



# Case/room controller (EEV)

## AK-CC55 Single Coil & AK-CC55 Single Coil UI

SW Ver. 2.4x

For refrigeration appliances and cold storage rooms.

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## Introduction

### Overview

#### Application

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

#### Advantages:

- Universal controller for several different refrigeration appliances
- Quick set-up with predefined settings
- Easy configuration and service using a mobile app with Bluetooth
- Energy optimization of the whole refrigeration appliance
- 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 degree on transcritical CO<sub>2</sub> systems with liquid ejectors

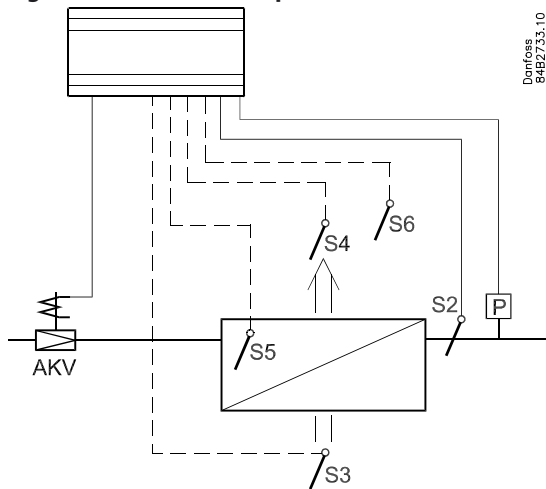
#### Principle

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.

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

The temperature of the evaporator is registered with the S5 sensor which can be used as a defrosting sensor. In addition to the output of the electronic AKV injection valve, the controller has relay outputs which are defined by the application setting.

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



## Ordering code

### Product code numbers

| Type                   | Function                   | Packing format  | Quantity per packing format | Code number |
|------------------------|----------------------------|-----------------|-----------------------------|-------------|
| AK-CC55 Single Coil    | AKV, Pe, 5 Relays          | Single pack     | 1                           | 084B4082    |
| AK-CC55 Single Coil UI | AKV, Pe, 5 Relays, Display | Single pack     | 1                           | 084B4083    |
| AK-CC55 Single Coil    | AKV, Pe, 5 Relays          | Industrial pack | 12                          | 084B4182    |
| AK-CC55 Single Coil UI | AKV, Pe, 5 Relays, Display | Industrial pack | 12                          | 084B4183    |

### Accessories code numbers



084B4076

#### AK-UI55 Set

Function: Remote Display, Packing format: Multi pack, Quantity per packing format: 30

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)


084B4077

#### AK-UI55 Info

Function: Remote Display, Packing format: Multi pack, Quantity per packing format: 30

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)


084B4192

#### AK-OB55 LON

Function: Option module, Communication type: LON RS-485, Packing format: Industrial pack, Quantity per packing format: 36

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)


084B4075

#### AK-UI55 Bluetooth

Function: Remote Display, Communication type: Bluetooth, Packing format: Multi pack, Quantity per packing format: 30

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)


084B4198

#### Electron. control accessories, AK-UI55 6m Cable I-Pack

AK-UI55 6m Cable I-Pack, Packing format: Industrial pack, Quantity per packing format: 24

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)


084B4194

#### AK-UI55 Set

Function: Remote Display, Packing format: Industrial pack, Quantity per packing format: 24

#### Related products

[084B4082](#) [084B4083](#) [084B4182](#) [084B4183](#)



084B4078

**Electron. control accessories,  
AK-UI55 3m Cable M-Pack**AK-UI55 3m Cable M-Pack, Packing  
format: Multi pack, Quantity per  
packing format: 24

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)


084B4079

**Electron. control accessories,  
AK-UI55 6m Cable M-Pack**AK-UI55 6m Cable M-Pack, Packing  
format: Multi pack, Quantity per  
packing format: 24

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)


084B4190

**Electron. control accessories,  
Conn.bag Single Coil I-pack,  
AK-CC55 Single Coil**Conn.bag Single Coil I-pack, Used for  
product: AK-CC55 Single Coil,  
Packing format: Industrial pack,  
Quantity per packing format: 48

## Related products

[084B4182](#)
[084B4183](#)


080G0073

**Programming key, MMIMYK**Function: Programmable Controller,  
Supply voltage [V] AC: 24,  
Communication type: TTL; CANBUS;  
RS485; MODBUS, Packing format:  
Single pack, Quantity per packing  
format: 1

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)


084B4195

**AK-UI55 Info**Function: Remote Display, Packing  
format: Industrial pack, Quantity per  
packing format: 24

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)


084B4196

**Electron. control accessories,  
AK-UI55 3m Cable I-Pack, AK-  
UI55**AK-UI55 3m Cable I-Pack, Used for  
product: AK-UI55, Packing format:  
Industrial pack, Quantity per packing  
format: 24

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)


084B4193

**AK-UI55 Bluetooth**Function: Remote Display,  
Communication type: Bluetooth,  
Packing format: Industrial pack,  
Quantity per packing format: 24

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)


084B4086

**Communication module, AK-  
OB55 Modbus TCP/IP**Function: Option module, Used for  
product: AK-CC55, Packing format:  
Multi pack, Quantity per packing  
format: 20

## Related products

[084B4082](#)
[084B4083](#)
[084B4182](#)
[084B4183](#)



084B4099

**Electron. control accessories,  
AK-UI55 Mounting Base S/M-  
pac**

AK-UI55 Mounting Base S/M-pac,  
Packing format: Multi pack, Quantity  
per packing format: 16

Related products

- 084B4082
- 084B4083
- 084B4182
- 084B4183



084B4070

**AK-OB55 LON**

Function: Option module,  
Communication type: LON RS-485,  
Packing format: Multi pack, Quantity  
per packing format: 20

Related products

- 084B4082
- 084B4083
- 084B4182
- 084B4183

## Product overview

### Product portfolio

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

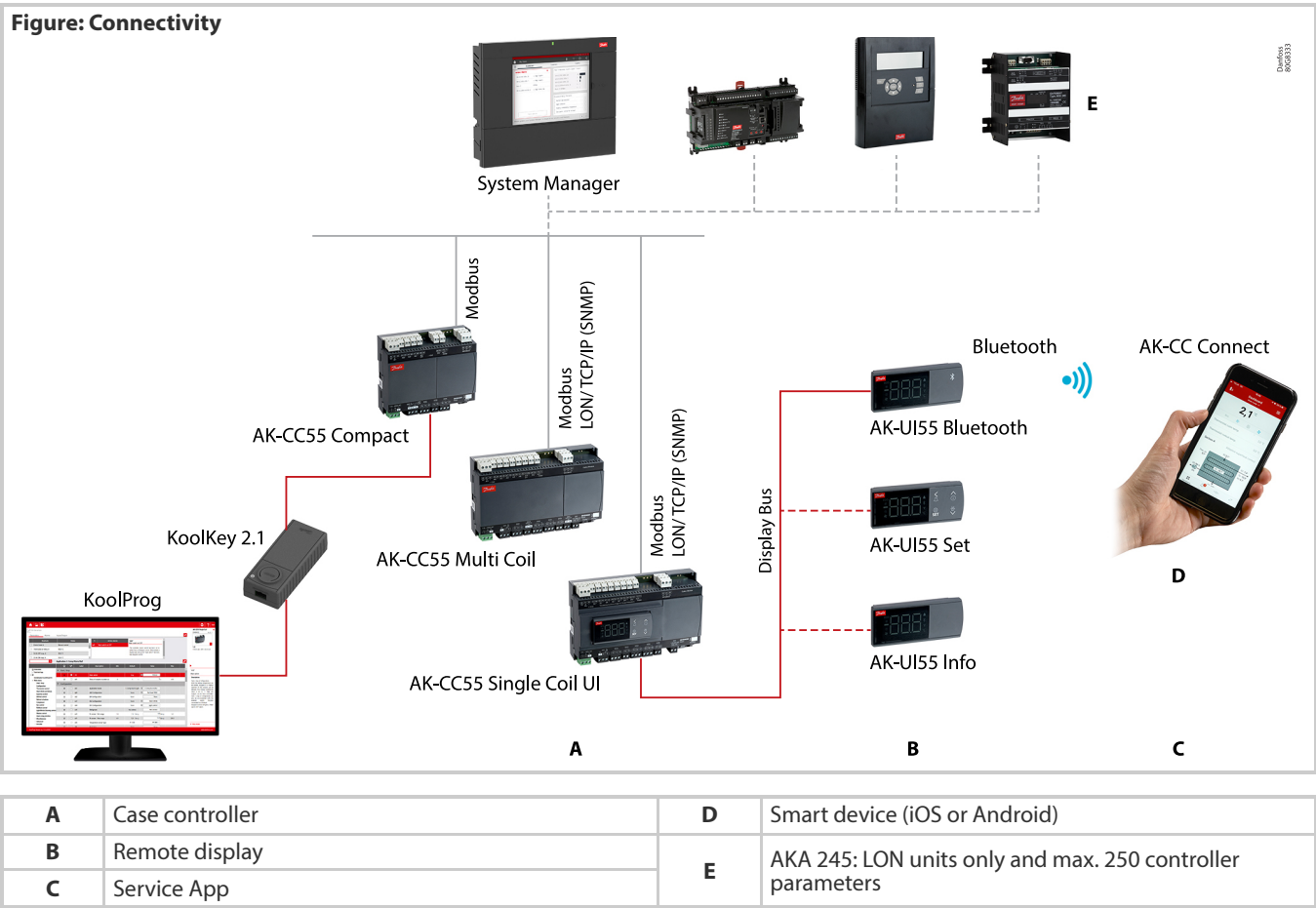
|                       | AK-CC55 Compact                                                                   | AK-CC55 Single Coil                                                               | AK-CC55 Single Coil UI                                                             | AK-CC55 Multi Coil                                                                  |
|-----------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 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

| Application                                                                                                        | Compact | Single Coil<br>Single Coil UI | Multi Coil |
|--------------------------------------------------------------------------------------------------------------------|---------|-------------------------------|------------|
| AKV - application (electrically operated expansion valve)                                                          | x       | x                             | x          |
| 0 – 10 V to control external stepper driver                                                                        | x       | 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                             | x          |
| Control of air humidity                                                                                            |         | x                             | x          |
| Variable fan speed                                                                                                 |         | x                             |            |
| Adaptive superheat                                                                                                 | x       | x                             | x          |
| Adaptive liquid control<br>(zero superheat control for transcritical CO <sub>2</sub> systems with liquid ejectors) | x       | x                             | x          |
| Adaptive defrosting                                                                                                |         | x                             |            |
| Leak alarm action                                                                                                  |         | x                             | 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.

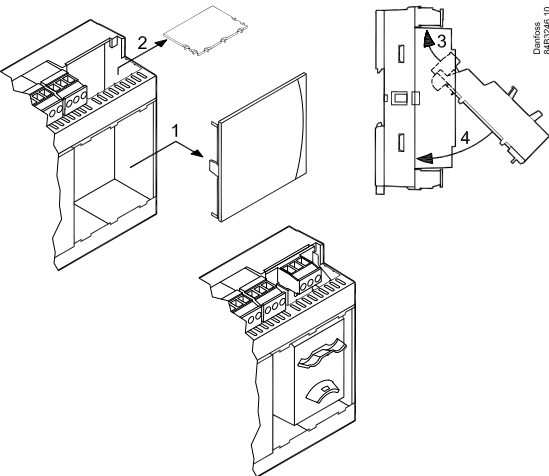


Data communication

The controller has built-in MODBUS data communication. If there is a requirement for a different form of data communication, a Lon RS 485 module can be inserted in the controller.

The connection must then be to the module.

Figure: Mounting of communication module



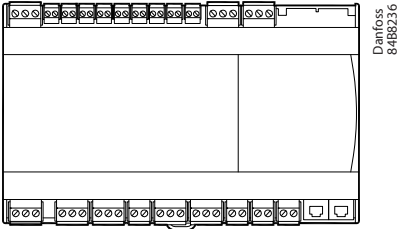


## AK-CC55 Single Coil and Single Coil UI

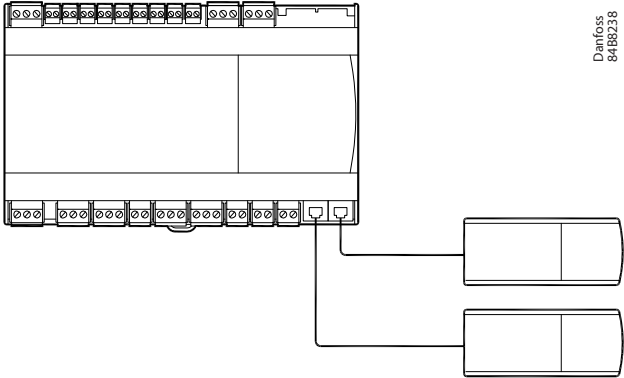
### AK-CC55 Single Coil – Controlling one EEV valve.

An application mode setting will configure inputs and outputs for the desired use. There are nine applications to choose from. Regulation is performed using an AKV expansion valve or an external stepper driver via Analogue Output AO1.

Standard enclosure. Typically used for display cases where the controller is mounted in a tray.



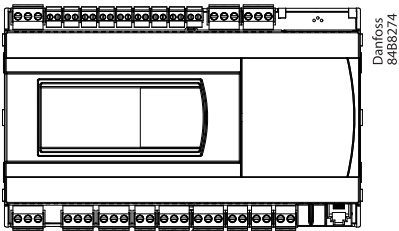
The standard enclosure can be expanded with one or two external displays.



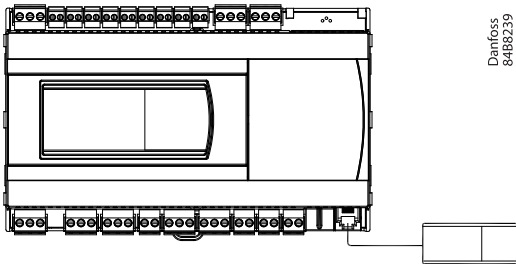
### AK-CC55 Single Coil UI

Single Coil controller with built-in display. Same functionalities as AK-CC55 Single Coil.

Enclosure with built-in setting display. Typically used for cold rooms.



For controllers with built-in, only one external display can be connected.



## 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-CC Connect mobile app.

| AK-UI55 Info | AK-UI55 Set | AK-UI55 Bluetooth |
|--------------|-------------|-------------------|
|              |             |                   |

## Functions

### Controller functions

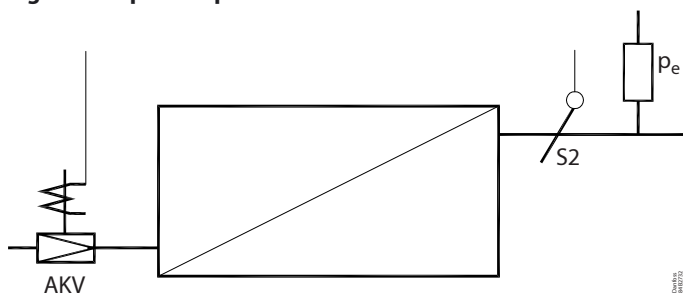
- Day/night thermostat with ON/OFF or modulating principle
- Product sensor S6 with separate alarm limits
- Switch between thermostat settings via digital input
- Adaptive control of superheat
- Adaptive liquid control
- Leak alarm action with leak shutoff valve and control shut down
- Oil recovery (flushing oil back to condensing unit)
- Adaptive defrosting based on diagnostics
- Start of defrost via schedule, digital input, network or setting display
- Natural, electric or hot gas 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
- Control of variable speed fans
- Appliance cleaning function for documentation of HACCP procedure
- Rail heat control via day/night load or dewpoint
- Humidity control in cold storage rooms
- Door function
- Control of two compressors
- Control of night blinds
- Light control
- Heat thermostat
- High accuracy inputs will guarantee a better measuring accuracy than stated in the standard EN ISO 23953-2 without subsequent calibration (Pt 1000 ohm sensor)
- Support of user-defined temp. sensor type
- Integrated MODBUS communication with the option of mounting a LonWorks communication card

### 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: Adaptive superheat control with AKV valve**



The superheat is measured via a pressure sensor  $p_e$  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.

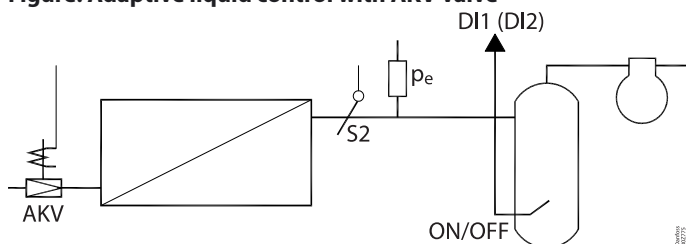
The function contains an adaptive algorithm which independently adjusts the valve's opening so that the evaporator constantly supplies optimum amount of refrigerant.

## Adaptive liquid control

Adaptive liquid control is used in trans-critical CO<sub>2</sub> 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: 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.

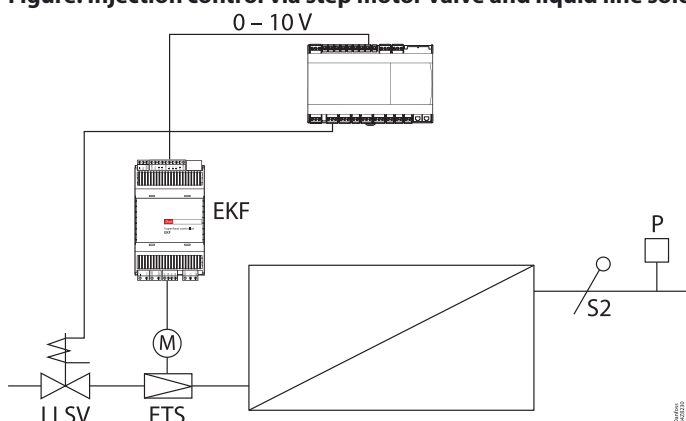
### Warning:

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.

## Liquid injection by use of stepper valve

Instead of AKV, an external stepper driver can be connected to AO1 (0 – 10 V) to drive a stepper valve. DO1 (AKV output) is then configured to close a liquid line solenoid valve (LLSV) when the stepper valve output is 0%. The LLSV is also closed at power failure.

**Figure: Injection control via step motor valve and liquid line solenoid valve (LLSV)**



## Oil recovery

In some multi evaporator systems, oil might accumulate in the evaporators over time. The oil recovery feature will help to get the oil back to the compressors/suction accumulator.

Oil recovery can be initiated via a digital input signal or as a network signal. When oil recovery is initiated, the valve opening degree will be increased to flush the oil out of the evaporator.

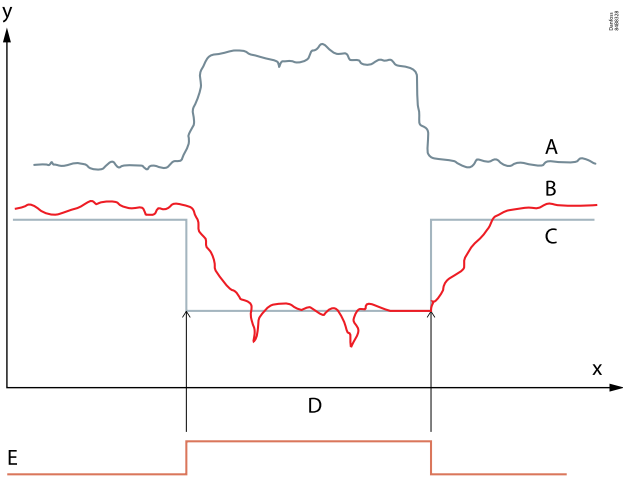
Oil recovery has the following control options:

- 0 = No oil recovery
- 1 = Adaptive liquid control + Normal fan control
- 2 = Adaptive liquid control + Fan OFF
- 3 = Fixed opening degree of valve + Normal fan control
- 4 = Fixed opening degree of valve + Fan OFF

**Adaptive liquid control (option 1 and 2)**

When oil recovery is initiated, the injection function will switch to adaptive liquid control, decreasing the superheat reference, increasing the valve opening degree and thereby achieving a controlled amount of liquid refrigerant at the outlet of the evaporator. As the compressor controller at the same time runs with a higher capacity/speed, this combination will result in a higher amount of returned oil.

**Figure: Adaptive liquid control increases valve opening degree during oil return**



|   |                                        |
|---|----------------------------------------|
| x | Time                                   |
| y | Temp%                                  |
| A | AKV OD%                                |
| B | Superheat                              |
| C | SH ref                                 |
| D | Adaptive liquid control forced cooling |
| E | Oil recovery                           |

**Fixed opening degree (option 3 and 4)**

When oil recovery is initiated, the injection function will switch to a user-defined opening degree to flood the evaporator with refrigerant and thereby flush the oil back to the compressor/suction accumulator. However, this option provides no control or monitoring of the superheat and it is solely up to the user to ensure that the system design provides a safeguard of the compressors.

**Safety**

A couple of safety functions are in place to protect the preserved food from too low temperatures during an oil recovery cycle. If an oil recovery has been ongoing for a longer period than the set "Max. oil recovery time", oil recovery will be stopped, and normal control resumed.

Oil recovery is stopped if the alarm air temperature decreases below the set low alarm limit.

**Temperature control**

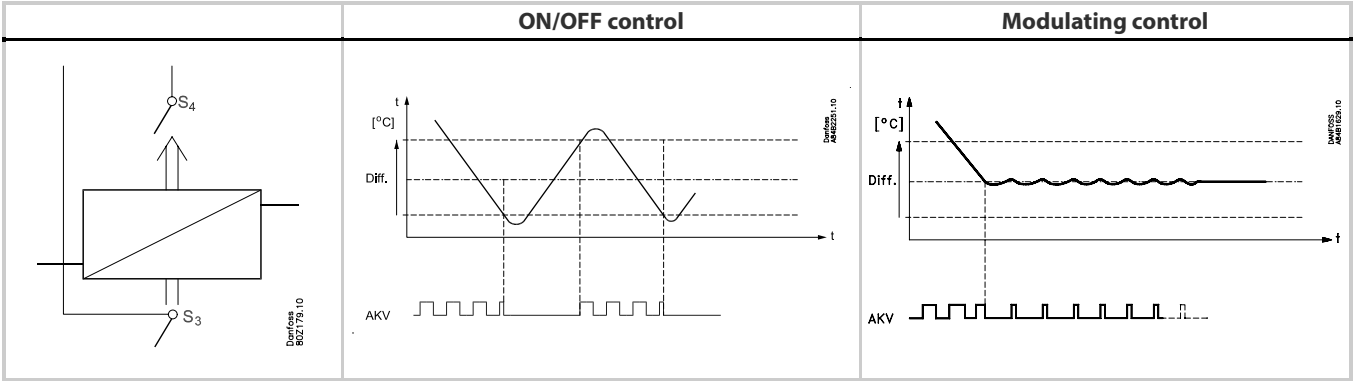
The temperature in the appliance is registered by one or two temperature sensors which are located in the return air before the evaporator (S3) or after the evaporator (S4) respectively. A setting for the thermostat, night thermostat, alarm thermostat and display reading determines how much the two sensor 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: Control methods**



### Food temperature sensor

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

### Temperature monitoring

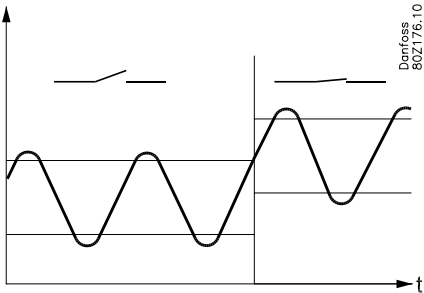
Just as is possible for the thermostat, the alarm monitoring can be set with a weighting between S3 and S4 so that you can decide how much the two sensor values should influence the alarm monitoring. Minimum and maximum limits can be set for alarm temperature and time delays. A longer time delay can 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 – also for the product sensor.

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: Thermostat band function with two different band settings**

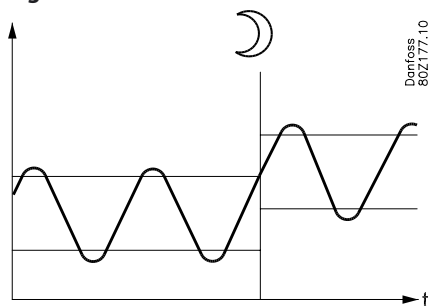


### Night setback of thermostat value

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
- via weekly schedule in controller

**Figure: Thermostat band function with night setback****Night event schedule**

Two daily scheduled events can be defined and associated to different weekdays. For each event, the user shall be able to define a time for opening of the store (daytime) and a time for closing of the store (Nighttime). Besides these two scheduled events, the user can select pre-defined events for a full day closed and a full day open.

