ENGINEERING
TOMORROW

User Guide

Case/room controller (EEV)
Type **AK-CC55 Compact**

SW Ver. 2.1x
For refrigeration appliances and cold storage rooms.



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Introduction

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

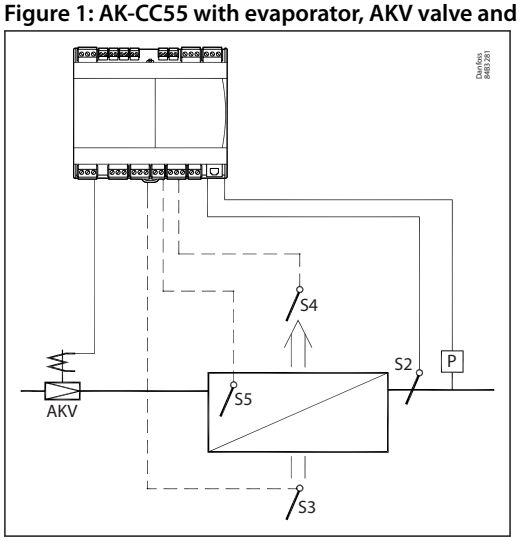
Advantages:
- Control of Thermostatic Expansion Valve (TEV) and Electronic Expansion valve(EEV) applications
- Quick set-up with predefined settings
- Easy configuration and service using a mobile app with Bluetooth
- Adaptive Minimum Stable Superheat (MSS) control is performed with lowest possible superheat
- Allows the suction pressure to be raised several degrees
- Adaptive Liquid Control (ALC) can be performed with superheat down to 0 degrees on transcritical CO_2 systems with liquid ejectors

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.

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

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

Figure 1: AK-CC55 with evaporator, AKV valve and sensor positions



Portfolio overview

The AK-CC55 portfolio contains four controllers with different functionalities and application settings, as outlined in the table.

Table 1: AK-CC55 Portfolio

	AK-CC55 Compact	AK-CC55 Single Coil	AK-CC55 Single Coil UI	AK-CC55 Multi Coil
Product image				
Valve	1 x TXV or AKV	1 x AKV	1 x AKV	3 x AKV
Digital Output	3	5	5	4
Digital input	1 (2)	3 (2)	3 (2)	3 (2)
Analogue Output	1	1	1	1
Analogue Input	5 (4)	6 (7)	6 (7)	6 (7)
Display	1 remote	2 remote	1 remote + 1 Integrated	2 remote
Comm. module	Modbus	Modbus	Modbus	Modbus
Optional comm. module		LON module	LON module	LON module

Function overview

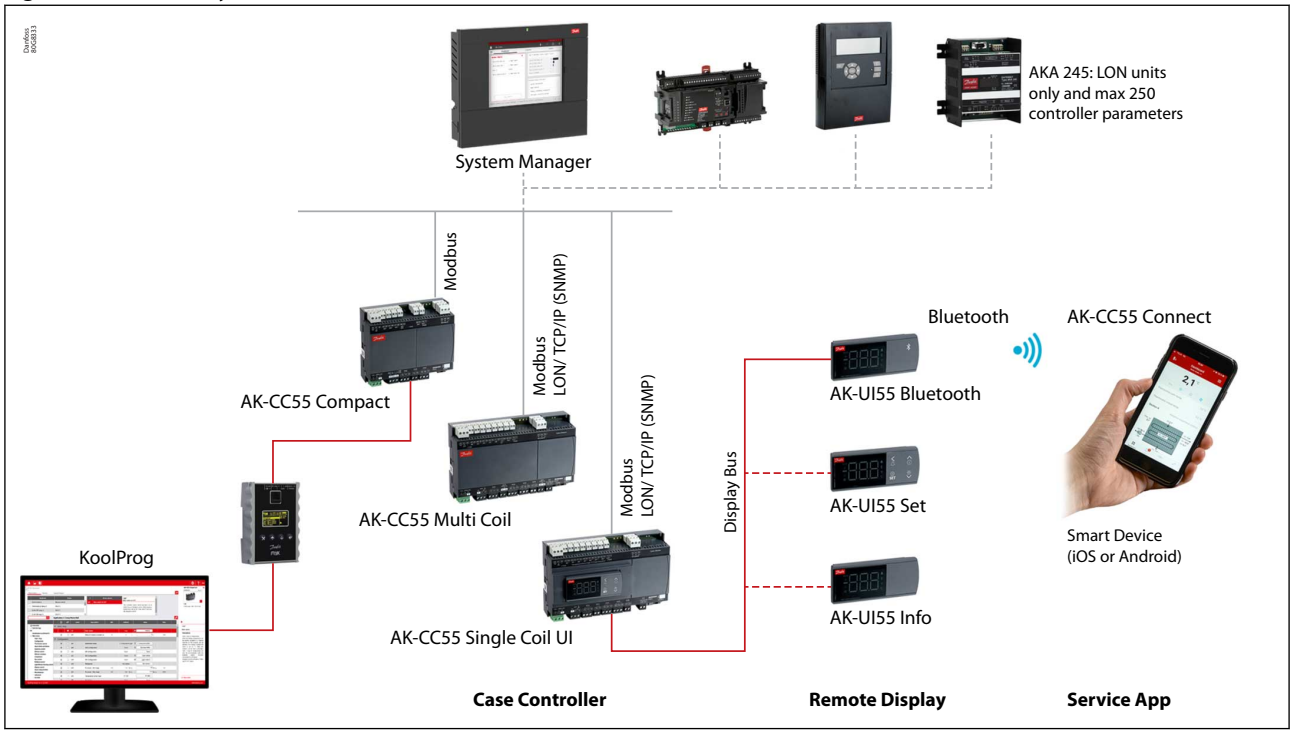
Table 2: AK-CC55 function overview by type

Application	AK-CC55 Compact	AK-CC55 Single Coil AK-CC55 Single Coil UI	AK-CC55 Multi Coil
AKV - application (electrically operated expansion valve)	x	x	x
0 – 10 V to control external stepper driver		x	
TXV - 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	
Oil recovery		x	
RS485 Lon, option (AK-OB55)		x	x

Connectivity

The diagram outlines the connectivity options presented by AK-CC55 for the design of system functionality.

Figure 2: Connectivity



Data communication

The AK-CC55 Compact controller has built-in MODBUS data communication only.

AK-CC55 Compact

Compact version for controlling one evaporator.

An application mode setting will configure inputs and outputs for the desired use. There are nine applications to choose from.

Regulation is performed using a TXV in combination with a liquid line solenoid valve, controlling a compressor or an AKV expansion valve.

AK-CC55 Compact is without display, and can be extended with one external display (see Figure 3 and Figure 4):

Figure 3: AK-CC55 Compact

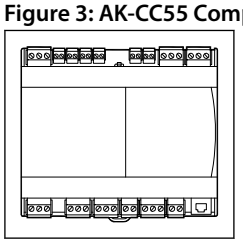
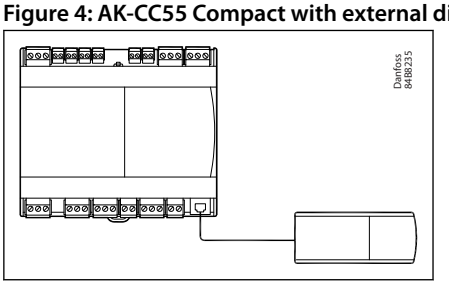


Figure 4: AK-CC55 Compact with external display.



External display

There are three versions available with different functions:

- AK-UI55 Info: Temperature display.
- AK-UI55 Set: Temperature display with control buttons on the front.
- AK-UI55 Bluetooth: Temperature display with Bluetooth communication, for use with AK-CC55 Connect Mobile app.

Figure 5: AK-UI55 Info



Figure 6: AK-UI55 Set



Figure 7: AK-UI55 Bluetooth



Controller functionality

Functions

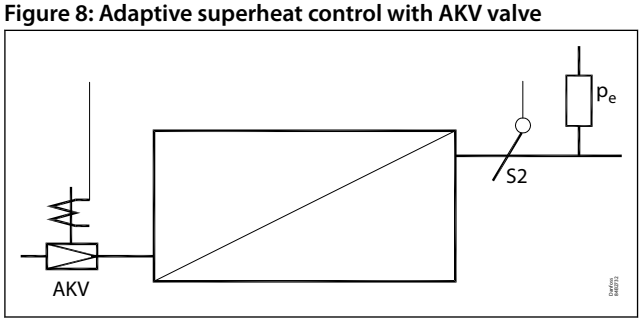
- Day/night thermostat with ON/OFF or modulating principle
- Switch between thermostat settings via digital input
- Adaptive superheat control
- Adaptive liquid control
- Modulating PWM control of brine valve
- Start of defrost via schedule, digital input, network or setting display
- Natural, electric, simple hot gas, or warm brine defrost.
- Stop of defrost on time and/or temperature
- Coordination of defrosting among several controllers in a line-up
- Pulsing or ECO 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
- Door function
- Control of two compressors
- Control of night blinds
- Light control
- Heat thermostat
- High accuracy inputs:
  - to guarantee a better measuring accuracy than stated in the standard EN ISO 23953-2 without subsequent calibration (Pt1000 ohm sensor).
- Support of user defined temp. sensor type
- Integrated MODBUS communication

Injection control

Adaptive superheat control

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.

Figure 8: Adaptive superheat control with AKV valve



The superheat is measured via a 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 max. 10 controllers, but only if there is no significant pressure difference between the evaporators in question.

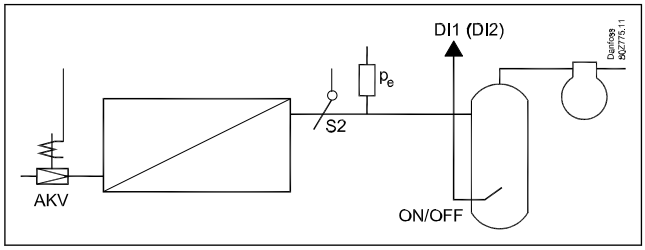
The function contains an adaptive algorithm which independently adjusts the valve's opening so that the evaporator constantly supplies optimum amount of refrigerant.

Adaptive liquid control

Adaptive liquid control is used in trans-critical CO_2 ejector systems, which allow liquid flow. When adaptive liquid control is initiated, the superheat of the evaporator will be minimized so that a controlled amount of liquid is present at the outlet of the evaporator.

This type of control requires that the controller receives an on/off signal from (for example) a suction accumulator in the suction line.

Figure 9: Adaptive liquid control with AKV valve



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.

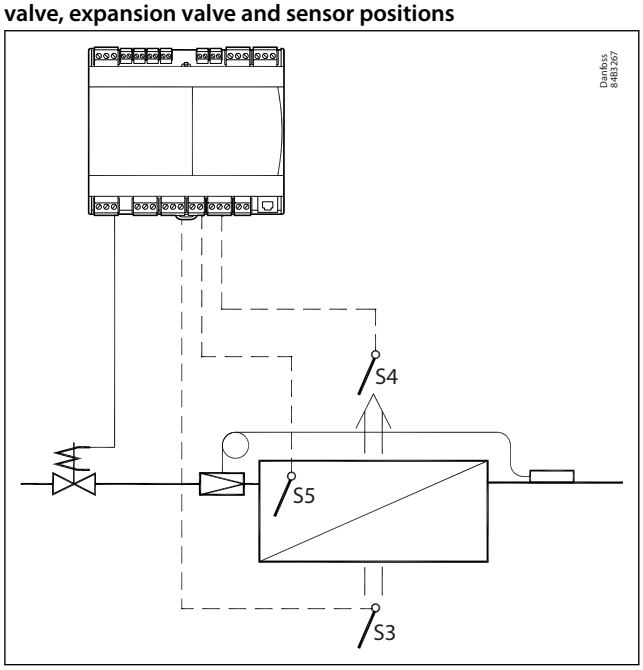
The function can also be activated via data communication from a system unit. If the adaptive liquid control signal is lost, the controller will automatically switch back to dry expansion.

⚠ 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.

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.

Figure 10: AK-CC55 Compact with evaporator, solenoid valve, expansion valve and sensor positions



Brine control
When changing from ON/OFF control to modulating control in TXV applications, a solenoid valve can be PWM controlled with a set period time from 30 – 900 sec. A number of additional brine control parameters are available in the injection control menu. When brine control is enabled, a dedicated brine defrost can also be set up in order to force open the brine valve while defrosting.

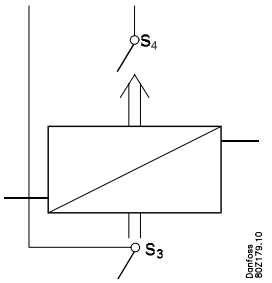
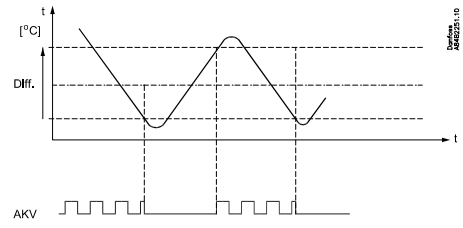
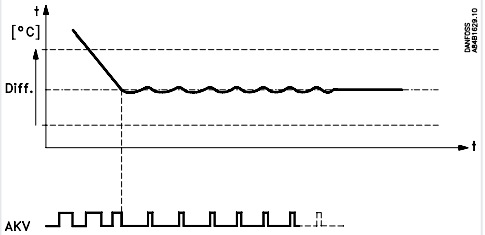
Temperature control

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:
1. As an ordinary ON/OFF regulation with a differential, or
2. As a modulating control where the temperature variation will not be nearly as high 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. It is not recommended to use modulating thermostat control in low temperature applications. 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.

Table 3: Control methods

	ON/OFF control	Modulating control
		

Temperature monitoring

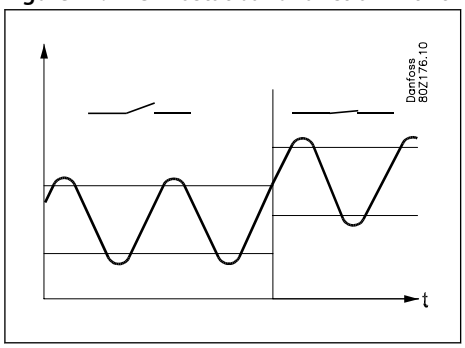
Just as is possible for the thermostat, the alarm monitoring can be set with a weighting between S3 and S4 so that you can decide how much the two sensor values should influence the alarm monitoring. Minimum and maximum limits can be set for alarm temperature and time delays. A longer time delay can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

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.

For the defrost control, separate defrost stop temperature and max. defrost time can be set for each thermostat band. For the compressor control it is possible to disable the second compressor in thermostat band 2 if required.

Figure 11: Thermostat band function with two different band settings

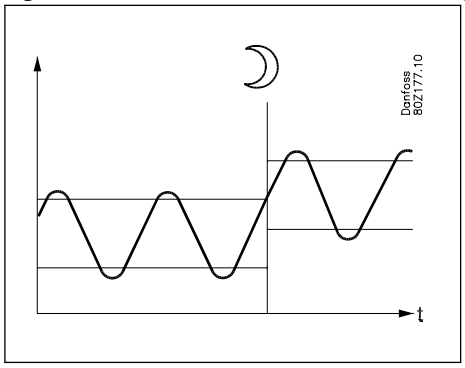


Night setback of thermostat value

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

Figure 12: Thermostat band function with Night setback



Temperature sensor types

The S2 and S6 sensors always have to be Pt1000 sensors due to the high measuring accuracy.

For the S3, S4 and S5 sensors, the user can select between the following sensor types:
0 = Pt1000 (Danfoss AKS 11)
1 = PTC1000 (Danfoss EKS 111)
2 = NTC 5k (Danfoss EKS 211)
3 = NTC 10k (Danfoss EKS 221)
4 = User-defined

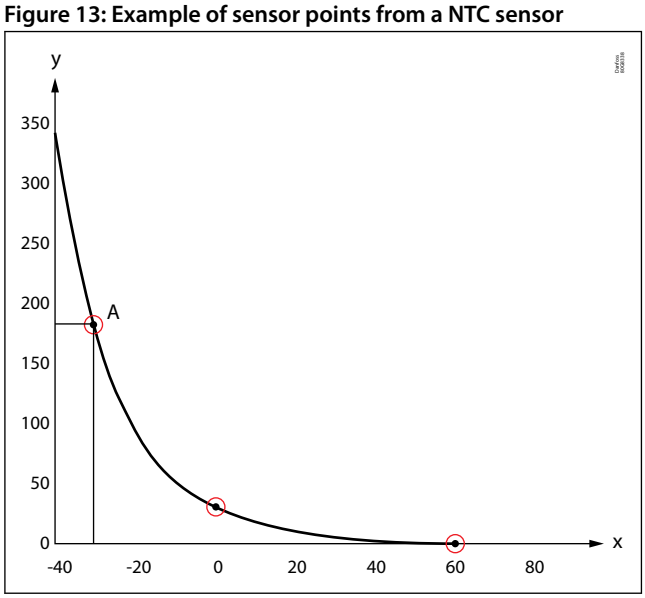
If "User-defined" is selected, three sensor measuring points must be provided and based on these three sensor points, a sensor characteristic is generated.

A sensor point is defined by setting a temperature value and the corresponding resistance value at this temperature. The resistance value is set via two values for kohm and ohm respectively. These values can be found in the data sheet for the sensor.

The three sensor points must be:
1. Lowest temperature in wanted measuring range
2. Highest temperature value in wanted temperature range
3. Temp. value in the middle where a high measuring accuracy is required

A sensor error is detected at temperature values below/above the min./max. temperature values typed in for the sensor points.

Figure 13: Example of sensor points from a NTC sensor



x	Temp [°C]
y	R [kohm]
A	Sensor point (-30 °C, 180 kΩ)

Limitations:
A user defined temperature sensor can only be be defined within the temperature range from -40 – +60 °C and within the resistance range from 400 – 179.999 ohm.

When applying a new user defined sensor type, please contact Danfoss for validation of compliance and measuring accuracy.

Appliance cleaning

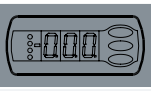
This function makes it easy for the shop's staff to carry out a cleaning of the appliance according to a standard procedure. Appliance cleaning is activated via a pulse signal – as a rule via a key switch placed on the appliance or via the AK-CC55 Connect mobile app.

