ENGINEERING
TOMORROW

Catalogue | ADAP-KOOL®

Energy efficient solutions designed to ensure **food safety**

Discover the full range of ADAP-KOOL® control and monitoring systems.

Achieve
33%
energy savings with the total monitoring solution from ADAP-KOOL®

www.food-retail.danfoss.com

ADAP-KOOL® Refrigeration control systems

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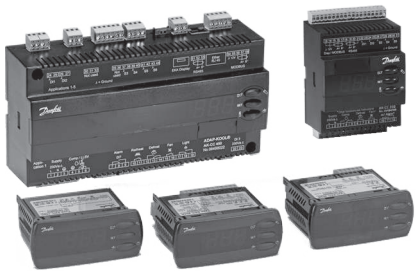
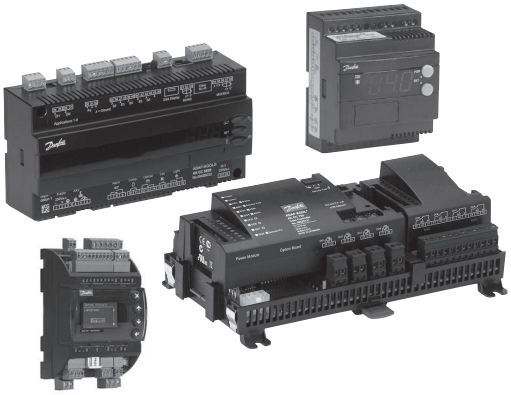
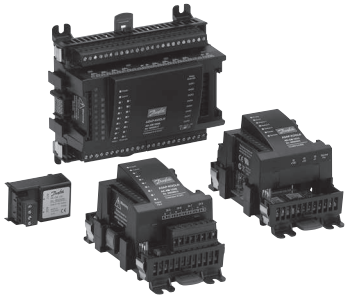
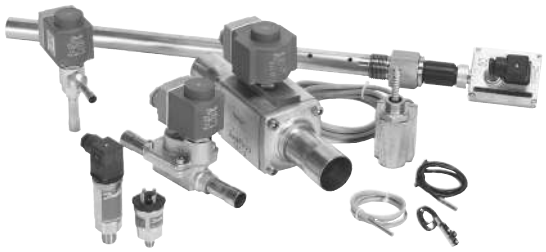








Introduction

Danfoss offers a comprehensive range of products for the retail food industry, consisting of electronic controllers, compressors, condensing units, line components and services, which provide optimised control of refrigeration systems and enable energy savings as well as HACCP compliance.

Electronic controllers, as a vital component of the ADAP-KOOL® refrigeration control system, provide a complete electronic system for control, monitoring, and alarm handling in supermarket refrigeration systems, including capacity control of compressors and condensers, evaporator and cold room control, HVAC and lighting control, and CO_2-based refrigeration systems.

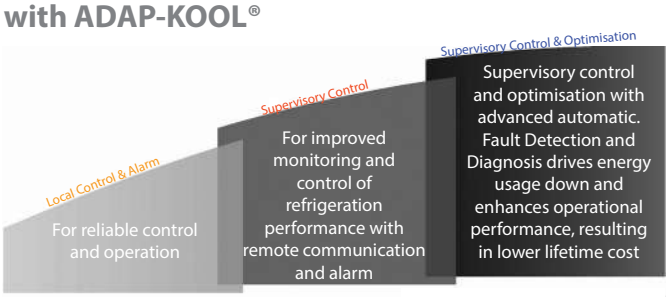
The ADAP-KOOL® refrigeration control system and its capabilities enable the optimisation of refrigeration performance and energy savings with a variety of features and functions tailored to application requirements. This is made possible by intelligent features such as adaptive superheat control, floating condensing pressure and suction pressure optimisation using AKV electronic expansion valves, speed control of compressors and/or condensers using VLT® variable speed drives, intelligent defrost, automatic fault detection and diagnosis, and so on.

Advanced ADAP-KOOL® solutions are compliant with Hazard Analysis of Critical Control Point (HACCP) requirements and enable HACCP registration. Achieving HACCP compliance is much easier with the ADAP-KOOL® refrigeration control system, which features controllers that maintain critical temperatures in accordance with defined limits and at measured time intervals that can be accurately monitored and logged with reference to defined parameters to provide suitable documentary evidence of HACCP compliance by means of simple, automatic recording of critical points. Data logs can be configured to identify critical temperatures for each area, cabinet or cold room as required, and they can easily be adapted to identify and record any incidents such as case cleaning, etc. for your HACCP registration, using data acquired using a data bus or network or directly from the controllers. In combination with AKS Pt1000 temperature sensors. controllers in the ADAP-KOOL® family maintain close and accurate set-point temperature control with a tolerance of less than ±1 °C, as specified by EN 441-13, without additional calibration.

HACCP

This catalogue is a general catalogue, so the actual range of controllers and other devices may vary from country to country.

Three control levels with ADAP-KOOL®



The ADAP-KOOL® refrigeration control system is compact, versatile, and easy to install and program, and it lets your system grow along with your needs. This flexible, modular concept enables continual adaptation to the evolution of the application, with easy retrofitting in existing installations. ADAP-KOOL® controllers provide three levels of control for various application requirements with increasing benefits and energy savings according to your needs:

- **Local control and alarm** solutions ensure accurate control and reliable operation of refrigeration systems with the option of HACCP compliance.
- **Supervisory control** is a more advanced solution with a remote alarm function using a data bus or network and a limited number of energy saving features, along with HACCP registration.
- **Supervisory control and optimisation** provide optimised control along with energy saving features such as master control, intelligent defrost, fault detection and diagnosis with extended remote service capabilities, combined with HACCP registration and compliance.

The electronic controllers described in this catalogue consist of the following types of controllers:

Compressor and condenser capacity controllers are used in systems ranging from relatively small basic systems with only two hermetic compressors to high-capacity systems with multiple semi-hermetic compressors equipped with variable speed drives and unloaders. ADAP-KOOL® Pack controllers offer several solution levels extending from compressor capacity control and step/variable control with local alarm capability to ensure accurate control and operational reliability, to advanced control solutions for systems with up to 10 compressors or fans equipped with intelligent control and optimisation of suction and condensing pressures according to the load and outdoor temperature.

Evaporator and cold room controllers provide control capability extending from simple thermostatic controllers with room temperature control using pump-down or compressor start/stop control to control using electronic expansion valves with many intelligent functions and energy saving features. In addition, various levels of evaporator solutions are available, ranging from local temperature control of a single evaporator with an alarm function to ensure easy, reliable control and operational confidence to advanced control of up to four evaporators with controllers that can simultaneously regulate room temperature, defrosting, door frame temperature, rail heat, lighting, and fan operation. Advanced features such as a defrost function, adaptive superheat control with an AKV electronic expansion valve, intelligent fault detection with diagnosis, and switch-mode operation of rail heating and fans enable the optimised operation of refrigeration systems to save energy and maintain food quality in display cases and cold rooms.

Variable speed control of compressors and condenser fans using VLT® variable speed drives reduces energy consumption and refrigerant charges as well noise levels. VLT® drives also help stabilise the condensing pressure and reduce dirt accumulation on the condenser.

All ADAP-KOOL® controllers are designed to be used either stand-alone or integrated in a complete ADAP-KOOL® refrigeration control system with a data bus or network. This enables local or remote monitoring with alarm handling, refrigeration system control, and proactive maintenance management while reducing operating costs.

ADAP-KOOL® controllers in CO_2 refrigeration applications
For environmental and cost reasons, CO_2 is being used as a refrigerant in more and more retail food refrigeration systems. The installation and energy costs are comparable to those of conventional refrigeration systems, there are no additional costs, and the performance of the refrigeration system is the same. The ADAP-KOOL® refrigeration control system is designed to handle the challenges of CO_2. All the benefits of the advanced adaptive control system, such as the energy-saving master controller functions, are also available in a refrigeration system based on CO_2. Danfoss control solutions are presently available for all types of cascade systems, and during recent years several large systems operating on CO_2 and controlled by ADAP-KOOL® have been installed for medium-temperature and low-temperature applications.

Enterprise level services: RETAIL-CARE™
For chain-store customers with a large number of diverse sales outlets, additional services such as alarm and maintenance management, energy management, performance reports including HACCP documentation, and key asset performance indicators are essential for reducing operating costs. For these services, Danfoss has developed a suite of expert services under the RETAIL-CARE™ banner that provide a complete set of management tools to assist retailers in operational management and the reduction of operating costs. In the retail food business, these services also help customers provide, maintain and document food quality. ADAP-KOOL® refrigeration controllers are an integral part of RETAIL-CARE™ services.

Danfoss's extensive product line lets you configure a complete solution for your business from a vast array of products for various applications, including not only the ADAP-KOOL® range but also compressors, sight glasses, solenoid valves, check valves, ball valves, shut-off valves, filter driers (cores and casings), pressure controllers, and expansion valves. Detailed information on these components is available in other Danfoss literature.

System Manager Front Ends

Introduction

The key component of an ADAP-KOOL® refrigeration system controller is the system unit. This unit coordinates data communication to and from the individual refrigeration controllers, acquires temperature data for logging, receives alarms, and forwards alarms to defined recipients. It may also coordinate optimisation functions, such as the optimisation of suction pressure, coordinated defrosting and schedules.
In addition the latest generation of Danfoss Front Ends (AK-SM 800 series) can share data to external systems via open XML, making it easy to implement into customers existing building management systems

AK-SM 350
This is a system unit for convenience stores, relatively small supermarkets, and relatively small industrial refrigeration installations.
The unit includes a display so the user can manage day-to-day operations at the desired level. There is also full access via the external user interface.

AK-SC 355
This is a system unit that comes in three versions, covering Convenience Store, Supermarket, and Full Supermarket (incl. HVAC). This unit can be operated locally using the front panel or remotely using a Web browser via the Internet.

AK-SM 720
This is a system unit for supermarkets and industrial systems where special functions outside the scope of refrigeration technology are required.
The unit can be operated locally with the front panel or remotely using the AK-ST 500 software.

AK-SC 255
This unit is for medium to large supermarkets that need lighting and HVAC control in addition to refrigeration system control.
It can be operated locally using the front panel or remotely using the AKA 65 software.
Web browser functions for end users.

AK-SM 820, 850 and 880
These units are for smaller, medium-sized and large supermarkets where there is a focus on easy set-up, operation via browser, improved food safety and functions for reducing energy consumption.

Overview of system units

Type	AK-SM 820	AK-SM 850	AK-SM 880	AK-SM 350	AK-SC 255	AK-SC 355CS	AK-SC 355	AK-SM 720
Application								
For smaller supermarkets	X			X		X		
For medium to large supermarkets		X	X		X		X	X
Functional description								
Control of separate refrigeration controllers	X	X	X	X	X	X	X	X
Built in store lighting	X	X	X		X	X	X	
Built in HVAC control	X		X		X	X	X	
Data collection	X	X	X	X	X	X	X	X
Alarm management and dispatching	X	X	X	X	X	X	X	X
Energy management								
Enterprise demand response - load shedding (EDS)	X	X	X		X		X	
Enterprise set point management (EDS)	X	X	X		X		X	
Optimization - master control								
Optimization of suction pressure	X	X	X	X	X	X	X	X
Schedules (defrost, on/off, night set back, case)	X	X	X	X	X	X	X	X
Pulse counter for energy measurement	X	X	X	X	X	X	X	X
Local load shedding	X	X	X		X	X	X	X
Option of connecting light sensors for lighting control	X	X	X		X	X	X	X
HVAC control	10		45		X	X	X	
Lighting control	10	30	30		X	X	X	X
Custom control function design capability			X					X
Networked energy meter	X	X	X		X	X	X	
Defrost optimization - coordinated defrost				X				X
Boolean function design capability	X	X	X		X	X	X	X
Option of connecting moisture sensors for dew-point control of edge heating (Rail Heat Control)	X	X	X	X	X	X	X	X
Number of supported nodes on network								
Number of measuring points on the unit				16				11
Number of measuring points on the network		100	100	65	128	80		200 ctrl.
Miscellaneous points (on/off, relay, sensor, variable)	80 (total)	250 (total)	250 (total)	0	250 (total)	250 (total)	250 (total)	76
Number of controllers on the network *) expandable via host network	32	120*	120*	65	120	32	120*	200
External communication								
TCP/IP	X	X	X	X	X	X	X	X
Modem				X	X			X
GSM modem				X	X	X	Alarms only	X
Interface with AKM software				Log/Alarm	Log/alarm	Log/alarm	Log/alarm	Log/Alarm
E-Mail	X	X	X		X	X	X	
XML	X	X	X		X	X	X	
Network printer				Lokal				
Fieldbus for network units								
SNMP	X	X	X		X		X	
LON	X	X	X	X	X	X	X	X
Modbus	X	X	X	X	X	X	X	X
DANBUSS via protocol interface AK-PI 200	X	X	X	X	X			X
Daikin units via protocol interface AK-PI 300								X
Device Connectivity								
Gas detector	X	X	X	X	X	X	X	X
Variable speed drive	X	X	X	X	X	X	X	X
Variable speed compressor (SLV)	X	X	X	X	X	X	X	X
Operation								
Display	X	X	X	X	X	X	X	
Graphical site layout (mimic)	X	X	X		X (AKM)	X	X (AKM)	
System configuration report	X	X	X		X	X	X	
Open XML interface	X	X	X		X	X	X	
License system (functionality upgrade)	X	X	X		X	X	X	
PC support tools								
Compatible with EM 800	X	X	X		X	X	X	
Compatible with RMT	X	X	X			X	X	
Using AK-ST 500 service tool	X	X	X	X				X
Using AKA 65 software					X			
Using AKM software				Log/Alarm	Log/alarm	Log/alarm	Log/alarm	Log/Alarm
Using Web browser (full)	X	X	X			X	X	

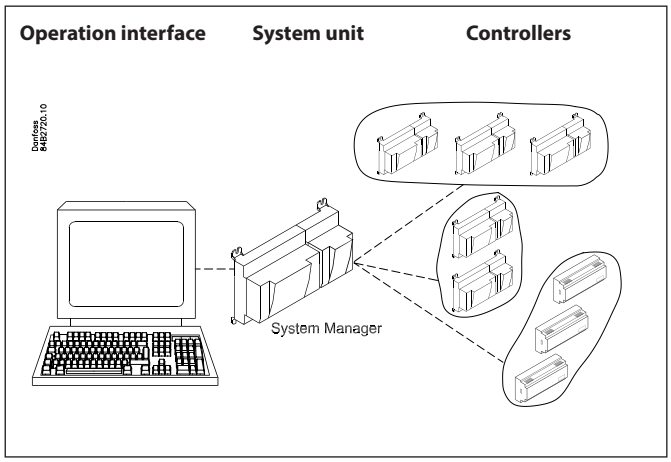
Optimisation

Introduction

The system unit in an ADAP-KOOL® refrigeration system includes override functions that transfer signals between selected controllers over the data bus or network.

The controllers are organised in groups according to the selected function.
When the override is activated, all controllers in the group receive the same overide signal.

The system unit must be one of the following types:
- AK-SM 720
- AK-SM 820
- AK-SM 850
- AK-SM 880
- AK-SC 255
- AK-SC 355



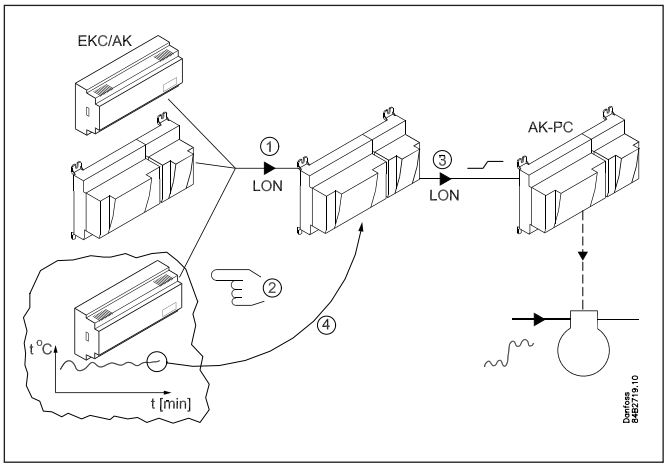
P0 and suction pressure optimisation

The override function lets you optimise the suction pressure to match the actual load on the system. During the optimisation process, the system collects data that shows you which refrigeration points are most heavily loaded.