For each weekday, the user shall be able to define which event that applies to the weekday in question - either "Open all day", "Closed all day", "Event 1" or "Event 2".

**Table: Night event schedule**

| Function          | Description                           | Values                               | Code | Short name        |
|-------------------|---------------------------------------|--------------------------------------|------|-------------------|
| Event 1 Day h     | Start day time in hours               |                                      | t58  | t58 Event1 Day h  |
| Event 1 Day min   | Start day time in minutes             |                                      | t59  | t59 Event1 Day m  |
| Event 1 Night h   | Start night time in hours             |                                      | t60  | t60 Event1 Ng t h |
| Event 1 Night min | Start night time in minutes           |                                      | t61  | t61 Event1 Ng t m |
| Event 2 Day h     | Start day time in hours               |                                      | t62  | t62 Event2 Day h  |
| Event 2 Day min   | Start day time in minutes             |                                      | t63  | t63 Event2 Day m  |
| Event 2 Night h   | Start night time in hours             |                                      | t64  | t64 Event2 Ng t h |
| Event 2 Night min | Start night time in minutes           |                                      | t65  | t65 Event2 Ng t m |
| Monday event      | Select scheduled event for Mondays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t66  | t66 Mon Event     |
| Tuesday event     | Select scheduled event for Tuesdays   | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t67  | t67 Tue Event     |
| Wednesday event   | Select scheduled event for Wednesdays | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t68  | t68 Wed Event     |
| Thursday event    | Select scheduled event for Thursdays  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t69  | t69 Thu Event     |
| Friday event      | Select scheduled event for Fridays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t70  | t70 Fri Event     |
| Saturday event    | Select scheduled event for Saturdays  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t71  | t71 Sat Event     |
| Sunday event      | Select scheduled event for Sundays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t72  | t72 Sun Event     |

**Example:**

Event 1

Daytime 08:00

Night-time 16:00

Event 2

Daytime 09:00

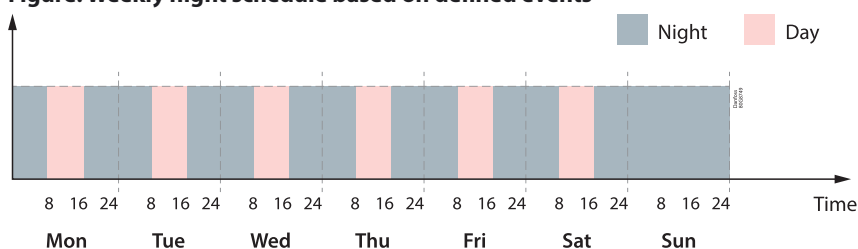
Night-time 20:00

Monday to Friday: Event 1

Saturday: Event 2

Sunday: Night all day

Based on the above, the weekly night schedule will be as shown in the figure below.

**Figure: Weekly night schedule based on defined events**

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.

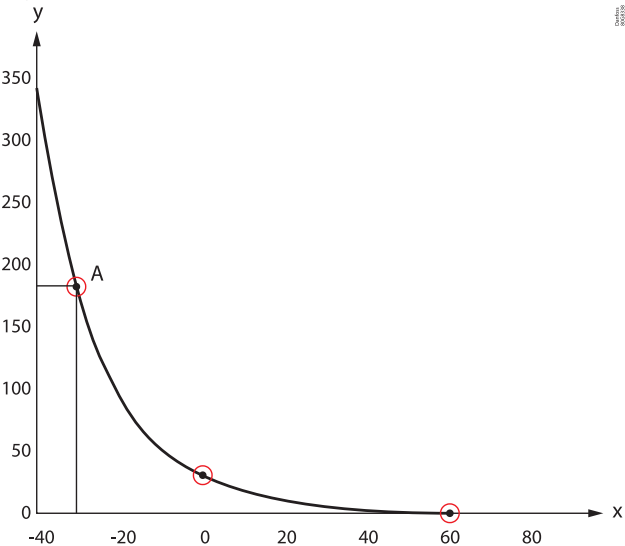
A sensor point is defined by setting a temperature value and the corresponding resistance value at this temperature. The resistance value is set via two values for kohm and ohm respectively. These values can be found in the data sheet for the sensor.

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: Example of sensor points from a NTC sensor



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

Limitations:

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

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: 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 control

Defrost method

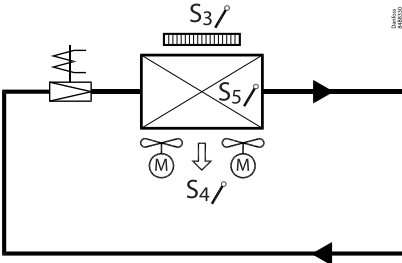
The following defrost methods can be selected:

- 0: None
- 1: Electrical
- 2: Hot gas defrost (Simple)
- 3: Natural
- 4: Electrical pulsing heaters

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.

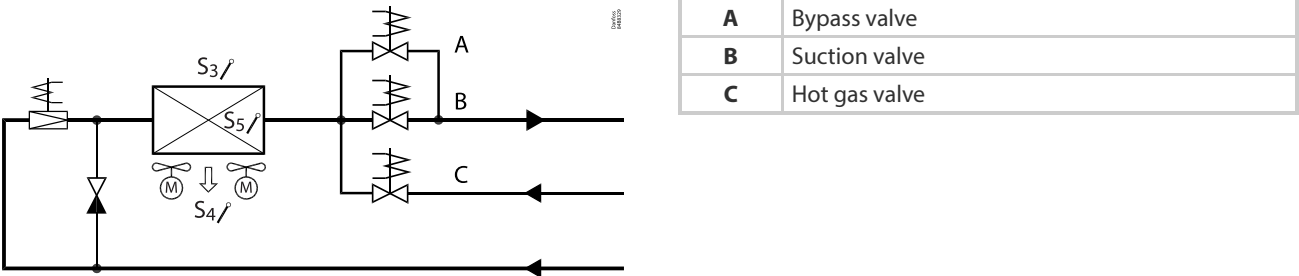
Figure: Electrical defrosting



**Hot gas defrosting**

Remote hot gas defrost is supported in application mode 5. The hot gas defrost sequence covers control of the hot gas valve, suction valve and drain valve. It is intended for smaller systems in e.g. supermarkets – the functional content has not been adapted to industrial systems with large refrigerant charges.

**Figure: Hot gas defrosting**



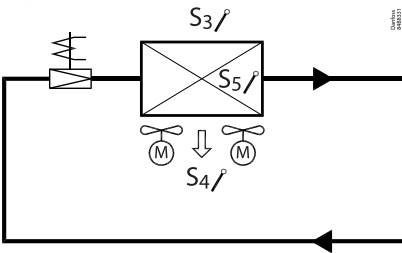
**Simple hot gas defrosting**

If hot gas defrost is selected in application 1-3, 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: Natural defrost**

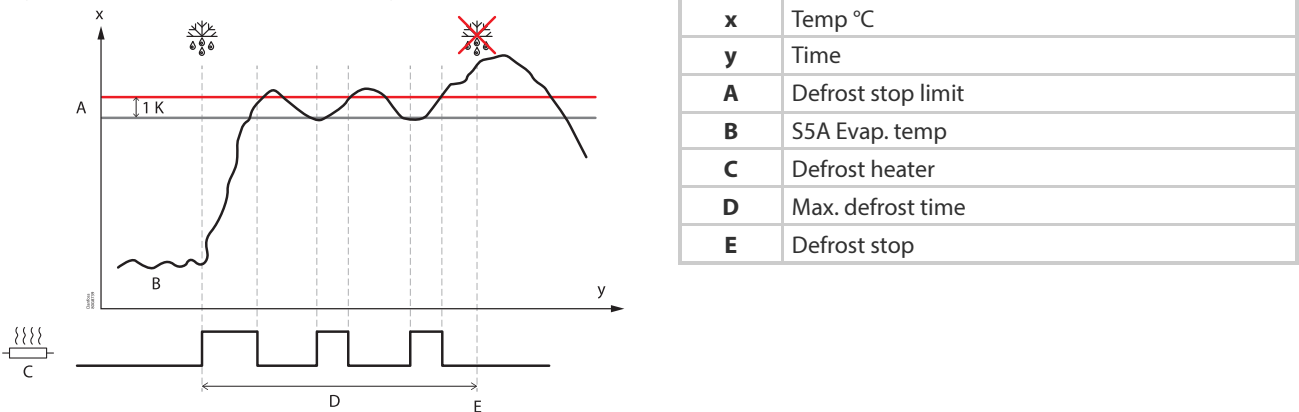


**Electrical defrost with pulsing heaters**

During the defrost state, the electrical heaters will be kept ON, until the defrost stop sensor reaches the set defrost stop limit. At this point in time the defrost heaters will be switched OFF. If the temperature of the selected defrost stop sensor decreases 1K below the set defrost stop limit, the defrost heaters will be switched ON again and kept ON until the defrost stop sensor reaches the defrost stop limit once again whereby the heaters are switched OFF.

This pattern is repeated until the max defrost time has expired whereby the active defrost state is terminated and the defrost sequence continues with the next defrost state - please refer to the figure below.

**Figure: Electrical defrost with pulsing heaters**



## 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.

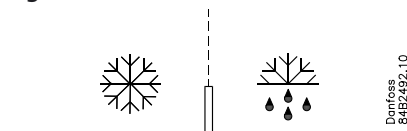
### Week schedule:

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: Defrost start**



### Network:

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

### Adaptive defrost:

Here, defrosting is started based on intelligent registering of evaporator performance.

### Max. thermostat runtime:

When the aggregate time has passed a preset value, a defrost will be initiated.

### Manual:

An extra defrost can be activated from the defrost button on the AK-UI55 Set display or via a 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)
- S5A and S5B temperatures (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.

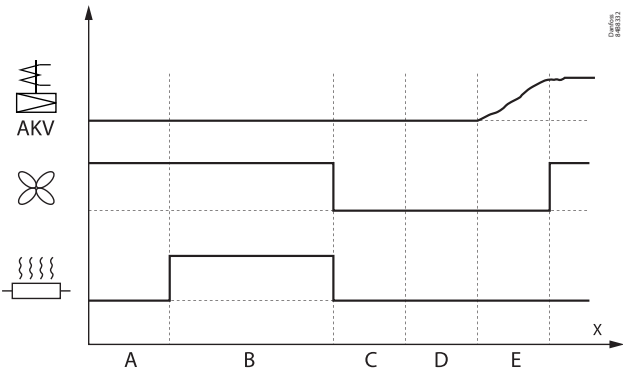
To prevent this, the user is given the option of setting a minimum defrost time. When a defrost is initiated, it will have to run for the set minimum time even if the set defrost stop limit has been reached by the selected defrost stop sensor.

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

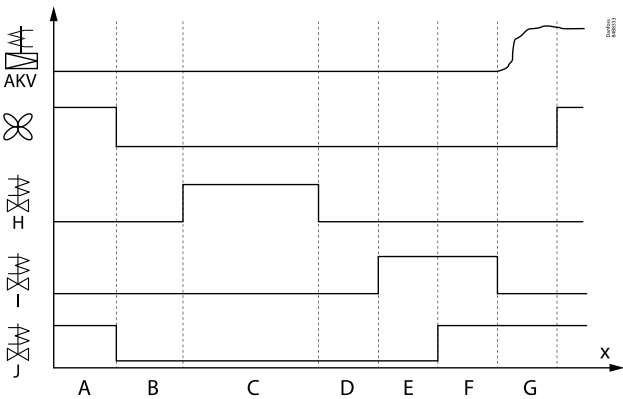
Figure: Electrical defrost sequence



| 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.

Figure: Remote hot gas defrost sequence



| x | Time                    |
|---|-------------------------|
| A | Pump down               |
| B | Hot gas injection delay |
| C | Defrost                 |
| D | Hold                    |
| E | Drain                   |
| F | Drip                    |
| G | Fan delay               |
| H | Hot gas valve           |
| I | Drain                   |
| J | Suction                 |

Remote hot gas defrost sequence where suction valve and drain valves are closed while hot gas valve is injecting hot gas into the evaporator. After defrost, the drain valve is opening to drain the evaporator for liquid refrigerant and then the suction valve is opening. When the water has dripped off the evaporator, liquid injection is started via the AKV valve and the fans start when the evaporator temperature has reached the fans' start temperature.

#### 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

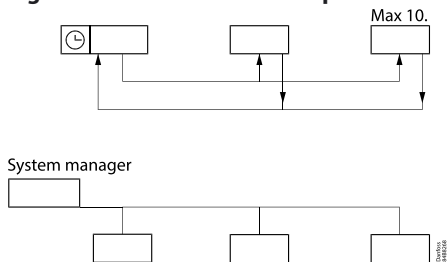
#### Real-time clock

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: 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.

## Adaptive defrosting

The Danfoss adaptive defrost algorithm detects the amount of ice build-up and cancels a scheduled defrost if it is not needed, or it can be set up to only perform defrost if the evaporator air flow is getting interrupted by frost or ice.

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

### 4 different adaptive defrost modes

#### 0 Off

#### 1. Monitoring

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

#### 2. Adaptive skip day:

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

#### 3. Adaptive skip day and night:

With this set-up, the controller can allow to cancel (skip) defrosts scheduled both within day time and within night time. For both adaptive skip day and night max. 3 consecutive defrosts can be skipped, whereafter the 4th scheduled defrost will be performed even if only little ice should be present.

#### 4. Full adaptive:

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

Adaptive defrosting requires the following connections:

- Expansion valve type AKV
- Pe evaporator pressure and S2 gas out temperature
- Temperature signal from both S3 and S4. Sensors must be placed in the airflow/channel immediately before / after the evaporator.
- Condensing temperature Tc is distributed via the network from the system manager. If Tc is not received by the case controller, the adaptive defrost function is using default back-up values

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

### Min. time between defrosts

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

## Melt function

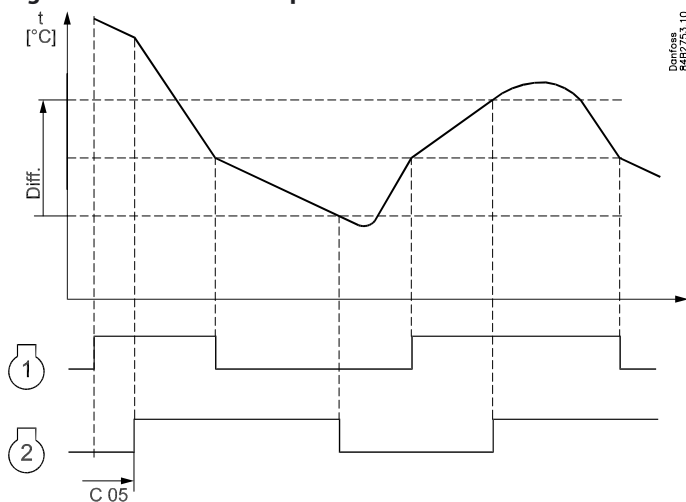
This function will prevent the air flow in the evaporator from being reduced by frost created by uninterrupted operation for a long time.

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

## Control of two compressors (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: 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.

## Rail heat

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

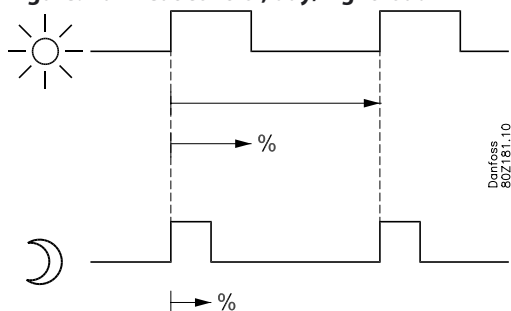
### Relay or analogue output

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

### Pulse control according to day and night

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

**Figure: Rail heat control, day/night load**



### Pulse control according to dewpoint

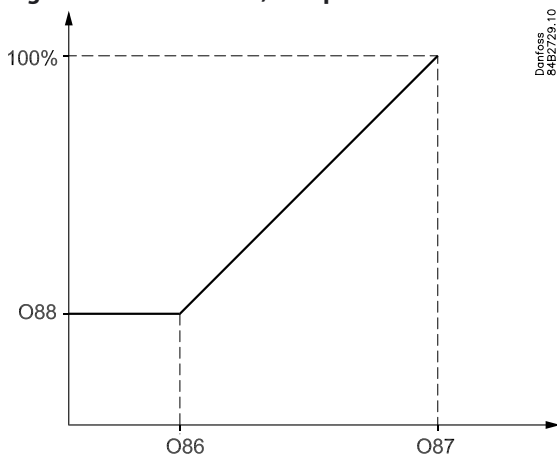
In order to use this function, a system manager of the type AK-SM is required which can measure ambient temperature and humidity to calculate dew point and distribute to the appliance controllers. For this the rail heat's ON period is controlled according to the distributed dewpoint.

Two dew point values are set in the appliance control:

- One where the effect must be max. i.e. 100%. (o87)
- One where the effect must be min. (o86)

At a dewpoint which is equal to or lower than the value in o86, the effect will be the value indicated in o88. In the area between the two dew point values, the controller will manage the power to be supplied to the rail heat.

**Figure: Rail heat control, dew point**



### During defrosting

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

## Fan

### Pulse control

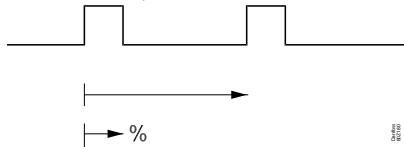
To obtain energy savings, it is possible to pulse control the power supply to the evaporator fans.

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: 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 at thermostat cut-out. The reduced fan speed at thermostat cut-out can be done during night operation only (cabinets with blinds) or during day and night operation (cabinets with glass covers) or all the time during night, independent of thermostat state.

Fan ECO mode:

0: No ECO mode control

1: Fan ECO mode at cut-out during night operation

2: Fan ECO mode at cut-out during day and night operation

3: Fan ECO mode during night time

The function is enabled when a relay has been configured for Fan ECO function in the application with flexible setup of relay functions.

The fan economy control (fan speed) is controlled via the two fan outputs:

- Fan output
- Fan ECO output

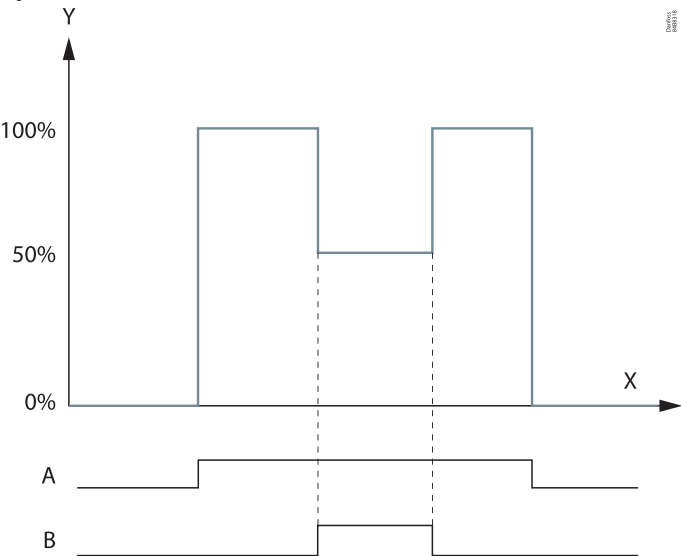
If the Fan output is activated, then the fan is running with 100% speed.

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



|   |           |
|---|-----------|
| x | Time      |
| y | Fan speed |
| A | Fan       |
| B | Fan ECO   |

The Fan ECO speed can be defined during defrost sequence and at leak alarm action.  
The fans will always run with full speed during first stage of case cleaning, forced cooling and when air heating is active.

**Variable fan speed control**

**Control of variable speed fans**

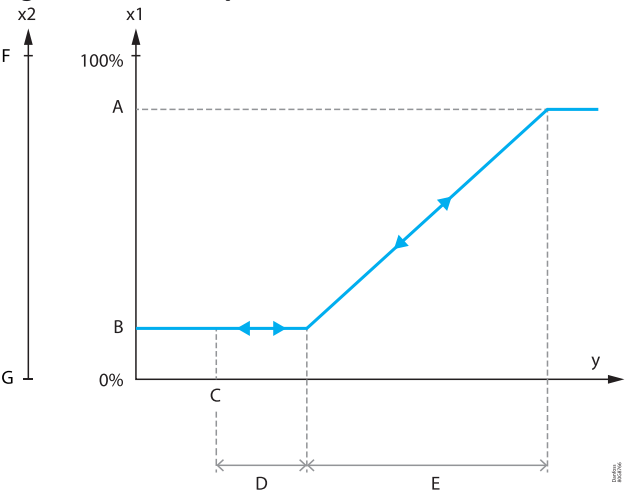
Variable fan speed control can be used to save energy as the fan speed is adapted according to the actual temperature of the refrigerated space. The allowable minimum fan speed setting is to be determined by the refrigeration system designer. The fan speed may be adjusted or controlled to maintain adequate air circulation to ensure product integrity and quality.

Control of variable speed fans is enabled when an analogue output has been defined for this purpose.

Variable fan speed cannot be used if adaptive defrost method is used as this feature requires a constant air flow and variable fan speed cannot be combined with fan pulsing feature.

The variable fan speed control is performed via a P-band control of the fan speed - please refer to the figure below.

**Figure: Variable fan speed control**



|    |                            |
|----|----------------------------|
| x1 | Fan speed %                |
| x2 | AO output                  |
| y  | Thermostat air temperature |
| A  | Max. speed                 |
| B  | Min. speed                 |
| C  | Actual thermostat cut-out  |
| D  | Fan speed differential     |
| E  | Fan speed P band           |
| F  | Max. signal                |
| G  | Min. signal                |

The P-band is placed with a set differential above the actual thermostat cut-out limit, taking night offset and thermostat band into account. When the actual thermostat air temperature is below “Actual cut-out” + “Fan speed diff”, the fans will run at minimum speed.

When the thermostat air temperature is above “Actual cut-out” + “Fan speed diff”, the fan speed will proportionally be increased from minimum speed to maximum fan speed at the end of the set P-band.

A filter time can be set for controlling how fast the fan speed is increasing and decreasing during normal control. The filter time for decreasing the fan speed should not be set too low to prevent that fast changes in the load condition of the evaporator will influence the injection control in a negative way.



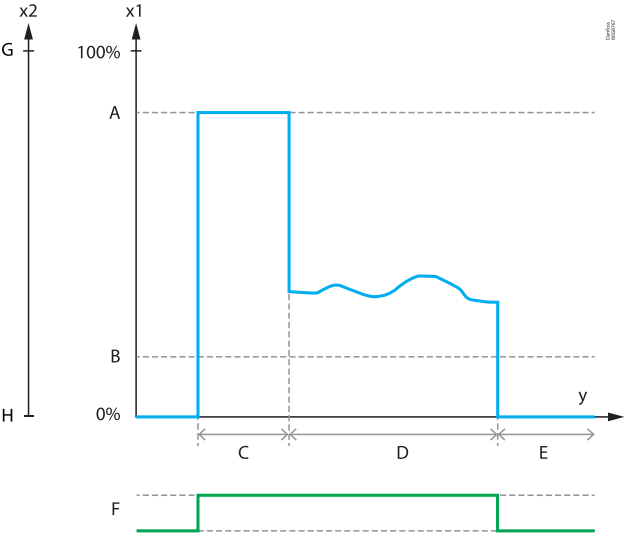
If the thermostat air temperature has a sensor error, the variable speed fans will run at maximum speed whenever fans are to be running.

**Boost of fan speed at start up**

When the fans are started from standstill position, the fans will be started at maximum speed for a set “Fan start time” to overcome the start inertia of the fans. If a digital output is defined for fan control, it will go in ON position. The fan start-up with max speed can be disabled by setting the fan start period to 0 seconds.

When the fans are stopped, the fan speed % will go to 0%, the analogue output signal will go to the defined minimum output signal and if a digital output is defined for fan control it will go in OFF position.