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.

There are no temperature alarms during appliance cleaning.

Table 4: Appliance cleaning function

			
-	+	+	°C
1	÷	+	Fan
2	÷	÷	Off
3	+	+	°C

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.

Defrost

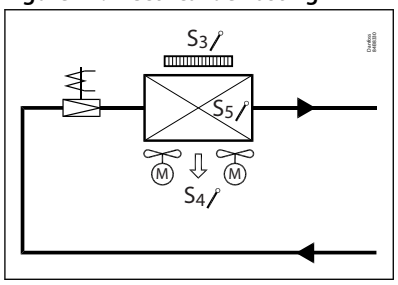
Depending on the application, you may choose between the following defrost methods:

- Natural: Here the fans are kept operating during the defrost
- Electric: The heating element is activated
- Hot gas: Simple hot gas defrost can be selected in application modes where a compressor is controlled. The compressor unit will operate during defrosting
- Brine defrost: The brine valve is forced open while defrosting (only possible when selecting modulating control in TXV applications)

Electrical defrosting

At electrical defrost, an electrical heater is placed in front of the evaporator and the fan will “pull” the hot air through the evaporator during defrosting.

Figure 14: Electrical defrosting



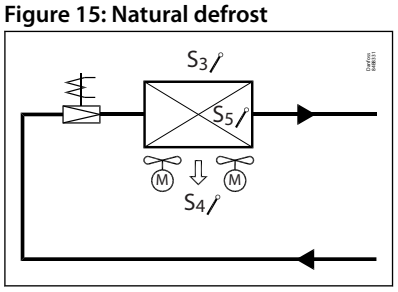
Simple hot gas defrosting

If hot gas defrost is selected in application 1-5, the compressor will be running during defrost and a hot gas valve (HGV) is bypassing the compressor discharge gas to the evaporator inlet and thereby the evaporator is defrosted.

Natural defrost

At natural defrost, the ice is melted by running the fans and thereby circulating warm air through the evaporator.

Figure 15: Natural defrost



Start of defrost

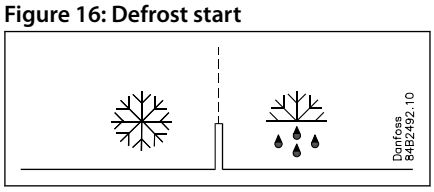
A defrost can be started in different ways:

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 defrosts per day.

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

Figure 16: Defrost start



Network:
The defrost start signal is received from a system manager via data communication.

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 on the AK-UI55 Set display via the app, or via the parameter setting. All the mentioned methods can be used in parallel – if just one of them is activated, a defrost will be started.

Stop of defrost

Defrosting can be stopped by either:
- Time
- S4A temperature (with time as safety)
- S5A temperature (with time as safety)

When the selected defrost stop sensor reaches the set defrost stop limit, the defrost is terminated. If the defrost stop sensor does not reach the set defrost stop limit within the set max. defrost time, the defrost will be terminated on time.

Minimum defrost time
When using hot gas for defrosting, the heat is coming from within the evaporator, and this means that the S5 sensor is rising fast when the inner layer of ice is melted. This will sometimes cause parts of the evaporator not to be defrosted when defrost is terminated on S5 evaporator temperature.

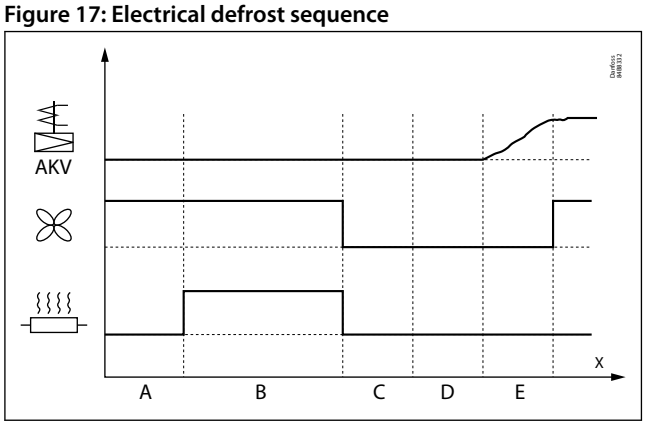
To prevent this, the user is given the option of setting a minimum defrost time. When a defrost is initiated, it will have to run for the set minimum time even if the set defrost stop limit has been reached by the selected defrost stop sensor.

Defrost sequence

When a defrost is initiated, the controller will run through the following sequence:

1. **Pump down:** where the evaporator is emptied of refrigerant
2. **Defrost:** where the ice on the evaporator is melted
3. **Hold after defrosting:** where multiple controllers wait for each other (coordinated defrost)
4. **Drip off:** where remaining water is dripping off evaporator
5. **Drain delay (Hot gas only):** where the drain valve is opened to drain the liquid refrigerant
6. **Fan delay:** where the fans are restarted when the remaining water on the evaporator has turned into ice

Figure 17: Electrical defrost sequence



x	Time
A	Pump down
B	Defrost
C	Hold
D	Drip
E	Fan delay

During an electrical defrost sequence where the defrost heater is ON during defrost, AKV valve is closed and fans are running during defrost but stopped during drip.

Fan control during defrost
During the defrost sequence, the evaporator fans can be controlled in one of the following ways:

1. The fan is OFF in the entire defrost sequence
2. The fan is ON during the entire defrost sequence except during fan delay state
3. The fan is ON during defrost state and is OFF in the rest of the defrost sequence
4. Like option 2, however the fans can be stopped if the selected defrost stop sensor exceeds a set fan stop limit

Real-time clock

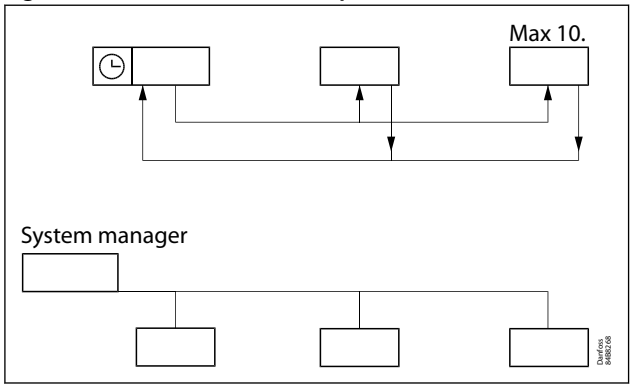
The controller has a built-in real-time clock which can be used to start defrosts. This clock has a power reserve of four days.

If the controller is equipped with data communication, the clock will automatically be updated from a Danfoss system manager.

Coordinated defrost

There are two ways in which coordinated defrost can be arranged.

Figure 18: Coordinated defrost options



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 manager 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.

Melt function

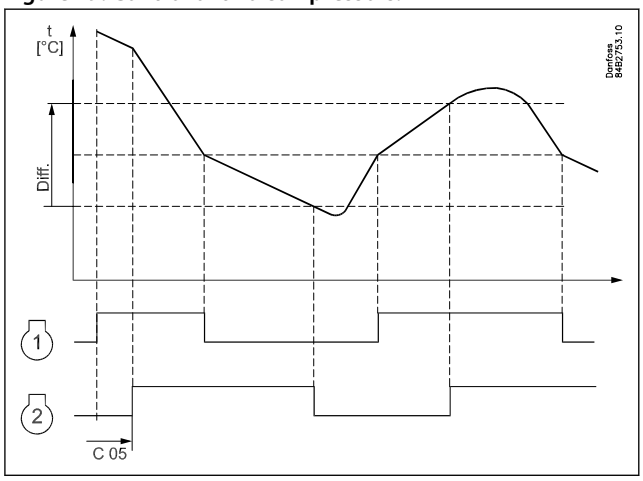
This function will prevent the air flow in the evaporator from being reduced by frost created by uninterrupted operation for a long time.

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 (only with custom set-up)

Two compressor steps can be controlled cyclic or sequentially. At cyclic control, two compressors must be of the same size, while in sequential control compressor step 1 can be larger than step 2.

Figure 19: Control of two compressors.



Cyclic control
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.

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, like e.g. defrost, door open function, case shutdown, forced closing, the "Min. On time" will be disregarded.

Sequential control
Compressor steps are controlled in the same manner as described for cyclic control, but compressor step 1 will always be started first and cut out as the last one. No time equalization is available in sequential control mode.

Thermostat band
In thermostat band 2, it is possible to disable the operation of the second compressor.

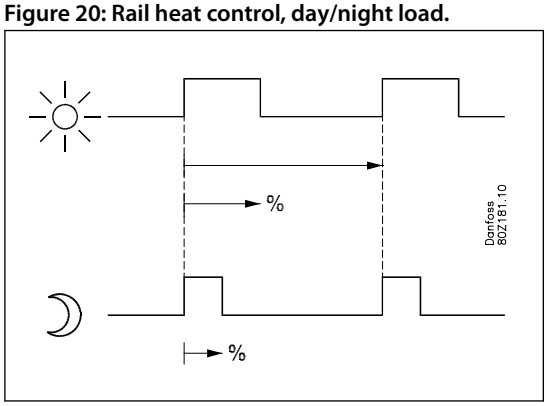
Rail heat

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 dewpoint.

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.

Figure 20: Rail heat control, day/night load.

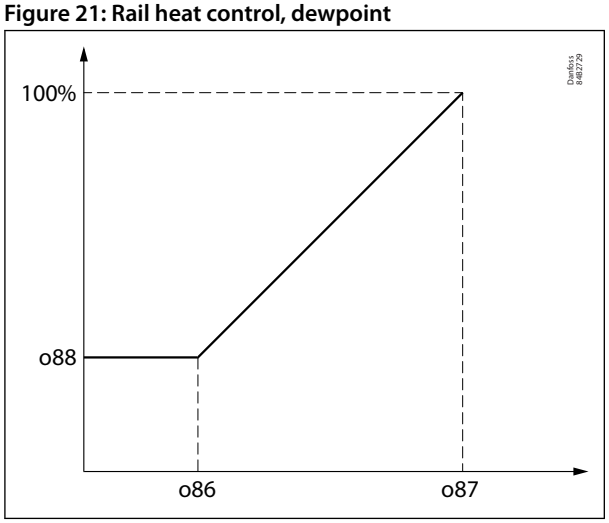


Pulse control according to dewpoint
In order to use this function, a system manager of the type AK-SM is required which can measure ambient temperature and humidity to calculate dewpoint and distribute to the appliance controllers. For this the rail heat's ON period is controlled according to the distributed dewpoint.

Two dewpoint 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 dewpoint 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 dewpoint values, the controller will manage the power to be supplied to the rail heat.

Figure 21: Rail heat control, dewpoint



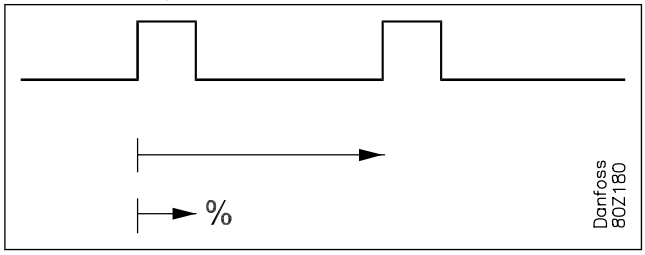
During defrosting
During defrosting rail heat will be active, as selected in setting d27.

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 blinds) (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.

Figure 22: Fan cycle time



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 fans will start running again when the S5 temperature has dropped 2K below the set limit. (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).

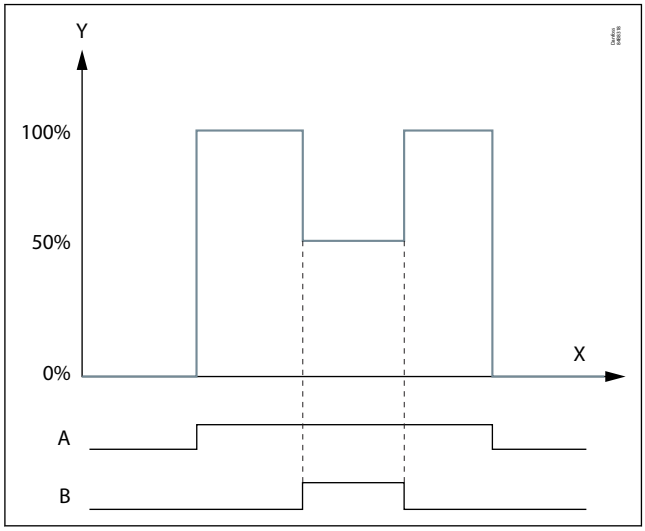
Fan ECO operation (only custom set-up)
Fan ECO operation is used to reduce fan speed during night operation – typically on cabinets with night blinds.

The function is enabled when a relay has been configured for Fan ECO function in one of the applications with custom set-up of relay functions.

The fan economy control (fan speed) is controlled via the two fan outputs:
- Fan output
- Fan Eco output

If the Fan output is activated, then the fan is running with 100% speed.
If the Fan ECO output is also activated, then the fan is running with reduced speed (typically 50%).
If both fan outputs are de-activated, then the fans are stopped.

Figure 23: Fan ECO control – Fan speed reduced to 50% during night operation



X	Time
Y	Fan speed
A	Fan
B	Fan ECO

The fans will always run with full speed during day operation, first stage of case cleaning, defrost, forced cooling and when air heating is active.

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:
1. The light is controlled via the day/night function. A digital input setup for light control can switch light ON, if the light is switched off during night
2. The light is controlled by a system manager via the parameter o39. A digital input setup for light control can switch light ON, if the light is switched off by the system manager.
3. Light is controlled via the door switch. Light is switched ON when door is opened and switched OFF 2 minutes after the door has been closed.
4. Like option 2, but here the light is switched ON automatically if the communication to the system manager has been lost for 15 minutes
5. Light is only controlled via a digital input setup for light control

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.

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.

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.

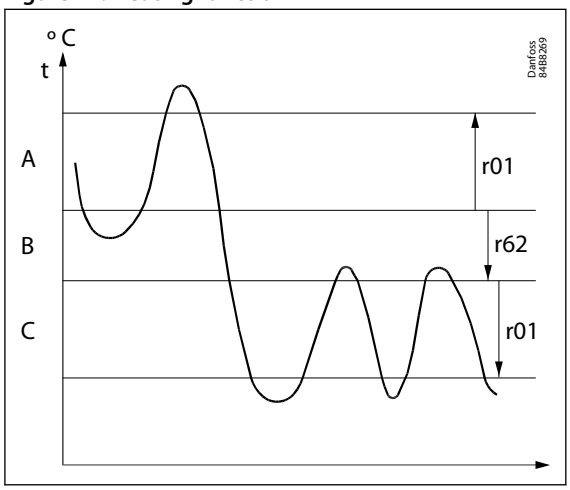
A setting can define that the night blind is opened when "r12" (Main switch) is set to off (see o98).

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.

Heating function (only with custom set-up)

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.

Figure 24: Heating function



A	Refrigeration
B	Neutral zone
C	Heat

Digital inputs

There are two digital inputs, DI1 and DI2, with dry contact function. They can be used for the following functions:

Table 5: Function table and DI settings

Function	Input / Settings menu		Setting
	DI1	DI2	
	o02	o37	
None	+	+	0
DI Status	+	+	1
Door function	+	+	2
Door alarm	+	+	3
Defrost start	+	+	4
Main switch	+	+	5
Night setback	+	+	6
Thermostat band	+	+	7
Alarm at closed	+	+	8
Alarm at open	+	+	9
Case cleaning	+	+	10
Forced cooling	+	+	11
Open blinds	+	+	12
Coordinated defrost		+	13
Forced closing	+	+	14
Shutdown	+	+	15
Light control	+	+	16
Leak detection	+	+	20
Adaptive liquid control	+	+	21
Door fan stop	+	+	29

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

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 cannot start again (however not at low pressure – LP).

Via a setting (see o90 Fan at forced closing) it is possible to define whether the fan should be ON or OFF during forced closing and whether an ongoing defrost is suppressed (i.e. put in standby position for a period of upto 10 minutes before it is cancelled) - this feature can be used in CO_2 systems to eliminate excessive heating while compressors cannot run.

The signal can be received from the DI-input or via the data communication.

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.

Alarm monitoring and stop of fans:
When the door is opened, only the fans are stopped. If the door remains open for a longer time than the set alarm delay, an alarm is triggered and the fans will start running again.

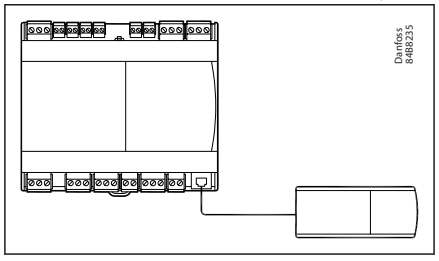
Display

The controller has one plug for an external display.
One of the following display types can be connected:
- AK-UI55 Info (temperature display).
- AK-UI55 Set (temperature display and operation).
- AK-UI55 Bluetooth (temperature display and app interface).

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.

Figure 25: Controller with one display



Override

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

Table 6: Override functionality

Master control function	Description
MC Ther. toggle	Master control signal used for switching case load ON/OFF depending on the load condition
MC Load request	Master control signal used to control the load balance between multiple case controllers on the same suction line
MC Max. Te offset	Requested offset to actual evaporating temperature in order to keep the air temperature at the actual setpoint
MC Liquid control	Master control signal allowing switch to adaptive liquid control

Master control function	Description
MC Night setback	Master control signal for changing between day and night time operation
MC Case shutdown	Master control signal used to shut down a case for a time period. During shutdown there will be no alarm monitoring
MC Forced closing	Master control signal that will close the injection valve
MC Forced cooling	Master control signal that will provide forced cooling
MC Defrost start	Master control signal for starting a defrost. At adaptive defrost the defrost might be skipped if the defrost is not needed
MC Defrost state	Read out the actual state of the defrost
MC Hold after defrost	Master control signal used for co-ordinated defrost control to hold cabinets from returning to normal refrigeration after a defrost until all cabinets have terminated defrost
MC Stop defrost	Master control signal used to prevent a defrost start in a controller.
MC Light signal	Master control signal for control of light via a data communication signal from the system manager
MC Actual dewpoint	Master control signal sending the actual measured dewpoint from the system manager to the controller over the network.
MC Po load factor	Calculated load factor for the refrigerated appliance. Used for suction pressure optimization.
MC Key/Bluetooth lock	Master control signal that will lock down all Bluetooth data communication
MC Min. delta T	Required minimum delta temperature across evaporator (S3 - Te) in order to keep the air temperature at the actual setpoint

Applications

The chapter outlines application examples:
- Standard display case
- Cold rooms

An application setting will configure inputs and outputs so that the controller's operation interface is reflecting the selected application.