The individual controllers handle temperature control in the refrigeration appliances. Some controllers control two refrigeration points in the same appliance, while others control three points. The load and operating conditions of each refrigeration point are continuously uploaded to the gateway via the data bus or interface. The acquired data is collected here, and the most heavily loaded refrigeration point is identified. The suction pressure is then adjusted to maintain the air temperature at the refrigeration point. The designation of the most heavily loaded refrigeration point cannot be changed until a certain time has elapsed (such as 20 minutes) or the operating conditions of the refrigeration point change (to defrost, cut out, etc.).
The system unit collects data from the refrigeration points and transmits an offset signal to the compressor controller to cause the suction pressure reference to be adjusted to suit the needs of the most heavily loaded refrigeration point.

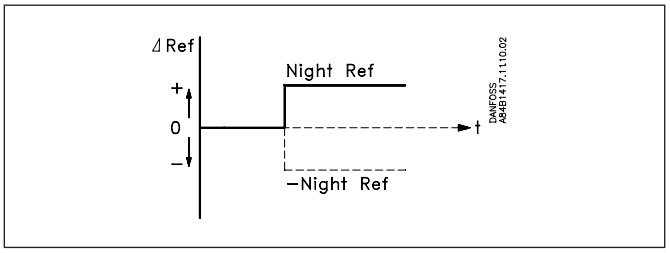
Of course, the preset minimum and maximum suction pressure limits are always observed.

The time interval during which a refrigeration point is designated as the most heavily loaded point is recorded in a log (history file). This data can be shown on a display for the last 24 hours and the last 168 hours (one week). The oldest values are continuously overwritten.
The two sets of data typically show the same pattern, but if a new pattern emerges, the situation should be examined in more detail.



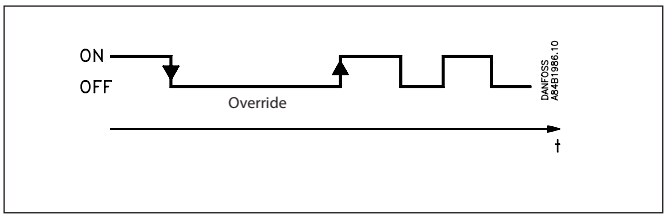
Day/night control

This function transmits a signal to selected controllers. The signal can be used to raise the temperature reference level and the suction pressure reference level.
When the individual controllers receive the signal, the reference level is changed by an amount set in each controller.



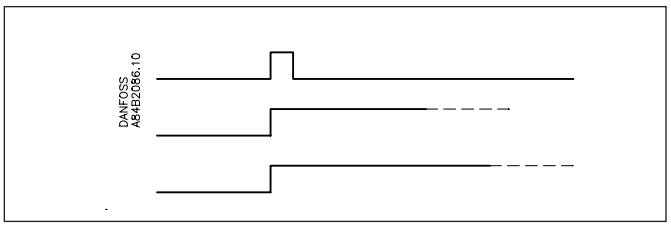
Time schedule

The override function enables you to define a number of time schedules.
Example of use:
Input signal for day/night control.



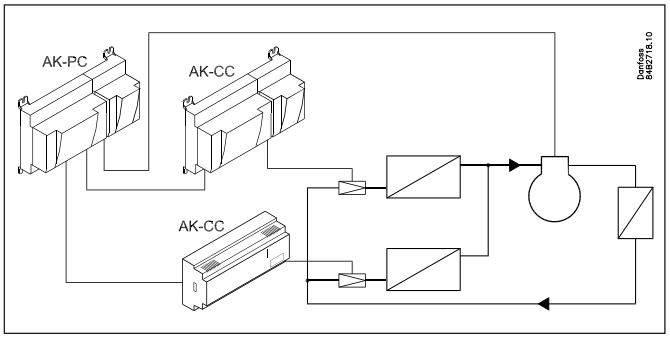
Defrost control

The override function enables you to define and start a number of defrost cycles.
After a defrost cycle has started, the individual controllers determine when to stop the cycle. In some cases it stops under time control, while in other cases it stops under temperature control.



Stopping liquid injection in case of a service interruption (inject on)

Every controller that controls an expansion valve has an 'Inject on' function. When this function is activated, the controller closes the valve to prevent liquid from passing through the evaporator.
This ensures that the valve closes when the compressor stops due to a service interruption.
This function can be implemented directly by wiring from the compressor controller to the flow controller, or it can be implemented using data communication from the compressor controller via the system unit to the flow controllers.



Additional information available:
Setup guide: RI8AL

AK-SM 820, AK-SM 850, AK-SM 880

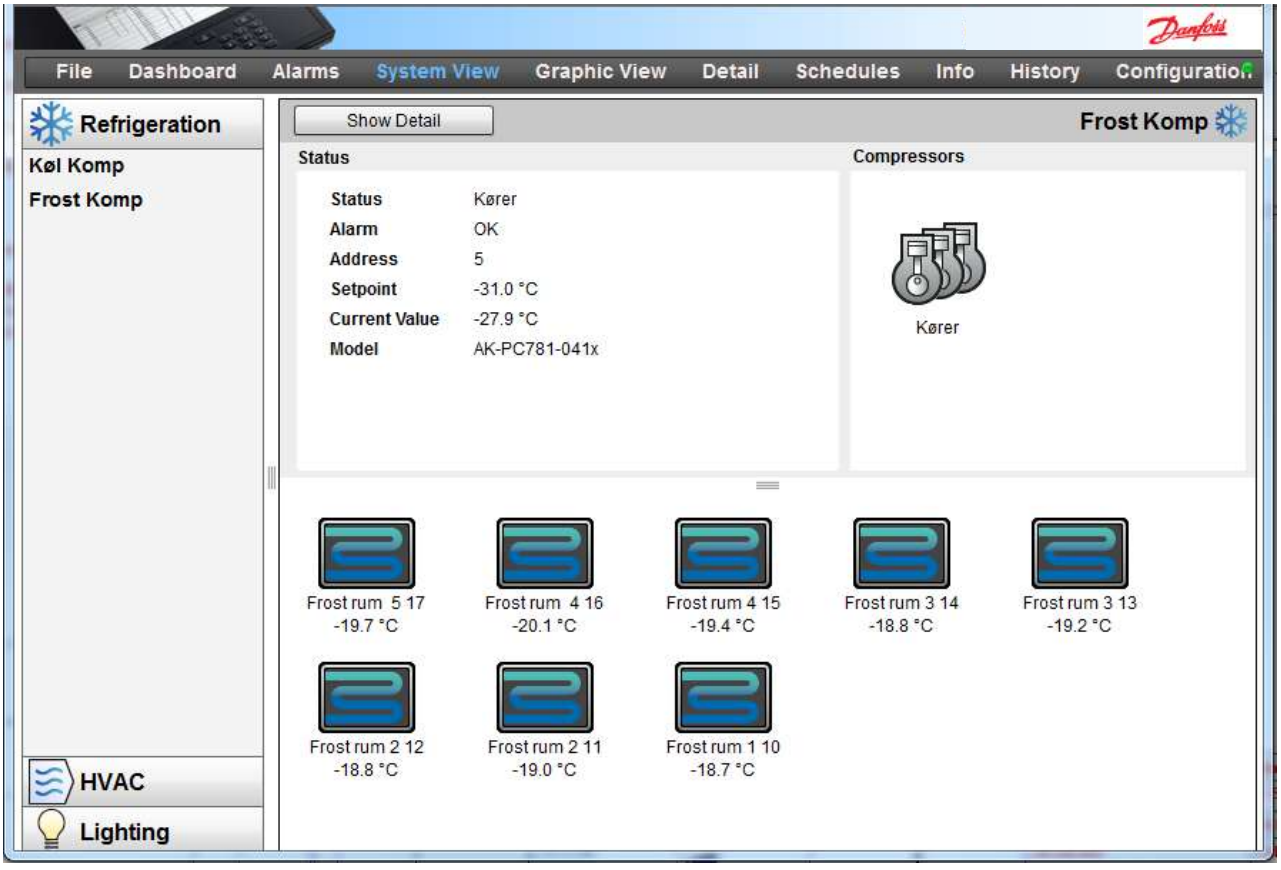
Application
This unit is a combined data acquisition and monitoring unit for small, medium and large stores covering Refrigeration, HVAC and Lighting applications

Functional description
- Control of separate cooling controllers
- Control of store lighting
- Control of HVAC
- Data collection
- Alarm management
- Data transmission to monitoring centre
- Energy optimisation functions

User interface
- Large colour display with graphic displays of refrigeration appliance in the store
- Intuitive user interface
- WEB brower-based
- Set-up and operation via RMT software (Remote Management Tool)
- Wizard configuration assistance

Data exchange
- Via TCP/IP to external monitoring centre
- XML data exchange
- Receives data from an offline programming/set-up
- Remote update of software
- Remote adjustment upon installation of new controllers
- Via USB

Example



Technical data
Power: ~ 100 - 240 V a.c. (+ / - 10%) 50/60 Hz. 12 VA

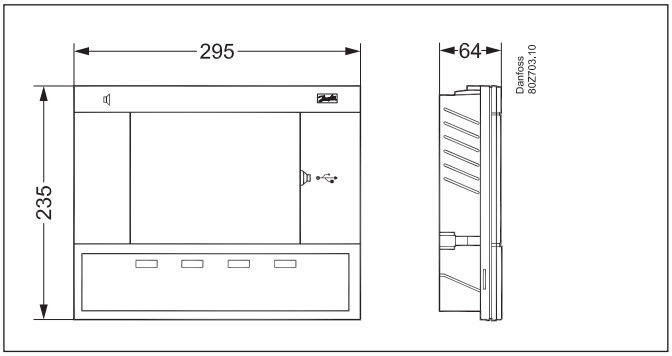
Alarm relay:
Built in. Max. 240 V a.c. 5 A ohmic (3 A inductive).

Ambient conditions:
Operating temperature (screen): -10 to +55˚C
0- 95% RH. non-condensing) / no vibrations.

Screen:
Active TFT colours (thin-film transistor), SVGA 800 x 600.

Enclosure: IP 20

Dimensions:



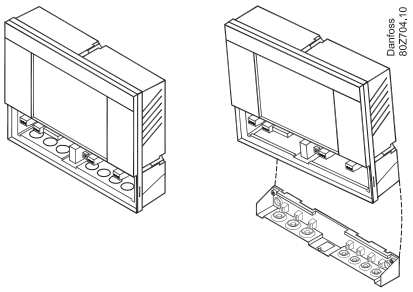
Connections:
LON RS485
Modbus

Ethernet RJ45
USB-A

Alarm relay

Approvals

E31024



When mounted on the wall, the cable run piece can be removed from the system unit.

Ordering

Type	Application	Data communication	Display	Code no.
AK-SM 820	C-Store	LON RS485	Yes	**080Z4004**
AK-SM 850	Refrigeration			**080Z4001**
AK-SM 880	Full store			**080Z4008**

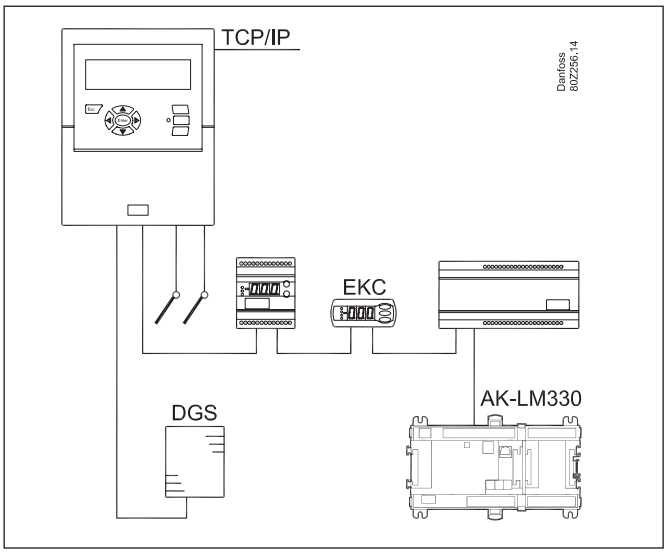
Additional information available:
USCO.PI.R1.E

AK-SM 350

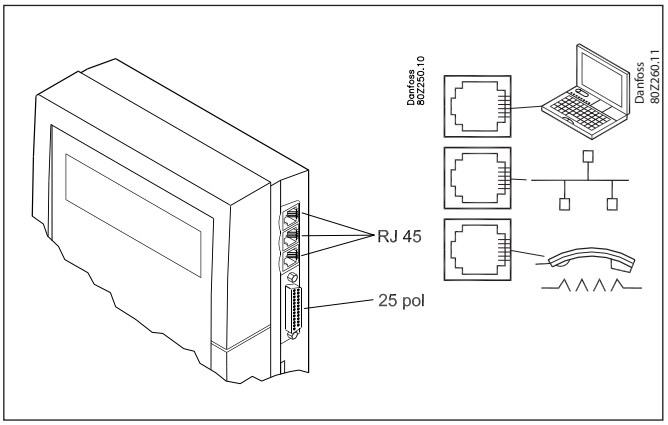
Application
This unit is a combined data acquisition and monitoring unit for relatively small refrigeration installations.
- Corner shops
- Small supermarkets
- Restaurants
- Food manufacturers

Advantages
- Compact temperature recording unit
- Collects temperature data for presentation to public authorities
- Alarm function
  - Local alarm or via modem or IP
  - Alarm on deviation in temperature
  - Alarm when doors of cold storage rooms or freezer rooms are open
- A description of the measured area can be added for each measuring point.

Functional description
The monitoring unit can monitor up to 65 measuring points. They can originate from:
- up to 16 direct connections to sensors or switch contacts;
- signals from separate refrigeration controllers (type EKC or AK) via a data bus or network;
- signals from gas detectors – these readings are also transferred via the data bus or network
- Pulse counting function for energy display
- All defined points can be recorded and saved at defined time intervals.
- The values can be viewed on the display and read out by connecting a printer, PC or modem.

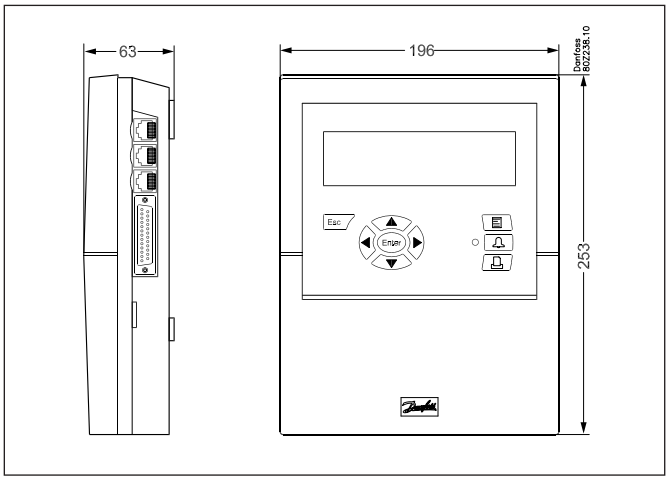


External connections
- Modem
  A modem can be connected to link the unit to external alarm destinations or service companies.
  The modem can be a standard telephone modem or a GSM modem for mobile telephony.
- Ethernet
  If a link to a TCP/IP network is required, a server can be connected. Contact Danfoss for additional information on recommended types.
- PC
  A PC can be connected to the unit. The PC may be stationary, portable or handheld. Configuration and/or alarm reception can be performed using an operational management program.