**Figure: Start and stop of variable speed fans**



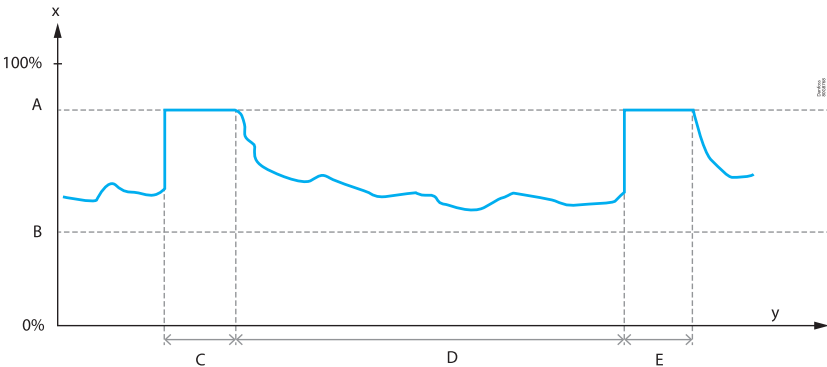
|    |                      |
|----|----------------------|
| x1 | Fan speed %          |
| x2 | AO output            |
| y  | Time                 |
| A  | Max. speed           |
| B  | Min. speed           |
| C  | Fan start time       |
| D  | Modulating fan speed |
| E  | Fan stopped          |
| F  | Fan relay            |
| G  | Max. signal          |
| H  | Min. signal          |

**Prevention of hot spots in cold rooms**

If the variable speed fans are running with low speed for a longer period of time, there is a risk that some areas of a cold room could become "hot spots" due to a low circulation rate of the air. To prevent this, the evaporator fans shall regularly run with maximum speed for a period of time to ensure that the cold air from the evaporator is reaching all "corners" of a cold room.

The user can define the time interval ("Fan max interval") between periods with maximum speed ("Fan max period") and also the duration of the time periods with maximum speed. The feature will be enabled when the analogue output is configured for variable speed fan and the user sets the duration of the Fan max period to a higher value than 0. Please refer to the drawing below.

**Figure: Periodic full speed of fans to prevent hot spots**



|   |                   |
|---|-------------------|
| x | Fan speed %       |
| y | Time              |
| A | Max. speed        |
| B | Min. speed        |
| C | Fan max. period   |
| D | Fan max. interval |
| E | Fan max. period   |

**Fan speed overrides**

The variable speed fans shall run at maximum speed at the following conditions:

- During defrost sequence (whenever the fans are to run during the sequence)
- During first phase of case cleaning
- During thermostat melt period
- During forced cooling
- During temperature pulldown cycle
- During de-humidification/humidification
- When heating thermostat is ON

## 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 either through the custom set-up night blind output or via the NO connector on the light relay. 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.

## Humidity control

In application 8 when setup for room control it is possible to define if humidity control should be done via a humidifier or a dehumidifier.

When humidity control is enabled, the second display will read out the actual humidity.

The controller measures the humidity via a 0 – 10 V signal from a humidity sensor and by means of a DO relay it can activate a humidifier or a de-humidifier.

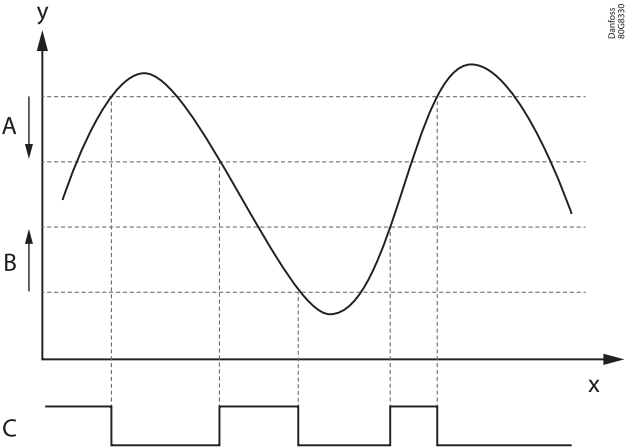
High and low humidity alarm limits can be set to generate a humidity alarm.

Humidity control is disabled when main switch is OFF, at manual control, at case shutdown, at forced closing mode, at door open, if cooling is stopped, at humidity sensor error and at case cleaning.

It is possible to define whether humidity control is enabled during defrost or not.



Figure: Humidity control

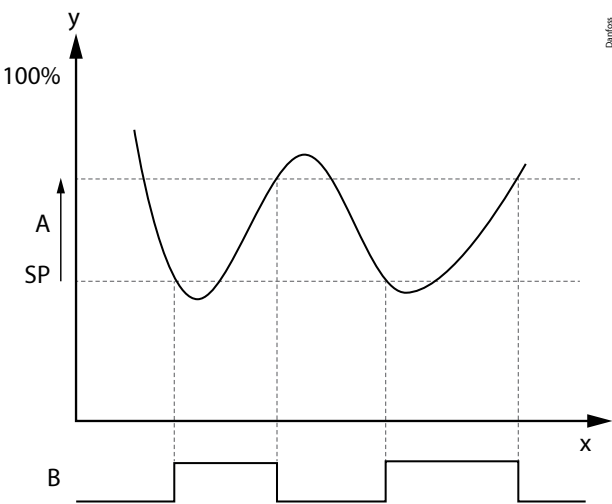


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|          |                                |
|----------|--------------------------------|
| <b>x</b> | Time                           |
| <b>y</b> | Temperature                    |
| <b>A</b> | Humidity max. temp. difference |
| <b>B</b> | Humidity min. temp. difference |
| <b>C</b> | Humidity control enabled       |

A max. and min. temperature range can be defined wherein the humidity control is enabled. Upper and lower differential is fixed at 1K. It can be defined whether humidity control is active during defrost or not.

Figure: Humidifier control



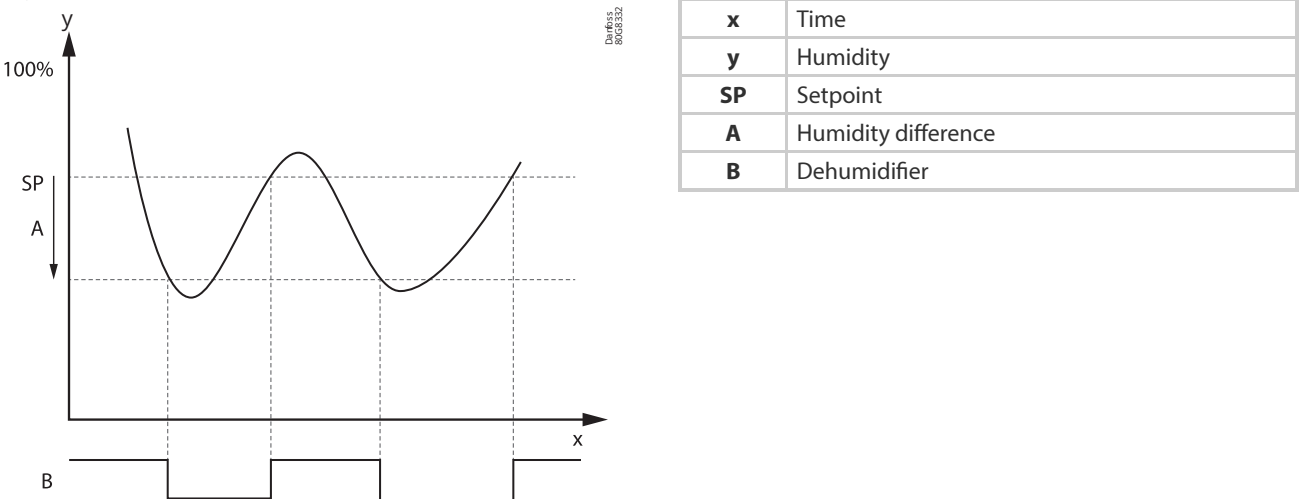
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|           |                     |
|-----------|---------------------|
| <b>x</b>  | Time                |
| <b>y</b>  | Humidity            |
| <b>A</b>  | Humidity difference |
| <b>SP</b> | Setpoint            |
| <b>B</b>  | Humidifier          |

If the humidity gets below the SP, then humidification is started via a DO signal to a humidifier.  
If the humidity increases to SP + humidity differential, then humidification is stopped.



Figure: Dehumidifier control

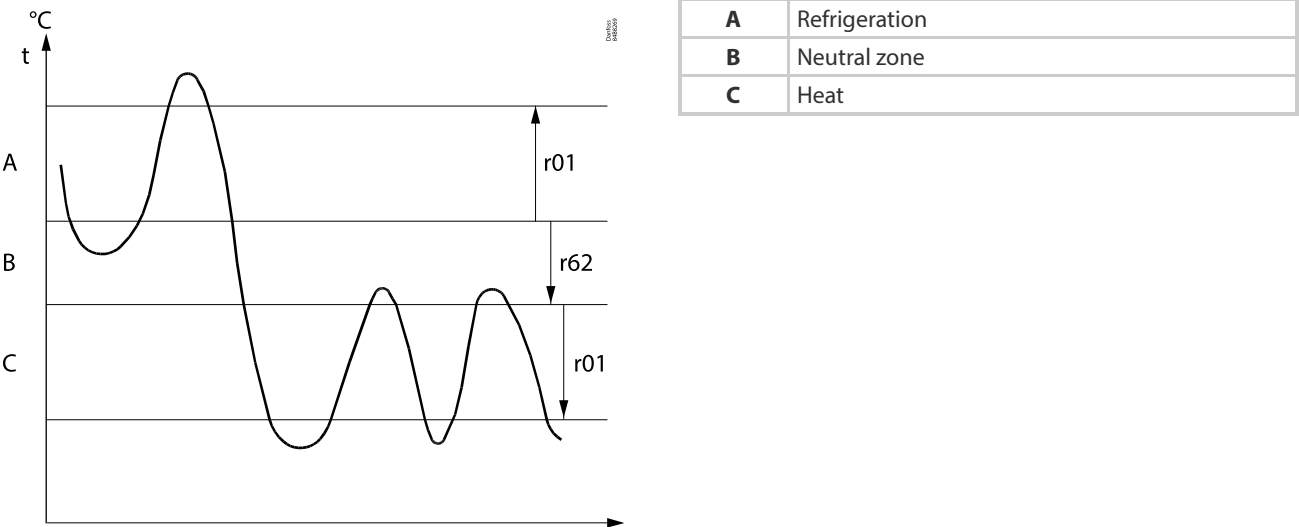


If the humidity rises above the SP, then dehumidification is started via a DO signal to a dehumidifier.  
If the humidity drops below the SP – Humidity differential, then dehumidification is stopped.

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: Heating function



Leak alarm and action

The feature is enabled if one of the digital inputs have been setup for leak detection monitoring. The user shall be able to define what the alarm action shall be if a refrigerant leak alarm is raised:

- Leak alarm action:
- 0: No action - Alarm only
  - 1: Safety shutdown with evaporator fans OFF
  - 2: Safety shutdown with evaporator fans ON

When safety shutdown is selected the following actions shall be initiated:

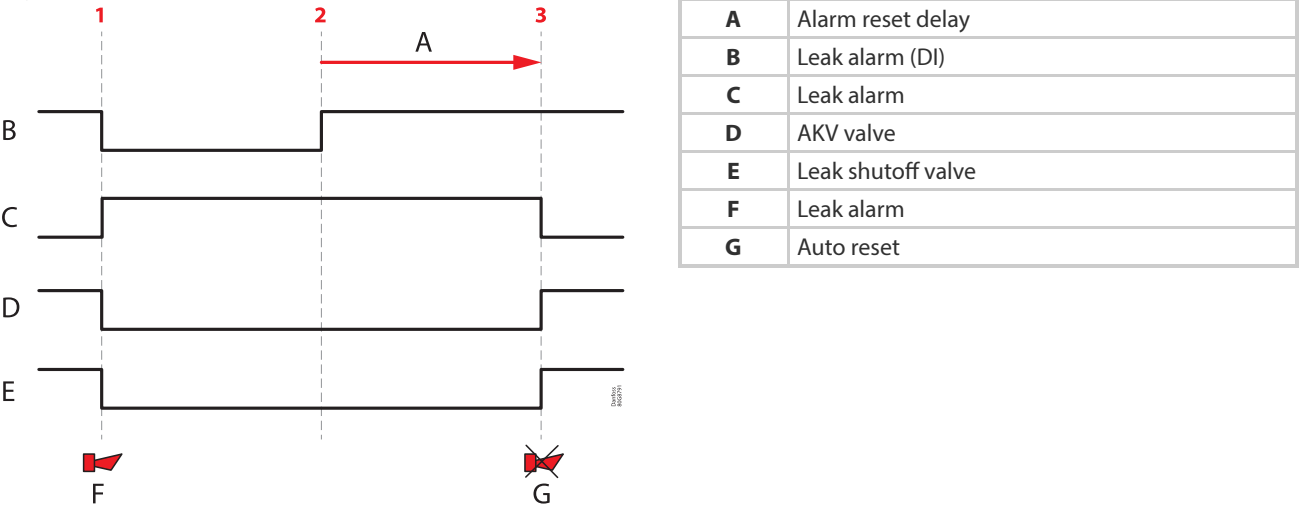
- a. Close AKV valves
- b. Close leak shutoff valve (de-energize)
- c. Stop on-going defrost and prevent any new defrost start
- d. Stop rail heaters to minimize heat transfer into case
- e. Air heater is stopped (if any defined)
- f. Humidification control stopped (if any defined)
- g. Light control is not affected

If leak alarm action with fans running is selected and a fan ECO is configured, the fan speed during leak alarm action can be selected. While the leak alarm safety shutdown is active, control state will readout "Leak action". While leak alarm signal is active, it is not be possible to reset the alarm manually.

Leak alarm and leak alarm action will not be overridden by Main switch = OFF.

When the leak alarm condition is cleared, the Leak alarm and the leak alarm action shall be kept for a set alarm reset delay. When the alarm reset delay has expired, the leak alarm is cleared automatically, and normal control shall be resumed – please refer to the figure below.

Figure: Leak alarm action



1. Refrigerant leak is signalled by a low signal on the digital input. A refrigerant leak alarm is generated, the leak shutoff valve is closed (de-energized), AKV valve is closed and system is shut down.
2. The leak alarm signal is disabled by a high signal on the digital input, but the leak alarm is still raised, and the system is still in shut down mode.
3. The leak alarm reset delay has expired causing the leak alarm to be cleared and the system is no longer in shut down mode resulting in opening of Leak shutoff valve and opening of AKV valve.

While in alarm reset delay, the user can reset the alarm manually whereby the leak alarm and the safety shutdown are reset and normal control is resumed.

The alarm reset delay will be disabled if the delay is set at the max range value (300 minutes). This means, reset of the leak alarm and the alarm action shall always require a manual alarm reset action.

- It shall be possible to reset the alarm manually by the following means:
- Perform a power cycle of the controller
  - Perform alarm reset via parameter from AK-SM 800A system manager
  - Perform alarm reset via a long press on alarm button on AK-UI55 Set display while being in the alarm menu

## Digital inputs

There are two digital inputs, DI1 and DI2, with dry contact function, and one digital input DI3 with high voltage signal. They can be used for the following functions:

**Table: Function table and DI settings**

| Function                   | Input / Settings menu |     |     | Setting |
|----------------------------|-----------------------|-----|-----|---------|
|                            | DI1                   | DI2 | DI3 |         |
|                            | o02                   | o37 | o84 |         |
| 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      |
| Valve driver alarm at open | +                     | +   |     | 22      |
| Fan alarm at open          | +                     | +   |     | 23      |
| Door fan stop              | +                     | +   | +   | 29      |
| Oil recovery               | +                     | +   | +   | 30      |

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 up to 10 minutes before it is cancelled) - this feature can be used in CO<sub>2</sub> 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 or two plugs for an external display

One of the following display types can be connected to a plug:

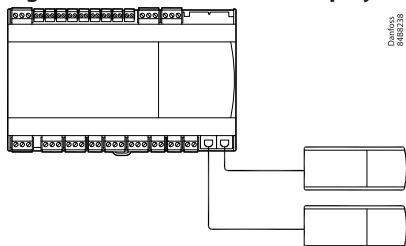
- AK-UI55 Info (temperature display)
- AK-UI55 Set (temperature display and operation)
- AK-UI55 Bluetooth (temperature display and app interface)

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.

If there are two external displays, it will be the sum of the two distances that cannot exceed 100 m.

**Figure: Controller with two 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:

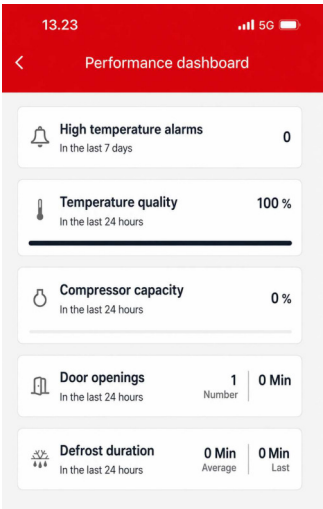
**Table: Override functionality**

| 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.                                                                                                                                                                                                                          |
| 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 Request next defrost | Master control signal used by system manager to see if a controller is requesting that the next defrost has to be carried out.                                                                                                                                                             |
| 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 Tc temp. mean        | Master control signal distributing the condensing temperature signal to the case controllers that are using adaptive defrost. At transcritical CO <sub>2</sub> sites the receiver pressure is distributed to the case controllers. This function needs to be set up in the system manager. |
| 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 and optionally also lock the display keyboard (parameter P89).                                                                                                                                                  |
| MC Min. delta T         | Required minimum delta temperature across evaporator (S3 - Te) in order to keep the air temperature at the actual setpoint.                                                                                                                                                                |
| MC Oil Recovery         | Master control signal used for starting and stopping an oil recovery sequence.                                                                                                                                                                                                             |

## Performance monitoring

The controller can monitor certain key performance indicators, telling something about how well the unit is operating. These key performance indicators are available in the AK-CC Connect app.

**Figure: Performance dashboard in AK-CC Connect app**



### Number of high temp. alarms

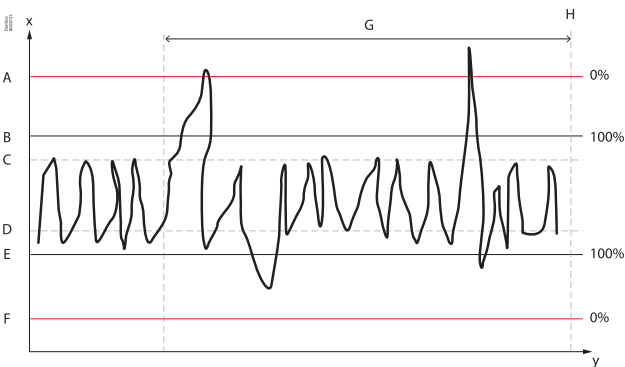
The controller keeps track of the number of high temperature alarm for the last 7 days.

### Temperature quality

The temperature quality tells how well the unit is performing temperature wise over a time window of 24 hours. The temperature quality read-out is a weighted value taking the temperature deviation and time into account. If the thermostat air temperature is within the band of “thermostat cutin + a set offset” and “Thermostat cutout – a set offset” the temperature quality will be 100%. The further away the thermostat air temperature is from this band, the lower the temperature quality will be. If the thermostat air temperature reaches the high or low alarm limit, the air quality will be 0%.

**Note:** the temperature quality will never be 100% as defrost cycles and other interruptions will be counted into the performance. But the value can be used to optimize control.

**Figure: Temperature quality as function of deviation from thermostat cut-in and cut-out limits**



|   |                            |
|---|----------------------------|
| x | Temp.                      |
| y | Time                       |
| A | High alarm limit           |
| B | Cut-in + 1K                |
| C | Cut-in                     |
| D | Cut-out                    |
| E | Cut-out – 1K               |
| F | Low alarm limit            |
| G | Rolling window of 24 hours |
| H | Quality level              |

**Table: Temperature quality**

| Parameter                 | Value    | Description                                                               |
|---------------------------|----------|---------------------------------------------------------------------------|
| X31 Air temp. performance | 0 – 100% | Readout of actual thermostat air quality for the last 24 hours            |
| X32 Temp. offset          | 0 – 10 K | Offset to thermostat cut-in and cut-out limits, where air quality is 100% |

## Network integration

The controller is supported by the following Danfoss system managers:

- AK-SM 800A

When installing the controller into a Danfoss network system, follow the following procedure:

1. Select the application mode (o61)
2. Set the unit address (o03)
3. Perform a network scan from the system manager

The controller can also be integrated into third party Modbus network systems and then the following network parameters might need to be set:

**Table: Network integration**

| Parameter | Values              |                                                                             | Description                                                                                                                                |
|-----------|---------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| o03       | Network address     | 0 – 240                                                                     | Network address<br>When used in a network system with a Danfoss system manager AK-SM 800A, the address has to be set in the range 1 – 199. |
| oa1       | Baudrate            | 1: Auto<br>2: 9600 baud<br>3: 19200 baud<br>4: 38400 baud<br>5: 115200 baud | Baudrate of data communication.<br>When installed in a Danfoss network system, leave the setting at "Auto".                                |
| oa2       | Parity and stop bit | 0: None<br>1: Even<br>2: Odd                                                | None: No parity bit and two stop bits<br>Even: Even parity bit and one stop bit<br>Odd: Odd parity bit and one stop bit                    |

A list of Modbus register numbers can be found at [danfoss.com](https://danfoss.com)

## Applications

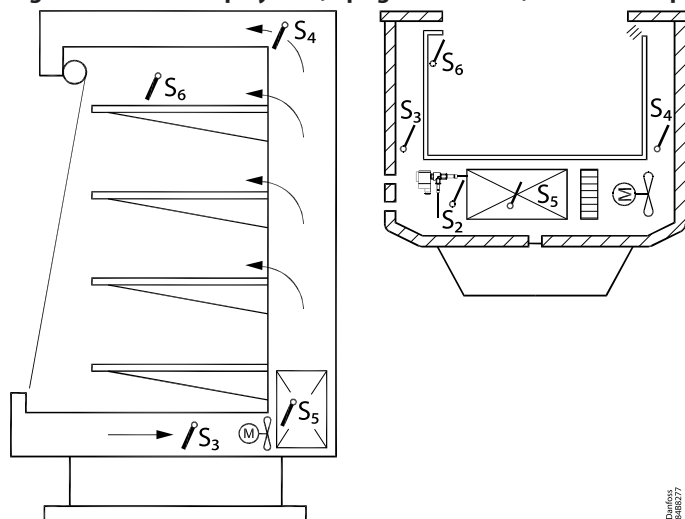
The AK-CC55 Single coil controller has 9 application modes to support different cabinet types and different IO functions.

### Application mode 1-5 and 9

These application modes are for standard cabinets or cold rooms with a single evaporator.

Application mode 9 offers the option for the user to select the IO functions manually.

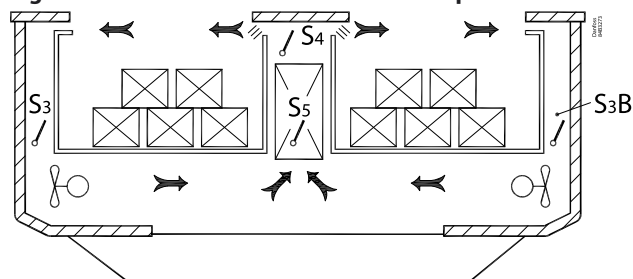
**Figure: Standard display case, upright or normal, with one evaporator**



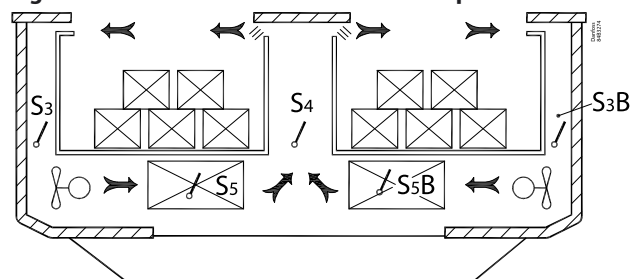
### Application mode 6-7

These application modes are for back-to-back cabinets having two cooling sections with respective 1 or 2 evaporators.