In application 4 and 9, users can custom define the functions of relay 2, 3 and 4, e.g.:
- Controlling two compressors
- Controlling the night blind
- Controlling the heat function
- ECO operations of fans

Figure 26: Standard display case, upright or normal, with one evaporator

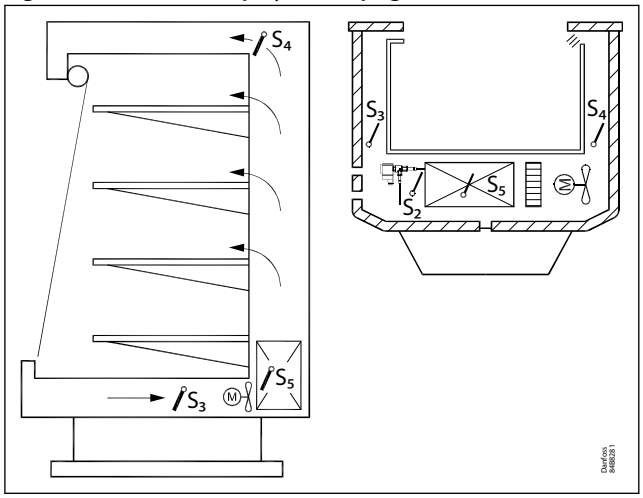
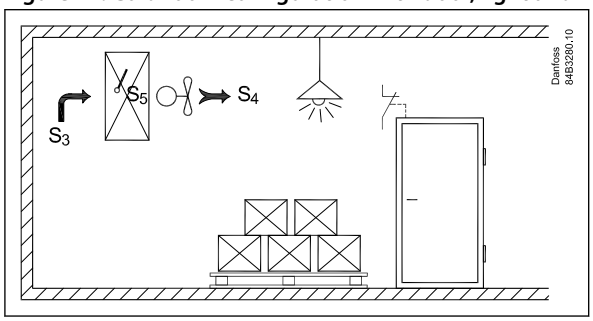
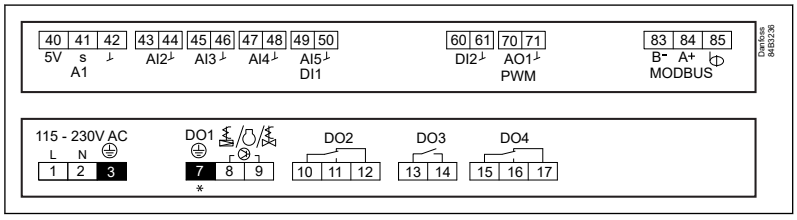


Figure 27: Cold room configuration with door, light and heat control function



AK-CC55 Compact connections and application options

Figure 28: Electrical connections AK-CC55 Compact



*	Max. 0.5 A - No overload protection!

AK-CC55 Compact is optimised for control of one evaporator plus different combinations of light, rail heat and alarm relays.

It has 4 Digital Outputs (DO), known as DO1 – DO4, one Analogue Output (AO), known as AO1, 4 Analogue Inputs (AI), known as AI1 – AI4, an input that can be used as either an AI5 or as a DI (Digital Input) DI1, and one Digital Input (DI2).

It has 9 different application options (Application 1 – Application 9) to control the functions of the input and output relays.

Table 7: Application with digital and analogue in/output specification

No.	Application description	DO1	DO2	DO3	DO4	AO1	AI1	AI2	AI3	AI4	AI5/ DI1	DI2
1	TXV appl.					●		S3	S4	S5	●	●
2	TXV appl.					●		S3	S4	S5	●	●
3	TXV appl.					●		S3	S4	S5	●	●
4	TXV appl./ User def. config.		User def.	User def.	User def.	●		S3	S4	S5	●	●
5	EEV appl.					●	Pe	S2	S3	S4	S5	●
6	EEV appl.					●	Pe	S2	S3	S4	S5	●
7	EEV appl.					●	Pe	S2	S3	S4	S5	●
8	EEV appl.					●	Pe	S2	S3	S4	S5	●
9	EEV appl./ User def. config.		User def.	User def.	User def.	●	Pe	S2	S3	S4	S5	●

● = Optional use

Table 8: Sensor description

Pe	Evaporating pressure
S2	Gas outlet of evaporator
S3	Return air temperature
S4	Discharge air temperature
S5	Evaporator temperature

Application set-ups and IO connections

AK-CC55 Compact is designed for control of one evaporator + different combinations of light, rail heat and alarm relays.

The most important variations are:

Applications 1-4: TEV applications

Control of compressor or solenoid valve, alarm relay, lights, rail heat

Application 4: Configurable outputs, e.g.: Dual compressor operation, heat function, night blind, ECO fan

Applications 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

Figure 29: Connections for application 1

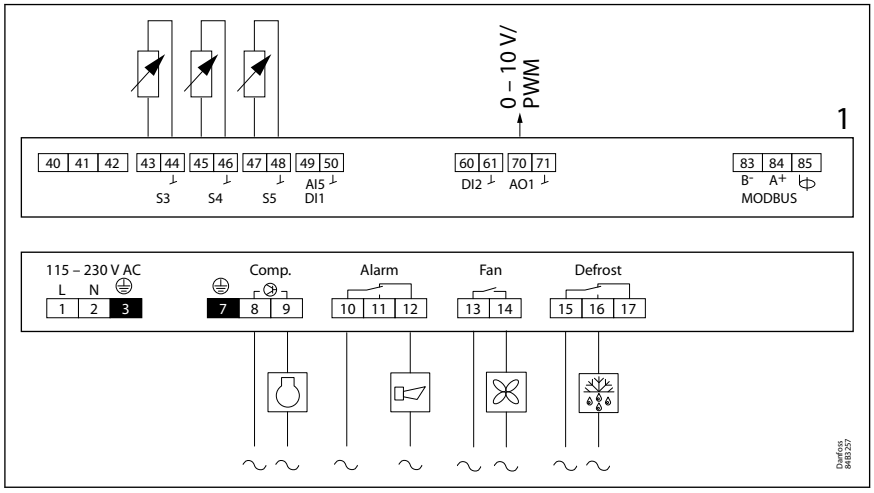


Figure 30: Connections for application 2

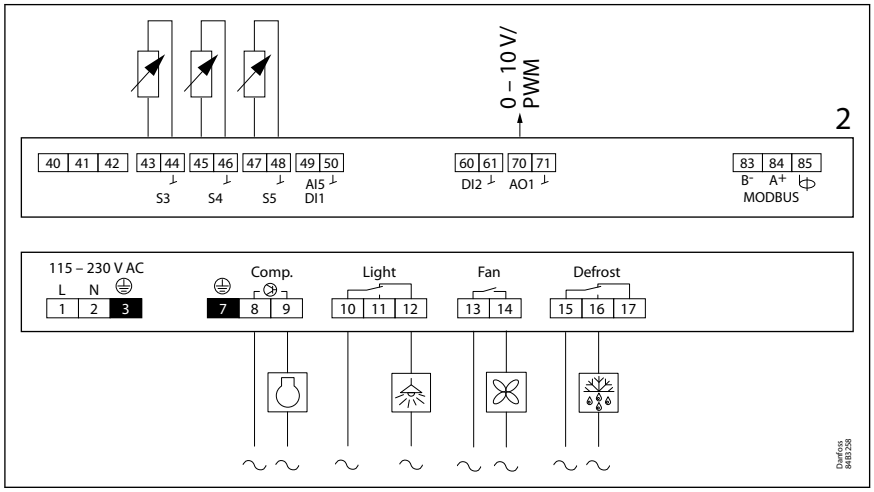


Figure 31: Connections for application 3

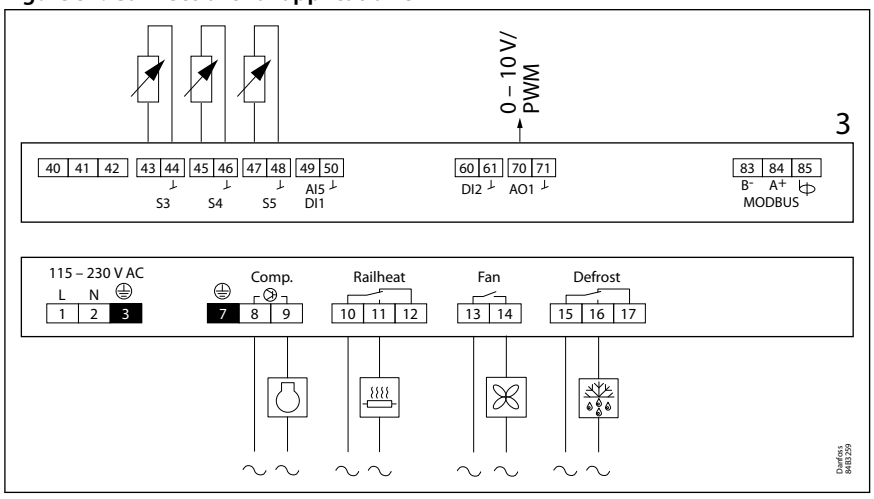


Figure 32: Connections for application 4

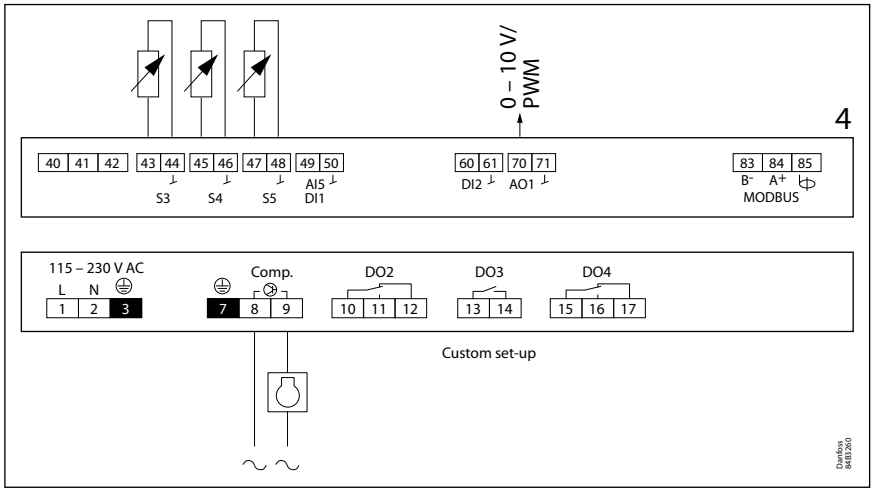


Figure 33: Connections for application 5

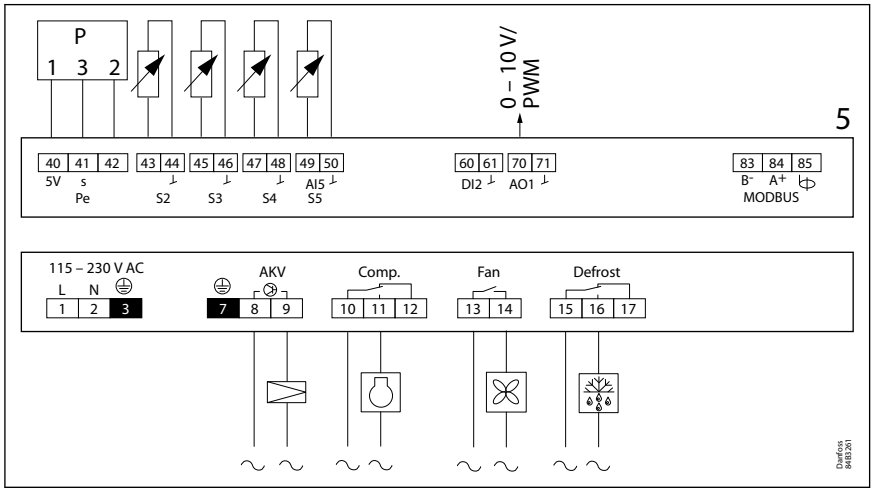


Figure 34: Connections for application 6

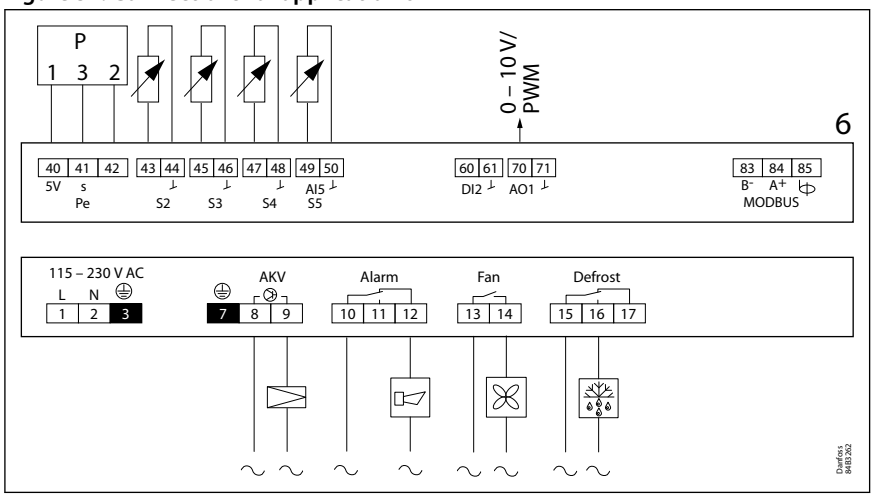


Figure 35: Connections for application 7

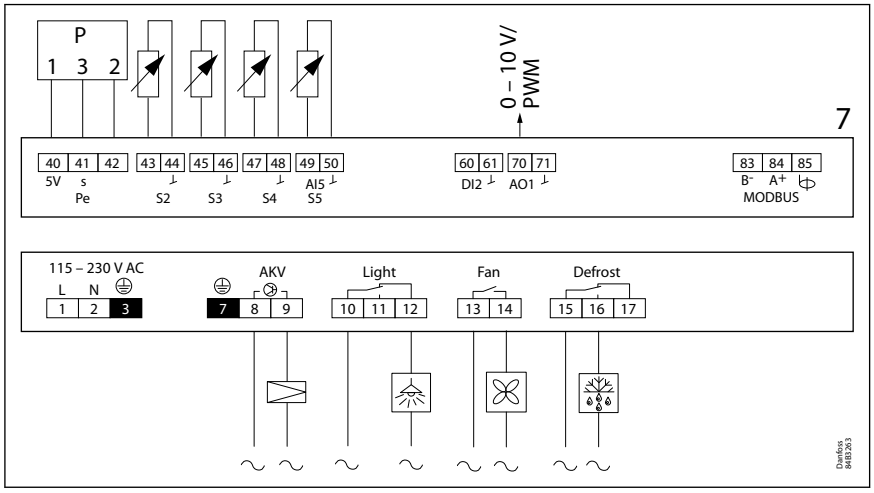


Figure 36: Connections for application 8

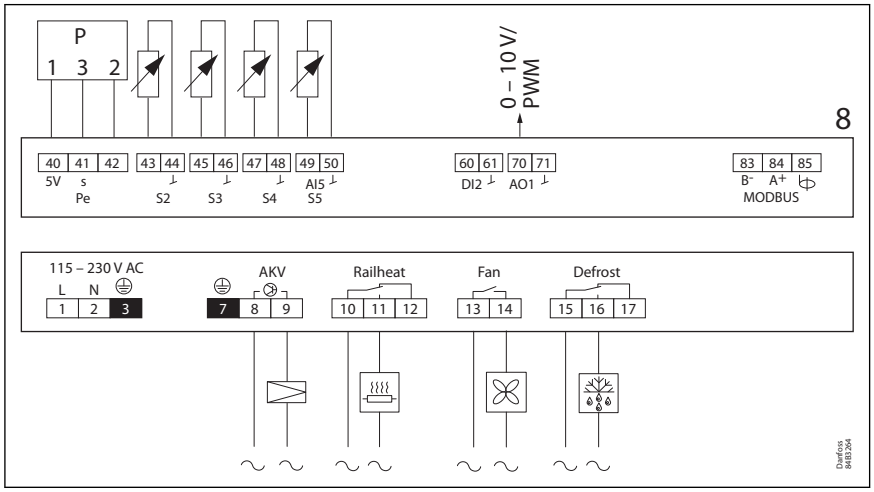
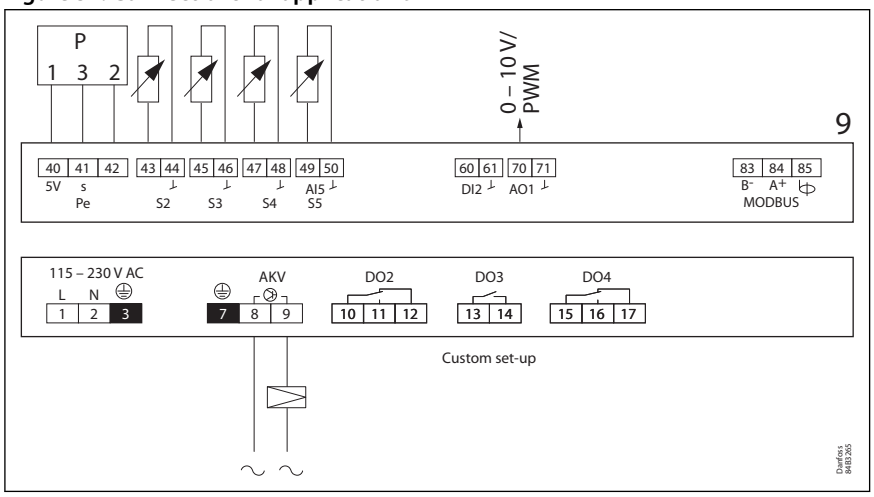


Figure 37: Connections for application 9



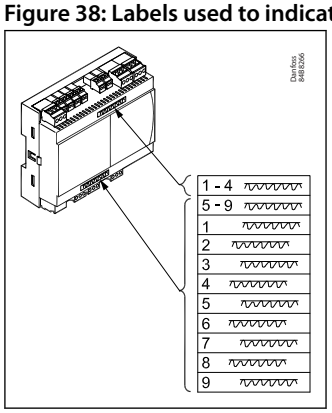
Product identification

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.