Technical data

Supply voltage		115 V / 230 V +10/-15%, 50/60 Hz, 10 VA
Connected device		PT 1000 ohm at 0°C or PTC 1000 ohm at 25°C or NTC 5000 ohm at 25°C or thermistor (-80 to 0°C, -40 to 40°C, or 0 to 100°C) Digital on/off signal or standard 0–10 V / 4–20 mA signal
Pulse counter inputs for output reading		Compliant with DIN 43864. (inputs 1 and 2 only)
Display		Graphic LCD, 240 x 64
Direct measuring points		16
Total number of points		65
Measuring range, general		-100 to +150°C
Measurement accuracy with Pt1000		Resolution 0.1 K Accuracy: ±0.5 K
Measurement interval		15, 30, 60, 120 or 240 minutes
Data storage		12 MB flash Storage capacity for recording all data from all measuring points for one year at 30-minute intervals. Last 200 alarm warnings
Battery backup		Button cell for clock function (2032)
Power supply for pressure transmitter, etc.		5 V, 50 mA max. 12 V, 50 mA max.
Printer connection		HP PCL-3, parallel
Modem connector		RJ 45
TCP/IP connector		RJ 45
PC connection		RJ 45 (RS 323)
Data communication		RS232, RS485 (LON), RS485 (Modbus), RS485 (TP) (TP = third party)
Relays	Quantity	2
	Max. load	24 V AC or 230 V AC Imax (AC-1): 5 A Imax (AC-15): 3 A
Enclosure		IP 20
Ambient conditions	0 to +50°C (operating) -20 to +70°C (transport) 20 to 80% RH, non-condensing No shock load or vibration	
Approvals		EN 60730-1 and EN 60730-2-9 EN 61000-6-3 and EN 61000-6-2 EN 12830 and EN 13485
Weight		1.6 kg



Ordering data

Type	Measuring points	Description	Language	Code
AK-SM 350	16	With inputs for PT 1000 ohm and PTC 1000 ohm	English, German, French, Dutch, Italian	**080Z8500**
			English (UK), Spanish, Portuguese, English (US)	**080Z8502**
			English, Danish, Swedish, Finnish	**080Z8503**
			English, Polish, Czech	**080Z8504**
Printer cable 3 m (parallel)				**080Z8401**
Cable for PC (see also AK-ST 500 documentation)		RJ 45 – Com port		**080Z0262**
Modem cable				**080Z0261**

Note:
Data bus or network cables and repeaters must be installed in accordance with the requirements specified in the following document:
Data Communication between ADAP-KOOL® Refrigeration System Controls
Document no.: RC8AC

Additional information available:
Manual: RS8EF

AK-SC 255

Application
The feature-rich AK-SC 255 system controller is the heart of your control and monitoring system. It features a brilliant full colour high resolution display, context-sensitive soft keys, easy navigation to every part of your system, an on-board Ethernet port, a complete suite of maintenance management tools, extensive alarm capability, and much more.

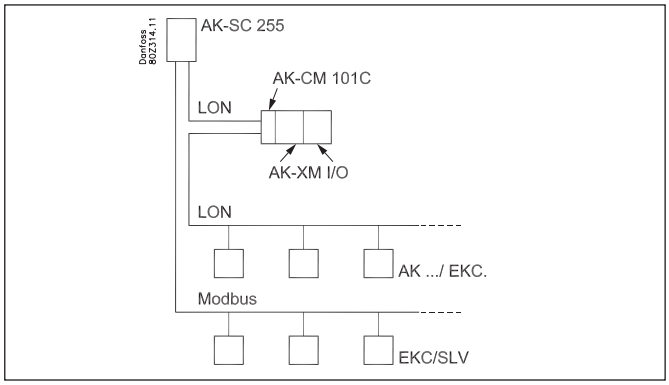
Advantages
Front end for ADAP-KOOL®
- Supports pack and evaporator controllers and I/O modules
- Temperature monitoring and alarm generation
- Enables HACCP compliance
- Local access with keypad and VGA screen
- Full remote access (serial or Internet)
- Energy optimisation with adaptive master control
- Flexibility with Boolean logic
- Lighting control
- Off-line programming enables off-site commissioning
- Host network with up to ten connected AK-SC 255 units supports a massive range of applications
- Flexible alarm routing, including relays, e-mail, XML, and printer
- Solution scalable to hypermarket level
- Remote access and alarm management reduces service calls and expenses
- User friendly menus and shortcut keys
- Daily user web browser

Regulation
The AK-SC 255 can control and monitor up to twelve suction and condenser controllers and up to 120 controllers in total.
With its compressed data storage, it provides a huge logging capacity.
There is a user-programmable logic processor for custom strategies.
Standard and custom alarms protect food products and equipment.
Software options can support up to 30 lighting zones, including motorised panels, and up to 40 HVAC systems.

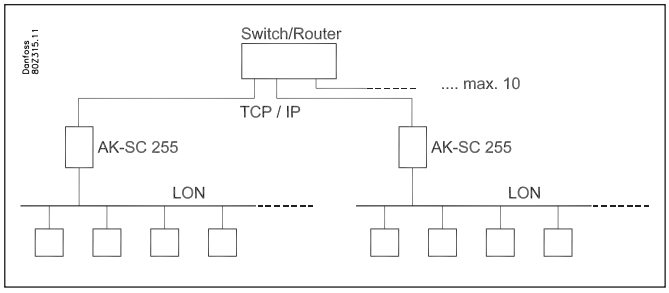
Network
The AK-SC 255 can control and monitor multiple network types to suit different application levels. The network options include:
- TCP/IP EKC controllers
- MOD-bus EKC controllers
- LonWorks RS 485 AK and EKC
- LonWorks AK I/O Modules

Lighting
- 30 lighting zones
- 6 relays per zone
- Standard or relative schedules
- 8 schedules per zone
- Auto override for burglar or fire alarm
- Switch override with OVR override box

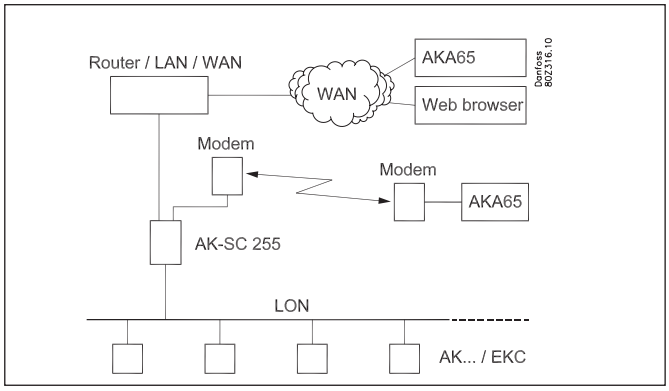
Miscellaneous features
- 96 miscellaneous Boolean logic statements per AK-SC 255
- 64 miscellaneous relay DOs per AK-SC 255
- 48 miscellaneous VOs per AK-SC 255
- 10 miscellaneous conversion factors
- 64 miscellaneous sensor inputs and on/off inputs – monitoring and alarming



Closed system with controllers



Several systems configured for setup and readout using a central AK-SC 255. Communication between systems via TCP/IP.



System manager with controllers and modem for remote system control via AKA 65.

Technical data

Recommended individual controller capacity per AK-SC 255	Type AK-CC 750	60	Max. configured evaporator sections: 120
	Type EKC (SNMP, LonWorks)	120	1 controller per evaporator section
Recommended remote AK I/O capacity (in addition to controllers)	AK I/O	64 points (max 8 AK-CM)	Analog (general I/O, HVAC, lighting)
	AK I/O	64 points (max 8 AK-CM)	Digital (general I/O, HVAC, lighting)
Available network protocols	Ethernet port (used for EKC SNMP controllers, 255 host network and remote AKA65 software tool) RS 485 host bus (used for multiple AK-SC 255 units) MOD-bus RS232 port (used for AKA 65 software tool) Modem port (used for serial modem)		
Energy meter (kWh) pulse input capacity	AK-XM 107A pulse module, 8 inputs maximum, Carlo Gavazzi EM24 via MOD-bus		
Additional AK-SC255 units inter connected via host network	Max. 10 AK-SC255 units (1 master and 9 slaves)		
History data entries	600		
History capacity	120 points sampled every 10 minutes = 1 year		
Remote connection software	AKA 65 v5.1: modem Daily user Web browser Ethernet Serial		
Recommended modem support	Zoom V.92 56k modem (model 3049)		
	AKA 231 modem		
Ambient conditions	Operating temperature	0 to +40°C at 95% RH (non condensing)	
		0 to +50°C at 0 to 90% RH (non condensing)	
	Storage temperature	-20 to +50°C	

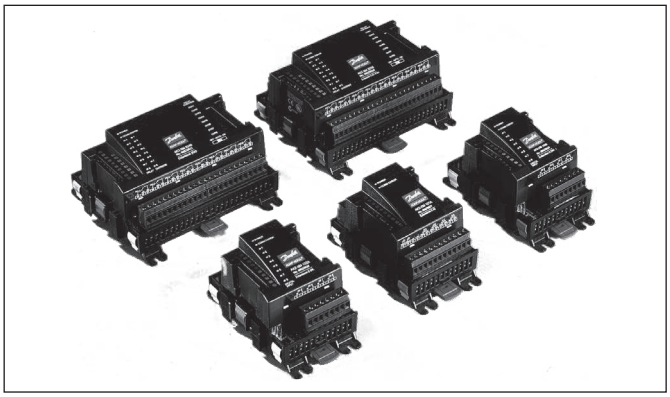
AK input/output module family

Place strings of up to nine self-addressing I/O modules wherever you need them, in any combination. Modules are available with:
- 8 relays (with or without override)
- 8 relays (with or without override) and 8 universal inputs
- 8 universal inputs
- 8 digital inputs (high and low voltage versions)
- 4 bipolar EEPR outputs

Each module string begins with a communication and power module that is connected to the AK-SC 255 system controller via Echelon® LonWorks®. The unique intermodule bus eliminates the need for wiring to individual modules.

Ordering data

Type	Functional description	Code
AK-SC 255	Refrigeration	**080Z2520**
AK-SC 255	Refrigeration, lighting, HVAC	**080Z2521**
AK-SC 255	Refrigeration, lighting, HVAC For DIN rail mounting (without screen)	**080Z2583**
Modem adapter for AK-SC 255 -> Modem AKA 231		**080Z2100**



AK-SC 255 solution components:
- Communication module
- I/O modules
- Pulse counter

Note:
Data bus and network cables and repeaters must be installed in accordance with the requirements specified in the following document:
Data Communication between ADAP-KOOL® Refrigeration Controls Document number: RC8AC

Additional information:
Manual: USCO.EC.R1.A

AK-SC 355

Application
Convenience store control system, AK-SC
Designed to make your facility more profitable:
- Energy efficiency
- Risk management
- Reduced maintenance costs

Specifically designed for small retail food facilities:
- Controls and monitors refrigeration, HVAC and lighting systems
- Distributed control with Danfoss EKC refrigeration controllers and smart thermostats
- Centralised control with Danfoss AK input/output modules

Easy to use and program:
- On-board VGA display with web-like graphics
- On-board web server for remote access and programming using a web browser

Easy data management:
- Extensive logging and graphing capability
- Temperature and door open alarms
- XML compatible for third-party data access
- USB flash drive support for easy software management

Key features	Benefits
Built-in compressor, condenser and circuit control	Built-in control functions reduce complexity and cost
HVAC control using built-in functions or remote controllers and sensors	Up to ten HVAC units for tight control and energy savings
Condenser and circuit control using Danfoss controllers	Full support for market-leading Danfoss refrigeration controllers
25 schedule groups (eight schedules per group)	Central defrost, case lighting, shop & outdoor lighting, night setback, and shutdown
Flexible alarm routing and output	Support for e-mail, IP address, multiple relays, modem, and print alarms
Built-in MOD-bus and LonWorks® network support	More scope for control solutions using established protocols
Full-colour VGA local screen view and access	Access all areas of your system from the convenient local screen
Built-in buzzer and bicolour LED	Easy local alarm notification
Supports Danfoss AK I/O modules	I/O module support enables versatile, extended control and monitoring
Simple site view imagery – capability for loading custom graphics and map parameters on the local screen	Create a simple, clear graphic screen showing only the key parameters, to simply the management of your services
600 log entries	Large history storage capacity to ensure HACCP compliance and provide service level details
Multiple users and user levels	Definable user list with clearly defined authorisation levels
Multiple language support	Local and browser language support
USB flash drive support	Reduce commissioning time and costs
Full web browser access	Standard web browser connection provides access to all areas of the system
Built-in Boolean logic commands	Define your own logic to control even the most arcane application
Remote management tool	Remotely manage your system: update software, back up the database, load images, use the VizEdit tool (built-in RMT) to create custom imagery and map parameters

Technical data

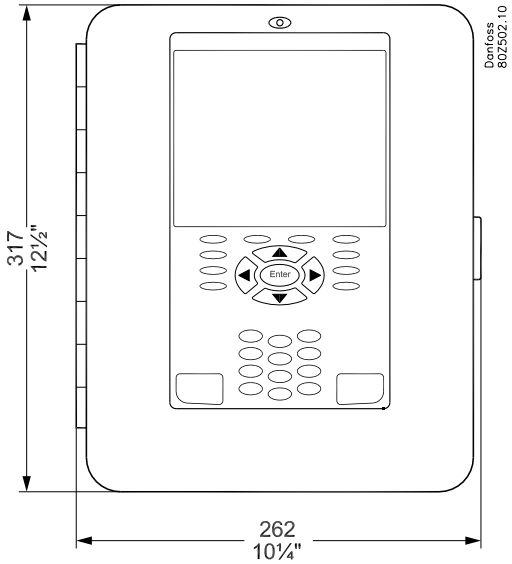
Power: 100–240 V a.c. (±10%) 50/60 Hz

Built in alarm relay: 30 V d.c. / 1 A, Class 2
(not available with RS 485 screen version)

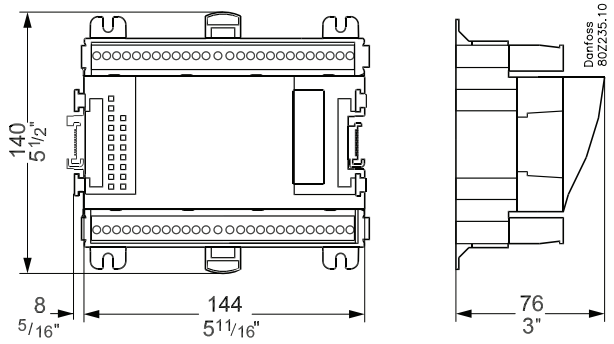
Ambient conditions
Operating temperature (screen): 32 to 104˚F (0 to +40˚C)
DIN: 32 to 122 ˚F (0 to +50˚C)
at 90% RH (non-condensing)

Approvals

E166834



Version with display



Version without display
(DIN mount version)

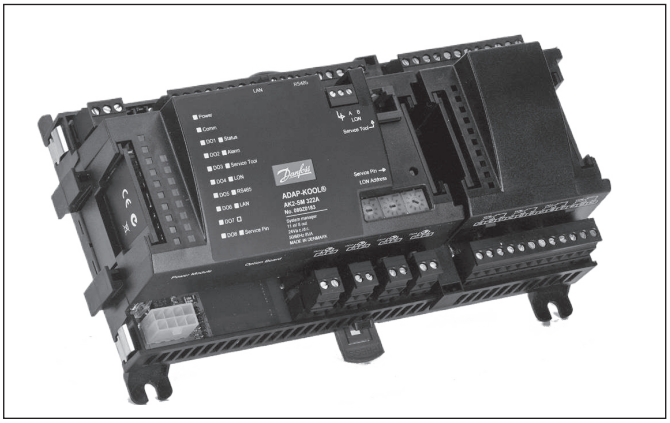
Ordering data

Type	Application	Data communication	Display	Code no.
AK-SC 355CS	C-Store	LON RS485	Yes	**080Z2561**
AK-SC 355CS	C-Store		No	**080Z2562**
AK-SC 355	Refrigeration		Yes	**080Z2560**
AK-SC 355	Full store		Yes	**080Z2564**
AK-SC 355	Full store		No	**080Z2568**

Note:
Data bus or network cables and repeaters must be installed in accordance with the requirements specified in the following document:
Data Communication between ADAP-KOOL® Refrigeration System Controls
Document no.: RC8AC

Additional information available:
USCO.EI.RF0.F

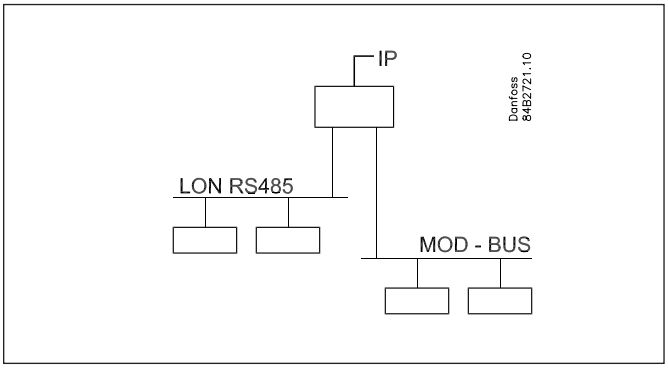
AK-SM 720



Application
The AK-SM 720 system manager is a system unit for use with AK series controllers.