**Figure: Back-to-back cabinet with one evaporator**



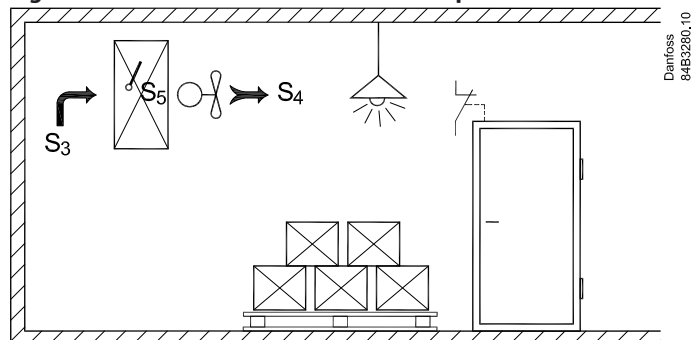
**Figure: Back-to-back cabinet with two evaporators**



### Application mode 8

This application mode is for cold rooms with a single evaporator and includes option for humidity or de-humidity control.

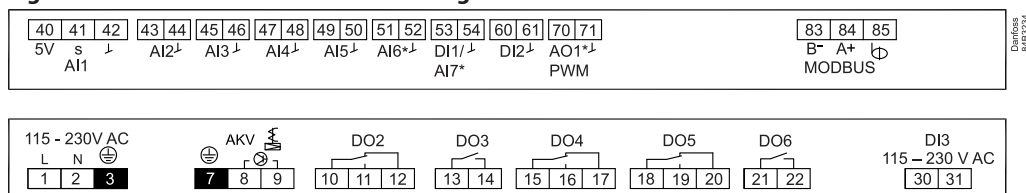
**Figure: Back-to-back cabinet with two evaporators**



## Application modes and IO functions

The general wiring diagram of the AK-CC55 SC controller is shown below:

**Figure: Electrical connections AK-CC55 Single Coil**



Overall, the hardware features the following IO:

- 6 digital outputs
- 3 digital inputs
- 7 analogue inputs (AI7 is mutual exclusive with DI1)
- 1 analogue output

The AK-CC55 Single coil controller has 9 application modes. For application modes 1-8, most of the input and output functions are pre-defined making it fast and foolproof to configure the controller. However, application 9 offers a fully flexible configuration of the digital outputs DO2-DO6 can be defined by the user. In application mode 6 and 7 for back-to-back cabinets DO2 and DO5 can also be user defined.

**Table: The application mode is set via the parameter**

| Parameter            | Description                                      |
|----------------------|--------------------------------------------------|
| o61 Application mode | Selection of application mode as per table above |

The selection gives the following IO configurations:

**Table: Overview of application modes and configuration of digital and analogue outputs**

| No. | Application description | DO1 | DO2       | DO3       | DO4       | DO5       | DO6       | AO1 |
|-----|-------------------------|-----|-----------|-----------|-----------|-----------|-----------|-----|
| 1   | Plug-in cabinet         |     |           |           |           |           |           | ●   |
| 2   | Plug-in cabinet         |     |           |           |           |           |           | ●   |
| 3   | Plug-in cabinet         |     |           |           |           |           |           | ●   |
| 4   | Remote cabinet          |     |           |           |           |           |           | ●   |
| 5   | Remote Hot gas defrost  |     |           |           |           |           |           | ●   |
| 6   | Back-to-back cabinet    |     |           |           |           |           |           | ●   |
| 7   | Back-to-back cabinet    |     |           |           |           |           |           | ●   |
| 8   | Cold storage room       |     |           |           |           |           |           | ●   |
| 9   | User def. config.       |     | User def. | User def. | User def. | User def. | User def. | ●   |

<sup>(1)</sup> User defined

- = Optional use

**Table: Overview of application modes and configuration of digital and analogue inputs**

| No. | Application description | AI1 | AI2 | AI3 | AI4 | AI5 | AI6 | AI7/DI1 | DI2 | DI3 |
|-----|-------------------------|-----|-----|-----|-----|-----|-----|---------|-----|-----|
| 1   | Plug-in cabinet         | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |
| 2   | Plug-in cabinet         | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |
| 3   | Plug-in cabinet         | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |
| 4   | Remote cabinet          | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |
| 5   | Remote hot gas defrost  | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |
| 6   | Back-to-back cabinet    | Pe  | S2  | S3  | S4  | S5  | S3B | ●       | ●   | ●   |
| 7   | Back-to-back cabinet    | Pe  | S2  | S3  | S4  | S5  | S3B | S5B     | ●   | ●   |
| 8   | Cold storage room       | Pe  | S2  | S3  | S4  | S5  | S6  | RH%     | ●   | ●   |
| 9   | User def. config.       | Pe  | S2  | S3  | S4  | S5  | S6  | ●       | ●   | ●   |

● = Optional use

**Table: Sensor description**

|     |                                                                                             |
|-----|---------------------------------------------------------------------------------------------|
| Pe  | Evaporating pressure                                                                        |
| S2  | Gas outlet of evaporator                                                                    |
| S3  | Return air temperature                                                                      |
| S4  | Discharge air temperature                                                                   |
| S5  | Evaporator temperature                                                                      |
| S6  | Product temperature                                                                         |
| S3B | Return air temperature on second cooling section                                            |
| S5B | Evaporator temperature on second evaporator or extra evaporator sensor on single evaporator |
| RH% | Relative humidity sensor                                                                    |

## User configuration of inputs and outputs

In the flexible application mode 6, the functions on the digital outputs and analogue inputs can be defined by the user

### Digital outputs

#### Application 6 and 7

For the back-to-back application modes 6 and 7, the function of the digital outputs DO2 and DO5 can be defined by the user.

#### Application 9

For this flexible application mode, the function of the digital outputs DO2 – DO6 can be defined by the user.

The following functions are selectable for digital outputs:

**Table: Selectable digital output functions**

| Value | Function          |
|-------|-------------------|
| 0     | None              |
| 1     | Fan               |
| 2     | Fan ECO           |
| 3     | Defrost           |
| 4     | Rail heat         |
| 5     | Alarm             |
| 6     | Light             |
| 7     | Blinds            |
| 8     | Compressor        |
| 9     | Compressor 2      |
| 10    | Air heater        |
| 17    | Leak safety valve |

#### Note:

DO1 is always used for the AKV valve and cannot be changed. However, if the analogue output is set up for stepper valve driver, then the DO1 output will switch function to control a liquid line solenoid valve in front of the stepper valve.

It is recommended to configure the alarm and light functions on the digital outputs with double contact set (DO2 or DO5) as they must be connected to the NO contact, so that the light will be switched ON and an alarm will be raised if the power to the controller should fail.

### Analogue outputs

For all application modes, the analogue output AO1 function can be selected.

**Table: Selectable analogue output functions**

| Value | Function                     |
|-------|------------------------------|
| 0     | None                         |
| 1     | Rail heat PWM (fast pulsing) |
| 2     | Stepper valve driver         |
| 5     | Variable fan speed           |

## Digital inputs

There are two digital inputs, DI1 and DI2, with dry contact function, and one digital input DI3 with high voltage signal.

For all application modes, the following functions can be selected:

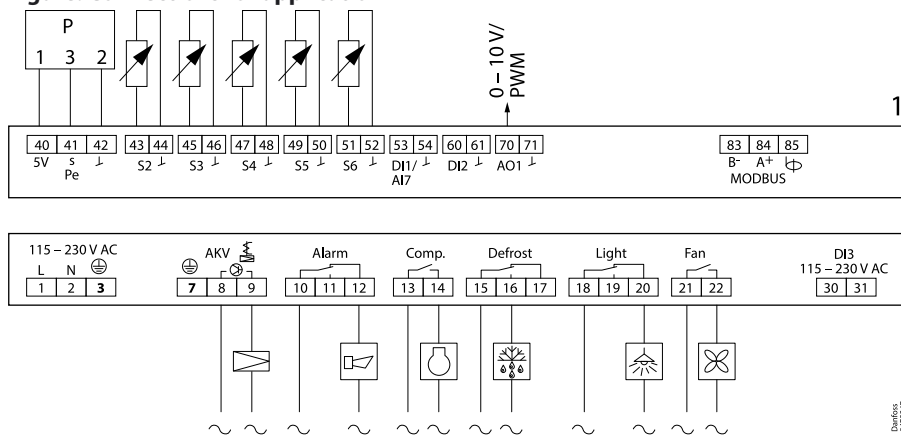
**Table: Function table and DI settings**

| Function                   | Input/Settings menu |     |     | Setting |
|----------------------------|---------------------|-----|-----|---------|
|                            | DI1                 | DI2 | DI3 |         |
|                            | o02                 | o37 | o84 |         |
| 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      |
| Valve driver alarm at open | +                   | +   |     | 22      |
| Fan alarm at open          | +                   | +   |     | 23      |
| Door fan stop              | +                   | +   | +   | 29      |
| Oil recovery               | +                   | +   | +   | 30      |

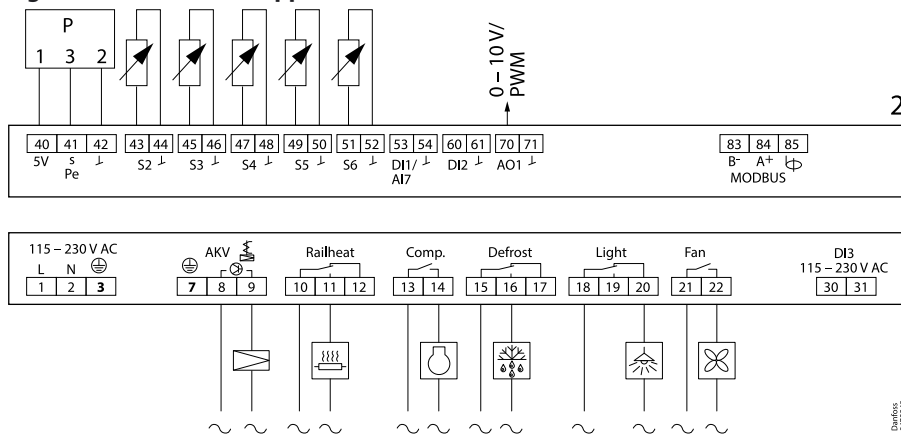
## Application diagrams

### Application set-ups and IO connections

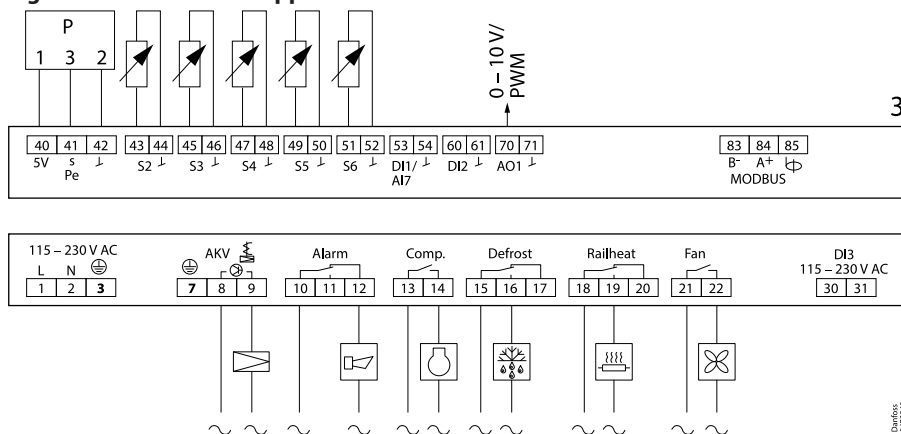
**Figure: Connections for application 1**

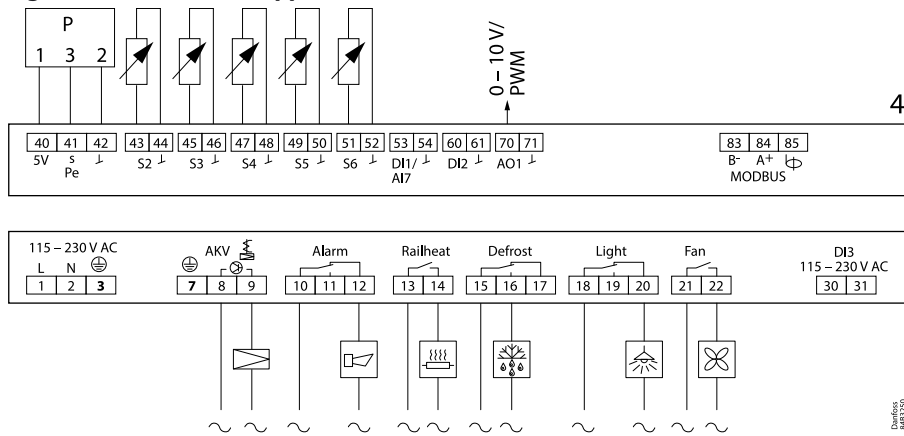
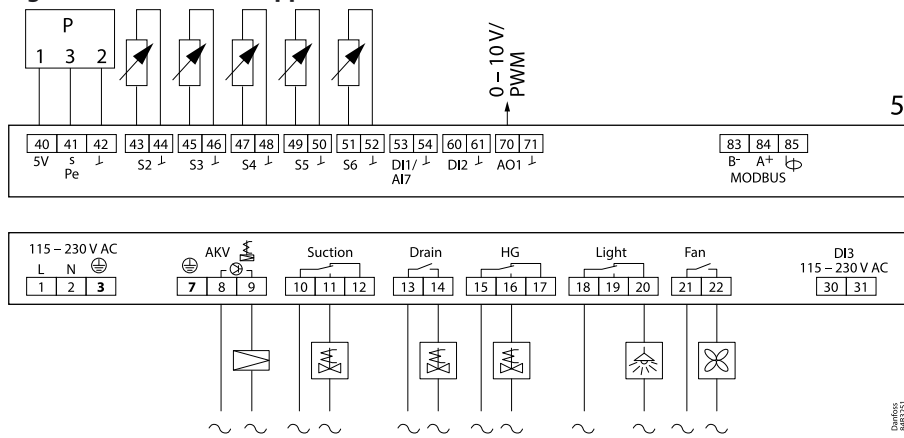
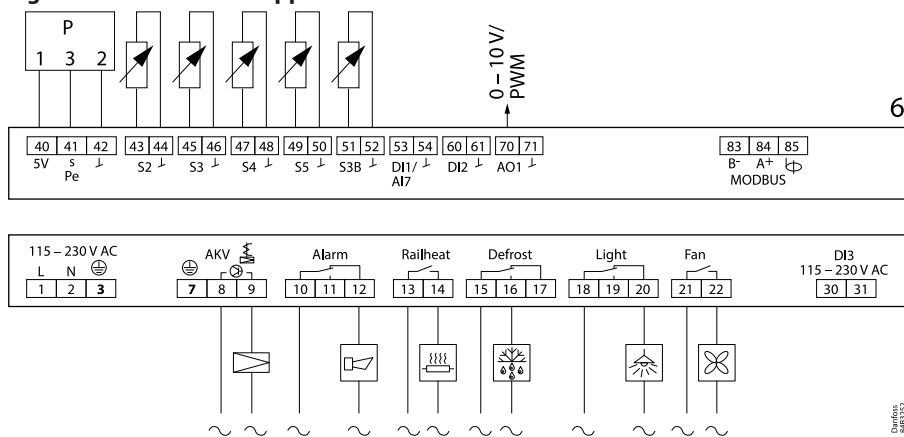


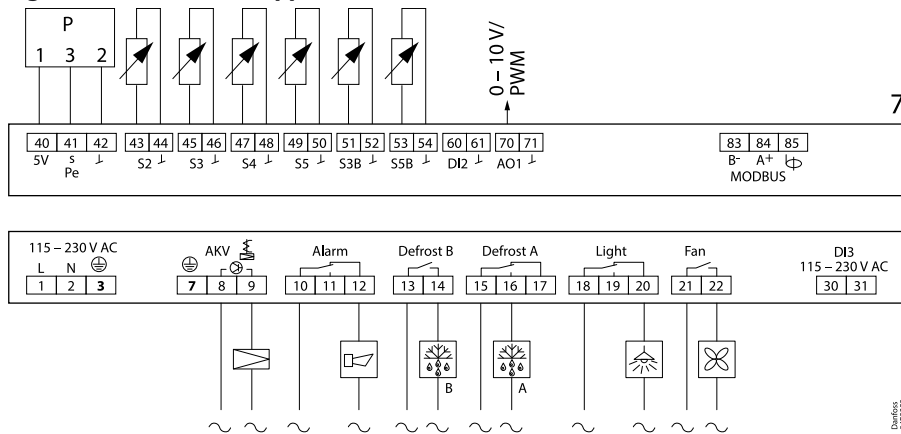
**Figure: Connections for application 2**



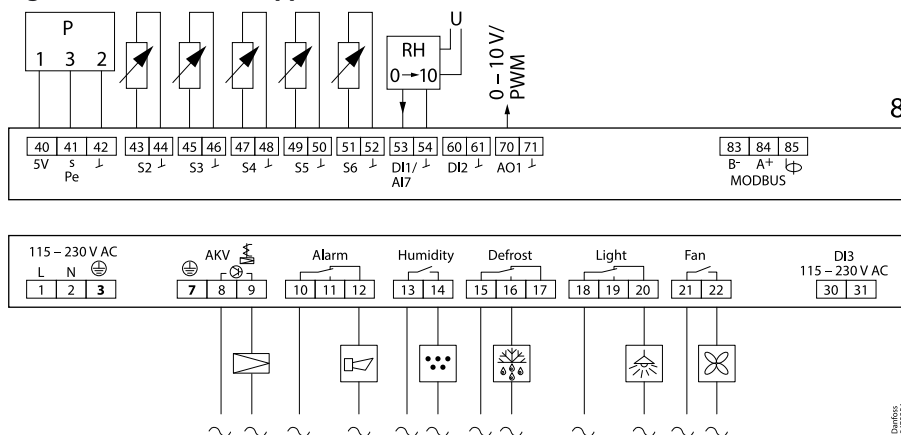
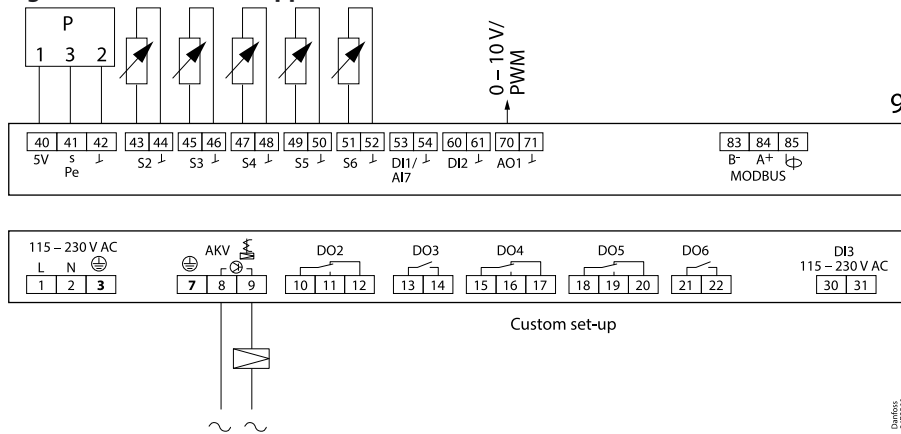
**Figure: Connections for application 3**



**Figure: Connections for application 4****Figure: Connections for application 5****Figure: Connections for application 6****Note:** DO2 and DO5 are user defined.

**Figure: Connections for application 7**

**Note:** DO2 and DO5 are user defined.

**Figure: Connections for application 8****Figure: Connections for application 9**



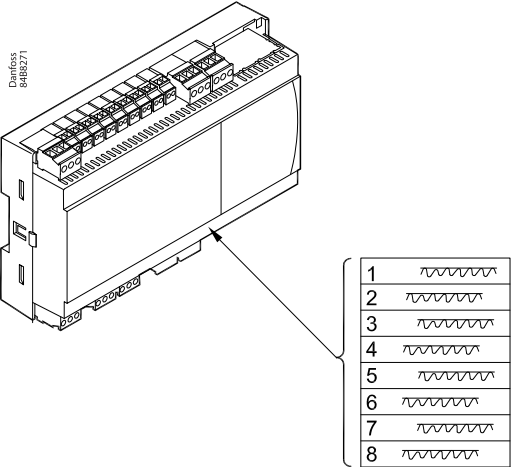
Product identification

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 can be applicable to multiple application options.

Figure: Product identification



Installation

Dimensions

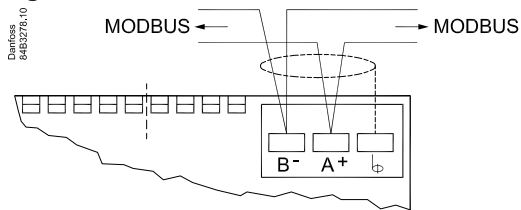
Measurements are in mm.

|                                   |                                      |
|-----------------------------------|--------------------------------------|
| <p><b>AK-CC55 Single Coil</b></p> | <p><b>AK-CC55 Single Coil UI</b></p> |
| <p><b>AK-CC55 Set</b></p>         | <p><b>AK-OB55</b></p>                |

## Connections

### Data communication

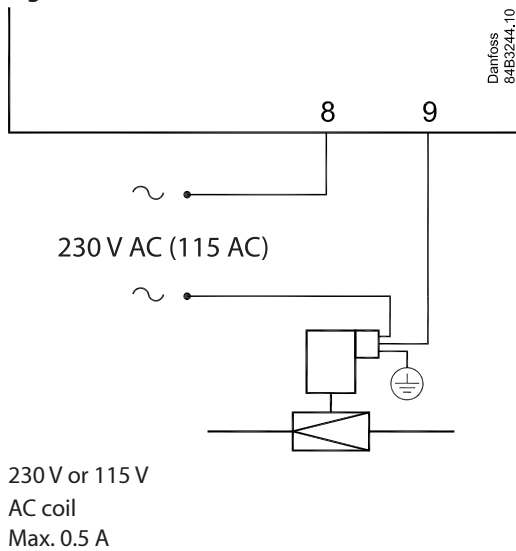
**Figure: Data communication**



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

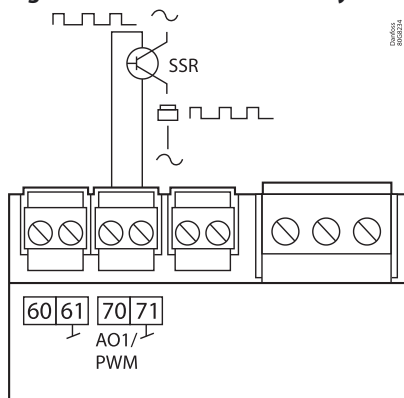
### AKV

**Figure: AKV info**



### External solid state relay for rail heat

**Figure: External solid state relay for rail heat**



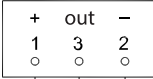
0 / 10 V Pulse Width Modulated (PWM)  
Max. 15 mA.