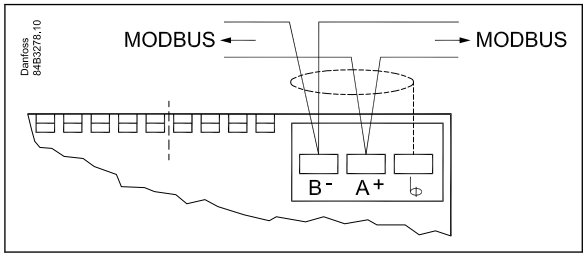
Figure 38: Labels used to indicate application number



AK-CC55 Compact connections

Data communication

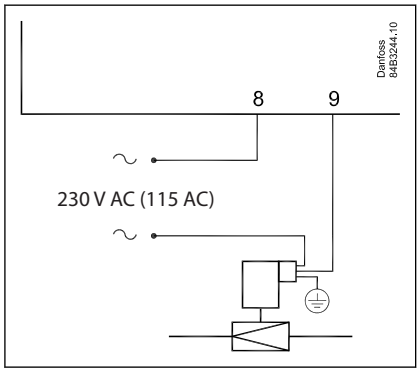
Figure 39: Data communication



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

AKV info

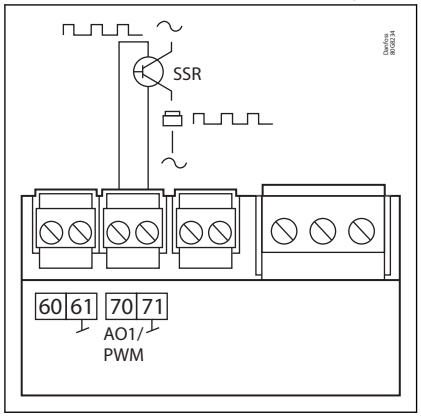
Figure 40: AKV info



230 V or 115 V
AC coil
Max. 0.5 A
Not overload protected

External solid state relay for rail heat

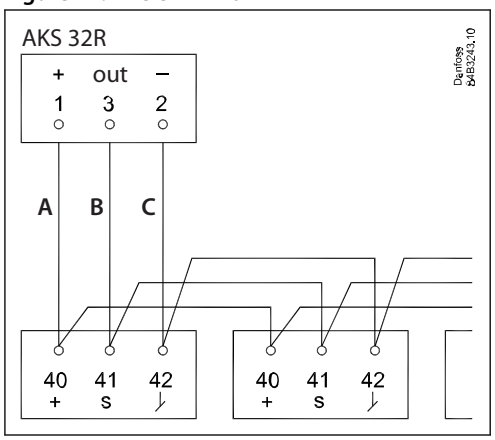
Figure 41: External solid state relay for rail heat



0 / 10 V Pulse Width Modulated (PWM)
Max. 15 mA.

AKS 32R info

Figure 42: AKS 32R info



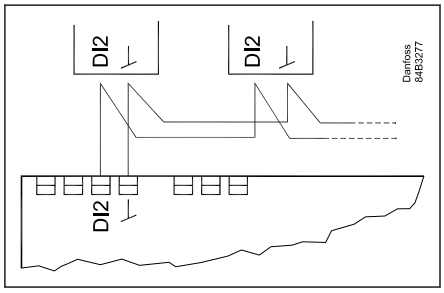
A	Black
B	Brown
C	Blue

NOTE:
A ratiometric pressure transmitter with a 5 V, 10 – 90% voltage output signal must be used.

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

Figure 43: Coordinated defrost via cable connections

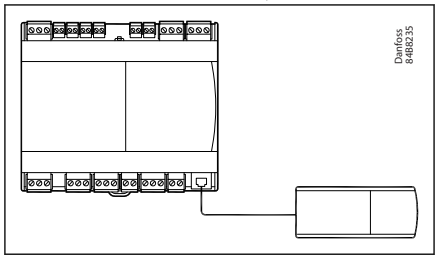


Max. 10
The following controllers can be connected in this way:
EKC 204A, AK-CC 210, AK-CC 250, AK-CC 450, AK-CC 550 and AK-CC55.

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

External display AK-UI55

Figure 44: External display AK-UI55



(Total length: max. 100 m)

Connections

Table 9: Connection details

AI1	**Pressure transmitter** AKS 32R Connect to terminal 40, 41 and 42. (Use 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 Figure 42: AKS 32R info.
AI2 - AI5	**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 or a user-defined sensor type. All have to be of the same type. • *S3, air sensor, placed in the warm air before the evaporator* • *S4, discharge 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* (If the DI1 input is used for a temperature measurement, it will appear as AI5.))
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 pulse control of rail heat via an external power solid state relay.
MODBUS	For data communication: • Terminal 83 = B- • Terminal 84 = A+ • Terminal 85 = screen
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** • *Compressor:* Connection of a relay. The coil must be a **230 V** or **115 V AC coil. Max. 0.5 A.** • *Solenoid valve:* The coil must be a **230 V** or **115 V AC coil. Max. 0.5 A.**
DO2	• *Alarm:* There is a connection between terminal 10 and 12 in alarm situations and when the controller is without power. DO2 has reinforced insulation that can be used with 24 V. • *Light, Rail heat, Compressor/Liquid line valve:* There is connection between terminal 10 and 11 (10 and 12 at light) when the function is ON.
DO3	• *Fan:* There is connection between terminal 13 and 14 when the fan is ON.
DO4	• *Defrost:* There is connection between terminal 15 and 16 when defrosting takes place.
DO2-DO4 + AO1 and Application 4 / 9	Here, the different outputs can be custom defined in q02-q09

Display (RJ12 plug)
If readings/operation of the controller is required, an external display can be connected. The max. cable length is 100 m.

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.

Operation

The controller can be operated in different ways depending on the user interface.

The following options are available:
- Via data commmunication
- Via AK-UI55 Setting display
- Via AK-UI55 Bluetooth display

Operation via data communication

Via system manager's display
All AK-CC55 controllers can be operated from a central location, e.g. AK-SM 800.
Data communication is to take place via MODBUS.

Via system manager and service tool
Operation can also be performed from a central location with PC software "Service Tool" connected to a system manager AK-SM 720 via MODBUS.

Programming via KoolProg
Programming by use of PC software type KoolProg® via interface MMIMYK connected to RJ12 display connector.

Direct operation

Operation via AK-UI55 setting display
The display can be located at a distance of up to 100 meters from the controller.

Smart phone and app via AK-UI55 Bluetooth display
The "AK-CC55 connect" app is used for smart phone operation.
AK-CC55 connect can be downloaded freely to a compatible iOS/Android smartphone device.
Menu operation is established by activating Bluetooth communication to the app.

Operation via AK-UI55 Set

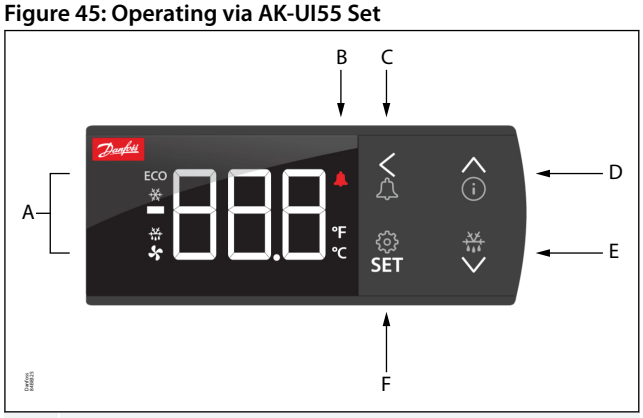
Display AK-UI55 Set
The values will be shown with three digits, and with a setting you can determine whether the temperature is to be shown in °C or in °F.

To prevent any passing-by user from making unauthorized changes, the access to the display menu is restricted by access codes.

Besides this, the parameter P89 provides the following options for handling of the display keyboard:

0	The display keys are always operative
1	The display keys will be locked automatically when not used for some time and the keyboard must be unlocked by pressing the arrow-up and arrow-down keys at the same time.
2	The display keys will be locked and unlocked by means of a master control signal from the System Manager.

Figure 45: Operating via AK-UI55 Set



A	Lights up in event of: Energy optimization, Cooling, Defrosting, Fan operation
B	Lights in event of alarm
C	Long press (3 seconds) on alarm button alarm — relay is reset — alarm code displayed — e.g. “A1”
D	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.
E	Long press (3 seconds) will start a defrost, “-d-” is shown in the display. Ongoing defrosting can be stopped by a long press.
F	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.

Table 10: Messages provided by the display

Display readout	Denomination
-d-	Defrost is in progress
Err	The temperature cannot be displayed due to a sensor error
Er1	The display cannot load data from the controller. Disconnect and then reconnect the display
Er2	Lost display communication
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 menu operation is locked. Unlock by pressing (for 3 seconds) on the ‘up arrow’ and ‘down arrow’ simultaneously
UnL	The menu operation 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. 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
CO2	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"

NOTE:

The OEM factory setting will either be the Danfoss factory settings or a user defined factory setting if one has been made.

The user can save his setting as OEM factory setting via parameter o67.

Parameter groups when operating via display

Figure 46: SET button parameter list

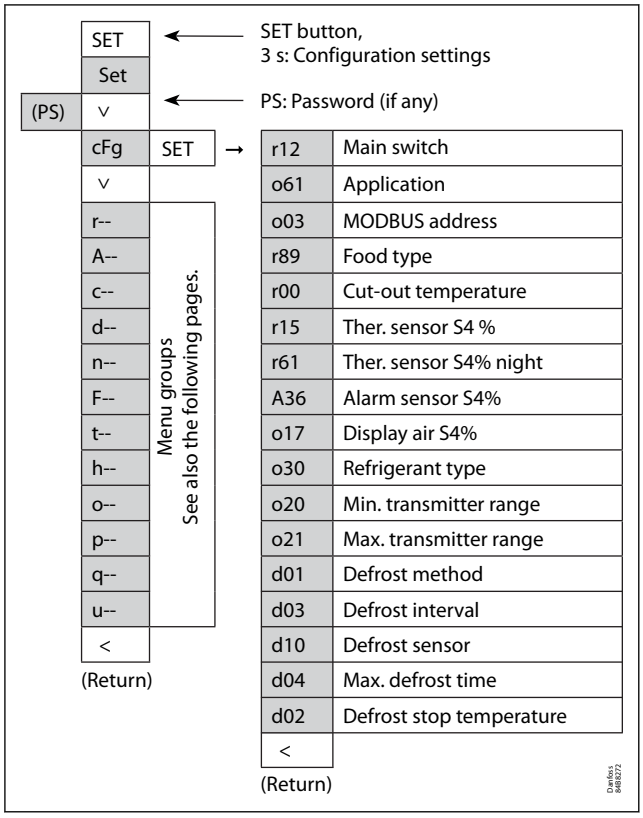
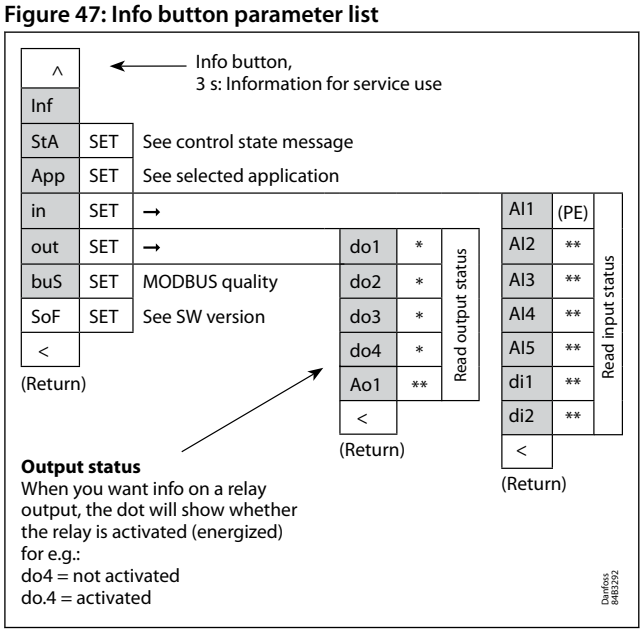


Figure 47: Info button parameter list



*	The output's function (determined at configuration). DOs and AOs can also be forced controlled from this menu, when r12 Main switch has been set to position "service". Forced control of a function can also be performed in codes q11 to q27.
**	The input's function (determined at configuration)
StA	See control state message in Table 43

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 (see Application set-ups and IO connections)
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. Set the weighted thermostat air temperature between S4 and S3 sensor r15
9. Set the weighted thermostat air temperature between S4 and S3 during night operation r61
10. Set the weighted alarm air temperature between S4 and S3 A36
11. Set the weighted display readout between S4 and S3 o17
12. Select refrigerant via parameter o30 (only application 5-9)
13. Set the pressure transmitter min. and max. range via parameter o20 and o21 (only application 5-9)
14. Set the desired defrost method in d01
15. Set the interval time between defrost starts in d03
16. Set the desired defrost sensor in d10
17. Set the maximum defrost time in d04
18. Set the defrost stop temperature in d02
19. Open parameter r12 and start the regulation
20. Go through the parameter list and change the factory values where needed
21. Get the controller up and running on network:
    - MODBUS: Activate scan function in system unit

Table 11: Food type settings

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

AK-UI55 display menu (SW ver. 2.1x)

R-W	If the operation is protected by one or more passwords, reading and setting the parameter will be limited to: R or W
R	This setting can be seen with password no. _ or higher (3 is the highest level).
W	This setting can be performed with password no. _ or higher (3 is the highest level).
*****	The asterisk indicates in which application from 1-9 the parameter is applicable

Thermostat

Table 12: Thermostat

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Cutout 1		0-0	r00	*	*	*	*	*	*	*	*	*	r03	r02	2.0 °C
Differential		1-2	r01	*	*	*	*	*	*	*	*	*	0.1 °C	20.0 °C	2.0 °C
Max cutout limit		0-2	r02	*	*	*	*	*	*	*	*	*	r03	50.0 °C	50.0 °C
Min cutout limit		0-2	r03	*	*	*	*	*	*	*	*	*	-60.0 °C	r02	-60.0 °C
Temperature unit	0=Celsius, 1=Fahrenheit	1-2	r05	*	*	*	*	*	*	*	*	*	0	1	0
S4 Air OFF evap. A - Adjustment		1-2	r09	*	*	*	*	*	*	*	*	*	-10.0 °C	10.0 °C	0.0 °C
S3 Air ON evap. A - Adjustment		1-2	r10	*	*	*	*	*	*	*	*	*	-10.0 °C	10.0 °C	0.0 °C
S5 Evaporator A - Adjustment		1-2	r11	*	*	*	*	*	*	*	*	*	-10.0 °C	10.0 °C	0.0 °C
Main switch	-1=Manual, 0=Stop, 1=Start	0-2	r12	*	*	*	*	*	*	*	*	*	-1	1	0
Night offset		1-2	r13	*	*	*	*	*	*	*	*	*	-50.0 °C	50.0 °C	0.0 °C
Thermostat mode	2=Modulating, 1=ON/OFF	1-2	r14	*	*	*	*	*	*	*	*	*	1	2	1
Thermostat sensor S4 %		1-2	r15	*	*	*	*	*	*	*	*	*	0 %	100 %	100%
Melt interval		1-2	r16	*	*	*	*	*	*	*	*	*	0 h	10 h	1 h
Melt period		1-2	r17	*	*	*	*	*	*	*	*	*	0 min	30 min	5 min
S2 Gas outlet A - Adjustment		1-2	r19	*	*	*	*	*	*	*	*	*	-10.0 °C	10.0 °C	0.0 °C
Cutout 2		0-2	r21	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	2.0 °C
Thermostat sensor S4 % night		1-2	r61	*	*	*	*	*	*	*	*	*	0 %	100 %	100%
Air heater neutral zone		1-2	r62				*					*	0.0 °C	50.0 °C	5.0 °C
Air heater start delay		1-2	r63				*					*	0 min	240 min	240 min
Food type	0=None, 1=Vegetables, 2=Dairy, 3=Meat and fish, 4=Frozen food, 5=Ice cream	1-2[1]	r89	*	*	*	*	*	*	*	*	*	0	5	0
Differential 2		1-2	r93	*	*	*	*	*	*	*	*	*	0.1 °C	20.0 °C	2.0 °C
S4 frost protection		1-2	r98	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	-60.0 °C

[1] In order to change this parameter the regulation must be stopped via the parameter r12 Main switch = OFF.