The system manager enables the configuration of complex control systems that support alarm monitoring and data logging for decentralised refrigeration systems.

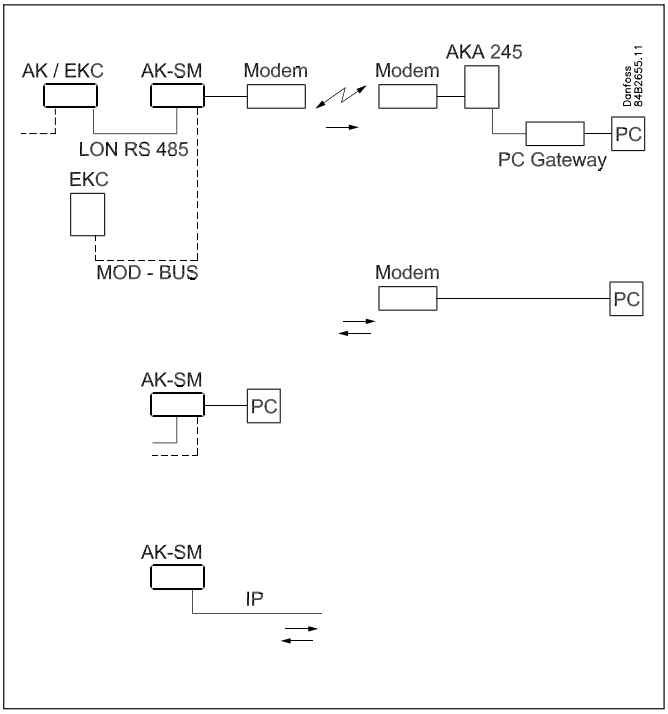
The controllers are connected to a data bus or network, with various communication options depending on the controller type:
LON RS 485
Modbus
TCP/IP
Modem



Functional description
Used for data communication with LON RS 485 or MOD-bus.
Up to 200 controllers can be connected, distributed over the LON RS 485 and MOD-bus.
Several system managers can be connected via the IP link, so that measurement data from a total of up to 400 controllers can be recorded.

Remote control is possible with a modem link or a link using an IP network.

Remote control utilises the AK-ST software.



The system manager can send alarms and logs to the AKM system software, but the system manager and the connected controllers cannot be remotely controlled using the AKM software.

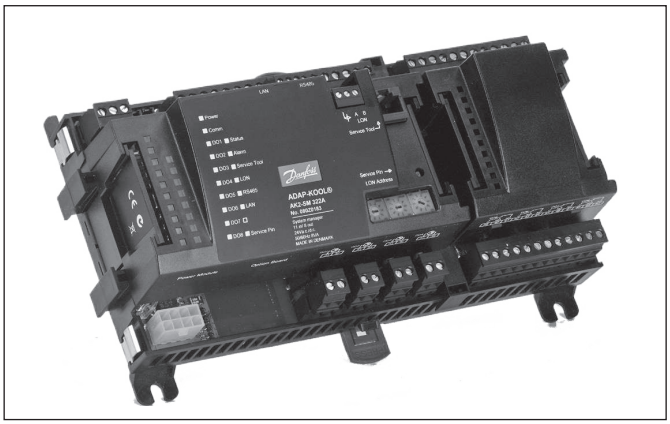
Ordering data

Type	Description	Language	Code No.
AK-SM 720	System manager	English, German, French, Italian, Dutch	**080Z8511**
		English, Spanish, Portuguese	**080Z8512**
		English, Danish, Swedish, Finnish	**080Z8513**

Note:
Data bus or network cables and repeaters must be installed in accordance with the requirements specified in the following document:
Data Communication between ADAP-KOOL® Refrigeration System Controls
Document no.: RC8AC

Additional information available:
Manual: RS8EC

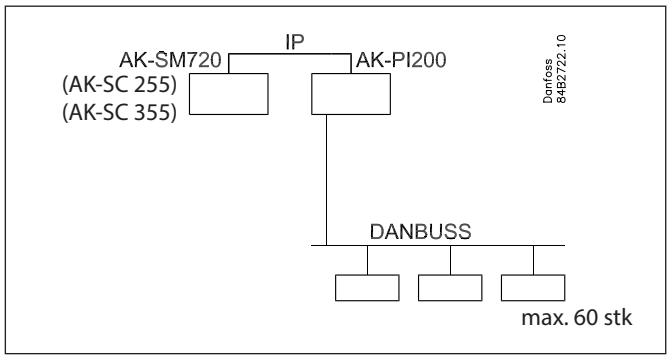
AK-PI 200



Application
Used when AKC controllers with DANBUSS support need to be connected to the system.

Functional description
AK-PI 200 is an interface module that provides data communication between a system manager (type AK-SM 720 / AK-SC 255 / AK-SC 355/AK-SM 800 series) and type AKC or AKL controllers with DANBUSS support.

Quantity
Up to 60 controllers can be connected to a single unit. Two units can be connected to an AK-SM 720 system manager, or four units to an AK-SC 255/AK-SC 355 /AK-SM 800 series.

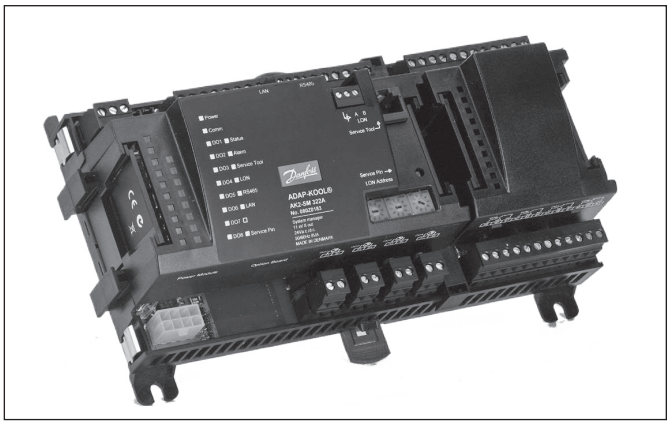


Ordering data

Type	Description	Language	Code No.
AK-PI 200	Protocol interface	English, German, French, Italian, Spanish, Portuguese, Dutch, Danish, Swedish, Finnish	**080Z8521**

Additional information available:
Manual: RS8EX

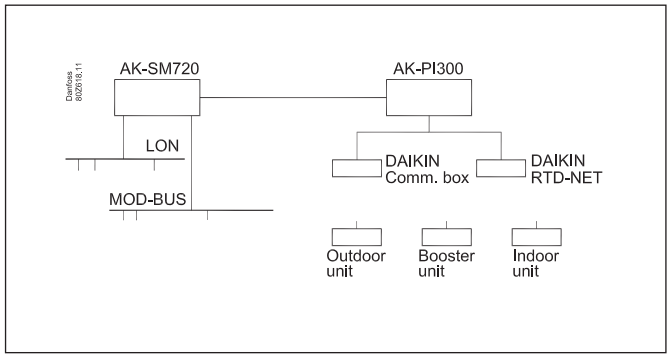
AK-PI 300



Application
To be used if using Daikin units on a system with a system manager type AK-SM 720.

Functional description
AK-PI 300 is an interface module that provides data communication between a system manager type AK-SM 720 and Daikin units.

Quantity
One Comm. box and three RTD units can be connected to a single AK-PI 300.
If there are more, use 2 AK-PI 300 units.
Up to two AK-PI-300 units can be connected to a single system manager, i.e. up to 2 Comm. boxes and 6 RTD units.



Ordering data

Type	Description	Language	Code No.
AK-PI 300	Protokol interface	English, German	**080Z8526**

Additional information available:
Manual: RS8GP-

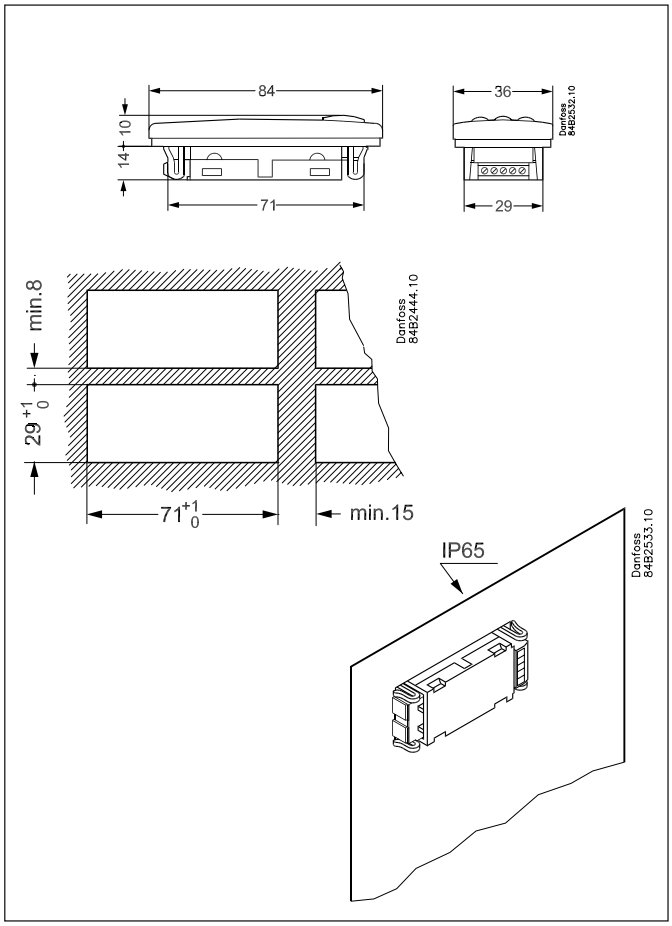
EKA 153

Introduction and application

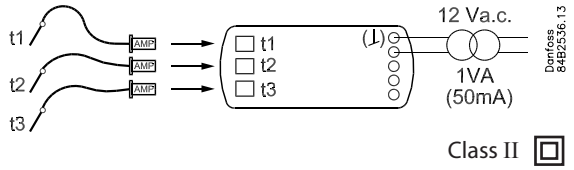
The EKA 153 is a thermometer used for registering up to three temperatures in connection with Refrigeration Appliance Controls. The temperatures can be read from the display and sent to a central system unit via data communication.
Alarm limits for high and low temperatures can be adjusted. If the alarm setting is activated, the LED lights will flash and an alarm signal will be sent to the system unit via data communication.
Design, fitting and operation are the same as controllers in the Danfoss EKC 202 series.

Technical data

Supply voltage	12 V a.c. ±15%, 1 VA / 12 V d.c. ±15%, 50 mA	
Sensor connection	Up to 3 identical sensors of type either Pt 1000 ohm at 0 °C, PTC 1000 ohm at 25°C Sensors with AMP plug has to be used	
Sensor cable	Max. 10 m	
Display	LED, 3 digits with 1 decimal	
Measurement range	-60 to +120°C	
Degree of accuracy	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K over +25°C
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per degree
Data communication	MOD-bus	
Enclosure	IP 10 IP 65 from front Buttons and gaskets are embedded in the front.	
Environments	0 to 55°C, during operation (-20 to 55°C by placement in the return air to evaporator) -40 to +70°C, during transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. EN 61000-6-3 and EN 61000-6-2	



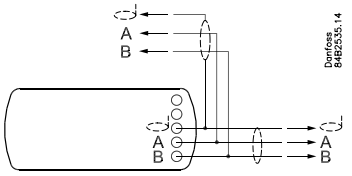
Connection



Class II ⧈

Sensor connection
eg. AKS 12
The sensor must be with AMP plug.

Power supply
If a number of EKA 153's are to be supplied from the same transformer, the polarity must be kept.
Ground **must** be connected to ground.



Data communication
MODBUS

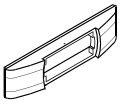
Settings

SW = 1.1x

Parameters Function	Codes	Min. value	Max. value	Factory setting	Actual setting
Normal operation					
Display of the selected temperature sensor	---	t1	t3	t1	
Thermostat					
Adjustment of temperature indication (the setting applies to all measurements)	r04	-20 K	20 K	0.0 K	
Temperature unit(°C/°F)	r05	°C	°F	°C	
Correction of the signal from sensor 1 (t1)	r41	-10 K	10 K	0 K	
Correction of the signal from sensor 2 (t2)	r42	-10 K	10 K	0 K	
Correction of the signal from sensor 3 (t3)	r43	-10 K	10 K	0 K	
Alarm					
Delay for temperature alarm	A03	0 min	240 min	30 min	
Alarm limit for t1- high temperature	A38	-50°C	50°C	50°C	
Alarm limit for t1- low temperature	A39	-50°C	50°C	-50°C	
Alarm limit for t2- high temperature	A40	-50°C	50°C	50°C	
Alarm limit for t2- low temperature	A41	-50°C	50°C	-50°C	
Alarm limit for t3- high temperature	A42	-50°C	50°C	50°C	
Alarm limit for t3- low temperature	A43	-50°C	50°C	-50°C	
Miscellaneous					
Network address	o03	0	240	0	
Access code (all settings)	o05	0	100	0	
Used sensor type (Pt /PTC)	o06	Pt	PTC	Pt	
Display step = 0.5 (normal 0.1 at Pt sensor)	o15	no	yes	no	
Service					
Temperature measured with t1 sensor	u72				
Temperature measured with t2 sensor	u73				
Temperature measured with t3 sensor	u74				

An "A" alarm or an "E" error can only appear if the setting in A38, A40 and A42, respectively, is set at a lower value than 50°C.

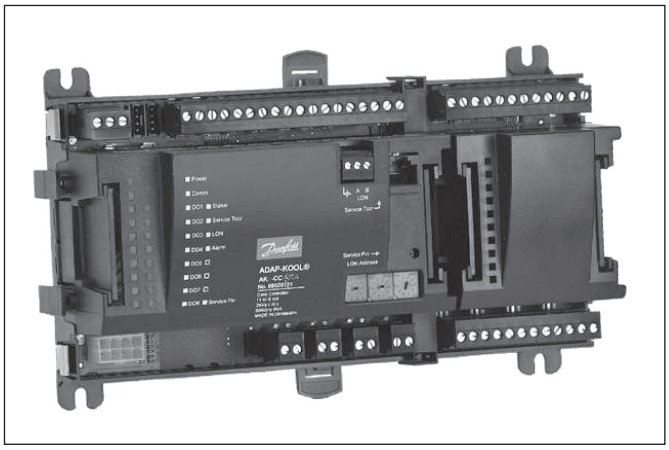
Ordering

	Type	Description	Code no.
	EKA 153	Thermometer with MODBUS	**084B8561**
	-	Display consol (to be used only with forward mounting)	**084B8584**

AKS 11 or AKS 12 temperature sensors are recommended when taking reading for the food safety log. The sensor must have an AMP plug.