AKS 32R info

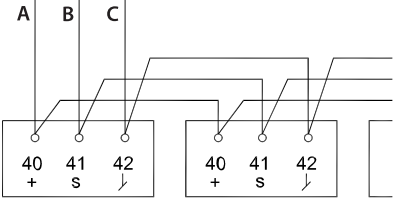
Figure: AKS 32R info

AKS 32R



Danfoss  
84B3277.10

|   |       |
|---|-------|
| A | Black |
| B | Brown |
| C | Blue  |

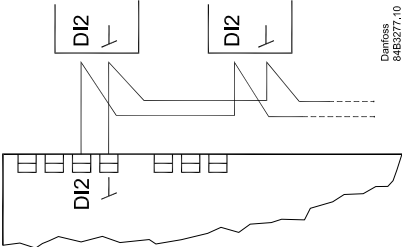


**Note:** A ratiometric pressure transmitter with a 5 V, 10 – 90% voltage output signal must be used.

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: Coordinated defrost via cable connections



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84B3277.10

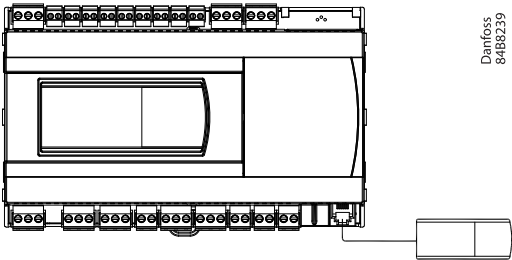
Max. 10

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: External display AK-UI55



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84B8239

Display  
084B4075 / 084B4076 / 084B4077  
Cable 3 m: 084B4078  
Cable 6 m: 084B4079  
(Total length: max. 100 m)

## Connections

**Table: Connection details**

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AI1</b>            | <p><b>Pressure transmitter</b><br/>AKS 32R<br/>Connect to terminal 40, 41 and 42.<br/>(Use cable 060G1034: Black=40, Brown=41, Blue=42)</p> <p>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 <i>Figure: AKS 32R info</i>.</p> <p><b>Note:</b> When replacing AK-CC 550 with AK-CC55, S and ground must be switched.</p>                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>AI2 - AI7</b>      | <p><b>Primarily for temperature inputs</b></p> <ul style="list-style-type: none"> <li>• <b>S2</b><br/>Pt 1000 ohm sensor AKS11, placed at the evaporator outlet</li> <li>• <b>S3, S4, S5</b><br/>Pt 1000 AKS11, PTC 1000 EKS111, NTC5K EKS211, NTC10K EKS221 or a user-defined sensor type.<br/>All have to be of the same type.</li> <li>• <b>S3, return air sensor, placed in the warm air before the evaporator</b></li> <li>• <b>S4, discharge air sensor, placed in the cold air after the evaporator</b><br/>(the need for either S3 or S4 can be selected in the configuration)</li> <li>• <b>S5, defrost sensor, placed in the evaporator</b></li> <li>• <b>S6, Pt 1000 ohm sensor, food temperature sensor placed in-between the food products</b></li> </ul> <p>(If the DI1 input is used for a temperature measurement, it will appear as AI7.)</p> |
| <b>DI1</b>            | <p><b>Digital input signal</b><br/>The defined function is active when the input is short-circuited or opened, depending on the function defined in o02.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>DI2</b>            | <p><b>Digital input signal</b><br/>The defined function is active when the input is short-circuited or opened, depending on the function defined in o37.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>AO1</b>            | <p><b>Analogue output signal</b></p> <ul style="list-style-type: none"> <li>• <b>Analogue 0 – 10 V</b><br/>Can be used to drive an external stepper driver</li> <li>• <b>Pulse width modulated signal</b><br/>Can be used for fast pulse control of rail heat via an external power solid state relay.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Modbus</b>         | <p>For data communication:</p> <ul style="list-style-type: none"> <li>• Terminal 83 = B-</li> <li>• Terminal 84 = A+</li> <li>• Terminal 85 = screen</li> </ul> <p><b>Note:</b> When replacing AK-CC 550 with AK-CC55 A+, B- and shield must be switched.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Supply voltage</b> | 230 V AC or 115 V AC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>DO1</b>            | <ul style="list-style-type: none"> <li>• <b>AKV valve:</b><br/>Connection of expansion valve type AKV, AKVA, AKVH or AKVP.<br/>The coil must be a <b>230 V</b> or <b>115 V AC coil</b></li> <li>• <b>Liquid line solenoid valve:</b><br/>Connection of normally closed valve in connection with stepper valve.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>DO2</b>            | <ul style="list-style-type: none"> <li>• <b>Alarm:</b><br/>There is a connection between terminal 10 and 12 in alarm situations and when the controller is without power.<br/>DO2 has reinforced insulation that can be used with 24 V.</li> <li>• <b>Light, Rail heat, Compressor, Night blind:</b><br/>There is connection between terminal 10 and 11 (10 and 12 at light) when the function is on.</li> <li>• <b>Suction line valve</b><br/>There is connection between terminal 10 and 11 when the suction line must be open.</li> </ul>                                                                                                                                                                                                                                                                                                                   |

|                                        |                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DO3</b>                             | <ul style="list-style-type: none"> <li>• <i>Compressor, Rail heat, Defrost, Drain valve, Humidity:</i><br/>There is connection between terminal 13 and 14 when the function must be active</li> </ul>                                                                                                                                                   |
| <b>DO4</b>                             | <ul style="list-style-type: none"> <li>• <i>Defrost:</i><br/>There is connection between terminal 15 and 16 when defrosting takes place.</li> <li>• <i>Hot gas:</i><br/>There is connection between terminal 15 and 16 when the hot gas valves must open.</li> </ul> <p><b>Note:</b> When replacing AK-CC 550 with AK-CC55, wires must be switched.</p> |
| <b>DO5</b>                             | <ul style="list-style-type: none"> <li>• <i>Light:</i><br/>There is connection between terminal 18 and 20 when the function must be active.</li> <li>• <i>Rail heat:</i><br/>There is connection between terminal 18 and 19 when the rail heat must be on.</li> </ul>                                                                                   |
| <b>DO6</b>                             | <ul style="list-style-type: none"> <li>• <i>Fan:</i><br/>There is connection between terminal 21 and 22 when the fan is on.</li> </ul>                                                                                                                                                                                                                  |
| <b>DO2-DO6 + AO1 and Application 9</b> | Here, the different outputs can be custom defined in q02 – q09                                                                                                                                                                                                                                                                                          |
| <b>DI3</b>                             | <p><b>Digital input signal</b><br/>The signal must have a voltage of 0 / 230 V AC (115 V AC).<br/>The function is defined in o84.</p>                                                                                                                                                                                                                   |

### Display (RJ12 plug)

If external readings/operation of the controller is required, a display can be connected. If there is no display on the front, two external displays can be connected. For one display the max. cable length is 100 m. For two displays the sum of the two cable lengths must not exceed 100 m.

**Note:** When replacing AK-CC 550 with AK-CC55, AKA 16X remote displays and cables have to be replaced with new AKUI55 displays and cables.

### Electric noise

Cables for sensors, low voltage DI inputs and data communication must be kept separate from other high voltage 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.

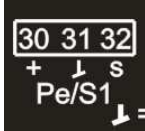
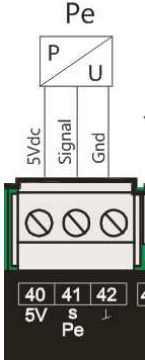
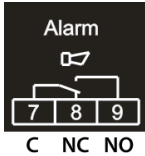
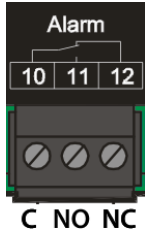
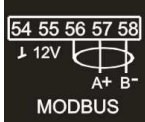
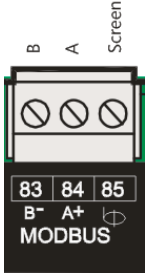
Special reference is made to the necessity of signals to the controller when the compressor is stopped and to the need of liquid receivers before the compressors.

Your local Danfoss agent will be pleased to assist with further advice, etc.

## Replacing AK-CC 550 with AK-CC55

**Note:** Be aware when exchanging an AK-CC 550 controller with a new AK-CC55 controller - new wiring principles!

**Table: Replacing AK-CC 550 with AK-CC55**

|                                                                                                                        | AK-CC 550                                                                            | AK-CC55                                                                               |
|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Pressure sensor has new connection – signal and ground are switched                                                    |    |    |
| SPDT relays have a new wiring scheme – NO and NC terminals are switched (e.g. defrost heater on when it should be off) |   |   |
| Modbus has new connection scheme (A,B and screen)                                                                      |  |  |
| New AK-UI55 displays and cables with 6 wires vs. 3 wires for EKA 16x                                                   |  |  |

- AK-CC55 does not support two EEC coils connected to one AKV output.
- Pressure transmitter can be shared between AK-CC 550 and AK-CC55.
- DI2 defrost coordination can be wired between AK-CC 550 and AK-CC55.

## Operation

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

The following options are available:

- Via data communication
- 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 or Lon.

#### 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 or Lon.

#### 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-CC connect** app is used for smart phone operation.

**AK-CC connect** can be downloaded freely to a compatible iOS/Android smartphone device.

The display can be placed at a distance of up to 100 metres from the controller.

Menu operation is established by activating Bluetooth communication to the app.

### Operation via AK-UI55 Set

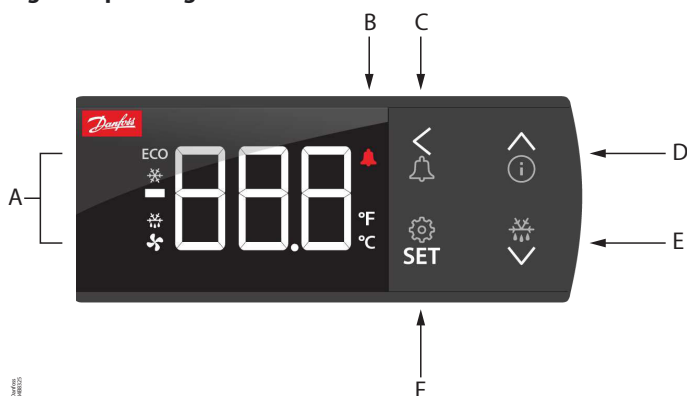
#### Display AK-UI55 Set

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:

|          |                                                                                                                                                                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>0</b> | The display keys are always operative                                                                                                                                      |
| <b>1</b> | 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. |
| <b>2</b> | The display keys will be locked and unlocked by means of a master control signal from the System Manager.                                                                  |

**Figure: Operating via AK-UI55 Set**

|          |                                                                                                                                                            |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A</b> | Lights up in event of: Energy optimization, Cooling, Defrosting, Fan operation                                                                             |
| <b>B</b> | Lights in event of alarm                                                                                                                                   |
| <b>C</b> | Long press (3 seconds) on alarm button alarm — relay is reset — alarm code displayed — e.g. "A1"                                                           |
| <b>D</b> | Long press (3 seconds) gives access to the information menu "InF".<br>Up arrow / Down arrow / Arrow to left: Navigation in the menu and setting of values. |

|          |                                                                                                                                                                                                                                                                                    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>E</b> | Long press (3 seconds) will start a defrost, "-d-" is shown in the display. Ongoing defrosting can be stopped by a long press.                                                                                                                                                     |
| <b>F</b> | 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: Messages provided by the display**

| Display readout | Denomination                                                                                                             |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| -d-             | Defrost is in progress                                                                                                   |
| Err             | The temperature cannot be displayed due to a sensor error                                                                |
| Err1            | The display cannot load data from the controller. Disconnect and then reconnect the display                              |
| Err2            | 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 <sub>2</sub> |

**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: SET button parameter list

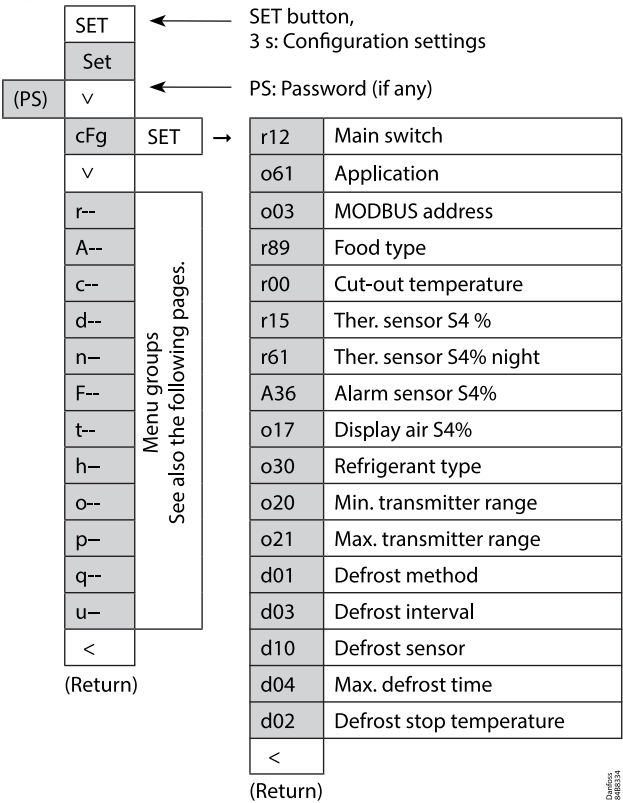
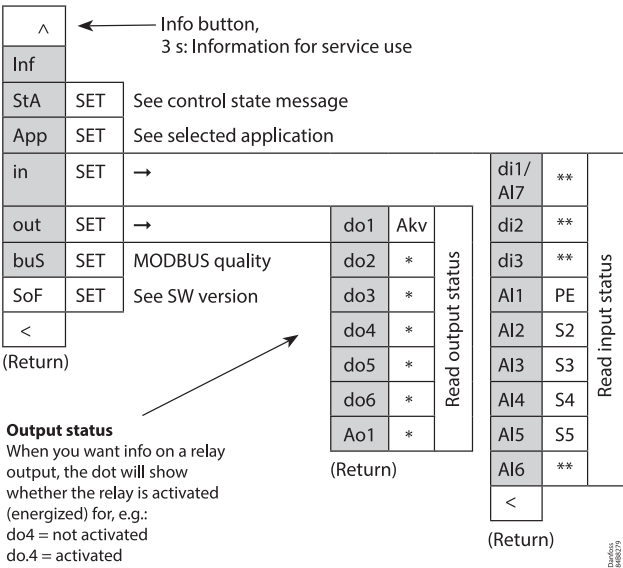


Figure: Info button parameter list



|     |                                                                                                                                                                                                                                                 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *   | 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 <i>Table: Operating status</i>                                                                                                                                                                                     |

## 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 presets. The few selected settings will now be transferred to the menu
7. Set the desired cut-out temperature r00
8. Set the weighted thermostat air temperature between S4 and S3 sensor r15
9. Set the weighted thermostat air temperature between S4 and S3 during night operation r61
10. Set the weighted alarm air temperature between S4 and S3 A36
11. Set the weighted display readout between S4 and S3 o17
12. Select refrigerant via parameter o30
13. Set the pressure transmitter min. and max. range via parameter o20 and o21
14. Set the desired defrost method in d01
15. Set the interval time between defrost starts in d03
16. Set the desired defrost stop method 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
  - If another data communication card is used in the controller:
    - Lon RS485: Activate the function o04
    - Ethernet: Use the MAC address

**Table: Food type settings**

| Setting of presets (r89)<br>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    |

## 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-CC Connect
- Start the app.

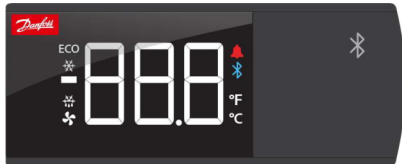
2. Click on the display's Bluetooth button for 3 seconds.

- The Bluetooth light will then flash while display is showing the controller's address.

3. Connect to the controller from the app.



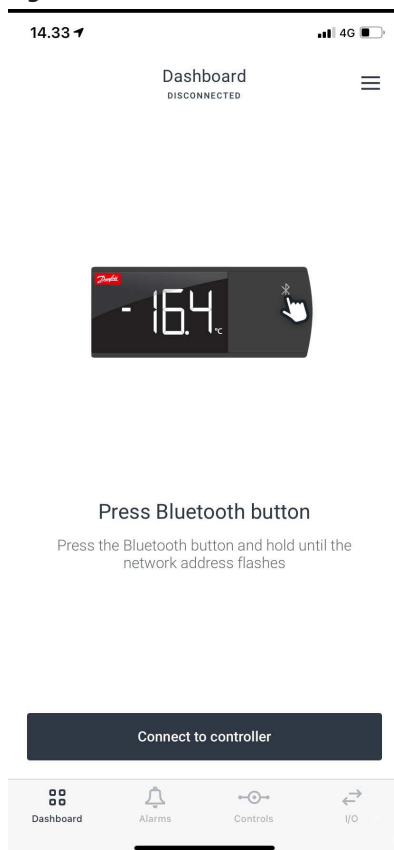
**Figure: AK-UI55 Bluetooth**



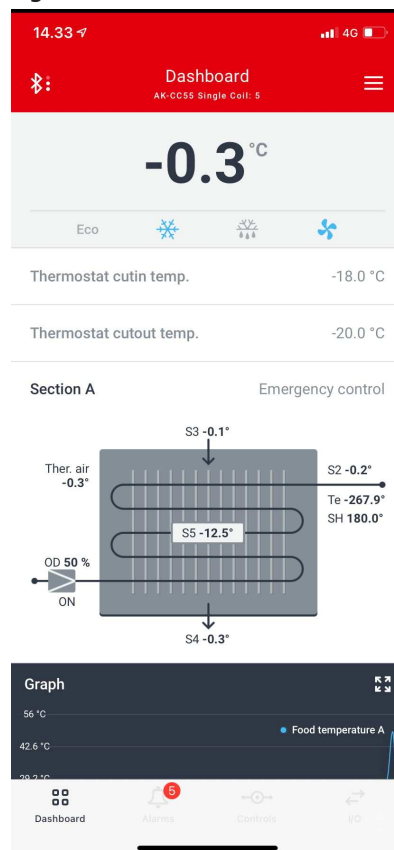
### Display info:

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

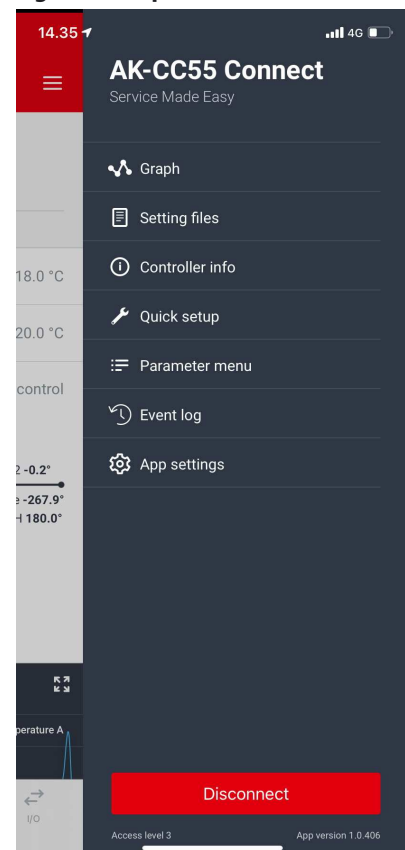
**Figure: Connect to controller**



**Figure: Controller dashboard**



**Figure: Set-up menu**



The functions are described on the chapter *AK-CC55 connect menu*.

## Parameters

### AK-UI55 display menu (SW ver. 2.4x)

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

### Thermostat

| Function                        | Values                                                                     | R-W                | Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Min .val ue | Max .val ue | Fact.v alue |
|---------------------------------|----------------------------------------------------------------------------|--------------------|------|---|---|---|---|---|---|---|---|---|-------------|-------------|-------------|
| Cut-out 1                       |                                                                            | 0-0                | r00  | * | * | * | * | * | * | * | * | * | r03         | r02         | 2 °C        |
| Differential                    |                                                                            | 1-2                | r01  | * | * | * | * | * | * | * | * | * | 0.1 °C      | 20 °C       | 2 °C        |
| Max cut-out limit               |                                                                            | 0-2                | r02  | * | * | * | * | * | * | * | * | * | r03         | 50 °C       | 50 °C       |
| Min cut-out limit               |                                                                            | 0-2                | r03  | * | * | * | * | * | * | * | * | * | -60 °C      | r02         | -60 °C      |
| Display readout adjustment      |                                                                            | 1-2                | r04  | * | * | * | * | * | * | * | * | * | -10 °C      | 10 °C       | 0 °C        |
| Temperature unit                | 0=Celsius, 1=Fahrenheit                                                    | 1-2                | r05  | * | * | * | * | * | * | * | * | * | 0           | 1           | 0           |
| S4 Air OFF evap. A - Adjustment |                                                                            | 1-2                | r09  | * | * | * | * | * | * | * | * | * | -10 °C      | 10 °C       | 0 °C        |
| S3 Air ON evap. A - Adjustment  |                                                                            | 1-2                | r10  | * | * | * | * | * | * | * | * | * | -10 °C      | 10 °C       | 0 °C        |
| S5 Evaporator A - Adjustment    |                                                                            | 1-2                | r11  | * | * | * | * | * | * | * | * | * | -10 °C      | 10 °C       | 0 °C        |
| Main switch                     | -1=Manual, 0=Stop, 1=Start                                                 | 0-2                | r12  | * | * | * | * | * | * | * | * | * | -1          | 1           | 0           |
| Night offset                    |                                                                            | 1-2                | r13  | * | * | * | * | * | * | * | * | * | -50 °C      | 50 °C       | 0 °C        |
| Thermostat mode                 | 1=ON/OFF, 2=Modulating                                                     | 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 °C      | 10 °C       | 0 °C        |
| Cut-out 2                       |                                                                            | 0-2                | r21  | * | * | * | * | * | * | * | * | * | -60 °C      | 50 °C       | 2 °C        |
| S3 Air ON evap. B - Adjustment  |                                                                            | 1-2                | r53  |   |   |   |   |   | * | * |   |   | -10 °C      | 10 °C       | 0 °C        |
| S6 product temp. - Adjustment   |                                                                            | 1-2                | r59  | * | * | * | * | * |   |   | * | * | -10 °C      | 10 °C       | 0 °C        |
| Thermostat sensor S4 % night    |                                                                            | 1-2                | r61  | * | * | * | * | * | * | * | * | * | 0 %         | 100 %       | 100 %       |
| Air heater neutral zone         |                                                                            | 1-2                | r62  |   |   |   |   |   | * | * |   | * | 0 °C        | 50 °C       | 5 °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 <sup>(1)</sup> | r89  | * | * | * | * | * | * | * | * | * | 0           | 5           | 0           |
| Differential 2                  |                                                                            | 1-2                | r93  | * | * | * | * | * | * | * | * | * | 0.1 °C      | 20 °C       | 2 °C        |
| S4 frost protection             |                                                                            | 1-2                | r98  | * | * | * | * | * | * | * | * | * | -60 °C      | 50 °C       | -60 °C      |

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

## 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 pull down A  |             | 1-2                | A12  | * | * | * | * | * | * | * | * | * | 0 min      | 240 min    | 90 min      |
| High alarm limit 1       |             | 1-2                | A13  | * | * | * | * | * | * | * | * | * | -60 °C     | 50 °C      | 8 °C        |
| Low alarm limit 1        |             | 1-2                | A14  | * | * | * | * | * | * | * | * | * | -60 °C     | 50 °C      | -30 °C      |
| High alarm limit 2       |             | 1-2                | A20  | * | * | * | * | * | * | * | * | * | -60 °C     | 50 °C      | 8 °C        |
| Low alarm limit 2        |             | 1-2                | A21  | * | * | * | * | * | * | * | * | * | -60 °C     | 50 °C      | -30 °C      |
| S6 High alarm limit 1    |             | 1-2                | A22  | * | * | * | * | * |   |   | * | * | -60 °C     | 50 °C      | 8 °C        |
| S6 Low alarm limit 1     |             | 1-2                | A23  | * | * | * | * | * |   |   | * | * | -60 °C     | 50 °C      | -30 °C      |
| S6 High alarm limit 2    |             | 1-2                | A24  | * | * | * | * | * |   |   | * | * | -60 °C     | 50 °C      | 8 °C        |
| S6 Low alarm limit 2     |             | 1-2                | A25  | * | * | * | * | * |   |   | * | * | -60 °C     | 50 °C      | -30 °C      |
| S6 alarm delay           |             | 1-2                | A26  | * | * | * | * | * |   |   | * | * | 0 min      | 240 min    | 60 min      |
| 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 %       |
| S6 alarm pull down delay |             | 1-2                | A52  | * | * | * | * | * |   |   | * | * | 0 min      | 240 min    | 90 min      |
| Alarm delay B            |             | 1-2                | A53  |   |   |   |   |   | * | * |   |   | 0 min      | 240 min    | 30 min      |
| Use product sensor S6    | 0=No, 1=Yes | 1-2 <sup>(1)</sup> | a01  | * | * | * | * | * |   |   | * | * | 0          | 1          | 0           |