Alarm settings

Table 13: Alarm settings

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Alarm delay A		1-2	A03	*	*	*	*	*	*	*	*	*	0 min	240 min	30 min
Door open alarm delay		1-2	A04	*	*	*	*	*	*	*	*	*	0 min	240 min	60 min
Alarm delay pulldown A		1-2	A12	*	*	*	*	*	*	*	*	*	0 min	240 min	90 min
High alarm limit 1		1-2	A13	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	8.0 °C
Low alarm limit 1		1-2	A14	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	-30.0 °C
High alarm limit 2		1-2	A20	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	8.0 °C
Low alarm limit 2		1-2	A21	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	-30.0 °C

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Alarm delay DI 1		1-2	A27	*	*	*	*						0 min	240 min	30 min
Alarm delay DI 2		1-2	A28	*	*	*	*	*	*	*	*	*	0 min	240 min	30 min
Alarm sensor S4% A		1-2	A36	*	*	*	*	*	*	*	*	*	0 %	100 %	100%

Compressor

Table 14: Compressor

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Min ON time		1-2	c01	*	*	*	*	*				*	0 min	30 min	0 min
Min OFF time		1-2	c02	*	*	*	*	*				*	0 min	30 min	0 min
Delay between comp.		1-2	c05				*					*	0 s	999 s	5s
Step control mode	1=Sequential, 2=Cyclic	1-2	c08				*					*	1	2	2
Comp. 2 ctrl. Th. band 2	0=OFF, 1=ON	1-2	c85				*					*	0	1	1

Defrost

Table 15: Defrost

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Defrost method	0=None, 1=Electrical, 2=Hot gas, 3=Brine, 4=Air/ Offcycle	1-3	d01	*	*	*	*	*	*	*	*	*	0	4	1
Defrost stop limit A		1-2	d02	*	*	*	*	*	*	*	*	*	0.0 °C	50.0 °C	6.0 °C
Defrost start interval		1-2	d03	*	*	*	*	*	*	*	*	*	0 h	240 h	8h
Max defrost time		1-2	d04	*	*	*	*	*	*	*	*	*	0 min	360 min	45 min
Time staggering power up		1-2	d05	*	*	*	*	*	*	*	*	*	0 min	240 min	0 min
Drip off time		1-2	d06	*	*	*	*	*	*	*	*	*	0 min	60 min	0 min
Fan start delay		1-2	d07	*	*	*	*	*	*	*	*	*	0 min	60 min	0 min
Fan start temperature		1-2	d08	*	*	*	*	*	*	*	*	*	-60.0 °C	10.0 °C	-5.0 °C
Fan control during defrost	0=OFF, 1=ON, 2=OFF at drip, 3=OFF at high temp	1-2	d09	*	*	*	*	*	*	*	*	*	0	3	1
Defrost stop method	0=Time, 1=S5 sensor, 2=S4 sensor	1-2	d10	*	*	*	*	*	*	*	*	*	0	2	0
Pump down delay		1-2	d16	*	*	*	*	*	*	*	*	*	0 min	60 min	0 min
Max thermostat runtime		1-2	d18	*	*	*	*	*	*	*	*	*	0 h	240 h	0h
Min. defrost time		1-2	d24	*	*	*	*	*	*	*	*	*	0 min	d04	0 min
Rail heat during defrost	0=OFF, 1=ON, 2=Normal control	1-2	d27	*	*	*	*	*	*	*	*	*	0	2	1
Defrost stop limit 2		1-2	d28	*	*	*	*	*	*	*	*	*	0.0 °C	50.0 °C	6.0 °C
Max. defrost time 2		1-2	d29	*	*	*	*	*	*	*	*	*	0 min	360 min	45 min
Display delay after defrost		1-2	d40	*	*	*	*	*	*	*	*	*	5 min	240 min	30 min
Fan stop temperature		1-2	d41	*	*	*	*	*	*	*	*	*	-20.0 °C	20.0 °C	0.0 °C

Injection control

Table 16: Injection control

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Max superheat limit		1-2	n09					*	*	*	*	*	n10	20.0 °C	12.0 °C
Min superheat limit		1-2	n10					*	*	*	*	*	2.0 °C	n09	3.0 °C
MOP temperature		1-2	n11					*	*	*	*	*	-60.0 °C	15.0 °C	15.0 °C
AKV Period time		1-2[1]	n13					*	*	*	*	*	3 s	6 s	6 s
Brine valve - Period time		1-2	n63	*	*	*	*						30 s	900 s	300 s
Brine valve max OD		1-2	n64	*	*	*	*						n65	100 %	100%
Brine valve min OD		1-2	n65	*	*	*	*						0 %	n64	0%
Brine valve windup		1-2	n66	*	*	*	*						0.2	1.0	1.0
Brine valve Kp		1-2	n67	*	*	*	*						0.5	10.0	4.0
Brine valve Tn		1-2	n68	*	*	*	*						60 s	1800 s	300 s

[1] In order to change this parameter the regulation must be stopped via the parameter r12 Main switch = OFF.

Fan control

Table 17: Fan control

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Fan stop high S5 temp.		1-2	F04	*	*	*	*	*	*	*	*	*	-60.0 °C	50.0 °C	50.0 °C
Fan pulsing mode	0=No pulsing, 1=Pulsing cutout, 2=Pulsing cutout night	1-2	F05	*	*	*	*	*	*	*	*	*	0	2	0
Fan period time		1-2	F06	*	*	*	*	*	*	*	*	*	1 min	30 min	5 min
Fan ON cycle		1-2	F07	*	*	*	*	*	*	*	*	*	0 %	100 %	100%

Defrost schedule

Table 18: Defrost schedule

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min.value	Max.value	Fact.value
Defrost schedule	0=No, 1=Yes	1-2	t00	*	*	*	*	*	*	*	*	*	0	1	0
Def. start 1 - Hours		1-2	t01	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 1 - Minutes		1-2	t11	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Def. start 2 - Hours		1-2	t02	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 2 - Minutes		1-2	t12	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Def. start 3 - Hours		1-2	t03	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 3 - Minutes		1-2	t13	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Def. start 4 - Hours		1-2	t04	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 4 - Minutes		1-2	t14	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Def. start 5 - Hours		1-2	t05	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 5 - Minutes		1-2	t15	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Def. start 6 - Hours		1-2	t06	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Def. start 6 - Minutes		1-2	t16	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Time hours		0-1	t07	*	*	*	*	*	*	*	*	*	0 h	23 h	0 h
Time minutes		0-1	t08	*	*	*	*	*	*	*	*	*	0 min	59 min	0 min
Time date		0-1	t45	*	*	*	*	*	*	*	*	*	1	31	1
Time month		0-1	t46	*	*	*	*	*	*	*	*	*	1	12	1
Time year		0-1	t47	*	*	*	*	*	*	*	*	*	0	100	0
Monday - Follow schedule	0=No, 1=Yes	1-2	t51	*	*	*	*	*	*	*	*	*	0	1	1
Tuesday - Follow schedule	0=No, 1=Yes	1-2	t52	*	*	*	*	*	*	*	*	*	0	1	1
Wednesday - Follow schedule	0=No, 1=Yes	1-2	t53	*	*	*	*	*	*	*	*	*	0	1	1
Thursday - Follow schedule	0=No, 1=Yes	1-2	t54	*	*	*	*	*	*	*	*	*	0	1	1
Friday - Follow schedule	0=No, 1=Yes	1-2	t55	*	*	*	*	*	*	*	*	*	0	1	1
Saturday - Follow schedule	0=No, 1=Yes	1-2	t56	*	*	*	*	*	*	*	*	*	0	1	1
Sunday - Follow schedule	0=No, 1=Yes	1-2	t57	*	*	*	*	*	*	*	*	*	0	1	1

Miscellaneous

Table 19: Miscellaneous

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Delay of outputs at power up		1-2	o01	*	*	*	*	*	*	*	*	*	0 s	600 s	5s
DI1 Configuration	0=None, 1=DI status, 2=Door function, 3=Door alarm, 4=Defrost start, 5=Main switch, 6=Night setback, 7=Thermostat band, 8=Alarm at closed, 9=Alarm at open, 10=Case cleaning, 11=Forced cooling, 12=Open blinds, 14=Forced closing, 15=Shutdown, 16=Light control, 20=Leak detection, 21=Adaptive liquid control, 29=Door fan stop	1-2(1)	o02	*	*	*	*						0	29	0
Network address		1-3(1)	o03	*	*	*	*	*	*	*	*	*	0	240	0

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Access code 3		3-3	o05	*	*	*	*	*	*	*	*	*	0	999	0
Temperature sensor type	0=Pt 1000, 1=PTC 1000, 2=NTC 5k, 3=NTC 10k, 4=User-defined	1-3(1)	o06	*	*	*	*	*	*	*	*	*	0	4	0
Max hold time		1-2	o16	*	*	*	*	*	*	*	*	*	0 min	360 min	20 min
Display air S4%		1-2	o17	*	*	*	*	*	*	*	*	*	0 %	100 %	100%
Pe Min range		1-3(1)	o20					*	*	*	*	*	-1.0 Bar	5.0 Bar	-1.0Bar
Pe Max range		1-3(1)	o21					*	*	*	*	*	6.0 Bar	200.0 Bar	12.0Bar
Refrigerant	0=Not seleted, 6=R13, 7=R13b1, 2=R22, 8=R23, 14=R32, 11=R114, 3=R134a, 12=R142b, 24=R170, 15=R227, 25=R290, 16=R401A, 18=R402A, 19=R404A, 21=R407A, 22=R407B, 20=R407C, 37=R407F, 49=R407H, 23=R410A, 32=R413A, 30=R417A, 31=R422A, 33=R422D, 34=R427A, 35=R438A, 40=R448A, 41=R449A, 48=R449B, 43=R450A, 44=R452B, 45=R454B, 9=R500, 4=R502, 10=R503, 17=R507, 36=R513A, 26=R600, 27=R600a, 5=R717, 28=R744, 46=R1233zdE, 38=R1234ze, 39=R1234yf, 47=R1234zeZ, 29=R1270, 42=R452A, 1=User defined display, 13=User defined	1-3(1)	o30					*	*	*	*	*	0	49	0
DI2 Configuration	0=None, 1=DI status, 2=Door function, 3=Door alarm, 4=Defrost start, 5=Main switch, 6=Night setback, 7=Thermostat band, 8=Alarm at closed, 9=Alarm at open, 10=Case cleaning, 11=Forced cooling, 12=Open blinds, 13=Coordinated defrost, 14=Forced closing, 15=Shutdown, 16=Light control, 20=Leak detection, 21=Adaptive liquid control, 29=Door fan stop	1-2(1)	o37	*	*	*	*	*	*	*	*	*	0	29	0
Light control mode	1=Day and night, 2=Network, 3=Door switch, 4=Network (Fallback), 5=Digital input	1-2	o38		*		*			*		*	1	5	1
MC Light signal	0=OFF, 1=ON	1-2	o39		*		*			*		*	0	1	0
Rail heat ON cycle day		1-2	o41	*	*	*	*	*	*	*	*	*	0 %	100 %	100%
Rail heat ON cycle night		1-2	o42	*	*	*	*	*	*	*	*	*	0 %	100 %	100%
Rail heat period time		1-2	o43			*	*				*	*	6 min	60 min	6min
Case cleaning mode	0=OFF, 1=Fans run, 2=Cleaning	0-1	o46	*	*	*	*	*	*	*	*	*	0	2	0
Application mode	1=1. Comp/Alarm/Fan/Defrost, 2=2. Comp/Light/Fan/Defrost, 3=3. Comp/Railheat/Fan/Defrost, 4=4. Comp/Custom, 5=5. EEV/Comp/Fan/Defrost, 6=6. EEV/Alarm/Fan/Defrost, 7=7. EEV/Light/Fan/Defrost, 8=8. EEV/Rail/Fan/Defrost, 9=9. EEV/Custom	1-3(1)	o61	*	*	*	*	*	*	*	*	*	1	9	5
Access code 2		2-2	o64	*	*	*	*	*	*	*	*	*	0	999	0
Make new factory	0=OFF, 1=ON	3-3(1)	o67	*	*	*	*	*	*	*	*	*	0	1	0
Rail heat control mode	0=ON, 1=Day/Night timer, 2=Dew point ctrl.	1-2	o85	*	*	*	*	*	*	*	*	*	0	2	0

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Dewpoint min limit		1-2	o86	*	*	*	*	*	*	*	*	*	-10.0 °C	o87	8.0 °C
Dewpoint max limit		1-2	o87	*	*	*	*	*	*	*	*	*	o86	50.0 °C	17.0 °C
Rail heat min ON cycle		1-2	o88	*	*	*	*	*	*	*	*	*	0 %	100 %	30%
Door restart inj. delay		1-2	o89	*	*	*	*	*	*	*	*	*	0 min	240 min	30 min
Fan at forced closing	0=OFF, 1=ON, 2=OFF and suppress defrost, 3=ON and suppress defrost	1-2	o90	*	*	*	*	*	*	*	*	*	0	3	1
Light at Main switch OFF	0=OFF, 1=Normal ctrl.	1-2	o98		*		*			*		*	0	1	0

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

Control

Table 20: Control

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Alarm relay priority	0=Not used, 1=High Priority, 2=Medium priority, 3=All	1-2	P41	*			*		*			*	0	3	2
Blinds max open time		1-2	P60				*					*	0 min	60 min	5 min
Fan stop at blinds closing		1-2	P65		*		*			*		*	0 s	300 s	0 s
Rail heat PWM - Period time		1-2	P82	*	*	*	*	*	*	*	*	*	4 s	60 s	10 s
Refrigerant factor K1		1-3(1)	P83					*	*	*	*	*	-999	999	300
Refrigerant factor K2		1-3(1)	P84					*	*	*	*	*	-999	999	300
Refrigerant factor K3		1-3(1)	P85					*	*	*	*	*	-999	999	300
Max superheat liquid ctrl.		1-2	P86					*	*	*	*	*	P87	20.0 °C	3.0 °C
Min superheat liquid ctrl		1-2	P87					*	*	*	*	*	0.0 °C	P86	1.0 °C
Access code 1		1-1	P88	*	*	*	*	*	*	*	*	*	0	999	0
Display keyboard lock	0=None, 1=Local, 2=Network	1-2	P89	*	*	*	*	*	*	*	*	*	0	2	0

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

DO config and manual

Table 21: DO config and manual

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
DO2 Configuration	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/ LLSV, 9=Compressor 2, 10=Air heater	1-3(1)	q02				*					*	0	10	6
DO3 Configuration	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/ LLSV, 9=Compressor 2, 10=Air heater	1-3(1)	q03				*					*	0	10	8
DO4 Configuration	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/ LLSV, 9=Compressor 2, 10=Air heater	1-3(1)	q04				*					*	0	10	9
AO1 Configuration	0=None, 1=Rail heat PWM	1-3(1)	q09	*	*	*	*	*	*	*	*	*	0	1	0
EEV override A		1-2(2)	q11					*	*	*	*	*	0 %	100 %	0%
Compressor 1 - override	0=MAN OFF, 1=MAN ON	1-2(2)	q12	*	*	*	*	*				*	0	1	0
Fan - override	0=MAN OFF, 1=MAN ON	1-2(2)	q13	*	*	*	*	*	*	*	*	*	0	1	0
Defrost A - override	0=MAN OFF, 1=MAN ON	1-2(2)	q14	*	*	*	*	*	*	*	*	*	0	1	0
Rail heat - override	0=MAN OFF, 1=MAN ON	1-2(2)	q15			*	*				*	*	0	1	0
Alarm relay - override	0=MAN OFF, 1=MAN ON	1-2(2)	q16	*			*		*			*	0	1	0
Light - override	0=MAN OFF, 1=MAN ON	1-2(2)	q17		*		*			*		*	0	1	0
Compressor 2 - override	0=MAN OFF, 1=MAN ON	1-2(2)	q19				*					*	0	1	0

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Blinds - override	0=MAN OFF, 1=MAN ON	1-2[2]	q21				*					*	0	1	0
Air heater - override	0=MAN OFF, 1=MAN ON	1-2[2]	q23				*					*	0	1	0
Fan ECO - override	0=MAN OFF, 1=MAN ON	1-2[2]	q24				*					*	0	1	0
Rail heat PWM - override		1-2[2]	q27	*	*	*	*	*	*	*	*	*	0 %	100 %	0%
High temperature - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q28	*	*	*	*	*	*	*	*	*	0	3	1
Low temperature - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q29	*	*	*	*	*	*	*	*	*	0	3	1
Sensor errors - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q30	*	*	*	*	*	*	*	*	*	0	3	1
DI alarms - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q31	*	*	*	*	*	*	*	*	*	0	3	2
Defrost - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q32	*	*	*	*	*	*	*	*	*	0	3	3
Miscellaneous - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q33	*	*	*	*	*	*	*	*	*	0	3	2
Injection - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q34	*	*	*	*	*	*	*	*	*	0	3	2
Control stopped - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q35	*	*	*	*	*	*	*	*	*	0	3	3
Leak detection - Priority	0=Disabled, 3=Low, 2=Medium, 1=High	1-2	q36	*	*	*	*	*	*	*	*	*	0	3	2
Food temp. sensor	1=Thermostat air, 2=Alarm air, 3=S3 Air ON evap.	1-2[1]	q39	*	*	*	*	*	*	*	*	*	1	3	2

[1] In order to change this parameter the regulation must be stopped via the parameter r12 Main switch = OFF.
[2] In order to change this parameter the parameter r12 Main switch must be set in position "SEr" allowing manual control of outputs.

Service

Table 22: Service

Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Control state A	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	0-X	u00	*	*	*	*	*	*	*	*	*	0	48	0
S5 Evaporator A		0-X	u09	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
DI1 Status	0=OFF, 1=ON	0-X	u10	*	*	*	*						0	1	0
Defrost time A		0-X	u11	*	*	*	*	*	*	*	*	*	0 min	900 min	0 min
S3 Air ON evap. A		0-X	u12	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Night condition	0=OFF, 1=ON	0-X	u13	*	*	*	*	*	*	*	*	*	0	1	0
S4 Air OFF evap. A		0-X	u16	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Thermostat air temp. A		0-X	u17	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Thermostat runtime A		0-X	u18	*	*	*	*	*	*	*	*	*	0 min	999 min	0 min
S2 Gas outlet A		0-X	u20					*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Superheat A		0-X	u21					*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Superheat reference A		0-X	u22					*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
EEV opening A		0-X	u23					*	*	*	*	*	0 %	100 %	0%

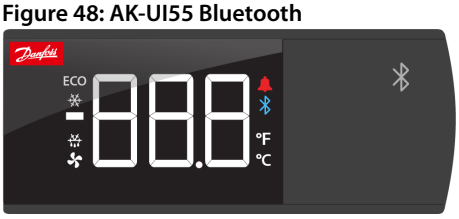
Function	Values	R-W	Code	1	2	3	4	5	6	7	8	9	Min. value	Max. value	Fact. value
Pe Evap. pressure		0-X	u25					*	*	*	*	*	-1.0 Bar	200.0 Bar	0.0Bar
Te Evap. temp.		0-X	u26					*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
DI2 Status	0=OFF, 1=ON	0-X	u37	*	*	*	*	*	*	*	*	*	0	1	0
Display readout 1		0-X	u56	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Alarm air temp. A		0-X	u57	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Compressor 1	0=OFF, 1=ON	0-X	u58	*	*	*	*	*				*	0	1	0
Fan	0=OFF, 1=ON	0-X	u59	*	*	*	*	*	*	*	*	*	0	1	0
Defrost A	0=OFF, 1=ON	0-X	u60	*	*	*	*	*	*	*	*	*	0	1	0
Rail heat	0=OFF, 1=ON	0-X	u61			*	*				*	*	0	1	0
Alarm relay	0=OFF, 1=ON	0-X	u62	*			*		*			*	0	1	0
Light	0=OFF, 1=ON	0-X	u63		*		*			*		*	0	1	0
Compressor 2	0=OFF, 1=ON	0-X	u67				*					*	0	1	0
Blinds	0=OFF, 1=ON	0-X	u82				*					*	0	1	0
Air heater	0=OFF, 1=ON	0-X	u84				*					*	0	1	0
Railheat power		0-X	u85	*	*	*	*	*	*	*	*	*	0 %	100 %	0%
Thermostat band	1=Band 1, 2=Band 2	0-X	u86	*	*	*	*	*	*	*	*	*	1	2	1
Thermostat cutin temp.		0-X	u90	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	4.0 °C
Thermostat cutout temp.		0-X	u91	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	2.0 °C
Brine valve opening		0-X	U02	*	*	*	*						0 %	100 %	0%
Fan ECO	0=OFF, 1=ON	0-X	U37				*					*	0	1	0
Network status		0-X	U45	*	*	*	*	*	*	*	*	*	0 %	100 %	0%
Rail heat PWM		0-X	U59	*	*	*	*	*	*	*	*	*	0 %	100 %	0%
Food temperature A		0-X	U72	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C
Defrost sensor temperature A		0-X	U73	*	*	*	*	*	*	*	*	*	-200.0 °C	200.0 °C	0.0 °C

Operation via 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.

