring of RH	0-10 V	Ri > 10K ohm Accuracy +/- 0,3% FS

Display	LED, 3 digits
External display	1 pc RJ12 output on compact versions and versions with integrated displays 2 pcs. RJ12 outputs on versions without displays Max. 100m cable total
Digital inputs DI1, DI2	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer Open loop: 12 V Contact 3.5 mA
Digital inputs DI3	115 V / 230 V AC
Electrical cable dimensions	Max.1.5 mm^2 multi-core cable

Solid state output	DO1 (for AKV coil) (DO3 and DO7 in Multi Coil)	115V / 230 V AC Max. 0.5 A Max. 1 x 20 W AKV for 115 V AC 2 x 20 W AKV for 230 V AC

Relays*	DO2, DO3, DO4
	DO5, DO6
		115 V / 230 V AC
		Load max.: CE. 8 (6)A
		            UL. 8A res. 3FLA 18LRA
		Load min.: 1VA
		Inrush: DO2 DO3 for Compact
		            DO5 DO6 for
		            Single/Multi Coil
		            TV-5 80A

Analogue output/ PWM	AO1	0 / 10 V Pulse Width Modulated (PWM) max. 15 mA. 0-10 V variable, max. 2 mA

Environments	0 – 55 °C, During operations -40 – 70 °C, During transport	
	20 – 80% Rh, not condensed	
	No shock influence / vibrations	
Density	IP 20	
Mounting	DIN-rail	
Weight	0.4 Kg	
Data communication Tx: Yellow LED Rx: Green LED	Fixed	MODBUS
	Extension option (Not for Compact version)	Lon RS485
Power reserve for the clock	4 days	

Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with
	LVD (2014/35/EU)
	   CB scheme acc. to IEC 60730-1 and 2-9
	EMC (2014/30/EU)
	   EN 61000-6-2 and 6-3
	Relays tested acc. to IEC 60079-15	

* DO2 to DO6 are 16 A relays. Max. load must be observed. DO3 DO4 for Compact and DO5 DO6 for Single / Multi Coil is recommended for EC Fan and LED light.
All relays are sealed for use with flammable refrigerant like Propane R290.
Compliance with EN 60 335-2-89: 2010 Annex BB.

AK-CC55 Compact

AK-CC55 Single Coil
AK-CC55 Multi Coil

AK-CC55 Single Coil UI

AK-UI55 Set

AK-OB55
Can be installed on Single Coil and Multi Coil versions.
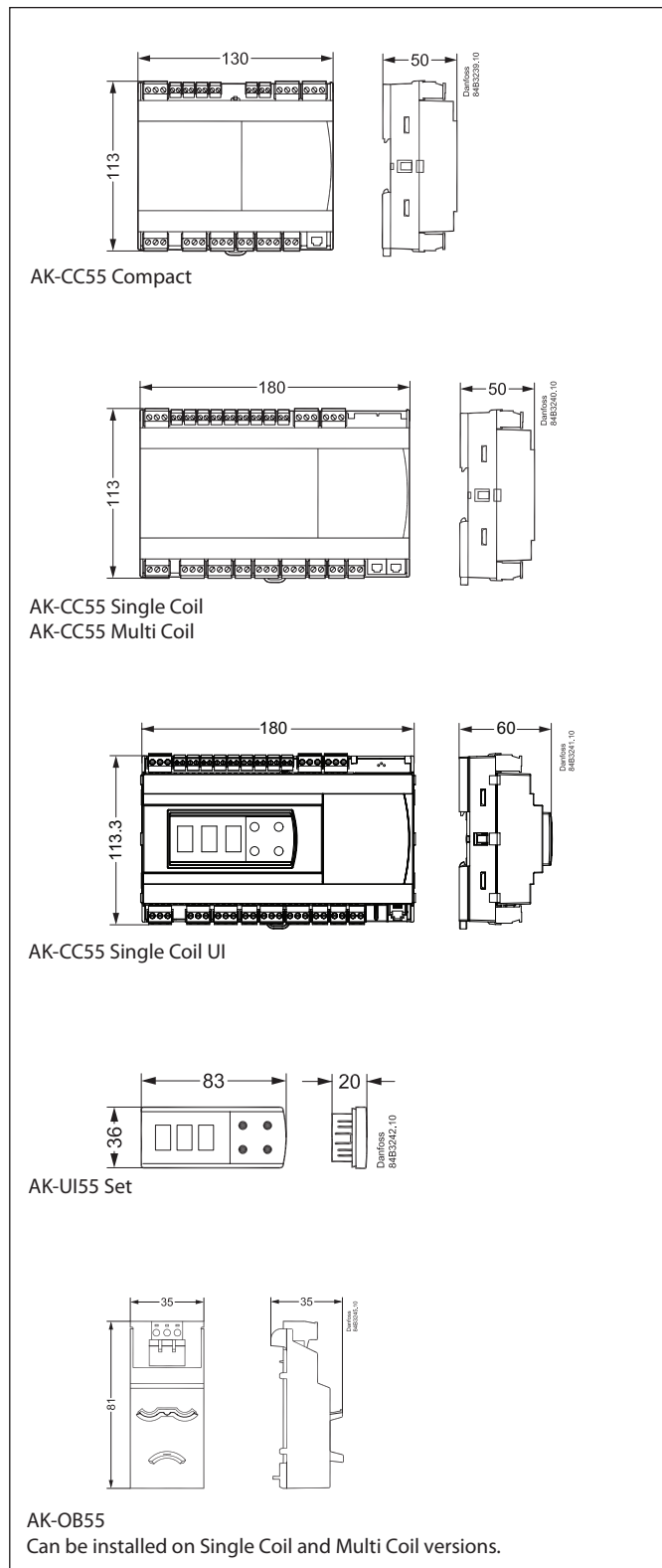
Ordering

Type		Function	Code no.
AK-CC55 Compact		Case controller with one AKV or solenoid valve	**084B4081**
AK-CC55 Single Coil		Case controller with one AKV valve	**084B4082**
AK-CC55 Single Coil UI		Case controller with one AKV valve Integrated display with control buttons	**084B4083**
AK-CC55 Multi Coil		Case controller with one, two or three AKV valves	**084B4084**
AK-UI55 Info		External display	**084B4077**
AK-UI55 Bluetooth*		External display with Bluetooth operation	**084B4075**
AK-UI55 Set		External display with control buttons	**084B4076**
AK-OB55 Lon		Data communication module Lon Can be mounted in Single Coil and Multi Coil versions	**084B4070**
AK-UI cable		External display cable with RJ12 connector. 3 m	**084B4078**
		External display cable with RJ12 connector. 6 m	**084B4079**

*Statements for the AK-UI55 Bluetooth display:

FCC COMPLIANCE STATEMENT
CAUTION: Changes or modifications not expressly approved could void your authority to use this equipment
This device complies with Part 15 of the FCC Rules. Operation to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

INDUSTRY CANADA STATEMENT
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ADAP-KOOL®

© Danfoss | DCS (vt) | 2020.01