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

## 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      | 5 s         |
| 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

| 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, 4=Air/Offcycle, 5=Electrical pulsing | 1-3 | d01  | * | * | * | * | * | * | * | * | * | 0          | 5          | 1           |
| Defrost stop limit         |                                                                       | 1-2 | d02  | * | * | * | * | * | * | * | * | * | 0 °C       | 50 °C      | 6 °C        |
| Defrost start interval     |                                                                       | 1-2 | d03  | * | * | * | * | * | * | * | * | * | 0 h        | 240 h      | 8 h         |
| Max. defrost time          |                                                                       | 1-2 | d04  | * | * | * | * | * | * | * | * | * | d24        | 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 °C     | 10 °C      | -5 °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, 3=S5A and S5B                       | 1-2 | d10  | * | * | * | * | * | * | * | * | * | 0          | 3          | 0           |
| Pump down delay            |                                                                       | 1-2 | d16  | * | * | * | * | * | * | * | * | * | 0 min      | 60 min     | 0 min       |
| Drain delay                |                                                                       | 1-2 | d17  |   |   |   |   | * |   |   |   |   | 0 min      | 60 min     | 0 min       |

|                             |                                                                    |                    |     |   |   |   |   |   |   |   |   |   |        |          |         |
|-----------------------------|--------------------------------------------------------------------|--------------------|-----|---|---|---|---|---|---|---|---|---|--------|----------|---------|
| Max. thermostat run time    |                                                                    | 1-2                | d18 | * | * | * | * | * | * | * | * | * | 0 h    | 240 h    | 0 h     |
| Adaptive defrost mode       | 0=OFF, 1=Monitoring, 2=Skip day, 3=Skip day/night, 4=Full adaptive | 1-2 <sup>(1)</sup> | d21 | * | * | * | * | * | * | * | * | * | 0      | 4        | 0       |
| Hot gas injection delay     |                                                                    | 1-2                | d23 |   |   |   |   | * |   |   |   |   | 0 min  | 60 min   | 0 min   |
| 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 °C   | 50 °C    | 6 °C    |
| Max. defrost time 2         |                                                                    | 1-2                | d29 | * | * | * | * | * | * | * | * | * | d24    | 360 mins | 45 mins |
| Display delay after defrost |                                                                    | 1-2                | d40 | * | * | * | * | * | * | * | * | * | 5 min  | 240 min  | 30 min  |
| Fan stop temperature        |                                                                    | 1-2                | d41 | * | * | * | * | * | * | * | * | * | -20 °C | 20 °C    | 0 °C    |
| Fan ECO Defrost             | 1=ECO Speed, 2=Full speed                                          | 1-2                | d46 |   |   |   |   |   |   | * | * | * | 1      | 2        | 2       |

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

## 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 °C      | 12 °C       |
| Min. superheat limit |        | 1-2                | n10  | * | * | * | * | * | * | * | * | * | 2 °C       | n09        | 3 °C        |
| MOP temperature      |        | 1-2                | n11  | * | * | * | * | * | * | * | * | * | -60 °C     | 15 °C      | 15 °C       |
| EEV Period time      |        | 1-2 <sup>(1)</sup> | n13  | * | * | * | * | * | * | * | * | * | 3 s        | 6 s        | 6 s         |

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

## 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 °C     | 50 °C      | 50 °C       |
| Fan pulsing mode         | 0=No pulsing, 1=Pulsing cut-out, 2=Pulsing cut-out night                  | 1-2 | F05  | * | * | * | * | * | * | * | * | * | 0          | 2          | 0           |
| Fan period time          |                                                                           | 1-2 | F06  | * | * | * | * | * | * | * | * | * | 1 min      | 120 min    | 5 min       |
| Fan ON cycle             |                                                                           | 1-2 | F07  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 100%        |
| Fan speed min limit      |                                                                           | 1-2 | F18  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 70%         |
| Fan speed max limit      |                                                                           | 1-2 | F19  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 100%        |
| Fan speed differential   |                                                                           | 1-2 | F26  | * | * | * | * | * | * | * | * | * | 0 K        | 20 K       | 2 K         |
| Fan speed P-band         |                                                                           | 1-2 | F27  | * | * | * | * | * | * | * | * | * | 0.1 K      | 30 K       | 5 K         |
| Fan start time           |                                                                           | 1-2 | F28  | * | * | * | * | * | * | * | * | * | 0 s        | 240 s      | 0 s         |
| Fan speed up filter      |                                                                           | 1-2 | F29  | * | * | * | * | * | * | * | * | * | 0 s        | 999 s      | 10 s        |
| Fan speed down filter    |                                                                           | 1-2 | F30  | * | * | * | * | * | * | * | * | * | 0 s        | 999 s      | 300 s       |
| Fan full speed interval  |                                                                           | 1-2 | F31  | * | * | * | * | * | * | * | * | * | 0 hours    | 96 hours   | 0 hours     |
| Fan Full Speed period    |                                                                           | 1-2 | F32  | * | * | * | * | * | * | * | * | * | 0 mins     | 120 mins   | 0 mins      |
| Fan ECO mode             | 0=No ECO mode, 1=Cut-out at night, 2=Always at cut-out, 3=Always at night | 1-2 | F33  |   |   |   |   |   | * | * |   | * | 0          | 3          | 0           |
| Fan speed at leak        |                                                                           | 1-2 | F34  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 100%        |
| Fan speed during defrost |                                                                           | 1-2 | F35  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 100%        |

## 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 - mins         |                                      | 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 - mins         |                                      | 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 - mins         |                                      | 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 - mins         |                                      | 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 - mins         |                                      | 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 - mins         |                                      | 1-2 | t16  | * | * | * | * | * | * | * | * | * | 0 min      | 59 min     | 0 min       |
| Time hours                  |                                      | 0-1 | t07  | * | * | * | * | * | * | * | * | * | 0 h        | 23 h       | 0 h         |
| Time mins                   |                                      | 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           |
| Event 1 Day h               |                                      | 1-2 | t58  | * | * | * | * | * | * | * | * | * | 0 hours    | 23 hours   | 0 hours     |
| Event 1 Day min             |                                      | 1-2 | t59  | * | * | * | * | * | * | * | * | * | 0 mins     | 59 mins    | 0 mins      |
| Event 1 Night h             |                                      | 1-2 | t60  | * | * | * | * | * | * | * | * | * | 0 hours    | 23 hours   | 0 hours     |
| Event 1 Night min           |                                      | 1-2 | t61  | * | * | * | * | * | * | * | * | * | 0 mins     | 59 mins    | 0 mins      |
| Event 2 Day h               |                                      | 1-2 | t62  | * | * | * | * | * | * | * | * | * | 0 hours    | 23 hours   | 0 hours     |
| Event 2 Day min             |                                      | 1-2 | t63  | * | * | * | * | * | * | * | * | * | 0 mins     | 59 mins    | 0 mins      |
| Event 2 Night h             |                                      | 1-2 | t64  | * | * | * | * | * | * | * | * | * | 0 hours    | 23 hours   | 0 hours     |
| Event 2 Night min           |                                      | 1-2 | t65  | * | * | * | * | * | * | * | * | * | 0 mins     | 59 mins    | 0 mins      |
| Monday event                | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t66  | * | * | * | * | * | * | * | * | * | 0          | 3          | 0           |
| Tuesday event               | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t67  | * | * | * | * | * | * | * | * | * | 0          | 3          | 0           |

|                 |                                      |     |     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----------------|--------------------------------------|-----|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| Wednesday event | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t68 | * | * | * | * | * | * | * | * | * | 0 | 3 | 0 |
| Thursday event  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t69 | * | * | * | * | * | * | * | * | * | 0 | 3 | 0 |
| Friday event    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t70 | * | * | * | * | * | * | * | * | * | 0 | 3 | 0 |
| Saturday event  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t71 | * | * | * | * | * | * | * | * | * | 0 | 3 | 0 |
| Sunday event    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | 1-2 | t72 | * | * | * | * | * | * | * | * | * | 0 | 3 | 0 |

## Humidity control

| Function                     | Values                               | R-W                | Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Min. value | Max. value | Fact. value |
|------------------------------|--------------------------------------|--------------------|------|---|---|---|---|---|---|---|---|---|------------|------------|-------------|
| Humidity cut-in              |                                      | 0-2                | h23  |   |   |   |   |   |   |   | * |   | 0 RH%      | 100 RH%    | 70 RH%      |
| Humidity differential        |                                      | 1-2                | h24  |   |   |   |   |   |   |   | * |   | 1 RH%      | 30 RH%     | 5 RH%       |
| Humidity high alarm limit    |                                      | 1-2                | h25  |   |   |   |   |   |   |   | * |   | 0 RH%      | 100 RH%    | 100 RH%     |
| Humidity low alarm limit     |                                      | 1-2                | h26  |   |   |   |   |   |   |   | * |   | 0 RH%      | 100 RH%    | 0 RH%       |
| Humidity alarm delay         |                                      | 1-2                | h27  |   |   |   |   |   |   |   | * |   | 0 min      | 240 min    | 60 min      |
| Humidity ctrl. at defrost    | 0=No, 1=Yes                          | 1-2                | h28  |   |   |   |   |   |   |   | * |   | 0          | 1          | 0           |
| Humidity sensor - Min signal |                                      | 1-2 <sup>(1)</sup> | h29  |   |   |   |   |   |   |   | * |   | 0 RH%      | h30        | 0 RH%       |
| Humidity sensor - Max signal |                                      | 1-2 <sup>(1)</sup> | h30  |   |   |   |   |   |   |   | * |   | h29        | 100 RH%    | 100 RH%     |
| Humidity control             | 0=None, 1=Humidifier, 2=Dehumidifier | 1-3 <sup>(1)</sup> | h31  |   |   |   |   |   |   |   | * |   | 0          | 2          | 0           |
| Humidity max. temp.          |                                      | 1-2                | h32  |   |   |   |   |   |   |   | * |   | h33        | 70.0 °C    | 70.0 °C     |
| Humidity min. temp.          |                                      | 1-2                | h33  |   |   |   |   |   |   |   | * |   | -5 °C      | h32        | 2 °C        |

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

## 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      | 5 s         |
| 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, 13=Coordinated defrost, 14=Forced closing, 15=Shutdown, 16=Light control, 20=Leak detection, 21=Adaptive liquid control, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery | 1-2 <sup>(1)</sup> | o02  | * | * | * | * | * | * |   |   | * | 0          | 30         | 0           |
| Network address              |                                                                                                                                                                                                                                                                                                                                                                                                            | 1-3 <sup>(1)</sup> | o03  | * | * | * | * | * | * | * | * | * | 0          | 240        | 0           |
| Service pin                  | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                | 1-2                | o04  | * | * | * | * | * | * | * | * | * | 0          | 1          | 0           |
| 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 <sup>(1)</sup> | 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 <sup>(1)</sup> | o20  | * | * | * | * | * | * | * | * | * | -1,0 Bar   | 5,0 Bar    | -1,0 Bar    |
| Pe Max range                 |                                                                                                                                                                                                                                                                                                                                                                                                            | 1-3 <sup>(1)</sup> | o21  | * | * | * | * | * | * | * | * | * | 6,0 Bar    | 200,0 Bar  | 12,0 Bar    |
| AO1 Min. voltage             |                                                                                                                                                                                                                                                                                                                                                                                                            | 1-3 <sup>(1)</sup> | o27  | * | * | * | * | * | * |   | * | * | 0,0 V      | o28        | 0,0 V       |
| AO1 Max. voltage             |                                                                                                                                                                                                                                                                                                                                                                                                            | 1-3 <sup>(1)</sup> | o28  | * | * | * | * | * | * |   | * | * | o27        | 10,0 V     | 10,0 V      |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |     |   |   |   |   |   |   |   |   |   |        |         |        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|---|---|---|---|---|---|---|---|---|--------|---------|--------|
| Refrigerant              | 0=Not selected, 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, 50=R454A, 45=R454B, 51=R454C, 52=R455A, 54=R469A, 9=R500, 4=R502, 10=R503, 17=R507, 36=R513A, 53=R516A, 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 <sup>(1)</sup> | o30 | * | * | * | * | * | * | * | * | * | 0      | 54      | 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, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery                                                                                                                                                                     | 1-2 <sup>(1)</sup> | o37 | * | * | * | * | * | * | * | * | * | 0      | 30      | 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 %   | 10 0%  |
| Rail heat ON cycle night |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1-2                | o42 | * | * | * | * | * | * | * | * | * | 0%     | 100 %   | 10 0%  |
| Rail heat period time    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1-2                | o43 | * | * | * | * | * | * | * | * | * | 6 min  | 60 min  | 6 min  |
| Case cleaning mode       | 0=OFF, 1=Fans run, 2=Cleaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-1                | o46 | * | * | * | * | * | * | * | * | * | 0      | 2       | 0      |
| Application mode         | 1=1. Comp/Alarm/Light, 2=2. Comp/Rail/Light, 3=3. Comp/Alarm/Rail, 4=4. Alarm/Rail/Light, 5=5. Hot gas remote, 6=6. Dual with 1 evap., 7=7. Dual with 2 evap., 8=8. Cold room, 9=9. Custom                                                                                                                                                                                                                                                                                                                                                                                     | 1-3 <sup>(1)</sup> | o61 | * | * | * | * | * | * | * | * | * | 1      | 9       | 1      |
| Access code 2            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2-2                | o64 | * | * | * | * | * | * | * | * | * | 0      | 999     | 0      |
| Make new factory         | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3-3 <sup>(1)</sup> | o67 | * | * | * | * | * | * | * | * | * | 0      | 1       | 0      |
| DI3 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, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery                                                                                                                                                                     | 1-2 <sup>(1)</sup> | o84 | * | * | * | * | * | * | * | * | * | 0      | 30      | 0      |
| Rail heat control mode   | 0=ON, 1=Day/Night timer, 2=Dewpoint ctrl.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1-2                | o85 | * | * | * | * | * | * | * | * | * | 0      | 2       | 0      |
| Dewpoint min. limit      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1-2                | o86 | * | * | * | * | * | * | * | * | * | -10 °C | o87     | 2 °C   |
| Dewpoint max. limit      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1-2                | o87 | * | * | * | * | * | * | * | * | * | o86    | 50 °C   | 12 °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      |
| Display readout          | 1=Display air, 2=S6 Product temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1-2                | o97 | * | * | * | * | * | * |   |   | * | 1      | 2       | 1      |
| Light at Main switch OFF | 0=OFF, 1=Normal ctrl.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1-2                | o98 | * | * |   | * | * | * | * | * | * | 0      | 1       | 0      |

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

## 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 <sup>(1)</sup> | P83  | * | * | * | * | * | * | * | * | * | -999       | 999        | 300         |
| Refrigerant factor K2         |                                                       | 1-3 <sup>(1)</sup> | P84  | * | * | * | * | * | * | * | * | * | -999       | 999        | 300         |
| Refrigerant factor K3         |                                                       | 1-3 <sup>(1)</sup> | P85  | * | * | * | * | * | * | * | * | * | -999       | 999        | 300         |
| Max. superheat liquid ctrl. A |                                                       | 1-2                | P86  | * | * | * | * | * | * | * | * | * | P87        | 20 °C      | 3 °C        |
| Min. superheat liquid ctrl A  |                                                       | 1-2                | P87  | * | * | * | * | * | * | * | * | * | 0 °C       | P86        | 1 °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   |
| LLSV closing delay    |                            | 1-2 | P92 | * | * | * | * | * | * |   | * | * | 0 s | 300 s | 5 s |

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

## 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, 17=Leak safety valve | 1-3 <sup>(1)</sup> | q02  |   |   |   |   |   | * | * |   | * | 0          | 17         | 5           |
| 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, 17=Leak safety valve | 1-3 <sup>(1)</sup> | q03  |   |   |   |   |   |   |   |   | * | 0          | 17         | 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, 17=Leak safety valve | 1-3 <sup>(1)</sup> | q04  |   |   |   |   |   |   |   |   | * | 0          | 17         | 3           |
| DO5 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, 17=Leak safety valve | 1-3 <sup>(1)</sup> | q05  |   |   |   |   |   | * | * |   | * | 0          | 17         | 6           |
| DO6 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, 17=Leak safety valve | 1-3 <sup>(1)</sup> | q06  |   |   |   |   |   |   |   |   | * | 0          | 17         | 1           |
| AO1 Configuration               | 0=None, 1=Rail heat PWM, 2=Valve driver, 5=Fan Speed                                                                                                  | 1-3 <sup>(1)</sup> | q09  | * | * | * | * | * | * | * | * | * | 0          | 5          | 0           |
| EEV override A                  |                                                                                                                                                       | 1-2 <sup>(2)</sup> | q11  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 0%          |
| Compressor 1 - override         | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q12  | * | * | * |   |   | * | * |   | * | 0          | 1          | 0           |
| Fan - override                  | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q13  | * | * | * | * | * | * | * | * | * | 0          | 1          | 0           |
| Defrost A - override            | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q14  | * | * | * | * |   | * | * | * | * | 0          | 1          | 0           |
| Rail heat - override            | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q15  |   | * | * | * |   | * | * |   | * | 0          | 1          | 0           |
| Alarm relay - override          | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q16  | * |   | * | * |   | * | * | * | * | 0          | 1          | 0           |
| Light - override                | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q17  | * | * |   | * | * | * | * | * | * | 0          | 1          | 0           |
| Suction valve - override        | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q18  |   |   |   |   | * |   |   |   |   | 0          | 1          | 0           |
| Compressor 2 - override         | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q19  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0           |
| Hot gas valve - override        | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q20  |   |   |   |   | * |   |   |   |   | 0          | 1          | 0           |
| Blinds - override               | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q21  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0           |
| Defrost B - override            | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q22  |   |   |   |   |   |   | * |   |   | 0          | 1          | 0           |
| Air heater - override           | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q23  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0           |
| Fan ECO - override              | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q24  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0           |
| Drain valve - override          | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q25  |   |   |   |   | * |   |   |   |   | 0          | 1          | 0           |
| Humidifier - override           | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q26  |   |   |   |   |   |   |   | * |   | 0          | 1          | 0           |
| Rail heat PWM - override        |                                                                                                                                                       | 1-2 <sup>(2)</sup> | 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           |
| Humidity ctrl. - Priority       | 0=Disabled, 3=Low, 2=Medium, 1=High                                                                                                                   | 1-2                | q37  |   |   |   |   |   |   |   | * |   | 0          | 3          | 2           |
| Food temp. sensor               | 1=Thermostat air, 2=Alarm air, 3=S3 Air ON evap., 4=S6 Product temp.                                                                                  | 1-2 <sup>(1)</sup> | q39  | * | * | * | * | * | * | * | * | * | 1          | 4          | 2           |
| Liquid line solenoid - override | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q45  | * | * | * | * | * | * |   | * | * | 0          | 1          | 0           |
| Dehumidifier - override         | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q46  |   |   |   |   |   |   |   | * |   | 0          | 1          | 0           |
| Fan speed - override            |                                                                                                                                                       | 1-2 <sup>(2)</sup> | q57  | * | * | * | * | * | * | * | * | * | 0%         | 100%       | 0%          |
| Leak alarm action               | 0=None, 1=Shutdown + Fans OFF, 2=Shutdown + Fans ON                                                                                                   | 1-2                | q59  | * | * | * | * | * | * | * | * | * | 0          | 2          | 0           |
| Leak shutoff valve - override   | 0=MAN OFF, 1=MAN ON                                                                                                                                   | 1-2 <sup>(2)</sup> | q82  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0           |
| Leak alarm reset delay          |                                                                                                                                                       | 1-2                | q84  | * | * | * | * | * | * | * | * | * | 0 mins     | 300 mins   | 0 mins      |
| Fan ECO at leak                 | 1=ECO Speed, 2=Full speed                                                                                                                             | 1-2                | q85  |   |   |   |   |   | * | * |   | * | 1          | 2          | 2           |

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

<sup>(2)</sup> In order to change this parameter the parameter r12 Main switch must be set in position "SEr" allowing manual control of outputs.

## Service

| Function                 | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | R-W | Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Min. value | Max. value | Fac. value |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|---|---|---|---|---|---|---|---|---|------------|------------|------------|
| Control state            | 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, 51=Oil recovery, 54=Leak action | 0-X | u00  | * | * | * | * | * | * | * | * | * | 0          | 54         | 0          |
| S5 Evaporator A          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u09  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 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 °C    | 200 °C     | 0 °C       |
| Night condition          | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u13  | * | * | * | * | * | * | * | * | * | 0          | 1          | 0          |
| S4 Air OFF evap.         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u16  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| Thermostat air temp.     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u17  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| Thermostat run time A    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u18  | * | * | * | * | * | * | * | * | * | 0 min      | 999 min    | 0 min      |
| S2 Gas outlet A          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u20  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| Superheat A              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u21  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| Superheat reference A    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u22  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| EEV opening A            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u23  | * | * | * | * | * | * | * | * | * | 0%         | 100 %      | 0%         |
| Pe Evap. pressure        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u25  | * | * | * | * | * | * | * | * | * | -1,0 Bar   | 200,0 Bar  | 0,0 Bar    |
| Te Evap. temp.           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u26  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| S6 product temp.         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u36  | * | * | * | * | * |   |   | * | * | -200 °C    | 200 °C     | 0 °C       |
| DI2 Status               | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u37  | * | * | * | * | * | * | * | * | * | 0          | 1          | 0          |
| Ther. section A          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u46  |   |   |   |   |   | * | * |   |   | -200 °C    | 200 °C     | 0 °C       |
| Ther. section B          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u47  |   |   |   |   |   | * | * |   |   | -200 °C    | 200 °C     | 0 °C       |
| Display readout 1        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u56  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 0 °C       |
| Alarm air temp. A        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u57  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 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          |
| Suction valve            | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u64  |   |   |   |   | * |   |   |   |   | 0          | 1          | 0          |
| Compressor 2             | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u67  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0          |
| S5 Evaporator B          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u75  | * | * | * | * | * | * | * |   | * | -200 °C    | 200 °C     | 0 °C       |
| S3 Air ON evap. B        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u76  |   |   |   |   |   | * | * |   |   | -200 °C    | 200 °C     | 0 °C       |
| Hot gas valve            | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u80  |   |   |   |   | * |   |   |   |   | 0          | 1          | 0          |
| Blinds                   | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u82  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0          |
| Defrost B                | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u83  |   |   |   |   |   |   | * |   |   | 0          | 1          | 0          |
| Air heater               | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u84  |   |   |   |   |   | * | * |   | * | 0          | 1          | 0          |
| Rail heat power          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u85  | * | * | * | * | * | * | * | * | * | 0%         | 100 %      | 0%         |
| Thermostat band          | 1=Band 1, 2=Band 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0-X | u86  | * | * | * | * | * | * | * | * | * | 1          | 2          | 1          |
| DI3 Status               | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0-X | u87  | * | * | * | * | * | * | * | * | * | 0          | 1          | 0          |
| Thermostat cut-in temp.  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u90  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 4 °C       |
| Thermostat cut-out temp. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0-X | u91  | * | * | * | * | * | * | * | * | * | -200 °C    | 200 °C     | 2 °C       |

|                              |                                                                         |     |     |   |   |   |   |   |   |   |   |   |         |          |         |
|------------------------------|-------------------------------------------------------------------------|-----|-----|---|---|---|---|---|---|---|---|---|---------|----------|---------|
| Adaptive defrost state       | 0=OFF, 1=Error, 2=Tuning, 3=OK, 4=Little ice, 5=Medium ice, 6=Heavy ice | 0-X | U01 | * | * | * | * | * | * | * | * | * | 0       | 6        | 0       |
| Accumulated defrosts         |                                                                         | 0-X | U10 | * | * | * | * | * | * | * | * | * | 0       | 32767    | 0       |
| Accumulated skipped defrosts |                                                                         | 0-X | U11 | * | * | * | * | * | * | * | * | * | 0       | 32767    | 0       |
| Alarm air temp. B            |                                                                         | 0-X | U34 |   |   |   |   |   | * | * |   |   | -200 °C | 200 °C   | 0 °C    |
| Display readout 2            |                                                                         | 0-X | U35 | * | * | * | * | * | * | * |   | * | -200 °C | 200 °C   | 0 °C    |
| Fan ECO                      | 0=OFF, 1=ON                                                             | 0-X | U37 |   |   |   |   |   | * | * |   | * | 0       | 1        | 0       |
| Network status               |                                                                         | 0-X | U45 | * | * | * | * | * | * | * | * | * | 0%      | 100 %    | 0%      |
| Drain valve                  | 0=OFF, 1=ON                                                             | 0-X | U55 |   |   |   |   | * |   |   |   |   | 0       | 1        | 0       |
| Humidity sensor              |                                                                         | 0-X | U57 |   |   |   |   |   |   |   | * |   | 0%      | 100 %    | 0%      |
| Humidifier                   | 0=OFF, 1=ON                                                             | 0-X | U58 |   |   |   |   |   |   |   | * |   | 0       | 1        | 0       |
| Rail heat PWM                |                                                                         | 0-X | U59 | * | * | * | * | * | * | * | * | * | 0%      | 100 %    | 0%      |
| Food temperature A           |                                                                         | 0-X | U72 | * | * | * | * | * | * | * | * | * | -200 °C | 200 °C   | 0 °C    |
| Defrost sensor temperature A |                                                                         | 0-X | U73 | * | * | * | * | * | * | * | * | * | -200 °C | 200 °C   | 0 °C    |
| Liquid line solenoid         | 0=OFF, 1=ON                                                             | 0-X | U95 | * | * | * | * | * | * | * |   | * | 0       | 1        | 0       |
| Dehumidifier                 | 0=OFF, 1=ON                                                             | 0-X | U96 |   |   |   |   |   |   |   | * |   | 0       | 1        | 0       |
| Average defrost time         |                                                                         | 0-X | ua2 | * | * | * | * | * | * | * | * | * | 0 mins  | 600 mins | 0 min s |
| Fan speed                    |                                                                         | 0-X | ua3 | * | * | * | * | * | * | * | * | * | 0%      | 100 %    | 0%      |
| Leak shutoff valve           | 0=OFF, 1=ON                                                             | 0-X | ua6 |   |   |   |   |   | * | * |   | * | 0       | 1        | 0       |