Figure 48: AK-UI55 Bluetooth



Display info:

- Loc
- The operation is locked and cannot be operated via Bluetooth.
- Unlock from the system manager.

Figure 49: Connect to controller

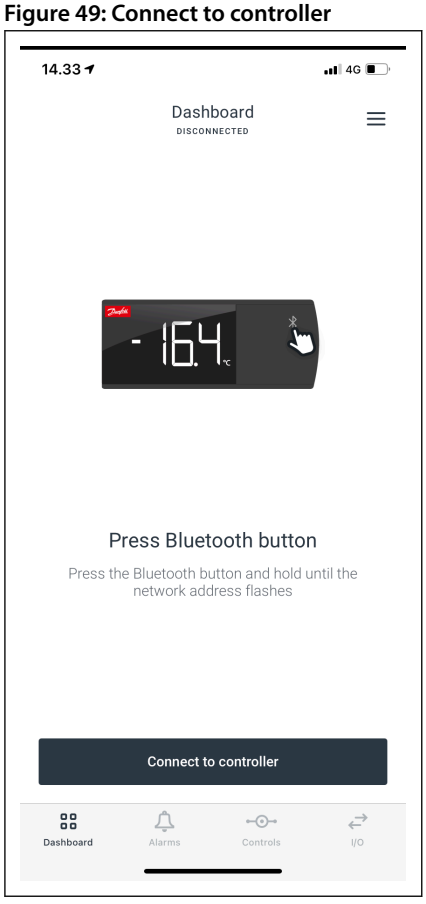


Figure 50: Controller dashboard

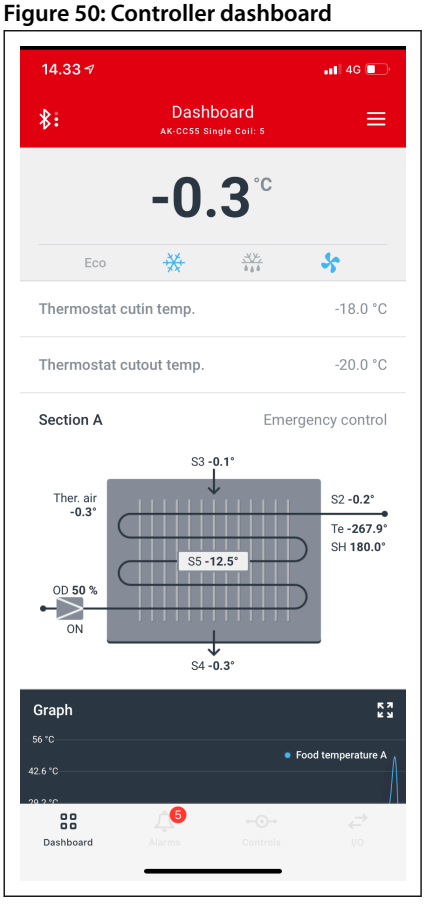
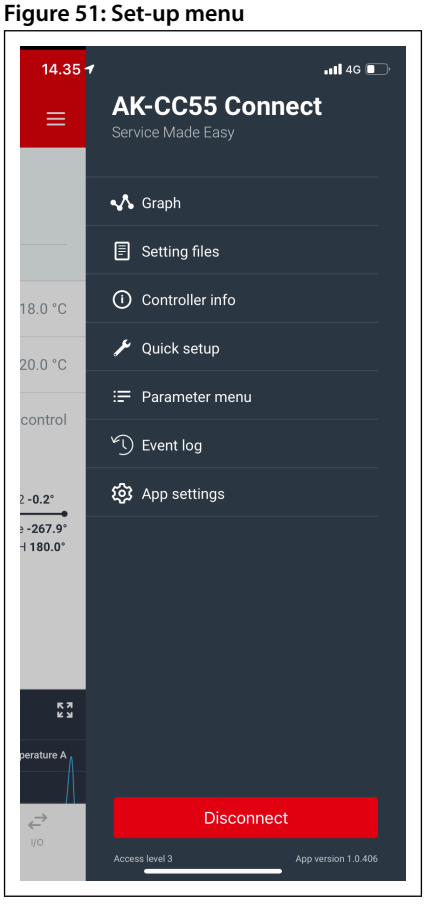


Figure 51: Set-up menu



The functions are described on Page 45 – Page 57.

AK-CC55 Connect menu (SW ver. 2.1x)

Start / Stop

Table 23: Start / Stop

Function	Description	Values	Code	Short name
Main switch	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. Then the outputs can be force controlled. Start / stop of refrigeration can also be accomplished with the external switch function connected to a DI input.Stopped control will give a "Main switch OFF" alarm.	-1=Manual, 0=Stop, 1=Start	r12	r12 Main switch
Delay of outputs at power up	Delay of output signal after start-up After start-up or 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	o01 DelayOfOutp.

Configuration

Table 24: Configuration

Function	Description	Values	Code	Short name
Main switch	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. Then the outputs can be force controlled. Start / stop of refrigeration can also be accomplished with the external switch function connected to a DI input.Stopped control will give a "Main switch OFF" alarm.	-1=Manual, 0=Stop, 1=Start	r12	r12 Main switch
Application mode	Selection of application The controller covers several applications for control of a refrigerated case. Here you set which of the possible applications is required.This menu can only be set when regulation is stopped, i.e. "r12 Main Switch" is set to 0.	1=1. Comp/Alarm/Fan/Defrost, 2=2. Comp/Light/Fan/Defrost, 3=3. Comp/Railheat/Fan/Defrost, 4=4. Comp/Custom, 5=5. EEV/Comp/Fan/Defrost, 6=6. EEV/Alarm/Fan/Defrost, 7=7. EEV/Light/Fan/Defrost, 8=8. EEV/Rail/Fan/Defrost, 9=9. EEV/Custom	o61	o61 Appl. mode
DO2 Configuration	Select the function of the digital output	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/LLSV, 9=Compressor 2, 10=Air heater	q02	q02 DO2 Config.
DO3 Configuration	Select the function of the digital output	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/LLSV, 9=Compressor 2, 10=Air heater	q03	q03 DO3 Config.
DO4 Configuration	Select the function of the digital output	0=None, 1=Fans, 2=Fan ECO, 3=Defrost, 4=Rail heat, 5=Alarm, 6=Light, 7=Blinds, 8=Compressor/LLSV, 9=Compressor 2, 10=Air heater	q04	q04 DO4 Config.
AO1 Configuration	Select the function of the analogue output	0=None, 1=Rail heat PWM	q09	q09 AO1 Config.
DI1 Configuration	Select the function of the digital input	0=None, 1=DI status, 2=Door function, 3=Door alarm, 4=Defrost start, 5=Main switch, 6=Night setback, 7=Thermostat band, 8=Alarm at closed, 9=Alarm at open, 10=Case cleaning, 11=Forced cooling, 12=Open blinds, 13=Coordinated defrost, 14=Forced closing, 15=Shutdown, 16=Light control, 20=Leak detection, 21=Adaptive liquid control, 29=Door fan stop	o02	o02 DI1 Config.
DI2 Configuration	Select the function of the digital input	0=None, 1=DI status, 2=Door function, 3=Door alarm, 4=Defrost start, 5=Main switch, 6=Night setback, 7=Thermostat band, 8=Alarm at closed, 9=Alarm at open, 10=Case cleaning, 11=Forced cooling, 12=Open blinds, 13=Coordinated defrost, 14=Forced closing, 15=Shutdown, 16=Light control, 20=Leak detection, 21=Adaptive liquid control, 29=Door fan stop	o37	o37 DI2 Config.
Refrigerant	Select the type of refrigerant. If the required refrigerant is not part of the list, the user defined option can be used. Please contact Danfoss for detailed informationWarning: Wrong selection of refrigerant may cause damage to the system.	0=Not seleted, 6=R13, 7=R13b1, 2=R22, 8=R23, 14=R32, 11=R114, 3=R134a, 12=R142b, 24=R170, 15=R227, 25=R290, 16=R401A, 18=R402A, 19=R404A, 21=R407A, 22=R407B, 20=R407C, 37=R407F, 49=R407H, 23=R410A, 32=R413A, 30=R417A, 31=R422A, 33=R422D, 34=R427A, 35=R438A, 40=R448A, 41=R449A, 48=R449B, 43=R450A, 44=R452B, 45=R454B, 9=R500, 4=R502, 10=R503, 17=R507, 36=R513A, 26=R600, 27=R600a, 5=R717, 28=R744, 46=R1233zdE, 38=R1234ze, 39=R1234yf, 47=R1234zeZ, 29=R1270, 42=R452A, 1=User defined, 13=User defined display	o30	o30 Refrigerant
Refrigerant factor K1	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		P83	P83 RfgFac.K1

Function	Description	Values	Code	Short name
Refrigerant factor K2	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		P84	P84 RfgFac.K2
Refrigerant factor K3	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		P85	P85 RfgFac.K3
Refrigerant factor A1	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		x65	--- Rfg.Fac.A1
Refrigerant factor A2	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		x66	--- Rfg.Fac.A2
Refrigerant factor A3	Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information		x67	--- Rfg.Fac.A3
Pe Min range	Minimum measuring range for sensor		o20	o20 MinTransPres
Pe Max range	Maximum measuring range for sensor		o21	o21 MaxTransPres
Temperature sensor type	Sensor type for S3, S4 and S5. Normally a Pt 1000 sensor with great signal accuracy is used. But you can also use a sensor with another signal accuracy. That could e.g. be a PTC sensor (1000 ohm at 25 °C). All the mounted sensors S3-S5 must be of the same type.	0=Pt 1000, 1=PTC 1000, 2=NTC 5k, 3=NTC 10k, 4=User-defined	o06	o06 SensorConfig
Sensor point 1 - Temp.	The temperature value for the user-defined temperature sensor in the reference point.		X20	--- SP1 Temp
Sensor point 1 - kohm	The resistance value in kohm for the user-defined temperature sensor in the reference point.		X21	--- SP1 kohm
Sensor point 1 - ohm	The resistance value in ohm for the user-defined temperature sensor in the reference point.		X22	--- SP1 ohm
Sensor point 2 - Temp.	The temperature value for the user-defined temperature sensor in the reference point.		X23	--- SP2 Temp
Sensor point 2 - kohm	The resistance value in kohm for the user-defined temperature sensor in the reference point.		X24	--- SP2 kohm
Sensor point 2 - ohm	The resistance value in ohm for the user-defined temperature sensor in the reference point.		X25	--- SP2 ohm
Sensor point 3 - Temp.	The temperature value for the user-defined temperature sensor in the reference point.		X26	--- SP3 Temp
Sensor point 3 - kohm	The resistance value in kohm for the user-defined temperature sensor in the reference point.		X27	--- SP3 kohm
Sensor point 3 - ohm	The resistance value in ohm for the user-defined temperature sensor in the reference point.		X28	--- SP3 ohm
Defrost method	Select method of defrost	0=None, 1=Electrical, 2=Hot gas, 3=Brine, 4=Air/ Offcycle	d01	d01 Def. method
Defrost stop method	Here you define whether a defrost cycle is to be stopped by time or by a temperature sensor	0=Time, 1=S5 sensor, 2=S4 sensor	d10	d10 DefStopSens.
Defrost stop limit A	When the selected defrost stop sensor reaches the set limit, the defrost cycle is terminated		d02	d02 Def.StopTemp
Food type	When changing the food type the controller will automatically adapt temperature setpoints and alarm limits according to the selected food type. Please be aware that the setting will revert to "None" after having been changed.	0=None, 1=Vegetables, 2=Dairy, 3=Meat and fish, 4=Frozen food, 5=Ice cream	r89	r89 Food type
Food temp. sensor	Select the temperature to be used for the food temperature representation	1=Thermostat air, 2=Alarm air, 3=S3 Air ON evap.	q39	q39 Food sensor
Network address	Network address of the controller		o03	o03 Unit addr.

Thermostat control

Table 25: Thermostat control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Thermostat air temp. A	Thermostat temperature		u17	u17 Ther. air
Food temperature A	Read out of food temperature		U72	U72 Food temp.
S3 Air ON evap. A	Actual sensor value		u12	u12 S3 air temp.

Function	Description	Values	Code	Short name
S4 Air OFF evap. A	Actual sensor value		u16	u16 S4 air temp.
Night condition	Status at the day-/night operation (night operation: on/off)	0=OFF, 1=ON	u13	u13 Night Cond.
Thermostat cutin temp.	Readout of the actual cutin value for the thermostat		u90	u90 Cutin temp.
Thermostat cutout temp.	Readout of the actual cut out value for the thermostat		u91	u91 Cutout temp.
Thermostat runtime A	Read the ongoing cutin time for the thermostat or the duration of the last completed cutin		u18	u18 Ther runtime
Thermostat band	Readout of which thermostat used for regulation: 1= Thermostat band 12= Thermostat band 2	1=Band 1, 2=Band 2	u86	u86 Ther. band
Air heater	Actual status of output function	0=OFF, 1=ON	u84	u84 Heat relay
Thermostat mode	Here it is defined how the thermostat is to operate. Either as an ordinary ON/OFF thermostat or as a modulating thermostat.When operation is "modulating" the valve will limit the flow of refrigerant so that the temperature variation will be less than for the ON/OFF thermostat.The thermostat differential (r01) must not be set lower than 2K for ""modulating"".In a decentralised plant you must select the ON/OFF thermostat setting."	2=Modulating, 1=ON/OFF	r14	r14 Therm. mode
Cutout 1	Set point. The thermostat's cutout value when the given thermostat band is in use		r00	r00 Cutout
Differential 1	When the temperature is higher than the set cutout + the set differential, the compressor relay will be cut in. It will cut out again when the temperature comes down to the set cutout limit		r01	r01 Differential
Cutout 2	Set point. The thermostat's cutout value when the given thermostat band is in use		r21	r21 Cutout 2
Differential 2	When the temperature is higher than the set cutout + the set differential, the compressor relay will be cutin. It will cutout again when the temperature comes down to the set cut-out limit		r93	r93 Diff Th2
Max cutout limit	Setpoint limitation - The controller's setting range for the thermostat 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	r02 Max cutout
Min cutout limit	Setpoint limitation - The controller's setting range for the thermostat 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 low setting of the setpoint, the min. allowable reference value may be increased		r03	r03 Min cutout
Thermostat sensor S4 %	Selection of thermostat sensor. Here you define the sensor the thermostat is to use for its control function. S3, S4, or a combination of them. With the setting 0%, only S3 is used. With 100%, only S4.		r15	r15 Ther. S4 %
Thermostat sensor S4 % night	Selection of thermostat sensor S4% during night operation with night blinds. Here you define the sensor the thermostat is to use for its control function. S3, S4, or a combination of them. With the setting 0%, only S3 is used. With 100%, only S4.		r61	r61 Ther.S4% Ngt
Night offset	Night setback value.The thermostat's reference will be the setpoint plus this value when the controller changes over to night operation.		r13	r13 Night offset
S4 frost protection	Frost protection on S4 air temperature. If the S4 temperature sensors measures a temperature lower than the set limit, refrigeration will be stopped in order to protect produce from ice formation. Refrigeration will start again when the S4 temperature has risen 2K above the set limit		r98	r98 S4 Min Lim
Air heater neutral zone	Heat function. Set the width of the Neutral Zone for changeover from cooling to heating "		r62	r62 Heat NZ

Function	Description	Values	Code	Short name
Air heater start delay	Time delay on transition from refrigeration phase to heating phase (there is not time delay on transition from heating phase to refrigeration phase)		r63	r63 HeatStartDel
Melt interval	Melt function. Only for control of MT cases/rooms (-5 to +10°C). The function ensures that the evaporator will not be blocked by ice crystals. Here you set how often the function is to stop the refrigeration and hence transform the ice crystals to water.		r16	r16 MeltInterval
Melt period	Melt period. Here you set how long an on-going melt function is to last		r17	r17 Melt period