Additional information:
Technical brochure: RD8CA

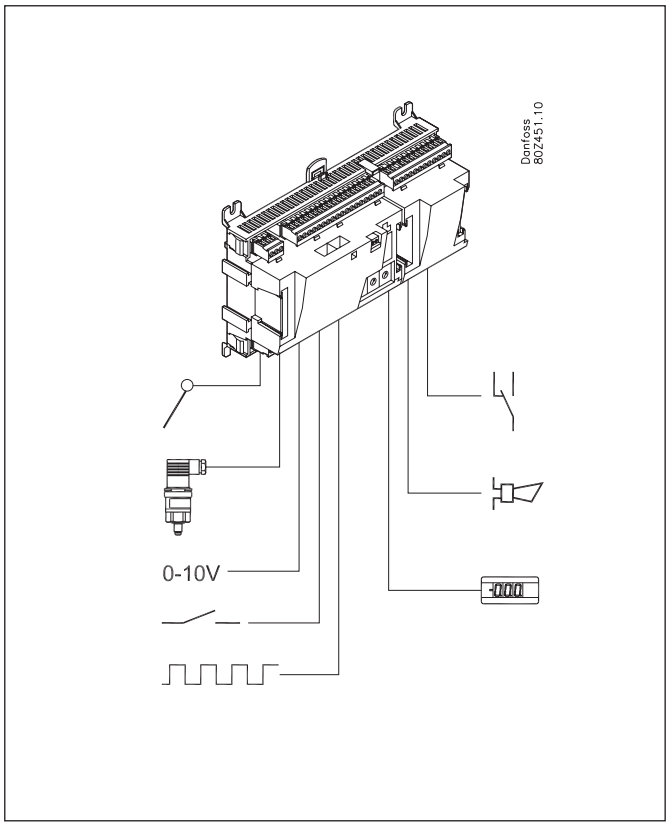
AK-LM 330



Application
AK-LM 330 is a complete monitoring unit with the option of control functions using relay contacts.
This monitoring unit is used to detect temperature, pressure, functions etc. in and around appliance cases and cold rooms for commercial and industrial cooling.
The monitoring unit has data communication support and is operated via a PC.

Functional description

Temperature
- Temperature detection
- Temperature monitoring with alarm function
- Extension of the alarm delay when a defrost signal (DI) is received
- Interruption of alarm monitoring when a switch signal (DI) is received
- Temperature control with relay function



Pressure
- Pressure detection
- Pressure monitoring with alarm function
- Pressure control with relay function

Voltage range 0–10 V
- Voltage detection
- Voltage monitoring with alarm function
- Voltage monitoring with relay function

On/off signals
- Detection of switch signals
- Alarm function with delay and relay function if applicable
- The switch signal can be inverted
- Hours counter for On time
- Counter for number of changes

Pulse signals
- Recording consumption of electricity, water, gas, etc.
- Energy reading
- Energy reading in a defined synchronisation period
- Energy reading in a period between synchronisation pulses
- Receiving synchronisation signal

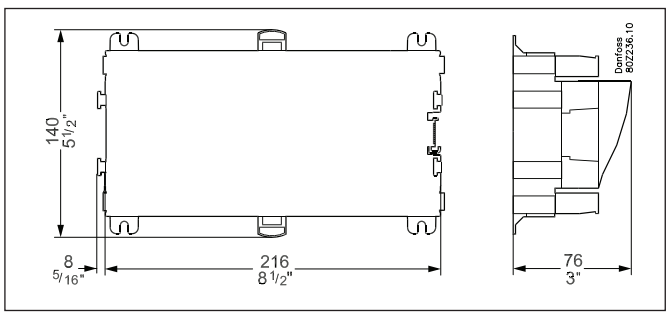
Alarm relay
- Two alarm relays that are actuated on different alarm priorities

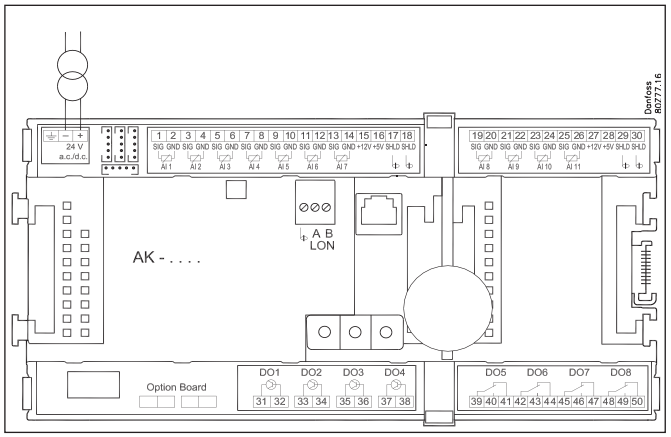
Display
- Four display connectors for readout of received signals

Data communication
- LON RS 485 bus support
- Connection to system manager or gateway
- Monitoring and data acquisition
- Customised alarm messages

Technical data

Supply voltage	24 V DC / AC ± 20%	
Power consumption	AK-LM 330	8 VA
Analog inputs	Pt 1000 ohm / 0°C	Resolution: 0.1°C Accuracy: ±0.5°C
	Pressure transmitter type AKS 32R / AKS 2050 / AKS 32 (1–5 V)	Resolution 1 mV Accuracy ±10 mV Up to five pressure transmitters can be connected to a single module.
	Other pressure transmitter: ratiometric signal Min. and max. pressure must be set Min and max. voltage must be set	
	Voltage signal 0–10 V	
	Contact function (on/off)	On when R < 20 ohm Off when R > 2 kohm (gold -plated contacts not necessary)
On/off voltage input	Low voltage 0 / 80 V a.c./d.c.	Off: U < 2 V On: U > 10 V
	High voltage 0 / 260 V a.c.	Off: U < 24 V On: U > 80 V
Relay outputs SPDT	AC-1 (resistive)	4 A
	AC-15 (inductive)	3 A
	U	Min. 24 V Max. 230 V Do not connect low-voltage and high-voltage signals to the same output group.
Solid state outputs	Can be used for loads that are switched on and off frequently, such as: rail heat, fans, AKV valve	Max. 240 V AC; min. 48 V AC Max. 0.5 A, leakage < 1 mA Max. 1 AKV
Ambient temperature	During transport	-40 to 70°C
	During operation	-20 to 55°C, 0 to 95% RH (non condensing) No shock load or vibration
Enclosure	Material	PC / ABS
	Penetration resistance	IP 10 , VBG 4
	Mounting	For mounting on panel, wall or DIN rail
Weight with screw terminals	Controller	approx. 600 g
Approvals	Compliant with EU Low Voltage Directive and EMC regulations	LVD tested according to EN 60730 EMC tested Immunity compliant with EN 61000-6-2 Emissions compliant with EN 61000-6-3
	UL 873, c UL us	UL file number: E166834 for XM UL file number: E31024 for LM





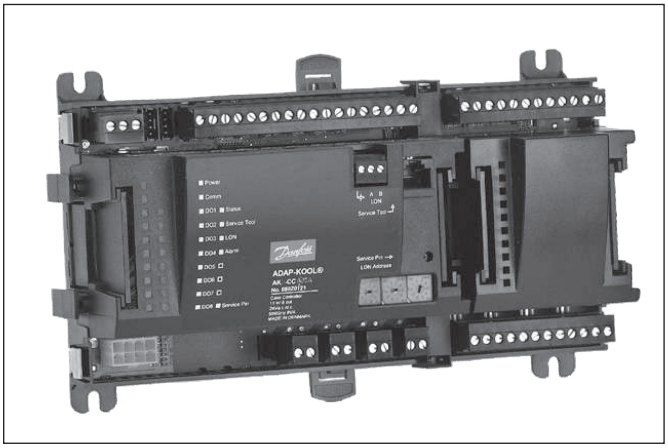
Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Ordering data

Type	Functional description	Application	Language	Code
Controller				
AK-LM 330	Monitoring unit	Monitoring of temperature, pressure, voltage, etc.	English, German, French, Italian, Dutch, Spanish, Portuguese, Danish, Russian, Polish, Czech, Chinese	**080Z0170**
Miscellaneous				
Expansion modules available for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying data such as appliance temperature.			EKC 163B, EKC 164B	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

Additional information available:
Manual: RS8FR

AK-LM 340



Application
AK-LM 340 is a complete monitoring unit with the option of regulation functions via relay switches, stepper valves, PWM outputs and voltage outputs.
The monitoring unit is used to detect temperature, pressure, functions etc. in and around appliance cases and cold rooms for commercial and industrial cooling.
The monitoring unit is equipped with data communication and is operated via a PC.

Functions

Temperature
- Temperature detection
- Temperature monitoring with alarm function
- Extension of the alarm delay when a defrost signal (DI) is received
- Interruption of alarm monitoring when a switch signal (DI) is received
- Temperature control with relay function
- Difference thermostat with relay function
- Two-sensor thermostat with relay function

Pressure
- Pressure detection
- Pressure monitoring with alarm function
- Pressostat with relay function
- Difference pressostat with relay function

Voltages of 0-10 V
- Voltage detection
- Voltage monitoring with alarm function
- Voltage monitoring with relay function

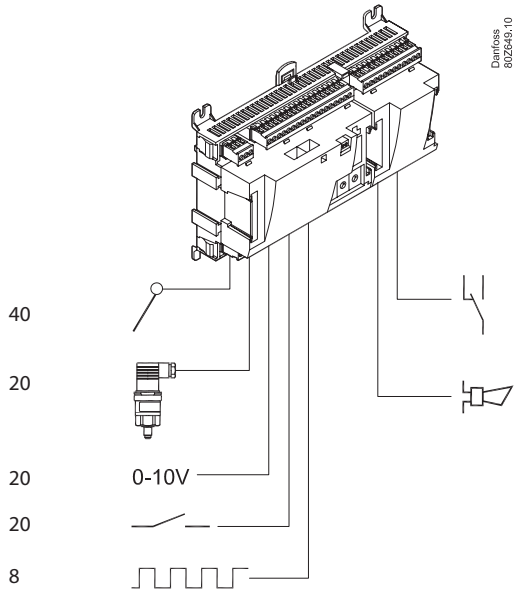
On/Off signals
- Detection of switch signals
- Alarm function with delay + relay function, if applicable
- The switch signal can be inverted
- Hour counter for On time
- Counter for number of changes

Pulse signals
- Registration of electricity, water, gas, etc.
- Energy reading

Alarm relay
- Two alarm relays that are enabled on different alarm priorities

PI regulations
- 10 separate functions can be constructed.

Data communication
- Connection to system manager or gateway
- Monitoring and data collection
- Customised alarm texts

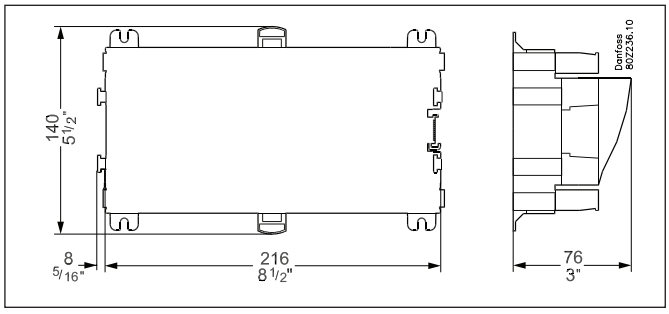


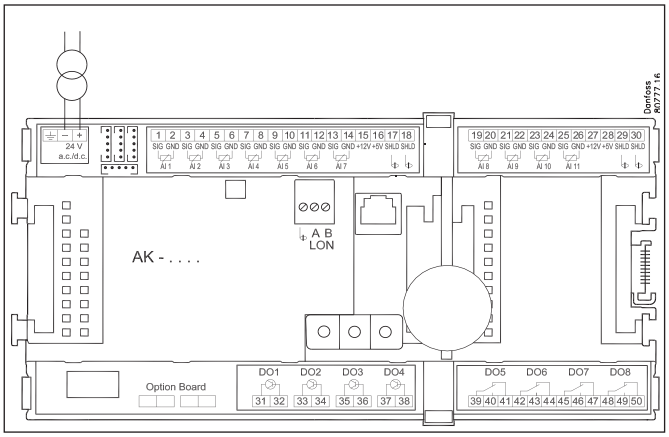
The same reading can be used by several different functions.

Up to 120 inputs and outputs are permitted.

Technical data

Supply voltage	24 V DC / AC ± 20%	
Power consumption	AK-LM 340	8 VA
Analog inputs	Pt 1000 ohm / 0°C	Resolution: 0.1°C Accuracy: ±0.5°C
	Pressure transmitter type AKS 32R / AKS 2050 / AKS 32 (1–5 V)	Resolution 1 mV Accuracy ±10 mV Up to five pressure transmitters can be connected to a single module.
	Other pressure transmitter: ratiometric signal Min. and max. pressure must be set Min and max. voltage must be set	
	Voltage signal 0–10 V	
	Contact function (on/off)	On when R < 20 ohm Off when R > 2 kohm (gold -plated contacts not necessary)
On/off voltage input	Low voltage 0 / 80 V a.c./d.c.	Off: U < 2 V On: U > 10 V
	High voltage 0 / 260 V a.c.	Off: U < 24 V On: U > 80 V
Relay outputs SPDT	AC-1 (resistive)	4 A
	AC-15 (inductive)	3 A
	U	Min. 24 V Max. 230 V Do not connect low-voltage and high-voltage signals to the same output group.
Solid state outputs	Can be used for loads that are switched on and off frequently, such as: rail heat, fans, AKV valve	Max. 240 V AC; min. 48 V AC Max. 0.5 A, leakage < 1 mA Max. 1 AKV
Ambient temperature	During transport	-40 to 70°C
	During operation	-20 to 55°C, 0 to 95% RH (non condensing) No shock load or vibration
Enclosure	Material	PC / ABS
	Penetration resistance	IP 10 , VBG 4
	Mounting	For mounting on panel, wall or DIN rail
Weight with screw terminals	Controller	approx. 600 g
Approvals	Compliant with EU Low Voltage Directive and EMC regulations	LVD tested according to EN 60730 EMC tested Immunity compliant with EN 61000-6-2 Emissions compliant with EN 61000-6-3
	UL 873,	UL file number: E166834 for XM UL file number: E31024 for LM





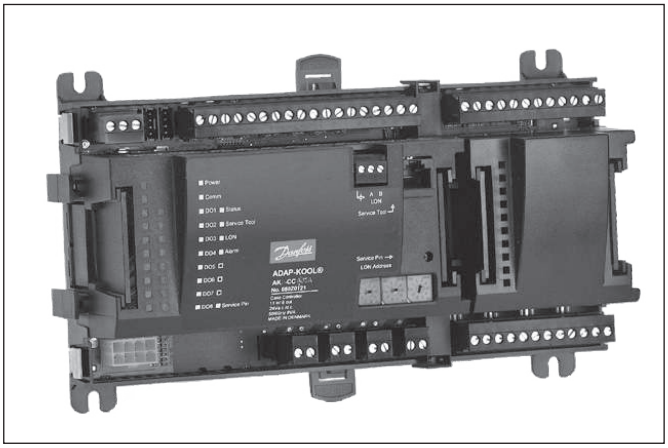
Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Ordering data

Type	Functional description	Application	Language	Code
Controller				
AK-LM 340	Monitoring unit with PI regulation	Monitoring of temperature, pressure, voltage, etc. Separate PI regulations	English, German, French, Italian, Dutch, Spanish, Portuguese, Danish, Russian, Polish, Czech, Chinese	**080Z0175**
Miscellaneous				
Expansion modules available for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

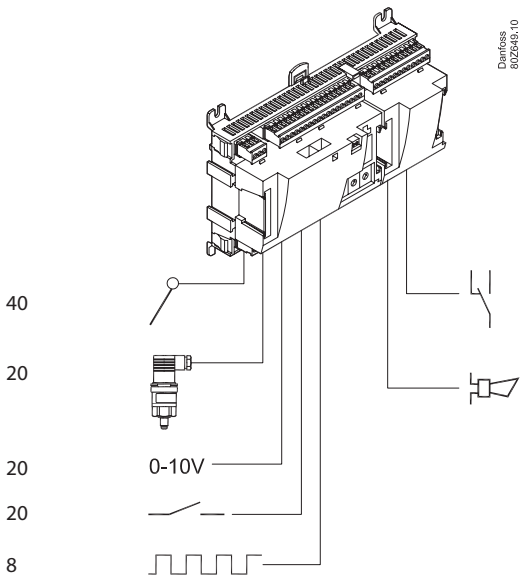
Additional information available:
Manual: RS8GV

AK-LM 350



Application
AK-LM 350 is a complete monitoring unit with the option of regulation functions via relay switches.
The monitoring unit is used to detect temperature, pressure, functions etc. in and around appliance cases and cold rooms for commercial and industrial cooling.
COP calculation can be made on the following systems:
- CO_2 booster
- CO_2 booster with heat recovery
- CO_2 booster with heat recovery and brine
- Cascade plant
- Single stage

The monitoring unit is equipped with data communication and is operated via a PC.



The same reading can be used by several different functions.

Up to 120 inputs and outputs are permitted.