## AK-CC55 Connect menu (SW ver. 2.4x)

### 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. Be aware: Some configuration parameters requires that Main switch is set in OFF position in order to be changed | -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

| 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. Be aware: Some configuration parameters requires that Main switch is set in OFF position in order to be changed | -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/Light, 2=2. Comp/Rail/Light, 3=3. Comp/Alarm/Rail, 4=4. Alarm/Rail/Light, 5=5. Hot gas remote, 6=6. Dual with 1 evap., 7=7. Dual with 2 evap., 8=8. Cold room, 9=9. 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, 17=Leak safety valve                                                                                                                                                                                                                                                      | 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, 17=Leak safety valve                                                                                                                                                                                                                                                      | 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, 17=Leak safety valve                                                                                                                                                                                                                                                      | q04  | q04 DO4 Config.  |
| DO5 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, 17=Leak safety valve                                                                                                                                                                                                                                                      | q05  | q05 DO5 Config.  |
| DO6 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, 17=Leak safety valve                                                                                                                                                                                                                                                      | q06  | q06 DO6 Config.  |
| AO1 Configuration | Select the function of the analogue output                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0=None, 1=Rail heat PWM, 2=Valve driver, 5=Fan Speed                                                                                                                                                                                                                                                                                                                                                       | q09  | q09 AO1 Config.  |
| AO1 Min. voltage  | Minimum voltage signal of the analogue output                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                            | o27  | o27 AO1 Min volt |
| AO1 Max. voltage  | Maximum voltage signal of the analogue output                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                            | o28  | o28 AO1 Max volt |
| 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, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery | 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, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery                                                                                                                                                                     | o37 | o37 DI2 Config.  |
| DI3 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, 22=Valve driver, 23=Fan alarm, 29=Door fan stop, 30=Oil recovery                                                                                                                                                                     | o84 | o84 DI3 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 information. Warning: Wrong selection of refrigerant may cause damage to the system.                                                                                                                                       | 0=Not selected, 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, 50=R454A, 45=R454B, 51=R454C, 52=R455A, 54=R469A, 9=R500, 4=R502, 10=R503, 17=R507, 36=R513A, 53=R516A, 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 | o30 | o30 Refrigerant  |
| Refrigerant factor K1   | Refrigerant factor for a custom refrigerant - please contact Danfoss for detailed information                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | P83 | P83 RfgFac.K1    |
| 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 pressure sensor                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | o20 | o20 MinTransPres |
| Pe Max range            | Maximum measuring range for pressure 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 10001 = PTC 10002 = NTC 5k3 = NTC 10k4 = User definedInfo: S2 and S6 sensors always have to be Pt1000 sensors | 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      |
| Food type               |                                                                                                                                                                                                                                                                                                                                                                                          | 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., 4=S6 Product temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | q39 | q39 Food sensor  |

|                     |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                       |     |                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----|------------------|
| Defrost method      | Select method of defrost                                                                                                                                                                                                                                                                                                                                                           | 0=None, 1=Electrical, 2=Hot gas, 4=Air/Offcycle, 5=Electrical pulsing | 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, 3=S5A and S5B                       | d10 | d10 DefStopSens. |
| Defrost stop limit  | When the selected defrost stop sensor reaches the set temperature limit, the defrost cycle is terminated                                                                                                                                                                                                                                                                           |                                                                       | d02 | d02 Def.StopTemp |
| Network address     | Network address of the controller                                                                                                                                                                                                                                                                                                                                                  |                                                                       | o03 | o03 Unit addr.   |
| Service pin         | If the controller is built into a LonWorks network with data communication, it must have an address, and the system manager must know this address. The address is sent to the system manager when the menu is set in pos. ON. IMPORTANT: Before you set o04, you MUST set the application mode of the controller (The function is not used when the data communication is MODBUS) | 0=OFF, 1=ON                                                           | o04 | o04 Service pin  |
| DO1 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U61 | U61 DO1 Config.  |
| DO2 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U62 | U62 DO2 Config.  |
| DO3 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U63 | U63 DO3 Config.  |
| DO4 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U64 | U64 DO4 Config.  |
| DO5 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U65 | U65 DO5 Config.  |
| DO6 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U66 | U66 DO6 Config.  |
| DI1 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y55 | DI1 Config       |
| DI2 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y56 | DI2 Config       |
| DI3 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y57 | DI3 Config       |
| AI1 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y58 | AI1 Config       |
| AI2 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y59 | AI2 Config       |
| AI3 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y60 | AI3 Config       |
| AI4 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y61 | AI4 Config       |
| AI5 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y62 | AI5 Config       |
| AI6 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y63 | AI6 Config       |
| AI7 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | Y64 | AI7 Config       |
| AO1 Function        | Function associated with the physical input or output                                                                                                                                                                                                                                                                                                                              |                                                                       | U69 | U69 AO1 Config.  |

## Thermostat control

| Function                 | Description                                                                                                                                                                                                                                                                                                                                                                                   | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state            | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Thermostat air temp.     | Thermostat temperature                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u17  | u17 Ther. air    |
| Ther. section A          | Thermostat temperature within case section A                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u46  | u46 Ther. Air A  |
| Ther. section B          | Thermostat temperature within section B                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u47  | u47 Ther. Air B  |
| Food temperature A       | Readout of food temperature                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U72  | U72 Food temp.   |
| S3 Air ON evap. A        | Actual temperature of S3 Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u12  | u12 S3 air temp. |
| S3 Air ON evap. B        | Actual temperature of S3B Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u76  | u76 S3 airtemp B |
| S4 Air OFF evap.         | Actual temperature of S4 Air OFF sensor placed in air flow after evaporator                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u16  | u16 S4 air temp. |
| Night condition          | Status of the day/night operation (night operation: on/off)                                                                                                                                                                                                                                                                                                                                   | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u13  | u13 Night Cond.  |
| Air temp. performance    | Average air temperature performance of the unit in the last 24 hours. A high value means that the average air temperature is within the thermostat operational band                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | X31  | --- TQAvgTmpPerf |
| Average air temp.        | Average thermostat air temperature for the last 24 hours                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | X30  | --- TQAvgAirTemp |
| Thermostat cut-in temp.  | Readout of the actual cut-in value for the thermostat                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u90  | u90 Cutin temp.  |
| Thermostat cut-out temp. | Readout of the actual cut-out value for the thermostat                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u91  | u91 Cutout temp. |
| Thermostat run time A    | Readout of the ongoing cut-in period for the thermostat or the duration of the last completed cut-in period                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u18  | u18 Ther runtime |
| Thermostat band          | Readout of which thermostat is 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 air heater output                                                                                                                                                                                                                                                                                                                                                            | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u84  | u84 Heat relay   |
| Door openings 24h        | Number of door openings for the last 24 hours                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | X70  | --- DoorOpen24h  |
| Door open time 24h       | Accumulated door opening time for the last 24 hours                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | X71  | --- DoorTime24h  |
| Thermostat mode          | Here it is defined how the thermostat is to be operated. Either as an ordinary ON/OFF thermostat or as a modulating thermostat. When operation is "modulating" the valve/speed compressor 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". | 1=ON/OFF, 2=Modulating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | r14  | r14 Therm. mode  |
| Cut-out 1                | Setpoint. The thermostat's cut-out value when the given thermostat band is in use                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | r00  | r00 Cutout       |
| Differential             | When the temperature is higher than the set cut-out + the set differential, the compressor relay will be cut-in. It will cut-out again when the temperature comes down to the set cut-out limit                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | r01  | r01 Differential |
| Cut-out 2                | Setpoint. The thermostat's cut-out value when the given thermostat band is in use                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | r21  | r21 Cutout 2     |
| Differential 2           | When the temperature is higher than the set cut-out + the set differential, the compressor relay will be cut-in. It will cut-out again when the temperature comes down to the set cut-out limit                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | r93  | r93 Diff Th2     |
| Max cut-out limit        | Setpoint limitation - The controller's setting range for the thermostat setpoint may be narrowed down, so that too high or 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 cut-out limit            | Setpoint limitation - The controller's setting range for the thermostat setpoint may be narrowed down, so that too high or 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 that 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 that 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 sensor measures a temperature lower than the set limit, refrigeration will be stopped in order to protect products 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      |
| Air heater start delay       | Time delay on transition from refrigeration phase to heating phase (there is no time delay on transition from heating phase to refrigeration)                                                                                                                                                |  | 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 ongoing melt function is to last                                                                                                                                                                                                                       |  | r17 | r17 Melt period  |
| Temp. offset                 | Temperature offset value used to calculate temperature performance. Air temperature has 100% performance within the cutIn+Offset and cutOut-Offset band                                                                                                                                      |  | X32 | --- TQTempOffset |

## Day/Night schedule

| Function          | Description                           | Values                               | Code | Short name       |
|-------------------|---------------------------------------|--------------------------------------|------|------------------|
| Event 1 Day h     | Start day time in hours               |                                      | t58  | t58 Event1 Day h |
| Event 1 Day min   | Start day time in minutes             |                                      | t59  | t59 Event1 Day m |
| Event 1 Night h   | Start night time in hours             |                                      | t60  | t60 Event1 NgT h |
| Event 1 Night min | Start night time in minutes           |                                      | t61  | t61 Event1 NgT m |
| Event 2 Day h     | Start day time in hours               |                                      | t62  | t62 Event2 Day h |
| Event 2 Day min   | Start day time in minutes             |                                      | t63  | t63 Event2 Day m |
| Event 2 Night h   | Start night time in hours             |                                      | t64  | t64 Event2 NgT h |
| Event 2 Night min | Start night time in minutes           |                                      | t65  | t65 Event2 NgT m |
| Monday event      | Select scheduled event for Mondays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t66  | t66 Mon Event    |
| Tuesday event     | Select scheduled event for Tuesdays   | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t67  | t67 Tue Event    |
| Wednesday event   | Select scheduled event for Wednesdays | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t68  | t68 Wed Event    |
| Thursday event    | Select scheduled event for Thursdays  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t69  | t69 Thu Event    |
| Friday event      | Select scheduled event for Fridays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t70  | t70 Fri Event    |
| Saturday event    | Select scheduled event for Saturdays  | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t71  | t71 Sat Event    |
| Sunday event      | Select scheduled event for Sundays    | 0=Day, 1=Night, 2=Event 1, 3=Event 2 | t72  | t72 Sun Event    |

## Alarm limits and delays

| Function                | Description                                                                                                                                                                                                                                                                        | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Alarm status            | Actual alarm status                                                                                                                                                                                                                                                                | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | x16  | --- Sum alarm    |
| Control state           | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Alarm air temp. A       | Measured temperature for alarm thermostat                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u57  | u57 Alarm air    |
| Alarm air temp. B       | Measured temperature for alarm thermostat                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U34  | U34 Alarm air B  |
| 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 temperature of S3 Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u12  | u12 S3 air temp. |
| S3 Air ON evap. B       | Actual temperature of S3B Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u76  | u76 S3 airtemp B |
| S4 Air OFF evap.        | Actual temperature of S4 Air OFF sensor placed in air flow after evaporator                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u16  | u16 S4 air temp. |
| S6 product temp.        | Actual temperature of S6 product sensor, placed to represent the temperature of the cooled goods                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u36  | u36 S6 temp.     |
| High temp alarms 7 days | The number of high temperature alarms for the last 7 days. The number will be reset at power failure                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | xx2  | --- NoHighTempAl |
| Low temp alarms 7 days  | The number of low temperature alarms for the last 7 days. The number will be reset at power failure                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | xx3  | --- NoLowTempAl  |
| Leak shutoff valve      | Status of leak shutoff valve                                                                                                                                                                                                                                                       | 0: OFF (closed), 1: ON (Open)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                  |
| 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 when the corresponding thermostat band is in use. 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 when the corresponding thermostat band is in use. 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 pull down A | Alarm delay at tempeature pull down conditions (long alarm delay). This time delay is used during start-up, during defrost and immediately after a defrost. There will be a change-over to the normal time delay when the temperature has dropped below the set upper alarm limit. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A12  | A12 Pulldown del |
| Alarm delay B           | 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                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A53  | A53 Al.Del.S3 B  |
| Use product sensor S6   | Select whether a separate S6 product sensor must be used for monitoring of the product temperature                                                                                                                                                                                 | 0=No, 1=Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | a01  | a01 S6 function  |

|                          |                                                                                                                                                                                                                                                                                                                                  |                                                     |     |                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----|------------------|
| S6 High alarm limit 1    | Upper alarm limit for S6 product temperature. The limit is raised with the nightoffset during night operation.                                                                                                                                                                                                                   |                                                     | A22 | A22 HighLim1 S6  |
| S6 Low alarm limit 1     | Lower alarm limit for S6 product temperature                                                                                                                                                                                                                                                                                     |                                                     | A23 | A23 LowLim1 S6   |
| S6 High alarm limit 2    | Upper alarm limit for S6 product temperature. The limit is raised with the nightoffset during night operation.                                                                                                                                                                                                                   |                                                     | A24 | A24 HighLim2 S6  |
| S6 Low alarm limit 2     | Lower alarm limit for S6 product temperature                                                                                                                                                                                                                                                                                     |                                                     | A25 | A25 LowLim2 S6   |
| S6 alarm delay           | S6 temperature alarm delay. The alarm is activated if one of the relevant alarm limits is exceeded. The time delay is set in minutes. (Alarms will not activate when the setting is set to the maximum value.)                                                                                                                   |                                                     | A26 | A26 AL.Delay S6  |
| S6 alarm pull down delay | Time delay on S6 (product sensor) at temperature pull down conditions (long alarm delay). This time delay is used for start-up, during defrosting, immediately after a defrost and after an appliance cleaning. A change is carried out to standard time delay when the temperature has reached below the set upper alarm limit. |                                                     | A52 | A52 PullD del.S6 |
| Door open alarm delay    | Time delay for door alarm                                                                                                                                                                                                                                                                                                        |                                                     | A04 | A04 DoorOpen del |
| Door restart inj. delay  | Start of refrigeration when the 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 |
| Leak alarm action        | Select the alarm action at refrigerant leak detection                                                                                                                                                                                                                                                                            | 0=None, 1=Shutdown + Fans OFF, 2=Shutdown + Fans ON | q59 | q59 Leak Action  |
| Leak alarm reset delay   | The leak alarm signal has to be OK for the set alarm reset delay time, before the leak alarm is reset and normal control is resumed. By setting the alarm reset delay to the max value, the leak alarm must be reset manually by the user                                                                                        |                                                     | q84 | q84 LeakResetDel |
| Fan ECO at leak          | Select the speed of the evaporator fans during a refrigerant leakage alarm action                                                                                                                                                                                                                                                | 1=ECO Speed, 2=Full speed                           | q85 | q85 Fan ECO Leak |
| Fan speed at leak        | Set the speed of the evaporator fans during a refrigerant leakage alarm action                                                                                                                                                                                                                                                   |                                                     | F34 | F34 FanSpeedLeak |

## Humidity control

| Function                     | Description                                                                                                                                  | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state                | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Humidity sensor              | Readout of the actual humidity measured by the humidity sensor                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U57  | U57 RH level %   |
| Humidifier                   | Actual status of humidifier output                                                                                                           | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U58  | U58 Humidifier   |
| Dehumidifier                 | Actual status of dehumidifier output                                                                                                         | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U96  | U96 Dehumidifier |
| Humidity control             | Select the type of humidity control                                                                                                          | 0=None, 1=Humidifier, 2=Dehumidifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | h31  | h31 RH function  |
| Humidity cut-in              | Setpoint for the humidity control. If the relative humidity goes below the setpoint, the humidifier is started                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h23  | h23 RH Cutin SP  |
| Humidity differential        | Differential for stopping humidifier. Humidification is stopped when the humidity has increased with the set differential above the setpoint |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h24  | h24 RH Diff.     |
| Humidity high alarm limit    | High alarm limit for relative humidity                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h25  | h25 RH HighLimAl |
| Humidity low alarm limit     | Low alarm limit for relative humidity                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h26  | h26 RH LowLimAl  |
| Humidity alarm delay         | Delay of high and low humidity alarms                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h27  | h27 RH Al. delay |
| Humidity sensor - Min signal | Relative humidity at minimum humidity sensor signal                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h29  | h29 RH Min Value |
| Humidity sensor - Max signal | Relative humidity at maximum humidity sensor signal                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | h30  | h30 RH Max Value |

|                           |                                                                                                                                                      |             |     |                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----|------------------|
| Humidity ctrl. at defrost | Select how to control humidity during defrost: No: Humidity control is stopped during defrost Yes: Normal humidity control is running during defrost | 0=No, 1=Yes | h28 | h28 RH CtrlAtDef |
| Humidity max. temp.       | Maximum limit for thermostat air temperature in order for humidity control to run (frost limit)                                                      |             | h32 | h32 RH Max temp. |
| Humidity min. temp.       | Minimum limit for thermostat air temperature in order for humidity control to run (frost limit)                                                      |             | h33 | h33 RH Min temp. |

## Injection control

| Function                      | Description                                                                                                                                                                                                                                                                                                                                                                         | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state                 | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Thermostat air temp.          | Thermostat temperature                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u17  | u17 Ther. air    |
| S3 Air ON evap. A             | Actual temperature of S3 Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u12  | u12 S3 air temp. |
| S3 Air ON evap. B             | Actual temperature of S3B Air ON sensor placed in air flow before evaporator                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u76  | u76 S3 airtemp B |
| S4 Air OFF evap.              | Actual temperature of S4 Air OFF sensor placed in air flow after evaporator                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u16  | u16 S4 air temp. |
| EEV opening A                 | Actual opening degree of electronic expansion valve                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u23  | u23 EEV OD %     |
| Liquid line solenoid          | Actual status of solenoid valve in liquid line                                                                                                                                                                                                                                                                                                                                      | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U95  | U95 LLSV         |
| Pe Evap. pressure             | Actual pressure at the Pe evaporating pressure transmitter                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u25  | u25 EvapPress Pe |
| Te Evap. temp.                | Temperature converted from pressure                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u26  | u26 EvapTemp Te  |
| S2 Gas outlet A               | Actual temperature of S2 sensor placed at the outlet of the evaporator                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u20  | u20 S2 temp.     |
| Superheat A                   | Readout of actual superheat at the outlet of the evaporator                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u21  | u21 Superheat    |
| Superheat reference A         | Readout of the actual superheat reference                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u22  | u22 SuperheatRef |
| OD Ctrl. status A             | Readout showing which part of the injection function that is in control of the valve opening degree                                                                                                                                                                                                                                                                                 | 0=Adaptive SH control, 1=MOP, 2=Superheat close, 3=MTR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Y32  | --- OD Status    |
| 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 the highest value that corresponds to OFF                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | n11  | n11 MOP temp.    |
| EEV Period time               | Period time for the pulse width modulation                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | n13  | n13 AKV Period   |
| Min. superheat liquid ctrl A  | Min. value for the superheat reference during adaptive liquid control                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P87  | P87 SH Min Liq.  |
| Max. superheat liquid ctrl. A | Max. value for the superheat reference during adaptive liquid control                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P86  | P86 SH Max Liq.  |
| LLSV closing delay            | Closing delay for liquid line solenoid valve                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P92  | P92 LLSV OFF del |
| Oil recovery mode             | Select how oil recovery is to be handled: 0 = None 1 = Adaptive liquid control with normal fan control 2 = Adaptive liquid control with fans OFF 3 = Fixed valve opening degree with normal fan control 4 = Fixed valve opening degree with fans OFF Warning: In option 3 and 4, superheat control is omitted and it is the responsibility of the user to safeguard the compressors | 0=None, 1=ALC and Fan ctrl, 2=ALC and Fan OFF, 3=Fixed OD and Fan ctrl, 4=Fixed OD and Fan OFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | x30  | --- Oil Rec Mode |
| Max oil recovery time         | Maximum time for an oil recovery cycle. If an oil recovery cycle lasts longer than the set time, the oil recovery cycle will be terminated                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | x31  | --- Oil Rec Max  |
| Oil recovery OD               | Fixed valve opening degree during oil recovery Warning: Superheat control is omitted and it is the responsibility of the user to safeguard the compressors                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | x32  | --- Oil Rec OD%  |

## Defrost control

| Function                     | Description                                                                                                                                                                                                                                                                                                    | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Code | Short name       |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state                | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Defrost sensor temperature A | Actual temperature of selected defrost stop sensor                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | U73  | U73 Def.StopTemp |
| S5 Evaporator A              | Actual temperature of S5A Evaporator sensor placed inside evaporator                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | u09  | u09 S5 temp.     |
| S5 Evaporator B              | Actual temperature of S5B Evaporator sensor placed inside evaporator                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | u75  | u75 S5 temp. B   |
| Defrost A                    | Actual status of defrost output                                                                                                                                                                                                                                                                                | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | u60  | u60 Def. relay   |
| Defrost B                    | Actual status of defrost B output                                                                                                                                                                                                                                                                              | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | u83  | u83 Def. relay B |
| Defrost time A               | Read the duration of the ongoing defrost or the duration of the last completed defrost.                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | u11  | u11 Defrost time |
| Average defrost time         | The average defrost time for the last 10 defrosts                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ua2  | ua2 Avr Def Time |
| Adaptive defrost state       | Actual state of the adaptive defrost function                                                                                                                                                                                                                                                                  | 0=OFF, 1=Error, 2=Tuning, 3=OK, 4=Little ice, 5=Medium ice, 6=Heavy ice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | U01  | U01 AD state     |
| Accumulated defrosts         | Number of defrosts carried out since the initial power-up or since the resetting of the function                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | U10  | U10 Acc.defrost  |
| Accumulated skipped defrosts | Number of defrosts skipped since the initial power-up or since the resetting of the function                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | U11  | U11 Acc.def.skip |
| Tc average temp.             | Average value of the condensing temperature signal distributed via the system manager to the case controllers that are using adaptive defrost. At transcritical CO2 sites the receiver pressure is distributed to the case controllers. The function needs to be set up in the system manager.                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | x02  | --- Tc temp. Ave |
| 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, 4=Air/Offcycle, 5=Electrical pulsing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 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, 3=S5A and S5B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | d10  | d10 DefStopSens. |
| Defrost stop limit           | When the selected defrost stop sensor reaches the set temperature 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 temperature 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            | 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 zero set and will start the timer function at each defrost start. When the time has expired the function will start a defrost. The function is used as a simple defrost start, or it may be used as a safeguard if the normal signal fails to appear. If master/slave 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 communication does not take place, the interval time will be used as max. time between defrosts. When there is defrost with clock function or data communication, the interval time must be set for a somewhat longer period of time than the planned one. In connection with power failure the interval time will be maintained, and when the power returns the interval time will continue from the maintained value. The interval time is not active when set to 0 |                                                | d03 | d03 Def.Interval |
| Time staggering power-up    | Time staggering for defrost cut-ins during start-up The function is only relevant if you have several refrigeration appliances or groups where you want the defrost to be staggered in relation to one another. The function is furthermore only relevant if you have chosen defrost with interval start. 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 run time    | 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 |
| Hot gas injection delay     | Delay before opening hot gas valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                | d23 | d23 HotGasInjDel |
| 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 telling that the refrigeration may be resumed. If this signal fails to appear for one reason or another, the controller itself will start the refrigeration when the standby time has elapsed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                | o16 | o16 MaxHoldTime  |
| Drain delay                 | Drain delay (only in connection with hot gas). Set the time where the evaporator is emptied of condensed refrigerant after the defrost.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                | d17 | d17 Drain delay  |
| 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 stopped 3: 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 speed during defrost    | Set the variable fan speed during defrost cycle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                | F35 | F35 FanSpeed Def |
| Fan ECO Defrost             | Select the speed level of evaporator fans during the defrost state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1=ECO Speed, 2=Full speed                      | d46 | d46 Fan ECO Def  |
| 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 |
| 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 |
| Rail heat during defrost    | Define how rail heat is controlled during defrost 0: Rail heat is OFF all the time 1: Rail heat is ON all the time 2: Normal rail heat 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. |