Alarm limits and delays

Table 26: Alarm limits and delays

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Alarm status	Actual alarm status	0=OFF, 1=ON	x16	--- Sum alarm
Alarm air temp. A	Measured temperature for alarm thermostat		u57	u57 Alarm air
High alarm limit	Readout of actual high alarm limit for the temperature monitoring		y10	--- High al. lim
Low alarm limit	Readout of actual low alarm limit for the temperature monitoring		y11	--- Low al. lim
S3 Air ON evap. A	Actual sensor value		u12	u12 S3 air temp.
S4 Air OFF evap. A	Actual sensor value		u16	u16 S4 air temp.
Reset alarms	Command for resetting all alarms, unless they are still active	0=OFF, 1=ON	x15	--- Reset alarm
Alarm sensor S4% A	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	A36 Alarm S4 %
High alarm limit 1	Upper alarm limit. The limit value is set in absolute value. The limit value will be raised with the night offset during night operation.		A13	A13 HighLim Air
Low alarm limit 1	Lower alarm limit. The limit value is set in absolute value		A14	A14 LowLim Air
High alarm limit 2	Upper alarm limit. The limit value is set in absolute value. The limit value will be raised with the night offset during night operation.		A20	A20 HighLim2 Air
Low alarm limit 2	Lower alarm limit. The limit value is set in absolute value		A21	A21 LowLim2 Air
Alarm delay A	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 delay has been passed. The time delay is set in minutes		A03	A03 Alarm delay
Alarm delay pulldown A	Alarm delay at tempeature pulldown conditions (long alarm delay). This time delay is used during start-up, during defrost, immediately after a defrost. There will be change-over to the normal time delay when the temperature has dropped below the set upper alarm limit.		A12	A12 Pulldown del
Door open alarm delay	Time delay for door alarm		A04	A04 DoorOpen del
Door restart inj. delay	Start of refrigeration when door is open. If the door has been left open, refrigeration will be started after the set time.		o89	o89 DoorInjStart
Alarm delay DI 1	Time delay for digital input alarm		A27	A27 Al.Delay DI1
Alarm delay DI 2	Time delay for digital input alarm		A28	A28 Al.Delay DI2

Injection control

Table 27: Injection control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Thermostat air temp. A	Thermostat temperature		u17	u17 Ther. air
S3 Air ON evap. A	Actual sensor value		u12	u12 S3 air temp.
S4 Air OFF evap. A	Actual sensor value		u16	u16 S4 air temp.
EEV opening A	Actual status of output function		u23	u23 EEV OD %
Pe Evap. pressure	Actual sensor signal		u25	u25 EvapPress Pe
Te Evap. temp.	Temperature converted from pressure		u26	u26 EvapTemp Te
S2 Gas outlet A	Actual sensor value		u20	u20 S2 temp.
Superheat A	Readout of actual superheat at the outlet of the evaporator		u21	u21 Superheat
Superheat reference A	Read out of the actual superheat reference		u22	u22 SuperheatRef
Brine valve opening	Actual status of output function		U02	U02 PWM OD %
Min superheat limit	Min. value for the superheat reference		n10	n10 Min SH
Max superheat limit	Max. value for the superheat reference		n09	n09 Max SH
MOP temperature	MOP temperature. The valve opening degree is reduced until the evaporating temperature reaches the set MOP limit. If no MOP function is required, select highest value, which corresponds to OFF		n11	n11 MOP temp.
AKV Period time	Period time for the pulse width modulation		n13	n13 AKV Period
Min superheat liquid ctrl	Min. value for the superheat reference during adaptive liquid control		P87	P87 SH Min Liq.
Max superheat liquid ctrl.	Max. value for the superheat reference during adaptive liquid control		P86	P86 SH Max Liq.
Brine valve - Period time	Period time for the pulse width modulation		n63	n63 Pwm Period
Brine valve max OD	Expert setting - please contact Danfoss for further info		n64	n64 Pwm Max. OD
Brine valve min OD	Expert setting - please contact Danfoss for further info		n65	n65 Pwm Min. OD
Brine valve windup	Expert setting - please contact Danfoss for further info		n66	n66 PwmWindUp-Fac
Brine valve Kp	Expert setting - please contact Danfoss for further info		n67	n67 Pwm Kp fact.
Brine valve Tn	Expert setting - please contact Danfoss for further info		n68	n68 Pwm Tn sec

Defrost control

Table 28: Defrost control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Defrost sensor temperature A	Actual temperature of selected defrost stop sensor		U73	U73 Def.StopTemp
S5 Evaporator A	Actual sensor value		u09	u09 S5 temp.

Function	Description	Values	Code	Short name
Defrost A	Actual status of output function	0=OFF, 1=ON	u60	u60 Def. relay
Defrost time A	Read the duration of the ongoing defrost or the duration of the last completed defrost.		u11	u11 Defrost time
Start defrost	Command for starting a defrost	0=OFF, 1=ON	x09	--- Def. Start
Stop defrost	Command for stopping an ongoing defrost cycle	0=OFF, 1=ON	x10	--- Def. Stop
Defrost method	Select method of defrost	0=None, 1=Electrical, 2=Hot gas, 3=Brine, 4=Air/ Offcycle	d01	d01 Def. method
Defrost stop method	Here you define whether a defrost cycle is to be stopped by time or by a temperature sensor	0=Time, 1=S5 sensor, 2=S4 sensor	d10	d10 DefStopSens.
Defrost stop limit 1	When the selected defrost stop sensor reaches the set limit, the defrost cycle is terminated		d02	d02 Def.StopTemp
Defrost stop limit 2	Defrost stop temperature limit when thermostat band 2 is in operation.When the selected defrost stop sensor reaches the set limit, the defrost cycle is terminated		d28	d28 DefStopTemp2
Min. defrost time	Minimum duration of a defrost cycle. The defrost cycle will as a minimum run for the set minimum defrost time once it is started		d24	d24 Min Def Time
Max. defrost time 1	Max. duration of a defrost cycle. The setting is also used as a safety time if the defrost is stopped on temperature. If the selected defrost stop sensor does not reach the set defrost stop temperature limit within the set time, the defrost will be stopped anyway.		d04	d04 Max Def.time
Max. defrost time 2	Max. duration of a defrost cycle when thermostat band 2 is in operation. The setting is also used as a safety time if the defrost is stopped on temperature. If the selected defrost stop sensor does not reach the set defrost stop temperature limit within the set time, the defrost will be stopped anyway.		d29	d29 MaxDefTime2
Defrost start interval	The function is zeroset 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 defrost 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 communcation 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. 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. he interval time is not active when set to 0		d03	d03 Def.Interval
Time staggering power up	Time staggering for defrost cutins 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. The function delays the interval time 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	d05 Time stagg.
Max thermostat runtime	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 not in use.		d18	d18 MaxTherRunT.
Pump down delay	Set the time where the evaporator is emptied of refrigerant prior to the actual defrost cycle		d16	d16 Pump dwn del
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	d06 DripOff time
Max hold time	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	o16 MaxHoldTime

Function	Description	Values	Code	Short name
Fan control during defrost	Fan operation during defrost Here you can set how the 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 stopped3: Running during pump down and defrost until defrost stop sensor reaches fan stop temperature limit	0=OFF, 1=ON, 2=OFF at drip, 3=OFF at high temp	d09	d09 FanDuringDef
Fan start delay	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 remaining water is transformed into ice on the evaporator).		d07	d07 FanStartDel
Fan start temperature	Temperature limit for starting the fans after a defrost. When the measured S5 evaporator temperature is getting below the set limit, the fans are started		d08	d08 FanStartTemp
Fan stop temperature	If the fan control during defrost has been set up for it, the fans can be stopped during the defrost if the defrost sensor exceeds the set temperature limit		d41	d41 Def Fan Stop
Rail heat during defrost	Define how railheat is controlled during defrost0: Railheat is OFF all the time1: Railheat is ON all the time2: Normal railheat control	0=OFF, 1=ON, 2=Normal control	d27	d27 Railh.at def
Display delay after defrost	Set the maximum time the display should show the defrost code "-d-" after a defrost. The normal temperature readout is normally started when the temperature in the case is OK again or if a high temperature alarm is raised.		d40	d40 Disp. d del.

Defrost schedules

Table 29: Defrost schedules

Function	Description	Values	Code	Short name
Defrost schedule		0=No, 1=Yes	t00	t00 Def.Schedule
Def. start 1 - Hours			t01	t01 Def. 1 hr.
Def. start 1 - Minutes			t11	t11 Def. 1 min.
Def. start 2 - Hours			t02	t02 Def. 2 hr.
Def. start 2 - Minutes			t12	t12 Def. 2 min.
Def. start 3 - Hours			t03	t03 Def. 3 hr.
Def. start 3 - Minutes			t13	t13 Def. 3 min.
Def. start 4 - Hours			t04	t04 Def. 4 hr.
Def. start 4 - Minutes			t14	t14 Def. 4 min.
Def. start 5 - Hours			t05	t05 Def. 5 hr.
Def. start 5 - Minutes			t15	t15 Def. 5 min.
Def. start 6 - Hours			t06	t06 Def. 6 hr.
Def. start 6 - Minutes			t16	t16 Def. 6 min.
Monday - Follow schedule		0=No, 1=Yes	t51	t51 Mon.Schedule
Tuesday - Follow schedule		0=No, 1=Yes	t52	t52 Tue.Schedule
Wednesday - Follow schedule		0=No, 1=Yes	t53	t53 Wed.Schedule
Thursday - Follow schedule		0=No, 1=Yes	t54	t54 Thu.Schedule
Friday - Follow schedule		0=No, 1=Yes	t55	t55 Fri.Schedule
Saturday - Follow schedule		0=No, 1=Yes	t56	t56 Sat.Schedule
Sunday - Follow schedule		0=No, 1=Yes	t57	t57 Sun.Schedule

Compressor

Table 30: Compressor

Function	Description	Values	Code	Short name
Compressor 1	Actual status of output function	0=OFF, 1=ON	u58	u58 Comp1/LLSV
Compressor 2	Actual status of output function	0=OFF, 1=ON	u67	u67 Comp2 relay
Min ON time	Minimum time the compressor is to run once it has been started.		c01	c01 Min. On time

Function	Description	Values	Code	Short name
Min OFF time	Minimum time the compressor has to be stopped		c02	c02 Min.Off time
Delay between comp.	Time delay for couplings of two compressors. The step delay is the time that has to elapse from the first compressor cuts in and until the next compressor can cut in.		c05	c05 Step delay
Step control mode	Selection of step control mode for compressors. At sequential mode compressor 1 will always be the first to start and the last to stop. In cyclic mode the run time between the compressor will be equalized.	1=Sequential, 2=Cyclic	c08	c08 Step mode
Comp. 2 ctrl. Th. band 2	Select whether compressor 2 is to be in operation in thermostat band 2	0=OFF, 1=ON	c85	c85 Cmp2 In Th2

Fan control

Table 31: Fan control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Fan	Actual status of output function	0=OFF, 1=ON	u59	u59 Fan relay
Fan ECO	Actual status of output function	0=OFF, 1=ON	U37	U37 Fan Eco
Fan pulsing mode	Pulse operation of fan 0: No pulse operation 1: Pulse operation when the thermostat is cut out2: Pulse operation when the thermostat is cut out, but only during night operation	0=No pulsing, 1=Pulsing cutout, 2=Pulsing cutout night	F05	F05 FanPulseMode
Fan period time	Periodtime for pulsing of fan		F06	F06 Fan cycle
Fan ON cycle	ON time for fan. The ON period is set as a percentage of the period time		F07	F07 Fan ON %
Fan stop high S5 temp.	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.		F04	F04 FanStop temp
Fan at forced closing	You can set whether fans should be operational or stopped if the function "Forced closing" is activated here. 0: Fans are OFF1: Fans are ON2: Fans are OFF and defrost is not permitted3: Fans are ON and defrost is not permitted	0=OFF, 1=ON, 2=OFF and suppress defrost, 3=ON and suppress defrost	o90	o90 Fan ForcedCl
Fan stop at blinds closing	When blinds are closing the fans are stopped in the defined time delay in order to ensure that the blinds are closed correctly		P65	P65 BlindFanStop

Railheat control

Table 32: Railheat control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Dewpoint	Actual dewpoint received from system manager via network		x18	--- Dew point
Rail heat	Actual status of output function	0=OFF, 1=ON	u61	u61 Railh. relay
Railheat power	Readout of the actual rail power in %		u85	u85 Rail DutyC %
Rail heat PWM	Actual status of output function		U59	U59 Railheat PWM

Function	Description	Values	Code	Short name
Rail heat control mode	The rail heat can be controlled in several ways: 0: Rail-heat is running all the time 1: Pulse control is used with a timer function following the day/night operation 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.	0=ON, 1=Day/Night timer, 2=Dew point ctrl.	o85	o85 Railh. mode
Rail heat ON cycle day	Railheat power during day time. The ON period is set as a percentage of the period		o41	o41 Railh.ONday%
Rail heat ON cycle night	Railheat power during night time. The ON period is set as a percentage of the period time		o42	o42 Railh.ONngt%
Rail heat period time	Periodtime for pulsing of railheat		o43	o43 Railh.cycle
Rail heat PWM - Period time	Period time for the pulse width modulation		P82	P82 RailCyclePWM
Rail heat min ON cycle	Lowest permitted rail heat power. When the measured dew point is below the defined minimum limit the rail heat will run with the set minimum power		o88	o88 Rail Min ON%
Dewpoint min limit	If the measuered dew point is below the set value the rail heat is running at minimum heat		o86	o86 DewP Min lim
Dewpoint max limit	If the measured dew point is above the set value the rail heat is maximum		o87	o87 DewP Max lim

Light/Blinds/Cleaning control

Table 33: Light/Blinds/Cleaning control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 14=Defrost, 15=Fan delay, 16=Forced closing, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Night condition	Status at the day-/night operation (night operation: on/off)	0=OFF, 1=ON	u13	u13 Night Cond.
Light	Actual status of output function	0=OFF, 1=ON	u63	u63 Light relay
Blinds	Actual status of output function	0=OFF, 1=ON	u82	u82 Blinds relay
Light control mode	Configuration of light function1: Light is controlled via day/night status 2: Light is controlled via data communication and master control parameter "MC Light signal" 3: Light is controlled by door contact on DI input. 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: Light is controlled via DI input signal	1=Day and night, 2=Network, 3=Door switch, 4=Network (Fallback), 5=Digital input	o38	o38 Light config
Light at Main switch OFF	Define how light and blinds are to be controlled at Main switch OFF 0: Light is switched off and night blinds are open when the main switch is off 1: Light and night blinds are independent of main switch.	0=OFF, 1=Normal ctrl.	o98	o98 Light MS=Off
Blinds max open time	Time delay from when blinds have been opened manually until they close again		P60	P60 BlindOpenTim
Case cleaning mode	The status of the function can be followed here or the function can be started manually.0 = Normal operation (no cleaning) 1 = Only fans are running to defrost the evaporator. All other outputs are Off. 2 = Cleaning with stopped fans. All outputs are Off. If the function is controlled by a digital input signal, the relevant status can be seen here in the menu.	0=OFF, 1=Fans run, 2=Cleaning	o46	o46 Case clean

Display control

Table 34: Display control

Function	Description	Values	Code	Short name
Control state A	Readout of the actual control state of the controller	0=Normal ctrl., 1=Hold after defrost, 2=Min ON timer, 3=Min OFF timer, 4=Drip off, 10=Main switch OFF, 11=Thermostat cut-out, 12=Frost protection S4, 13=Not_used, 14=Defrost, 15=Fan delay, 17=Door open, 18=Melt period, 19=Modulating temp. control, 20=Emergency control, 23=Adaptive superheat control, 24=Start injection, 25=Manual control, 26=No refrigerant selected, 16=Forced closing, 29=Case cleaning, 30=Forced cooling, 31=Door open, 32=Power-up delay, 33=Air heating, 45=Shut down controller, 48=Adaptive liquid control	u00	u00 Ctrl. state
Display readout 1	Read out of the temperature shown on the display		u56	u56 Display air
Display air S4%	Signal to the display sensor. Here you have to define the ratio between the sensors which the display has to use. S3, S4 or a combination of the two. With setting 0% only S3 is used. With 100% only S4 is used		o17	o17 Disp. S4 %
Display readout adjustment	Correction of the display´s temperature.If the temperature at the products and the temperature received by the controller are not identical, an offset adjustment of the display temperature can be carried out."		r04	r04 Disp. Adj. K
Temperature unit	Select whether temperatures are to be shown as °C or as °F.	0=Celsius, 1=Fahrenheit	r05	r05 Temp.unit
Display keyboard lock	With this setting it is possible to lock the keyboard operation of the local display. None: Display keyboard operation will never be locked. Local: When not used for some time, the local display will lock the keyboard operations and a special key combination is required in order to enable the keyboard operations. Network: When the controller receives a master control signal (--- Key/BT lock) via the network, the display keyboard operations will be locked. The keyboard operations can only be activated again by setting the master control signal OFF via the System Manager.	0=None, 1=Local, 2=Network	P89	P89 LockDispKey

Alarm relay priorities

Table 35: Alarm relay priorities

Function	Description	Values	Code	Short name
Alarm relay	Actual status of output function	0=OFF, 1=ON	u62	u62 Alarm relay
Alarm relay priority	Set which alarm priorities that are to activate the alarm relay: 0=Not used, alarm relay is not used1: High, alarm with high priority will activate relay2: Medium, alarms with high or medium priority will activate the alarm relay3: All, all alarms will activate alarm relay	0=Not used, 1=High Priority, 2=Medium priority, 3=All	P41	P41 Al.Rel.Prio
Mute alarm	When muting alarms, the alarm relay will stop signalling the alarm until a new alarm arises	0=OFF, 1=ON	q38	q38 Mute Alarm
High temperature - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q28	q28 Hi Temp Prio
Low temperature - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q29	q29 Lo Temp Prio
Sensor errors - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q30	q30 Sensor Prio
DI alarms - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q31	q31 DIAlarm Prio
Defrost - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q32	q32 Defrost Prio

Function	Description	Values	Code	Short name
Miscellaneous - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q33	q33 Misc Prio
Injection - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q34	q34 Inject Prio
Control stopped - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q35	q35 CtrlOFF Prio
Leak detection - Priority	Select the priority of the alarms associated to the alarm group. Be aware - by selecting "Disable" the alarms will not be shown on the display or be routed to the alarm relay or to the network.	0=Disabled, 3=Low, 2=Medium, 1=High	q36	q36 Leak Prio

Miscellaneous

Table 36: Miscellaneous → Access codes

Function	Description	Values	Code	Short name
Access code 3	Access code for local display		o05	o05 Acc. code 3
Access code 2	Access code for local display		o64	o64 Acc. code 2
Access code 1	Access code for local display		P88	P88 Acc. code 1

Table 37: Miscellaneous → Network

Function	Description	Values	Code	Short name
Network status	Quality of the network communication		U45	U45 Comm. status
Network address	Network address of the controller		o03	o03 Unit addr.
Baudrate	Communication speed of network	1=Auto, 2=9600 Baud, 3=19200 Baud, 4=38400 Baud	x96	--- Bus baudrate
Parity and stop bit	Select parity and stop bit of Modbus messages	0=None, 1=Even, 2=Odd	x97	--- Parity bit