Functions

Temperature
- Temperature detection
- Temperature monitoring with alarm function
- Extension of the alarm delay when a defrost signal (DI) is received
- Interruption of alarm monitoring when a switch signal (DI) is received
- Temperature control with relay function

Pressure
- Pressure detection
- Pressure monitoring with alarm function
- Pressure control with relay function

Voltages of 0-10 V
- Voltage detection
- Voltage monitoring with alarm function
- Voltage monitoring with relay function

On/Off signals
- Detection of switch signals
- Alarm function with delay + relay function, if applicable
- The switch signal can be inverted
- Hour counter for On time
- Counter for number of changes

Pulse signals
- Registration of electricity, water, gas, etc.
- Energy reading
- Energy reading in a set synchronisation period
- Energy reading in a period between synchronisation pulses
- Receiving synchronisation signal

COP calculation
- COP for MT and LT
- Etais for MT and LT
- Refrigeration capacity for MT and LT
- Heat recovery
- Heat loos
- COSP for the whole system

The COP calculation requires a 0-10 V signal that indicates how much of the compressor capacity is connected.

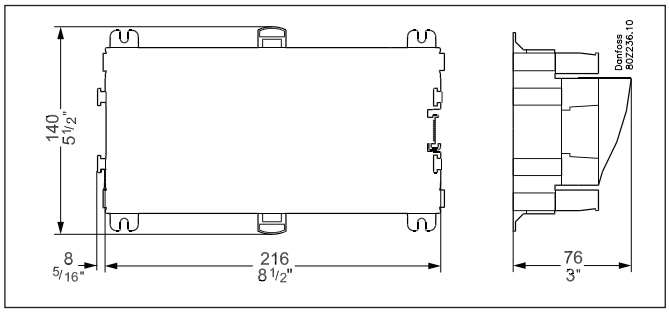
This signal can be retrieved from the compressor controller, if it is one of the following types:
AK-PC 772
AK-PC 781
AK-PC 783

Alarm relay
- Two alarm relays that are enabled on different alarm priorities

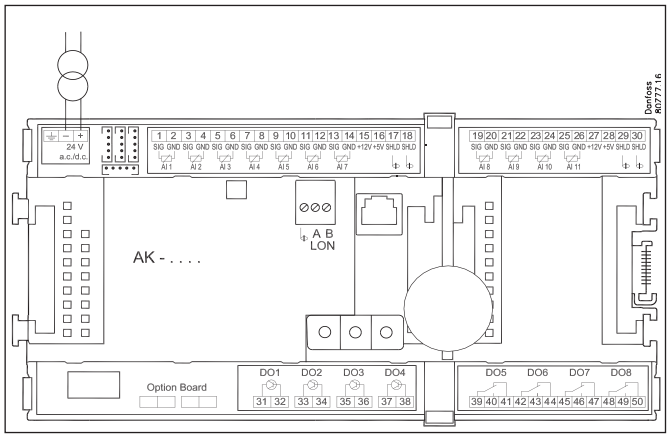
Data communication
- Connection to system manager or gateway
- Monitoring and data collection
- Customised alarm texts

Technical data

Supply voltage	24 V DC / AC ± 20%	
Power consumption	AK-LM 350	8 VA
Analog inputs	Pt 1000 ohm / 0°C	Resolution: 0.1°C Accuracy: ±0.5°C
	Pressure transmitter type AKS 32R / AKS 2050 / AKS 32 (1–5 V)	Resolution 1 mV Accuracy ±10 mV Up to five pressure transmitters can be connected to a single module.
	Other pressure transmitter: ratiometric signal Min. and max. pressure must be set Min and max. voltage must be set	
	Voltage signal 0–10 V	
	Contact function (on/off)	On when R < 20 ohm Off when R > 2 kohm (gold -plated contacts not necessary)
On/off voltage input	Low voltage 0 / 80 V a.c./d.c.	Off: U < 2 V On: U > 10 V
	High voltage 0 / 260 V a.c.	Off: U < 24 V On: U > 80 V
Relay outputs SPDT	AC-1 (resistive)	4 A
	AC-15 (inductive)	3 A
	U	Min. 24 V Max. 230 V Do not connect low-voltage and high-voltage signals to the same output group.
Solid state outputs	Can be used for loads that are switched on and off frequently, such as: rail heat, fans, AKV valve	Max. 240 V AC; min. 48 V AC Max. 0.5 A, leakage < 1 mA Max. 1 AKV
Ambient temperature	During transport	-40 to 70°C
	During operation	-20 to 55°C, 0 to 95% RH (non condensing) No shock load or vibration
Enclosure	Material	PC / ABS
	Penetration resistance	IP 10 , VBG 4
	Mounting	For mounting on panel, wall or DIN rail
Weight with screw terminals	Controller	approx. 600 g
Approvals	Compliant with EU Low Voltage Directive and EMC regulations	LVD tested according to EN 60730 EMC tested Immunity compliant with EN 61000-6-2 Emissions compliant with EN 61000-6-3
	UL 873, c UL us	UL file number: E166834 for XM UL file number: E31024 for LM



Additional information available:
Manual: RS8GX



Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Ordering data

Type	Functional description	Application	Language	Code
Controller				
AK-LM 350	Monitoring unit with COP calculation	Monitoring of temperature, pressure, voltage, etc. COP calculations	English, German, French, Italian, Dutch, Spanish, Portuguese, Danish, Finnish, Russian, Polish, Czech, Chinese	**080Z0176**
Miscellaneous				
Expansion modules available for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

System software

Introduction

ADAP-KOOL® refrigeration system controllers offer several software options for operating controllers and systems. These options are intended for use in various situations.
Many of the controllers do not have a direct operating interface, since most of them are located in inaccessible places such as below and above refrigerators or in cabinets in machine rooms. After they have been configured, there is no direct need for user interaction with these controllers. The controllers regulate the associated devices and exchange data regarding various operating conditions with the system unit via the data bus or network.
This data is available to the system software, which can process it for use in house or by external service company.
Data can be transferred to the service company by a modem (AKA gateways and AK-SM 720 only) or a TCP/IP network.
Examples of data transfer:

- Data collection with a connection with the shop during which all the acquired temperature data is transferred.
- Alarm monitoring, where the system unit sends an alarm to the defined recipient.
- Optimisation by the service company. The service companies, which are specialists in monitoring the various temperatures and functions in the shop, are experts in spotting inconsistencies. Here they can fine-tune regulation and carry out adjustments before problems arise.
- On-line measurement data. On hot summer days, the refrigeration system works especially hard – perhaps so much so that the refrigerator temperature is at the high end of the scale. Here the service company can monitor the system and adjust the control parameters hour by hour if necessary.

To download software please open your WEB browser and go to http://food-retail.danfoss.com/knowledge-center/software/adap-kool-software/

AK-ST 500
This program is intended for setting up and servicing controllers in the AK series with expansion modules.
This series has a Windows-based setup system, which simplifies the process of setting up the controller. As this controller type has a large number of functions to choose from, the software ensures that once a particular function has been chosen, the other 'non-relevant' functions are omitted from operation. In other words, during set-up the final user interface is adapted to the system in question.
The program can also be used for the remote operation of the controller via a modem or TCP/IP (not for AK-SC 255 or AK-SC 355).

AKA 65
This program is for the remote control of the AK-SC 255 system controller.
All user controls of the system controller on the front panel can be operated using AKA 65 via a modem or TCP/IP. This provides also the option of:

- a graphic system overview;
- alarm management;
- displaying log data.

RMT
The Remote Management Tool (RMT) is a PC software application that provides several useful functions in support of the Danfoss front ends (AK-SC 355 and AK-SM 800 series). With RMT it is possible to make a complete Off-line WEB programming, a program simulation, manage system graphics and to make file and software management.

Storeview desktop
Is a desktop application which emulates the WEB access. It can be used for service, monitoring and temperature and alarm recording.

AK-EM 800
The AK-EM 800 is an Enterprise Management solution for the food retail industry. The AK-EM 800 is a multi-user, multi-site server PC application that provides alarm management and automatic data collection, together with reporting features.

The AK-EM 800 can run on both a real and virtual server. Database and application can be installed on different machines, but both machines must be in the same local area network.

The AK-EM 800 can receive alarms and retrieve logs from systems where AKM is installed (where the system unit is e.g. an AK-SM 720, AKA 245, ...).
On the AKM PC, the "AKM agent" must be installed. The agent is included in the AK-EM800 installation file.
The "AKM agent" will then handle the communication between AKM section and AK-EM 800.

Overview of software programs

Application	AK-EM 800	RMT	Storeview desktop	Site service app. for mobil	AK-ST 500	AKA 65
Setup and operation of controllers in the AK series with expansion modules. Both local and remote operation					x	
PC-Software for the operation of AK-SC 255						x
PC-Software for the operation of AK-SM 820, 850 and 880 and AK-SC 355		x	x			
Program for daily use in supermarkets. Focus on simple operation, monitoring and temperature recording				x		x
Program for servicing. Focus on setup, service, monitoring, temperature recording and importing data	x		x	x (no data-logging)	x	x

AK-EM 800

Application
WEB server application for alarm management and data collection on chain level.
If more than 100 stores are linked, the control system must be 64 bit.

Function
- Alarm management. Alarm routing to several destinations
- Data logging and analysis
- Report generation with collected alarm and log data

Principle
- Server/client-based Web interface
- Graphic depiction of log data

Additional information available:
User Guide: USCO.PI.R1.G

Ordering

Type	Function	Max. no. of stores	Code no.
AK-EM 800	Enterprise manager. Alarm Management and HACCP reporting	1	**080Z4106**
		50	**080Z4100**
		250	**080Z4101**
		500	**080Z4102**
		1000	**080Z4103**

RMT — Remote Management Tool

Application
PC software for managing the system units:
AK-SM 800 series and AK-SC 355.

Function
Configuration and continuous updating of the system's functions.
Offline programming.
Build custom graphics showing current asset status.

To download software please open your WEB browser and go to http://food-retail.danfoss.com/knowledge-center/software/adap-kool-software/

Additional information available:
User Guide: USCO.PI.R1.D

SiteService App

Applicaton
Mobile App for simple operation of functions on the following front end:
AK-SM 800 series, AK-SC 255 and AK-SC 355

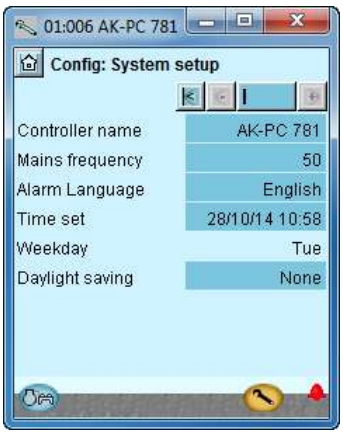
Function
The programme logs onto the system and can continuously monitor the temperature, alarms, defrosting cycles, lighting, heat, etc. It is also possible to change setpoints, start defrosts, switch off controller, etc.

Principle
App. for mobile phones.

Is available at the Apple App Store and Google Play.

Additional information available:
User Guide: DKRCE.PB.RF0.D

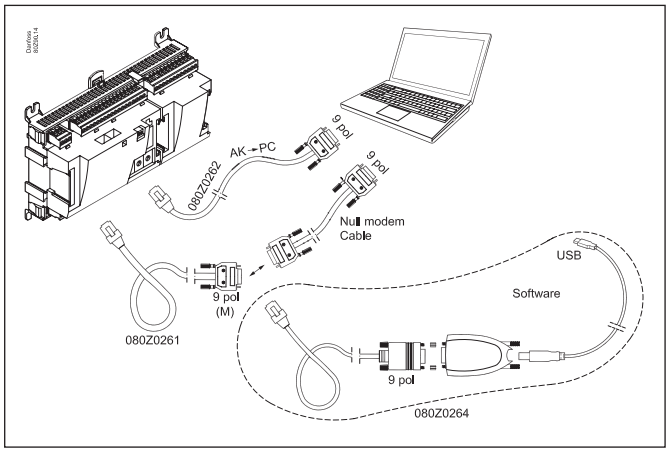
AK-ST 500



Application
Software for operation of AK controllers from the AK series AK with expansion modules:
AK-CC 750
AK-CH 650
AK-PC 730
AK-PC 772
AK-PC 781
AK-PC 783
AK-LM 330
AK-SM 720
and others

Functional description
The program is an advanced software tool for operating refrigeration controls on a network, where it acts as a sort of browser for the controllers involved since it has only one user interface.
Functions and settings are presented in a number of menus shown on the right.

Operating principle
The AK controller is connected to the PC tool installed by the program. The PC may be portable or stationary.
All settings are then set using Windows menus.



Ordering data

Type	Functional description	Application	Code
AK-ST 500	Operational software for AK controls	AK operation	**080Z0161**
-	Cable between PC and AK controller	AK - Com port	**080Z0262**
-	Cable between null modem cable and AK controller	AK - RS 232	**080Z0261**
-	Cable between PC and AK controller	AK-USB	**080Z0264**

Additional information available:
Manual: RS8ES

AKA 65

For System controller type AK-SC 255 and controllers connected to AK-SC 255
This software is used for operating the controller from a PC.

Compressor and Condenser Controllers

Introduction

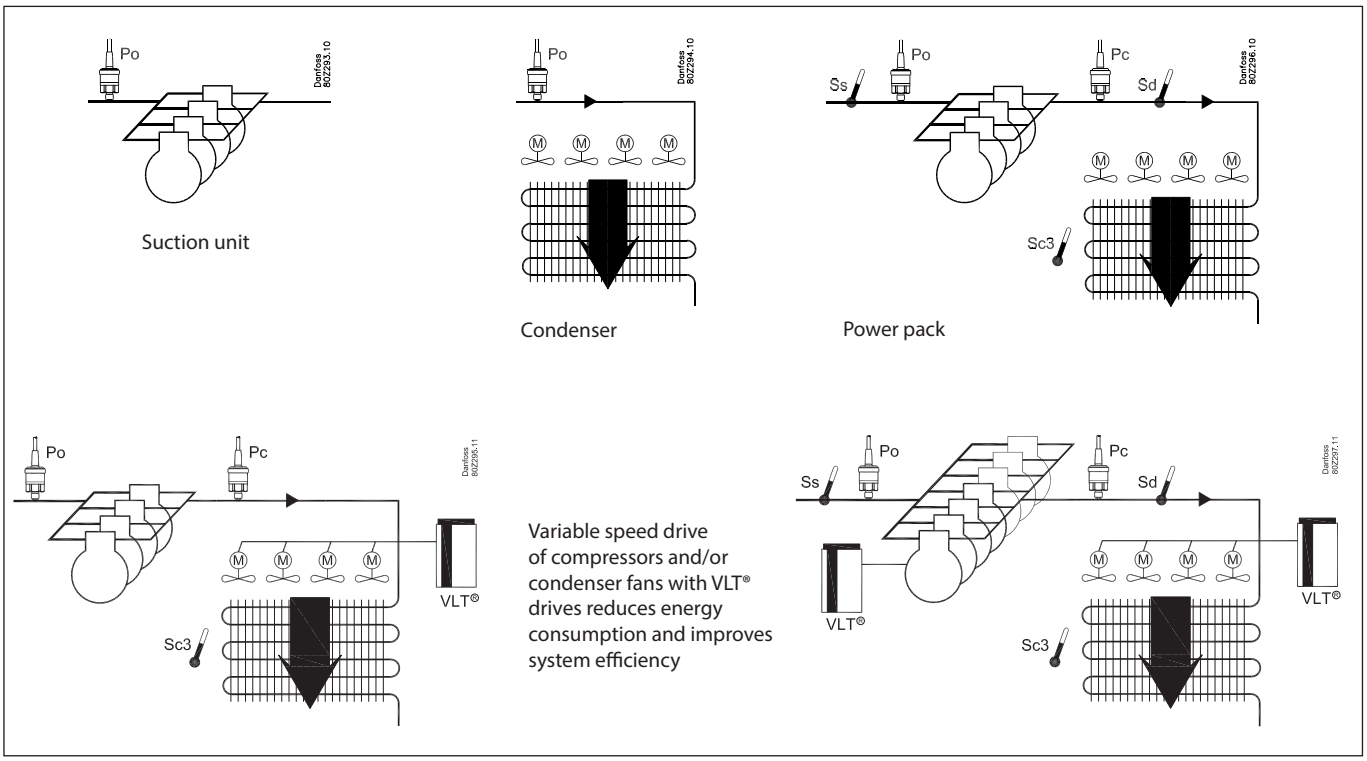
Compressor and condensers capacity controls are used in installations ranging from compact systems with only two hermetic compressors up to large power packs with multiple semi-hermetic compressors equipped with variable speed drives and unloaders.