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                    |     |             |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----|-------------|
| Adaptive defrost mode | Adaptive defrost is used to skip planned defrost cycles if they are not needed or in order to start an extra defrost when required: 0: Not used, 1: Monitors the evaporator and triggers an alarm in the case of icing up 2: Scheduled defrosts during day time can be skipped. 3: Scheduled defrosts during day and night time can be skipped. 4: All schedules are carried out + extra if it is registered that this is required. (Temporary setting to OFF will reset the recorded values.) | 0=OFF, 1=Monitoring, 2=Skip day, 3=Skip day/night, 4=Full adaptive | d21 | d21 AD mode |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----|-------------|

## Defrost schedules

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

## Compressor

| Function                 | Description                                                                                                                                                                                                         | Values                 | Code | Short name       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|------------------|
| Compressor 1             | Actual status of compressor output                                                                                                                                                                                  | 0=OFF, 1=ON            | u58  | u58 Comp1/LLSV   |
| Compressor 2             | Actual status of compressor 2 output                                                                                                                                                                                | 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 |
| Min OFF time             | Minimum time the compressor has to be stopped                                                                                                                                                                       |                        | c02  | c02 Min.Off time |
| Step control mode        | Selection of step control mode for compressors. 1: At sequential mode compressor 1 will always be the first to start and the last to stop. 2: In cyclic mode the run time between the compressor will be equalized. | 1=Sequential, 2=Cyclic | c08  | c08 Step mode    |
| 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   |
| 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

| Function                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state              | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Fan                        | Actual status of fan output                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u59  | u59 Fan relay    |
| Fan ECO                    | Actual status of Fan ECO output                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | U37  | U37 Fan Eco      |
| Fan speed                  | Actual status fan speed in percentage of max speed                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ua3  | ua3 Fan Speed    |
| 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 cut-out, 2=Pulsing cut-out night                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | F05  | F05 FanPulseMode |
| Fan period time            | Period time 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 ECO mode               | Select when the evaporator fans shall run during normal control:0) Evaporator fans does not run in ECO mode1) Evaporator fans run in ECO mode at thermostat cutout at night time only2) Evaporator fans run in ECO mode at thermostat cutout at day and night time3) Evaporator fans run in ECO mode at night time independent of thermostat statusP5. Fans can be defined to run in ECO mode during defrost and Leak action                                                                     | 0=No ECO mode, 1=Cut-out at night, 2=Always at cut-out, 3=Always at night                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | F33  | F33 FanEcoMode   |
| 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. With a value of 50 °C this function is disabled. With a value lower than 50 °C, the fan stops by the result of the S5 temperature. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 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 OFF 1: Fans are ON 2: Fans are OFF and defrost is not permitted 3: 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 |
| Fan speed min limit        | Minimum speed limit for fan                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F18  | F18 Fan Min Spd  |
| Fan speed max limit        | Maximum speed limit for fan                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F19  | F19 Fan Max Spd  |
| Fan speed differential     | Temperature differential above actual thermostat cut-out value, where the fan speed starts to increase from minimum speed                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F26  | F26 Fan Spd Diff |
| Fan speed P-band           | Temperature band where fan speed is increased from minimum speed to maximum speed                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F27  | F27 Fan P-band   |
| Fan start time             | Fan start-up time where the fans are run at maximum speed                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F28  | F28 Fan Startup  |
| Fan speed up filter        | Filter time for fan speed increase. Used to prevent fast changes in fan speed control                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F29  | F29 SpdUp Filter |
| Fan speed down filter      | Filter time for fan speed decrease. Used to prevent fast changes in fan speed control. To prevent issues with superheat control, it not recommended to set the filter time too low.                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F30  | F30 SpdDwnFilter |
| Fan full speed interval    | Time interval between fan full speed periods where the fans will run with full speed and circulate air with max flow, to prevent hot spots in refrigerated area                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F31  | F31 Full Spd Int |
| Fan Full Speed period      | Time period of fan full speed state where the fans will run with full speed and circulate air with max flow, to prevent hot spots in refrigerated area                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | F32  | F32 Full Spd Per |

## Railheat control

| Function                    | Description                                                                                                                                                                                                                                                                                                                                                                                           | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state               | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Dewpoint                    | Actual dewpoint received from system manager via network                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | x18  | --- Dew point    |
| Rail heat                   | Actual status of rail heat output                                                                                                                                                                                                                                                                                                                                                                     | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u61  | u61 Railh. relay |
| Rail heat power             | Readout of the actual rail power in %                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u85  | u85 Rail DutyC % |
| Rail heat PWM               | Actual power used for rail heaters                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U59  | U59 Railheat PWM |
| 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 dewpoint function. This function requires that a signal is received about the dewpoint 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=Dewpoint ctrl.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | o85  | o85 Railh. mode  |
| Rail heat ON cycle day      | Rail heat power during day time. The ON period is set as a percentage of the period                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | o41  | o41 Railh.ONday% |
| Rail heat ON cycle night    | Rail heat power during night time. The ON period is set as a percentage of the period time                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | o42  | o42 Railh.ONngt% |
| Rail heat period time       | Period time for pulsing of rail heat                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 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 dewpoint 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 measured dewpoint is below the set value the rail heat is running at minimum heat                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | o86  | o86 DewP Min lim |
| Dewpoint max. limit         | If the measured dewpoint is above the set value the rail heat is maximum                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | o87  | o87 DewP Max lim |

## Light/Blinds/Cleaning control

| Function           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state      | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Night condition    | Status of the day/night operation (night operation: on/off)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u13  | u13 Night Cond.  |
| Light              | Actual status of light output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | u63  | u63 Light relay  |
| Blinds             | Actual status of night blinds output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 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 seen 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

| Function                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| Control state              | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state  |
| Display readout 1          | Readout of the temperature shown on the display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | u56  | u56 Display air  |
| Display readout 2          | Readout of the temperature shown on the display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U35  | U35 Display air2 |
| Display readout            | Select which temperature to show in the display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1=Display air, 2=S6 Product temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | o97  | o97 Displ. Ctrl. |
| SW ver. display 1          | Readout of display software version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U97  | U97 Display 1 SW |
| SW ver. display 2          | Readout of display software version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | U98  | U98 Display 2 SW |
| 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

| Function             | Description                                                                                                                                                                                                                                                                          | Values                                                | Code | Short name      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------|-----------------|
| Alarm relay          | Actual status of alarm output                                                                                                                                                                                                                                                        | 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 used 1: High. Alarm with high priority will activate relay 2: Medium. Alarms with high or medium priority will activate the alarm relay 3: 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 assigned 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 assigned 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 assigned 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 assigned 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 assigned 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 |
| Miscellaneous - Priority    | Select the priority of the alarms assigned 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 assigned 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 assigned 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 CtrIOFF Prio |
| Leak detection - Priority   | Select the priority of the alarms assigned 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    |
| Humidity ctrl. - Priority   | Select the priority of the alarms assigned 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 | q37 | q37 Humid Prio   |

## Miscellaneous

### Miscellaneous → Access codes

| Function      | Description                         | Values | Code | Short name      |
|---------------|-------------------------------------|--------|------|-----------------|
| Access code 3 | Access code for commissioning / OEM |        | o05  | o05 Acc. code 3 |
| Access code 2 | Access code for service             |        | o64  | o64 Acc. code 2 |
| Access code 1 | Access code for daily operations    |        | P88  | P88 Acc. code 1 |

### 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, 5=115200 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   |

### Miscellaneous → Time

| Function     | Description               | Values | Code | Short name       |
|--------------|---------------------------|--------|------|------------------|
| Time hours   | Hour setting for clock    |        | t07  | t07 Clock Hour   |
| Time minutes | Minutes setting for clock |        | t08  | t08 Clock Minute |
| Time date    | Date setting for clock    |        | t45  | t45 Clock Date   |
| Time month   | Month setting for clock   |        | t46  | t46 Clock Month  |

|           |                        |  |     |                |
|-----------|------------------------|--|-----|----------------|
| Time year | Year setting for clock |  | t47 | t47 Clock Year |
|-----------|------------------------|--|-----|----------------|

### 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   |
| S3 Air ON evap. B - Adjustment  | Correction of sensor signal e.g. due to long sensor cable |        | r53  | r53 Adjust S3 B |
| S5 Evaporator A - Adjustment    | Correction of sensor signal e.g. due to long sensor cable |        | r11  | r11 Adjust S5   |
| S6 product temp. - Adjustment   | Correction of sensor signal e.g. due to long sensor cable |        | r59  | r59 Adjust S6   |

### Miscellaneous → Factory reset

| Function                  | Description                                                                                                                        | Values      | Code | Short name       |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------|------|------------------|
| Reset to factory settings | Command which will revert all controller settings to factory values.                                                               | 0=OFF, 1=ON | z06  | Reset factory    |
| 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 |

## Advanced

### 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 the PI controller adjusting the valve opening degree (expert setting)                                                                                                                                                  |                          | x70  | --- SH Kp min    |
| Superheat Kp max. A            | Max limit for amplification factor of the PI controller adjusting the valve opening degree (expert setting)                                                                                                                                                  |                          | x71  | --- SH Kp max    |
| Superheat Tn A                 | Integration time of the PI controller adjusting the valve opening degree (expert setting)                                                                                                                                                                    |                          | x72  | --- SH Tn        |
| Te feedback gain A             | Gain factor for feedback of evaporating temperature signal Te to the 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 the injection valve (expert readout)                                                                                                                                                                                    |                          | x80  | --- Max OD %     |
| Superheat close liquid ctrl. A | Minimum limit of superheat where the valve is closing during adaptive liquid control                                                                                                                                                                         |                          | x87  | --- SH close Liq |
| SH Band                        | Expert injection setting - contact Danfoss for further information                                                                                                                                                                                           |                          | Y28  | --- SH Band      |
| Ther. duty cycle SP            | Expert setting - contact Danfoss for further information                                                                                                                                                                                                     |                          | Y29  | --- ThDutyCycle  |
| Ther. 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 A           | Readout showing which part of the injection function that is in control of the valve opening degree                                                                                                                                                                                                                   | 0=Adaptive SH control, 1=MOP, 2=Superheat close, 3=MTR | Y32 | --- OD Status    |
| SH Impact factor A          | Superheat impact factor is used in the superheat reference search. The higher the impact factor, the more unstable the superheat signal is allowed to be before the reference superheat value is decreased                                                                                                            |                                                        | Y35 | --- SH ImpactFac |
| SH Std deviation A          | Standard deviation in superheat signal. The higher the value, the more instability in the superheat signal                                                                                                                                                                                                            |                                                        | Y36 | --- SH Std Dev   |
| Start-up OD A               | The valve will operate with the set start opening degree for the set start time. Do not set the start time and opening degree at too high values as this could result in getting liquid back to the compressor. When the start time is set to 0, the injection will not start with a fixed opening degree at start up |                                                        | n17 | n17 Start OD %   |
| Start up injection period A | The valve will operate with the set start opening degree for the set start time. Do not set the start time and opening degree at too high values as this could result in getting liquid back to the compressor. When the start time is set to 0, the injection will not start with a fixed opening degree at start up |                                                        | n15 | n15 StartUp Time |
| Reset injection             | Injection control will go back to factory condition                                                                                                                                                                                                                                                                   | 0=No, 1=Yes                                            | x88 | --- Reset Inj.   |

### Advanced → Advanced adaptiv defrost control

| Function             | Description                                              | Values | Code | Short name       |
|----------------------|----------------------------------------------------------|--------|------|------------------|
| AD sensibility       | Expert setting - contact Danfoss for further information |        | Z06  | --- AD sense     |
| Flash gas sense      | Expert setting - contact Danfoss for further information |        | x89  | --- FlashGasSens |
| Air tuning value     | Expert setting - contact Danfoss for further information |        | x90  | --- AD AirTuning |
| New air tuning value | Expert readout - contact Danfoss for further information |        | x92  | --- NewAirTunVal |
| Little ice indicator | Expert readout - contact Danfoss for further information |        | Y04  | --- FaultIndic.0 |
| Medium ice indicator | Expert readout - contact Danfoss for further information |        | x91  | --- FaultIndic.1 |
| Heavy ice indicator  | Expert readout - contact Danfoss for further information |        | Y05  | --- FaultIndic.2 |
| Flash gas indicator  | Expert readout - contact Danfoss for further information |        | x93  | --- Fl.Gas.Indic |
| AD int. state        | Expert readout - contact Danfoss for further information |        | Y11  | --- ADintState   |
| Time constant Lpf    | Expert setting - contact Danfoss for further information |        | Y19  | --- TimeConstLpf |
| DefrostOut           |                                                          |        | Y24  | DefrostOut       |
| AirTuneValR          |                                                          |        | Y26  | AirTuneValR      |
| IceLevel             |                                                          |        | Y27  | IceLevel         |

### Advanced → Master control

| Function      | Description                                           | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Code | Short name      |
|---------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|
| Control state | 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, 51=Oil recovery, 54=Leak action | u00  | u00 Ctrl. state |

|                         |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                             |     |                  |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------|
| 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, 16=Oil recovery | x62 | --- Reg. Cond.   |
| MC Actual cut-in temp.  | Readout of the actual cut-in value for the thermostat                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                             | x63 | --- Cutin temp.  |
| MC Actual cut-out temp. | Readout of the actual cut-out value for the thermostat                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                             | x64 | --- Cutout temp. |
| MC Ther. toggle         | Master control signal used for switching case load ON/OFF depending on the load condition                                                                                                                                                                                      | 0=No action, 1=Toggle ON, 2=Toggle OFF                                                                                                                                                                                                                                                      | x81 | --- TherToggle   |
| MC Load request         | Master control signal used to control the load balance between multiple case controllers on the same suction line                                                                                                                                                              |                                                                                                                                                                                                                                                                                             | x82 | --- LoadReq      |
| MC Max. Te offset       | Requested offset to actual evaporating temperature in order to keep the air temperature at the actual setpoint                                                                                                                                                                 |                                                                                                                                                                                                                                                                                             | 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 shutdown 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. |
| 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 Request next defrost | Master control signal used by system manager to see if a controller is requesting that the next defrost has to be carried out                                                                                                                                                  | 0=No, 1=Yes                                                                                                                                                                                                                                                                                 | x94 | --- AD def.req.  |
| MC Light signal         | Master control signal for control of light via a data communication signal from the system manager                                                                                                                                                                             | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                 | o39 | o39 Light remote |
| MC Actual dewpoint      | Master control signal sending the actual measured dewpoint from the system manager to the controller over the network.                                                                                                                                                         |                                                                                                                                                                                                                                                                                             | x03 | --- Act.DewPoint |
| MC Tc temp. mean        | Master control signal distributing the condensing temperature signal to the case controllers that are using adaptive defrost. At transcritical CO2 sites the receiver pressure is distributed to the case controllers. This function needs to be set up in the system manager. |                                                                                                                                                                                                                                                                                             | x04 | --- TcTempMean   |
| MC Po load factor       | Master control signal calculating the actual load of the unit                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                             | 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 | --- Key/BT Lock  |
| MC Min. delta T         | Required minimum delta temperature across evaporator (S3 - Te) in order to keep the air temperature at the actual setpoint                                                                                                                                                     |                                                                                                                                                                                                                                                                                             | y04 | --- Min Delta T  |
| MC Oil recovery         | Master control signal for starting and stopping a oil recovery cycle                                                                                                                                                                                                           | 0=OFF, 1=ON                                                                                                                                                                                                                                                                                 | x29 | --- Oil Recov    |

## 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 Alarm limits and delays). Here are the messages that may appear:

**Table: 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                                                                                   |
| E28  | S6 product temp. A - sensor error  | Sensor signal is out of range. Please check the sensor for correct operation                                                                                   |
| E34  | S3 Air ON evap. B - sensor error   | Sensor signal is out of range. Please check the sensor for correct operation                                                                                   |
| E37  | S5 Evaporator B - sensor error     | Sensor signal is out of range. Please check the sensor for correct operation                                                                                   |
| E59  | Humidity sensor - 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                                                                                       |
| A13  | S6 high product temperature A      | The S6 Product temperature has been above the max alarm limit for a longer time period than the set alarm delay.                                               |
| A14  | S6 low product temperature A       | The S6 Product temperature has been below the min alarm limit for a longer time period than the set alarm delay.                                               |
| 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 main switch has been set to either Stop or Manual control. Alternatively a digital input set up for "main switch" function, has stopped control |
| A59  | Case in cleaning mode              | A case cleaning operation has been started on a case                                                                                                           |
| A70  | High temperature alarm B           | The alarm temperature has been above the max alarm limit for a longer time period than the set alarm delay.                                                    |
| A71  | Low temperature alarm B            | The alarm temperature has been below the min alarm limit for a longer time period than the set alarm delay.                                                    |
| AA2  | CO <sub>2</sub> leak detected      | CO <sub>2</sub> is leaking from the refrigeration system. Refrigerant leak alarm if the refrigerant is selected as CO <sub>2</sub> .                           |
| AA3  | Refrigerant leak detected          | Refrigerant is leaking from the refrigeration system                                                                                                           |
| a02  | High humidity alarm                | The humidity level is too high                                                                                                                                 |
| a03  | Low humidity alarm                 | The humidity level is too low                                                                                                                                  |
| a04  | Wrong IO configuration             | Inputs and outputs have not been configured correctly                                                                                                          |
| X02  | Evaporator is icing up             | The adaptive defrost function has detected heavy ice formation on evaporator.                                                                                  |
| Z01  | Max defrost time exceeded A        | The last defrost cycle has stopped on time instead of set temperature                                                                                          |
| A34  | Fan alarm                          | Alarm from digital input monitoring function                                                                                                                   |
| A43  | Valve driver alarm                 | Alarm from digital input monitoring function                                                                                                                   |

### 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: 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 <sup>(1)</sup>                                                                                                                                       | 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-CC 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 CO <sub>2</sub> systems with ejectors. Signal is provided via digital input or from the system manager |
| S50               | Oil recovery                                                                                                                                                           | The controller is running an oil recovery sequence                                                                                                                                                       |
| S54               | Leak alarm action                                                                                                                                                      | The control has been shut down due to a leak detection                                                                                                                                                   |

<sup>(1)</sup> 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 details

### General data

**Table: Electrical specifications**

| Feature                                          | Value                                     |
|--------------------------------------------------|-------------------------------------------|
| Supply voltage AC [V]                            | 115/230 V, +10/-15%, 50/60 Hz             |
| Power consumption [VA]                           | 5 VA                                      |
| Power ON indicator                               | Green LED                                 |
| Electrical cable dimensioning [mm <sup>2</sup> ] | Max. 1.5 mm <sup>2</sup> multi-core cable |

**Table: Sensor and measuring data**

| Feature                        | Value                                                                                                                      |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Sensor S2, S6                  | Pt 1000 AKS11                                                                                                              |
| Sensor S3, S4, S5              | Pt 1000 AKS11<br>PTC 1000 EKS111<br>NTC5K EKS211<br>NTC10K EKS221 sensor<br>(All 3 must be of the same type)               |
| Temperature measuring accuracy | Pt1000: -60 – 120 °C. ±0.5 K<br>PTC1000: -60 – 80 °C. ±0.5 K<br>NTC5K: -40 – 80 °C. ±1.0 K<br>NTC10K: -40 – 120 °C. ±1.0 K |
| Pt1000 sensor specification    | ±0.3 K at 0 °C<br>±0.005 K per degree                                                                                      |
| Pe measuring                   | AKS 32R Ratiometric pressure transmitter: 10 – 90%                                                                         |
| RH measuring                   | 0 – 10 V<br>Ri > 10K ohm<br>Accuracy +/- 0.3% FS                                                                           |

**Table: Input and output relay specifications**

| Feature              | Input/output                    | Description                                                                                                                                                                                                |
|----------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital input        | DI1<br>DI2                      | Signal from dry contact functions<br>Requirements to contacts: Gold plating<br>Cable length must be max. 15 m<br>Use auxiliary relays when the cable is longer<br>Open loop: 12 V (SELV)<br>Contact 3.5 mA |
| Digital input        | DI3                             | 115 V / 230 V AC                                                                                                                                                                                           |
| Solid state output   | DO1 (for AKV coil)              | 115V / 230 V AC<br>Max. 0.5 A<br>Max. 1 x 20 W AKV for 115 V AC<br>2 x 20 W AKV for 230 V AC<br><b>Note:</b> 2 EC coils are not supported.                                                                 |
| Relays               | DO2<br>DO3<br>DO4<br>DO5<br>DO6 | 115 V / 230 V AC<br>Load max.: CE. 8 (6)A<br>UL 8A res. 3FLA 18LRA<br>Load min.: 1VA<br>Inrush: DO5 DO6 TV-5 80A                                                                                           |
| Analogue output/ PWM | AO1                             | 0 / 10 V Pulse Width Modulated (PWM) max. 15 mA.<br>0 – 10 V variable, max. 2 mA                                                                                                                           |

**Note:**

- DO2 to DO6 are 16 A relays.
- Max. load must be observed.
- DO5 / DO6 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.

**Table: Function data**

| Feature                                  | Value                                          |
|------------------------------------------|------------------------------------------------|
| Display                                  | LED 3 digit                                    |
| External display, AK-CC55 Single Coil UI | 1 external display                             |
| External display, AK-CC55 Single Coil    | 2 external displays                            |
| External display connection              | RJ12                                           |
| Max. display cable length                | 100 m                                          |
| Data communication built-in              | MODBUS                                         |
| Data communication option                | AK-OB55 Lon RS485 module (Not AK-CC55 Compact) |
| Clock battery backup power reserve       | 4 days                                         |
| Mounting                                 | DIN rail                                       |

**Performance and environmental conditions****Table: 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 |

## Certificates, declarations and approvals

| Approval type                 | Title                                                | Issuer                                              | Approval topic |
|-------------------------------|------------------------------------------------------|-----------------------------------------------------|----------------|
| EMC Certificate               | <a href="#"><u>ACMA CF13198_AU-Rev.00</u></a>        | ACMA - Australian Communication and Media Authority | RCM            |
| UA Declaration                | <a href="#"><u>Danfoss UA 8537</u></a>               | Danfoss                                             | UA RoHS        |
| CB Test Certificate           | <a href="#"><u>CB US-35091-M1-UL</u></a>             | UL - Underwriters Laboratories inc.                 |                |
| EU-UK Declaration             | <a href="#"><u>Danfoss EU-UK 084R0835.AB</u></a>     | Danfoss                                             | LVD            |
| Manufacturer's Declaration    | <a href="#"><u>Danfoss MD 080R1237.01</u></a>        | Danfoss                                             | EAEU RoHS      |
| EAC Declaration               | <a href="#"><u>EAC KZ 7100841.13.12.01062</u></a>    | EAC - Eurasian Customs Union                        | EMC            |
| Electrical Safety Certificate | <a href="#"><u>EAC KZ 7100841.01.01.01245</u></a>    | EAC - Eurasian Customs Union                        | LVD            |
| Export Control Declaration    | <a href="#"><u>Case/room controller (EEV)</u></a>    | Danfoss                                             |                |
| EU Declaration                | <a href="#"><u>PL25 EU Declaration packaging</u></a> | Danfoss                                             | Packaging      |

### 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 is subject 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.

## Online support

Danfoss offers a wide range of support along with our products, including digital information, software, mobile apps and expert guidance. See the possibilities below.



### The Danfoss Design center

Discover the Design Center, our advanced digital platform that streamlines product selection. With integrated tools and enhanced type pages, it's simpler than ever to access product information and documentation, and to select the right products. Check the availability of Danfoss products at partner locations and enjoy seamless transitions from selection to purchase with our basket-to-basket functionality. Whether you're buying from our distributors or directly from the Product Store, the Design Center simplifies your experience. Learn more at: [designcenter.danfoss.com](https://designcenter.danfoss.com).



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