Table 38: Miscellaneous → Sensor adjustment

Function	Description	Values	Code	Short name
S2 Gas outlet A - Adjustment	Correction of sensor signal e.g. due to long sensor cable		r19	r19 Adjust S2
S3 Air ON evap. A - Adjustment	Correction of sensor signal e.g. due to long sensor cable		r10	r10 Adjust S3
S4 Air OFF evap. A - Adjustment	Correction of sensor signal e.g. due to long sensor cable		r09	r09 Adjust S4
S5 Evaporator A - Adjustment	Correction of sensor signal e.g. due to long sensor cable		r11	r11 Adjust S5

Table 39: Miscellaneous → Factory reset

Function	Description	Values	Code	Short name
Make new factory	With this command you save the controller's actual settings as a new basic setting (the earlier factory settings are overwritten).	0=OFF, 1=ON	o67	o67 Make factory
Reset to factory settings	Command which will revert all controller settings to factory values.	0=OFF, 1=ON	z06	--- Reset factory

Advanced

Table 40: Advanced → Advanced injection control

Function	Description	Values	Code	Short name
Superheat ctrl. mode A	Select how to control the superheat of the evaporator. At adaptive control the superheat reference is adapted automatically to give the best utilization of the evaporator surface. At load based control the superheat reference is increased at high loads	1=Adaptive, 2=Load based	n21	n21 SH mode
Superheat close A	Minimum superheat limit where the valve is closing		x68	--- SH close
AFidentForce A	Expert setting - contact Danfoss for further information		x69	--- AFidentForce
Superheat Kp min A	Min limit for amplification factor of PI controller adjusting the valve opening degree (expert setting)		x70	--- SH Kp min
Superheat Kp max A	Max limit for amplification factor of PI controller adjusting the valve opening degree (expert setting)		x71	--- SH Kp max

Function	Description	Values	Code	Short name
Superheat Tn A	Integration time of PI controller adjusting the valve opening degree (expert setting)		x72	--- SH Tn
S2 stabillity A	Setting of required stability of S2 gas outlet temperature before the superheat reference is reduced (Expert setting)A higher value will allow more instabillity in S2 signalA lower value will allow less instabillity in S2 signal		Y33	--- S2 Stability
S2 Std deviation	Expert injection setting - contact Danfoss for further information		Y34	--- S2 Std Dev
Te feedback gain A	Gain factor for feedback of evaporating temperature signal Te to PI controller controlling the superheat (expert setting)		x73	--- Te-gain
Kp MTR control A	Amplification factor for modulating temperature control (Expert setting)		x77	--- MTR Kpfactor
Tn MTR control A	Integration time for modulating temperature control (Expert setting)		x78	--- MTR Tn sec
AFident A	Expert readout - contact Danfoss for further information		x79	--- AFident
Calculated Max OD A	Calculated maximum opening degree of injection valve (expert readout)		x80	--- Max OD %
Superheat close liquid ctrl. A	Minimum limit of superheat where the valve is closing duting adaptive liquid control		x87	--- SH close Liq
Emergency OD day	Average opening degree of liquid line solenoid valve during day operation		z01	--- EmerC OD day
Emergency OD night	Average opening degree of liquid line solenoid valve during night operation		z02	--- EmerC OD ngt
SH Band	Expert injection setting - contact Danfoss for further information		Y28	--- SH Band
Injection duty cycle SP	Expert setting - contact Danfoss for further information		Y29	--- ThDutyCycle
Injection duty cycle	Expert injection setting - contact Danfoss for further information		Y30	--- ActDutyCycle
P-gain	Expert injection setting - contact Danfoss for further information		Y31	--- P - Gain
OD Ctrl. status	Readout showing which part of the injection function that is in control of the valve opening degree	Values must be changed as per below: 0=Adaptive SH control 1=MOP 2=Superheat close 3=MTR	Y32	--- OD Status

Table 41: Advanced → Master control

Function	Description	Values	Code	Short name
Regulation condition A	Readout of the actual control state of the controller	0=Main switch OFF, 1=Injection start, 2=Superheat ctrl., 3=Fill evap., 4=Defrost, 5=Post defrost, 6=Forced closing, 7=Injection fault, 8=Emergency control, 9=Modulating ctrl., 10=Melt period, 11=Door open, 12=Case cleaning, 13=Cutout, 14=Forced cooling, 15=Shut down	x62	--- Reg. Cond.
MC Actual cutin temp.			x63	--- Cutin temp.
MC Actual cutout temp.			x64	--- Cutout temp.
MC Ther. toggle	Master control signal used for switching case load ON/OFF depending on load condition	0=No action, 1=Toggle ON, 2=Toggle OFF	x81	--- TherToggle
MC Load request	Master control signal used to control load balance between multiple case controllers on the same suction line		x82	--- LoadReq
MC Max Te offset	Requested offset to actual evporating temperature in order to keep the air temperature at the actual set point		x84	--- MaxTeOffset
MC Liquid control	Master control signal allowing switch to adaptive liquid control	0=OFF, 1=ON	x85	--- MC Liq. Ctrl
MC Night setback	Master control signal for changing between day and night time operation	0=OFF, 1=ON	x06	--- Night setbck
MC Case shutdown	Master control signal used to shut down a case for a time period. During shut down there will be no alarm monitoring	0=OFF, 1=ON	x17	--- Case shutdwn
MC Forced closing	Master control signal that will close the injection valve	0=OFF, 1=ON	x07	--- Forced close
MC Forced cooling	Master control signal that will provide forced cooling	0=OFF, 1=ON	x08	--- Forced cool.

Function	Description	Values	Code	Short name
MC Defrost start	Master control signal for starting a defrost. At adaptive defrost the defrost might be skipped if the defrost is not needed	0=OFF, 1=ON	x13	--- MC def.start
MC Defrost state	Read out the actual state of the defrost	0=OFF, 1=ON	x14	--- DefrostState
MC Hold after defrost	Master control signal used for co-ordinated defrost control to hold cabinets from returning to normal refrigeration after a defrost until all cabinets have terminated defrost	0=OFF, 1=ON	x11	--- HoldAfterDef
MC Stop defrost	Master control signal used to prevent a defrost start in a controller.	0=OFF, 1=ON	x12	--- Disable def.
MC Light signal	Master control signal for control of light via data communication signal from system manager	0=OFF, 1=ON	o39	o39 Light remote
MC Actual dewpoint	Master control signal sending the actual measured dew point from system manager to controller over the network.		x03	--- Act.DewPoint
MC Po load factor			x83	--- Load factor
MC Key/Bluetooth lock	Master control signal that will lock down all Bluetooth data communication and optionally also the operation of the display keys (depend upon selection in P89 Display keyboard lock).	0=OFF, 1=ON	X33	--- BT lock
MC Min delta T	Required minimum delta temperature across evaporator (S3 - Te) in order to keep the air temperature at the actual set point		y04	--- Min Delta T

Fault message

In an error situation the alarm LED on the front will be on and the alarm relay will be activated (depending on priority). If you push the alarm button for 3 seconds you can see the alarm report in the display. (Alarm priorities can be changed. See the Table 35: Alarm relay priorities.) Here are the messages that may appear:

Table 42: Fault message

Code	Alarm text	Description
E01	Hardware failure	The controller has a hardware failure
E06	Clock lost time	Clock has lost valid time
E20	Pe Evap. pressure A - Sensor error	Sensor signal is out of range. Please check the sensor for correct operation
E24	S2 Gas outlet A - Sensor error	Sensor signal is out of range. Please check the sensor for correct operation
E25	S3 Air ON evap. A - Sensor error	Sensor signal is out of range. Please check the sensor for correct operation
E26	S4 Air OFF evap. A - Sensor error	Sensor signal is out of range. Please check the sensor for correct operation
E27	S5 Evaporator A - Sensor error	Sensor signal is out of range. Please check the sensor for correct operation
A01	High temperature alarm A	The alarm temperature has been above the max alarm limit for a longer time period than the set alarm delay.
A02	Low temperature alarm A	The alarm temperature has been below the min alarm limit for a longer time period than the set alarm delay.
A04	Door open alarm	The door has been open for a too long time
A05	Max defrost hold time exceeded	The controller has been waiting longer time than permitted after a co-ordinated defrost.
A11	Refrigerant not selected	The refrigerant has not been selected hence control can not be initiated
A15	DI alarm 1	Alarm signal from digital input signal
A16	DI alarm 2	Alarm signal from digital input signal
A45	Main switch set OFF	The controller manin switch has been set to either Stop or Manaual control. Alternatively a digital input set up for "main switch" function, has stopped control
A59	Case in cleaning mode	A case cleaning operation has been started on a case
AA2	CO_2 leak detected	CO_2 is leaking from the refrigerantion system
AA3	Refrigerant leak detected	Refrigerant is leaking from the refrigeration system
a04	Wrong IO configuration	Inputs and outputs have not been configured correctly

NOTE:

Data communication

The importance of individual alarms can be defined with a setting. The setting must be carried out in the group "Alarm destinations"

Operating status

Table 43: Operating status

Ctrl. State/ Code	Operating status	Description
	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:	
S0	Normal ctrl.	The controller is running normal control. There is no other control taking priority
S1	Hold after defrost	The controller is waiting for other controllers to terminate coordinated defrost
S2	Min ON timer	The compressor is restricted from stopping until the minimum ON timer expires
S3	Min OFF timer	The compressor is restricted from starting until the minimum OFF timer expires
S4	Drip off	The defrost has terminated and the controller is waiting for drip delay to expire, while the water is dripping off the evaporator
S10	Main switch OFF	The controller has been stopped because the parameter r12 Main switch has been set in OFF or Service position or the controller has been stopped via Main switch function on DI input
S11	Thermostat cut-out	The air temperature has reached the thermostat cut-out value
S12	Frost protection S4	The air off temperature is below the minimum S4 frost limit (r98, S4 frost protection)
S14	Defrost	The controller is running a defrost cycle
S15	Fan delay	The evaporator fans are waiting to start after a defrost cycle (d07, Fan start delay and d08, Fan start temperature)
S16	Forced closing	The injection valve has been forced closed via a signal on a digital input or from the system manager (compressor pack is restricted from starting)
S17	Door open	DI signal indicates that the cold room door is open
S18	Melt period	The controller has stopped refrigeration for a short while to turn ice crystals into water and thereby improve air flow through the evaporator
S19	Modulating temp. control	The air temperature is controlled close to the set point via a modulating temperature control
S20	Emergency control[1]	The air temperature is controlled according to an emergency procedure due to sensor error (Pe, S2, S3 or S4)
S23	Adaptive superheat control	The superheat of the evaporator is optimized
S24	Start injection	The liquid injection into the evaporator has started
S25	Manual control	Main switch has been set in Service position for manual control of outputs
S26	No refrigerant selected	The refrigerant type has not been selected (parameter o30 Refrigerant)
S29	Case cleaning	A case cleaning operation has been initiated via parameter o46 Case cleaning mode or via a signal on a digital input or via the AK-CC55 Connect app
S30	Forced cooling	The thermostat has been overruled to run forced cooling via a signal on a digital input
S32	Power-up delay	The controller has just been powered up and the output control is waiting for the power-up delay to expire (parameter o01, Delay of outputs at power-up)
S33	Air heating	The air heater is energized in order to raise the air temperature (parameters r62, Air heater neutral zone and r63, Air heater start delay)
S45	Shut down controller	The control has been stopped due to a digital input signal or from the system manager
S48	Adaptive liquid control	The superheat control is running adaptive liquid control with reduced superheat for transcritical CO2 systems with ejectors. Signal is provided via digital input or from the system manager

[1] Emergency control:

- If Pe or S2 sensor fails, the controller will operate with a safe opening degree based on normally registered opening degree during day and night operation.
- If S3 or S4 sensor fails, the thermostat will operate with a registered ON/OFF duty cycle during day and night operation.

Product specification

Technical data

Electrical specifications

Table 44: Electrical specifications

Electrical data	Value
Supply voltage AC [V]	115 V / 230 V, 50/60 Hz
Power consumption [VA]	5 VA
Power ON indicator	Green LED
Electrical cable dimensioning [mm²]	Max. 1.5 mm² multi-core cable

Sensor and measuring data

Table 45: Sensor and measuring data

Sensor and measuring data	Value
Sensor S2	Pt 1000 AKS11
Sensor S3, S4, S5	Pt 1000 AKS11 PTC 1000 EKS111 NTC5K EKS211 NTC10K EKS221 sensor (All 3 must be of the same type)
Temperature measuring accuracy	Pt1000: -60 – 120 °C. ±0.5 K PTC1000: -60 – 80 °C. ±0.5 K NTC5K: -40 – 80 °C. ±1.0 K NTC10K: -40 – 120 °C. ±1.0 K
Pt1000 sensor specification	±0.3 K at 0 °C ±0.005 K per degree
Pe measuring	AKS 32R Ratiometric pressure transmitter: 10-90%

Input and output relay specifications

Table 46: Input and output relay specifications

Input and output relay specifications	Input/output	Description
Digital input	DI1 DI2	Signal from dry 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 (SELV) Contact 3.5 mA
Solid state output	DO1 (for AKV coil)	115V / 230 V AC Max. 0.5 A (No overload protection!) Max. 1 x 20 W AKV for 115 V AC 2 x 20 W AKV for 230 V AC **Note:** 2 EC coils are not supported.
Relays	DO2 DO3 DO4	115 V / 230 V AC Load max.: CE. 8 (6)A UL. 8A res. 3FLA 18LRA Load min.: 1VA Inrush: DO2 DO3 TV-5 80A
Analogue output/ PWM	AO1	0 / 10 V Pulse Width Modulated (PWM) max. 15 mA. 0 – 10 V variable, max. 2 mA

NOTE:

- DO2 to DO4 are 16 A relays.
- Max. load must be observed.
- DO2 / DO3 is recommended for load with high inrush current e.g. 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.

Function data

Table 47: Function data

Function data	Value
Display	LED 3 digit
External display, AK-CC55 Compact	1 external display
External display connection	RJ12
Max. display cable length [m]	100 m
Data communication built-in	MODBUS
Clock battery backup power reserve	4 days
Mounting	DIN rail

Environmental conditions

Table 48: Environmental conditions

Environmental conditions	Value
Ambient temperature range, operation	0 – 55 °C
Ambient temperature range, transport	-40 – 70 °C
Enclosure rating IP	IP20
Relative humidity range [%]	20 – 80%, non-condensing
Shocks/Vibrations	No shocks and vibrations allowed

Dimensions

Measurements are in mm.

Figure 52: AK-CC55 Compact

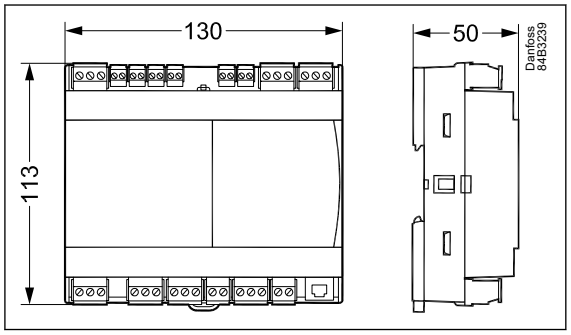
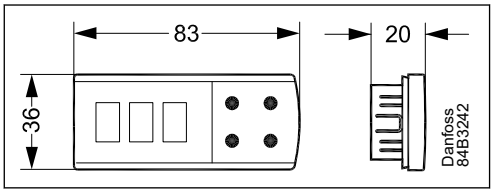


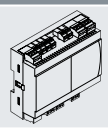
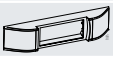
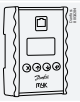
Figure 53: AK-CC55 Set



Ordering

The list contains the components that make up an AK-CC55 Compact setup. For other Danfoss products mentioned in the document, such as sensors and valves, refer to relevant product documentation.

Table 49: Ordering

Type	Symbol	Function	Code no.
AK-CC55 Compact		Case controller for one AKV or solenoid valve	**084B4081**
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-UI55 Mounting Base		Mounting kit for display types: AK-UI55 Set, AK-UI55 Bluetooth, AK-UI55 Info	**084B4099**
AK-UI cable		External display cable with RJ12 connector. 3 m	**084B4078**
AK-UI cable		External display cable with RJ12 connector. 6 m	**084B4079**
MMIMYK		Gateway between AK-CC55 and PC installed with KoolProg software	**080G0073**

Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Table 50: Controller

Control	Certification	Mark	Country
Compact	EMC/LVD/RoHS	CE	EU
Compact	UL recognized	cURus	NAM (US and Canada)
Compact	ACMA (EMC)	RCM	Australia/New Zealand
Compact	LVE/EMC/RoHS	EAC	Russia, Kazakhstan, Belarus
Compact	LVD/EMC/RoHS	UA	Ukraine

Table 51: Display module

Display module	Certification	Mark	Country
AK-UI55 Bluetooth	RED	CE	EU
AK-UI55 Bluetooth	FCC	FCC ID	USA
AK-UI55 Bluetooth	IC (ISED)	IC ID	Canada
AK-UI55 Bluetooth	CMIIT	CMITT ID	China
AK-UI55 Bluetooth	ACMA (EMC/Wireless)	RCM	Australia
AK-UI55 Bluetooth	RSM (EMC/Wireless)	RCM	New Zealand
AK-UI55 Bluetooth	EMC/LVD/Wireless	UA	Ukraine
AK-UI55 Info	EMC/LVD	UA	Ukraine
AK-UI55 Info	ACMA (EMC)	RCM	Australia
AK-UI55 Info	RSM (EMC)	RCM	New Zealand
AK-UI55 Info	RoHS	EAC	Russia, Kazakhstan, Belarus
AK-UI55 Set	EMC/LVD	UA	Ukraine
AK-UI55 Set	ACMA (EMC)	RCM	Australia
AK-UI55 Set	RSM (EMC)	RCM	New Zealand
AK-UI55 Set	RoHS	EAC	Russia, Kazakhstan, Belarus

Controllers/displays/option module:
CB certificate including all deviation according to IEC 60730-1 and 2-9

Relays:
Tested according to IEC 60079-15

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.

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