ADAP-KOOL® pack controls offer solution levels, ranging from compressor capacity control and step/variable control with local alarm to ensure accurate control and operational reliability to advanced solutions for controlling up to 10 compressors or fans with intelligent controllers that optimise the suction and condensing pressure according to the load and outdoor temperatures. Intelligent features such as floating condensing pressure control and suction pressure optimisation are available.

Additional energy savings are achieved by using variable speed control of condenser fans and compressors and other advanced features, such as adaptive defrost, self-diagnosis, and automatic fault detection of blocked condensers. These features reduce service and maintains costs and help maximise the efficiency of refrigeration systems.

Among their many benefits, ADAP-KOOL® refrigeration control systems with full communication provide a knowledgeable and well organised diagnostic tool for remote servicing. Almost all parameters are accessible remotely. For example, signals such as 'night setback' are sent to all controllers in the network, which avoids extra installation wiring and site labour costs while ensuring optimal system operation.

Danfoss provides solutions at several different levels to support diverse applications. They ensure that when you choose a Danfoss pack controller, your refrigeration control system perfectly matches your application without being over-dimensioned or unnecessarily complex.



Comparison of controllers in this section

Capacity control

Function	Compressor and condenser						Chiller		Dry cooler
Type	AK-PC 351	AK-PC 551	AK-PC 651	AK-PC 772	AK-PC 781	AK-PC 783	AK-CH 650	AK-CH 650A	AK-PC 420
Number of outputs	6	8	15	Basic 8	Basic 8	Basic 8	Basic 8	Basic 8	10
Output extension				Up to 40	Up to 40	Up to 40	Up to 40	Up to 40	
Total number of inputs and outputs	20	26	47	Up to 120	Up to 120	Up to 120			30
Number of compressor groups	1	2	1	2	1	2	1	2	
Booster control				X					
Cascade control						X			
Number of compressor	4	8 / 2x4	10	3+2	8	4+4 / 5+3		2 x 4	
Compressor control	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	
Digital scroll	X	X	X	X					
Copeland stream 4, 1 unload	X	X	X						
Copeland stream 6, 2 unloader			X						
Bitzer CRII 4, 2 unloader		X	X						
Bitzer CRII 6, 3 unloader			X						
Control	PI	PI	PI	PI	PI	PI	PI	PI	
Control sensor, compressor	Pressure/ Temperature	Pressure/ Temperature	Pressure/ Temperature	Pressure	Pressure/ Temperature	Pressure/ Temperature	Temperature	Temperature	
Safety signal per compressor	1	1	1	Up to 6	Up to 6	Up to 6	Up to 6	Up to 6	
Night setback	X	X	X	X	X	X	X	X	
P0 - optimisation	X	X	X	X	X	X	X	X	
Load shedding		X	X	XX	XX	XX	X	X	
Oil management				equalisation	X	X			
Three-way valve control				X	XXX				X
Pump control				X	XX	X	X	X	X
Speed control of pumps								X	
Max. number of fans	4	8	8	4	8	8	8	8	6
Fan control	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed	Step / Speed
PI/P control	P / PI	P / PI	P / PI	PI	P / PI	P / PI	PI	PI	P / PI
Control sensor, condenser	Pressure/ Temperature	Pressure/ Temperature	Pressure/ Temperature	Temperature	Pressure/ Temperature	Pressure/ Temperature	Pressure/ Temperature	Pressure/ Temperature	Pressure/ Temperature
Floating condenser pressure	X	X	X	X	X	X	X	X	X
Heat recovery function		X	X	X	XX	X	X	X	X
CO_2 gas pressure control				X	X				
Condenser error monitoring				X	X	X			X
Display	X	X	X	Option	Option	Option	Option	Option	Option
Data communication	Modbus	Modbus	Modbus	LON RS485	LON RS485	LON RS485	LON RS485	LON RS485	Option
General alarm input	Max. 1	Max. 3	Max. 3	Max. 10	Max. 10	Max. 10	Max. 10	Max. 10	3
General thermostat		1	1	Max. 1	Max. 5	Max. 5	Max. 5	Max. 5	
General pressostat switch				Max. 1	Max. 5	Max. 5	Max. 5	Max. 5	
General analog input				Max. 1	Max. 5	Max. 5	Max. 5	Max. 5	

Note
Variable speed is not available with all compressors.
Check compressor data.

Gas cooler

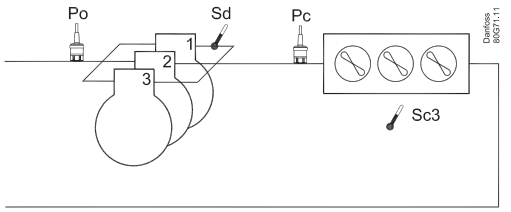
Function	EKC 326A
Regulation of gas pressure in gas coolers and systems with CO_2 refrigerant	X

AK-PC 351

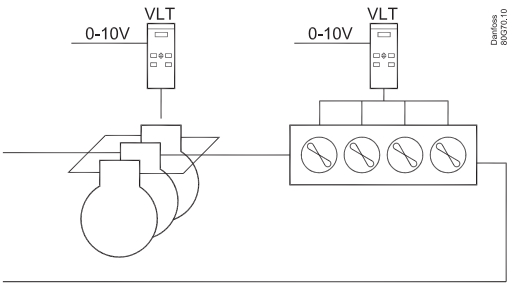
Application
The controller is used for capacity regulation of compressors and condensers in small refrigeration applications. A maximum of 4 compressors and one condenser can be regulated. For example:
- One suction group + one condenser group, max. 6 steps total
- One compressor group, max. 4 steps
- One condenser group, max. 4 steps

Advantages
- Energy savings via:
  - Optimisation of suction pressure
  - Night set back
  - Floating condensing pressure

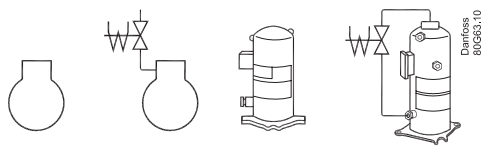
Input and output
There are a limited number of available inputs and outputs.
For each signal type, though, the following can be connected:
- Analogue inputs, max. 4 pcs.
  Signal from 2 pressure transmitters and 2 temperature sensors
- Digital inputs, max. 8 pcs.
  Signal from automatic safety control, external start stop, night signal, general alarm.
- Relay outputs, max. 5 pcs.
  Connection of compressors, condenser fans, alarm relay
- Solid state outputs, max. 1 pcs.
  Control of bypass on a digital scroll or for controlling unloader on a stream compressor. If the output is not used for this function, it can be used as ordinary relay output
- Analogue outputs, max. 2 pcs.
  Speed control of compressors and condenser fans.



Compressor types
The following types of compressor combinations can be used for regulation:
- Single-step compressors
- Speed controlled compressor together with single-step
- Digital scroll compressor together with single-step
- Stream 4 cylinder compressor together with single-step
- Compressors with an equal number of unloaders.

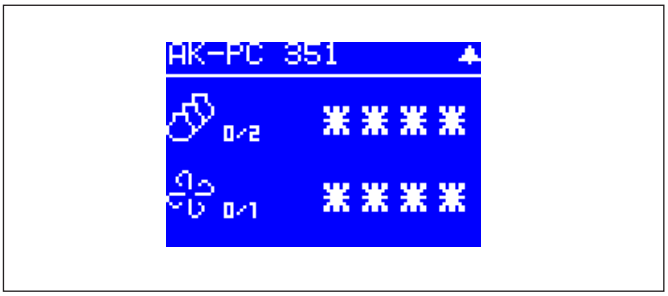


Fan control
The fans can be controlled incrementally using the controller's relays, or they can be speed-controlled via the controller's analogue output.
Speed control can be via a frequency VLT-type transformer.
If the fans have EC motors, the 0-10 V signal can be used directly.



Operation

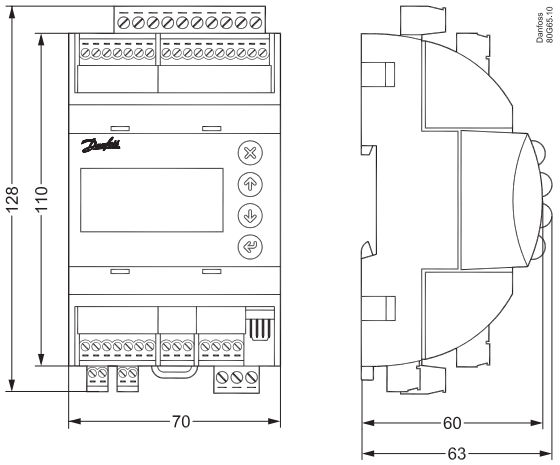
The daily operation can be set up directly on the controller. During set-up, the display images will be adjusted so that only the relevant images are opened for additional setting and end-user operation.
The operation is password protected, and three levels of access can be granted.
The controller contains several languages. Select the preferred language at start-up.



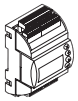
Data

Supply voltage	24 V a.c. +/-15% 50/60 Hz, 9 VA 24 V d.c. (20-60 V), 9 VA	
4 analog Input	Pressure measuring: Ratiometric pressure transmitter type AKS 32R 1-5 volt pressure transmitter type AKS 32 0-20 (4-20) mA pressure transmitter type AKS 33	
	Temperature measurement Pt 1000 ohm/0°C NTC - 86K from digital scroll / stream	
8 digital input	From contact function E.g. to: Start/stop of regulation Monitoring of safety circuits General alarm function	
Relay output to capacity control	5 pcs. SPDT (5A)	AC-1: 5 A (ohmic) AC-15: 2 A (inductive)
	1 pcs. Solid State. PWM for scroll - unload	Imax. = 0.5A Imin. = 50 mA. Leak<1.5 mA
2 Voltage outputs	0-10 V d.c. Ri = 1kohm	
Data communication	Modbus for AK-SM 800	
Environments	-20 - 60°C, During operations -40 - 70°C, During transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	
Density	IP 20	
Weight	0,2 kg	
Mounting	DIN-rail	
Connection terminals	max. 2.5 mm² multi core	
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9 EMC-tested acc. EN61000-6-2 and 3	

Mounting /Dimensions



Ordering

Type	Function	Operation		Supply voltage	Code no.
AK-PC 351	Capacity controller		With buttons and display	24 V	**080G0289**

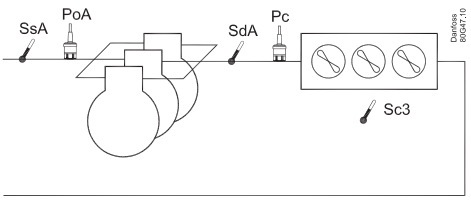
Additional information available:
Manual: RS8GZ--

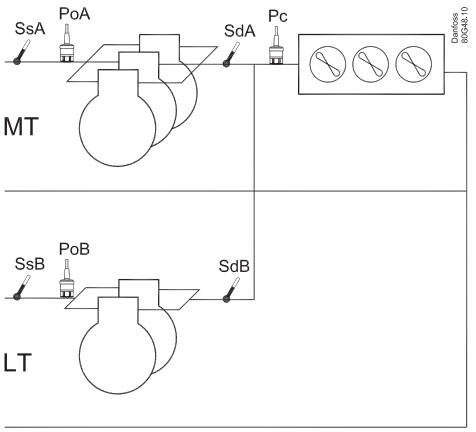
AK-PC 551

Application
The controller is used for capacity regulation of compressors and condensers in small refrigeration applications. A maximum of 8 compressors and one condenser can be regulated. For example:
- One suction group + one condenser group
- Two suction groups + one shared condenser (max. 4 + 4 steps)
- One compressor group, max. 8 steps
- One condenser group, max. 8 steps

Advantages
- Energy savings via:
  - Optimisation of suction pressure
  - Night time increase
  - Floating condensing pressure
  - Load limitation

Input and output
There are a limited number of available inputs and outputs.
For each signal type, though, the following can be connected:
- Analogue inputs, max. 8 pcs.
  Signal from pressure transmitters, temperature sensors, voltage signal, etc.
- Digital inputs, max. 8 pcs.
  Signal from automatic safety control, day/night signal, etc.
- Relay outputs, max. 6 pcs.
  Connection of compressors, condenser fans
- Solid state outputs, max. 2 pcs.
  - Control of capacity valve on a Copeland digital scroll
  - Control of unloader on a Copeland stream compressor.
  - Control of both unloaders on a Bitzer CRII
  If the outputs are not used for these functions, they can be used as ordinary relay outputs
- Analogue outputs, max. 2 pcs.
  Speed control of compressors or condenser fans.



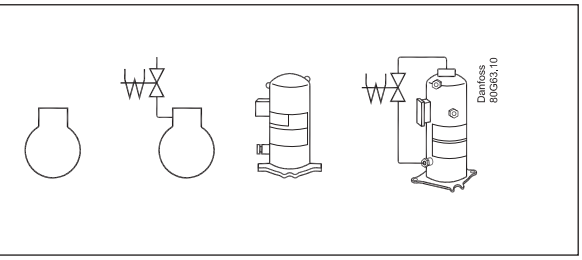


Compressor types
The following types of compressors can be used for regulation:
- Single-step compressors (one can be speed-regulated)
- Compressor with unloaders
- Scroll compressors (one can be a digital scroll)
- Copeland Stream compressor with one unloader (4 cylinders)
- Bitzer CRII compressor with two unloaders (4-cylinders)

Fan control
The fans can be controlled incrementally using the controller's relays, or they can be speed-controlled via the controller's analogue output.
Speed control can be via a frequency VLT-type transformer.
If the fans have EC motors, the 0-10 V signal can be used directly.

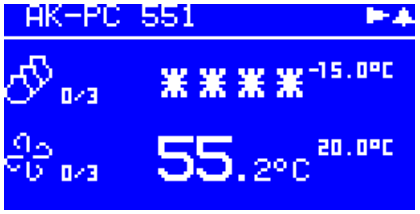
During night operation, the noise level of the fans can be kept down. This is done by limiting the cutin capacity.
For speed control, keep the number of revolutions low.
Omit step cutin for step-by-step activation.

The limitation is bypassed if safety functions Sd max. and Pc max. start to function.



Operation

The daily operation can be set up directly on the controller or via an external display device.
During set-up, the display images will be adjusted so that only the relevant images are opened for additional setting and end-user operation.
The operation is password protected, and three levels of access can be granted.
The controller contains several languages. Select the preferred language at start-up.

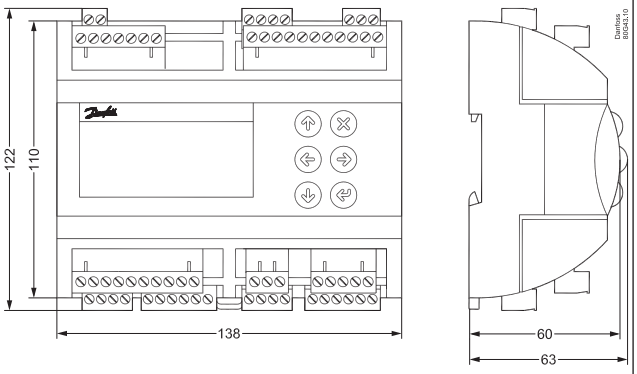


Data

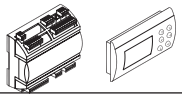
Supply voltage	24 V a.c. +/-15% 50/60 Hz, 17 VA 24 V d.c. (20-60 V), 17 VA 230 a.c. (85-265 V) 50/60 Hz, 20 VA	
8 analog Input	Pressure mesauring: Ratiometric pressure transmitter type AKS 32R 1-5 volt pressure transmitter type AKS 32 0-20 (4-20) mA pressure transmitter type AKS 33	
	Temperature measurement Pt 1000 ohm/0°C NTC - 86K from digital scroll / stream	
8 digital input	From contact function E.g. to: Start/stop of regulation Monitoring of safety circuits General alarm function	
Relay output to capacity control	4 pcs. SPDT (8A)	AC-1: 6 A (ohmic) AC-15: 4 A (inductive)
	2 pcs. SPST (16A)	AC-1: 10 A (ohmic) AC-15: 3.5 (inductive)
	2 pcs. Solid State. PWM for scroll - unload	Imax. = 0.5A Imin. = 50 mA. Leak<1.5 mA
2 Voltage output	0-10 V d.c. Ri = 1kohm Separate 24 V supply required	
Display output	For type MMIGRS2	
Data communication	Modbus for AK-SM 800	
Environments	-20 - 60°C, During operations -40 - 70°C, During transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	

Density	IP 20
Weight	0,4 kg
Mounting	DIN-rail
Connection terminals	max. 2.5 mm² multi core
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9 EMC-tested acc. EN61000-6-2 and 3 UL approval

Mounting /Dimensions



Ordering

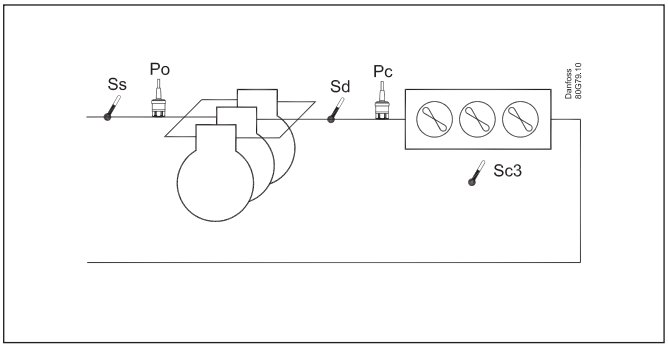
Type	Function	Operation		Supply voltage	Code no.
AK-PC 551	Capacity controller		With buttons and display	230 V	**080G0281**
				24 V	**080G0283**
			With external display and 1.5 m wire for display unit	230 V	**080G0282**
				24 V	**080G0288**
MMIGRS2	Display unit		With buttons and display	-	**080G0294**
	Wire for display unit, L = 1.5 m, 1 pcs.				**080G0075**
	Wire for display unit, L = 3 m, 1 pcs.				**080G0076**

Additional information available:
Manual: RS8GY--

AK-PC 651

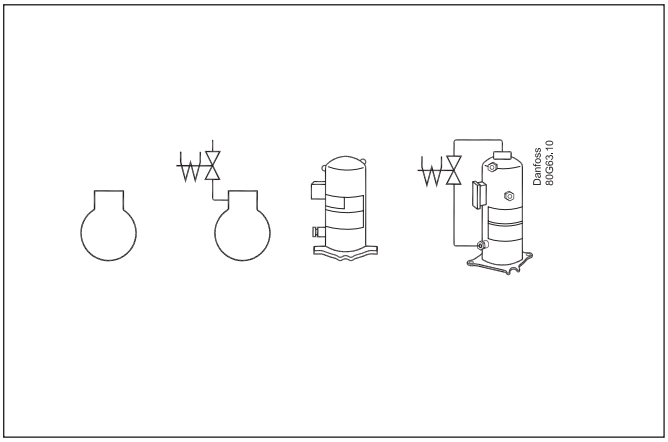
Application
The controller is used for capacity regulation of compressors and condensers in small refrigeration applications. A maximum of 10 compressors and one condenser can be regulated. For example:
- One suction group + one condenser group (max. 15 steps)
- One compressor group, max. 10 steps
- One condenser group, max. 8 steps

Advantages
- Energy savings via:
  - Optimisation of suction pressure
  - Night time increase
  - Floating condensing pressure
  - Load limitation



Input and output
There are a limited number of available inputs and outputs. For each signal type, though, the following can be connected:
- Analogue inputs, max. 10 pcs.
  Signal from pressure transmitters, temperature sensors, voltage signal, etc.
- Digital inputs, max. 18 pcs.
  Signal from automatic safety control, day/night signal, etc.
- Relay outputs, max. 13 pcs.
  Connection of compressors, condenser fans
- Solid state outputs, max. 2 pcs.
  - Control of capacity valve on a Copeland digital scroll
  - Control of unloaders on a Copeland stream compressor.
  - Control of unloaders on a Bitzer CRII Ecoline compressor

  If the outputs are not used for these functions, they can be used as ordinary relay outputs
- Analogue outputs, max. 4 pcs.
  Speed control of compressors or condenser fans.



Compressor types
The following types of compressor combinations can be used for regulation:
- Several single-step compressors
- One speed controlled compressor + single-step compressors or multi -step compressors
- One Digital scroll compressor + single-step compressors or multi -step compressors
- One Copeland Stream Compressor (4 or 6 cylinders) + single-step or multi-step compressors
- Bitzer CRII compressor (4 or 6 cylinders) + single-step or multi-step compressors
- One multi-step compressor + single-step compressors
- Several multi-step compressors with the same number of unloaders

In the combinations where the first compressor is different from the others, it may be of a different size than the subsequent single-stage compressors.

Fan control
The fans can be controlled incrementally using the controller's relays, or they can be speed-controlled via the controller's analogue output.

Speed control can be via a frequency VLT-type transformer.
If the fans have EC motors, the 0-10 V signal can be used directly.

During night operation, the noise level of the fans can be kept down. This is done by limiting the cutin capacity.
For speed control, keep the number of revolutions low.
Omit step cutin for step-by-step activation.

The limitation is bypassed if safety functions Sd max. and Pc max. start to function.

Operation

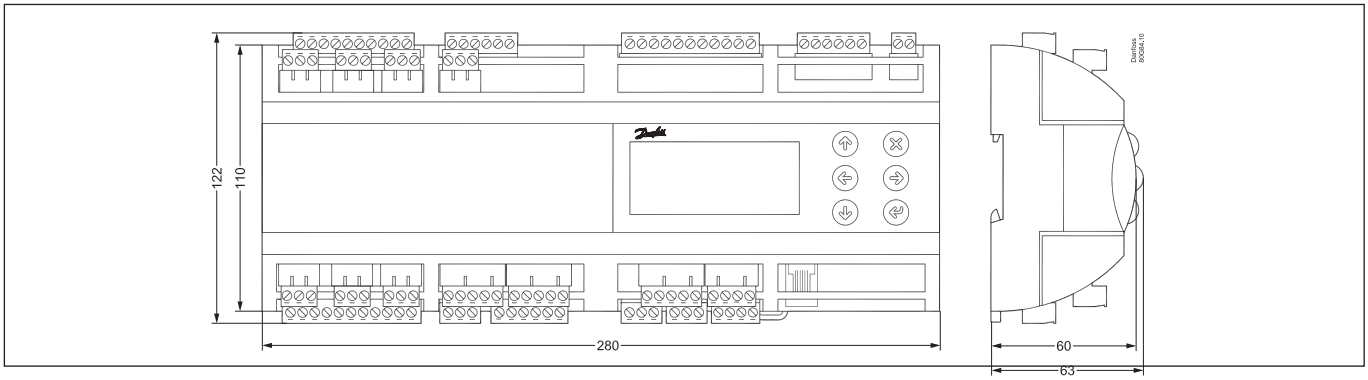
The daily operation can be set up directly on the controller or via an external display device.
During set-up, the display images will be adjusted so that only the relevant images are opened for additional setting and end-user operation.
The operation is password protected, and three levels of access can be granted.
The controller contains several languages. Select the preferred language at start-up.

Technical data

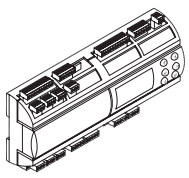
Supply voltage	230 a.c. (85-265 V) 50/60 Hz, 26 VA	
10 analog Input	Pressure meauring: Ratiometric pressure transmitter type AKS 32R 1-5 volt pressure transmitter type AKS 32 0-20 (4-20) mA pressure transmitter type AKS 33	
	Temperature measurement Pt 1000 ohm/0°C NTC - 86K from digital scroll / stream	
18 digital input (14 for low voltage + 4 for high voltage or low voltage)	From contact function E.g. to: Start/stop of regulation Monitoring of safety circuits General alarm function	
15 Relay output to capacity control	7 pcs. SPST (8A)	AC-1: 6 A (ohmic) AC-15: 4 A (inductive)
	4 pcs. SPDT (8A)	AC-1: 6 A (ohmic) AC-15: 4 (inductive)
	2 stk. SPDT (16A)	AC-1: 7 A (ohmic) AC-15: 3,5 (inductiv)
	2 pcs. Solid State. PWM for unloader valves	Imax. = 0.5A Imin. = 50 mA. Leak<1.5 mA

4 Voltage output	0-10 V d.c. Ri = 1kohm Separate 24 V supply required
Display output	For type MMIGRS2
Data communication	Modbus for AK-SM 800
Environments	-20 - 60°C, During operations -40 - 70°C, During transport
	20 - 80% Rh, not condensed
	No shock influence / vibrations
Density	IP 20
Weight	0,8 kg
Mounting	DIN-rail
Connection terminals	max. 2.5 mm² multi core
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9 EMC-tested acc. EN 61000-6-2 and 3

Mounting /Dimensions

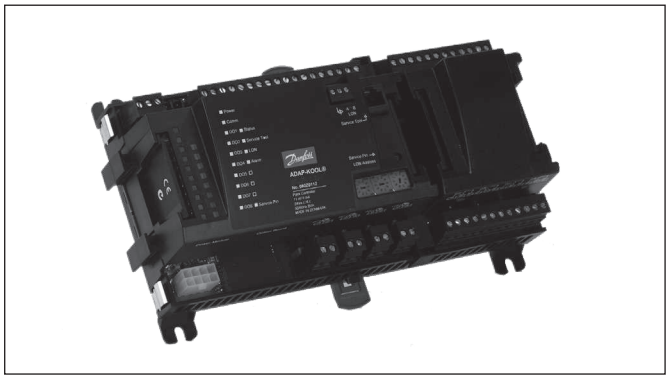


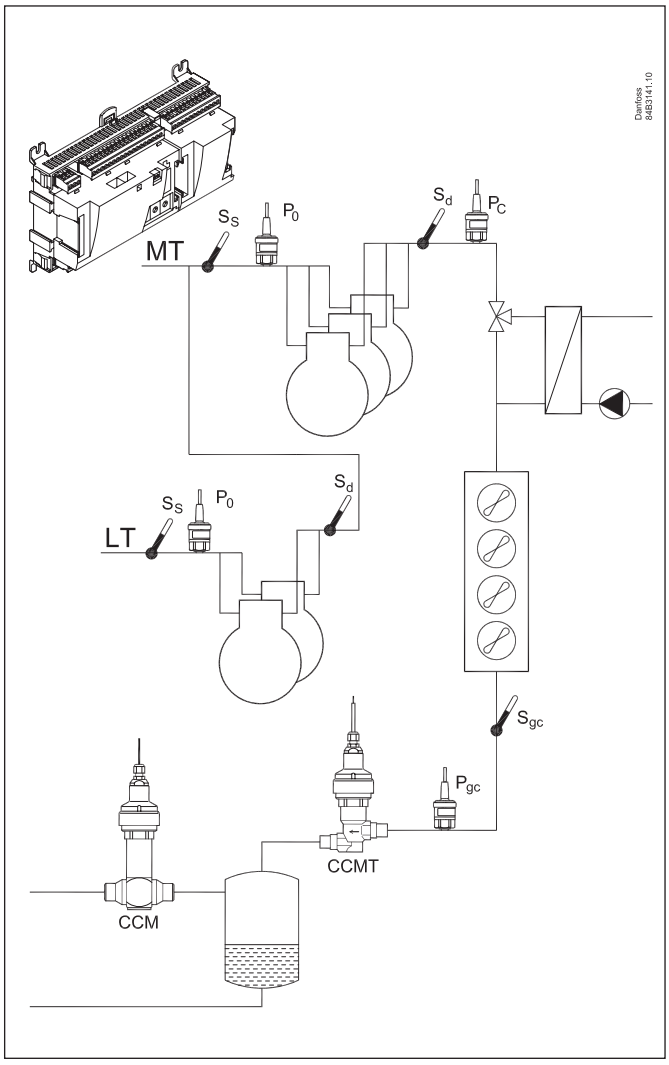
Ordering

Type	Function	Operation		Supply voltage	Code no.
AK-PC 651	Capacity controller		With buttons and display	230 V	**080G0312**
MMIGRS2	Display unit		With buttons and display	-	**080G0294**
	Wire for display unit, L = 1.5 m, 1 pcs.				**080G0075**
	Wire for display unit, L = 3 m, 1 pcs.				**080G0076**

Additional information available:
Manual: RS8HA--

AK-PC 772





Application

AK-PC 772 is complete regulating units for capacity control of compressors and gas cooler in a small CO_2 booster systems. The controller is with oil management, heat recovery function and CO_2 gas pressure control.

In addition to capacity control the controllers can give signals to other controllers about the operating condition, e.g. forced closing of expansion valves, alarm signals and alarm messages.

The controller's main function is to control compressors and gas cooler so that operation all the time takes place at the energy-optimum pressure conditions. Both suction pressure and gas pressure are controlled by signals from pressure transmitters and temperature sensors.

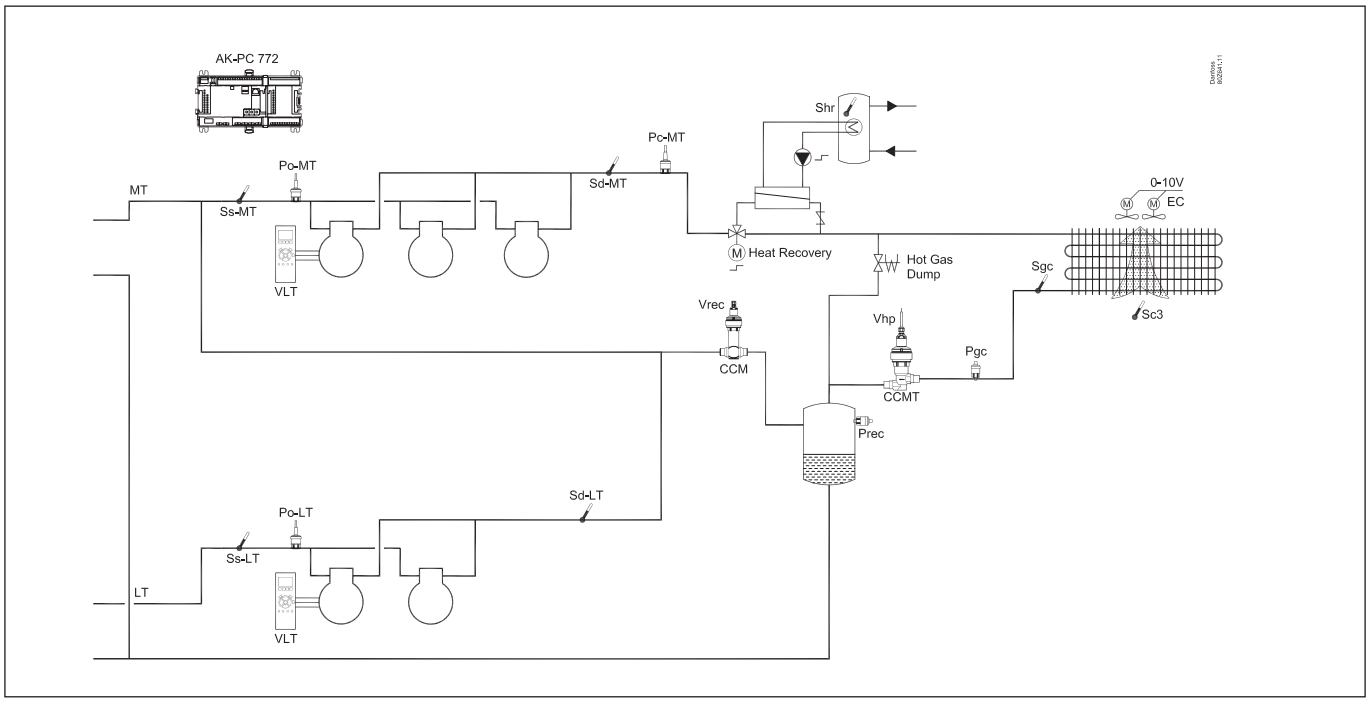
Advantage

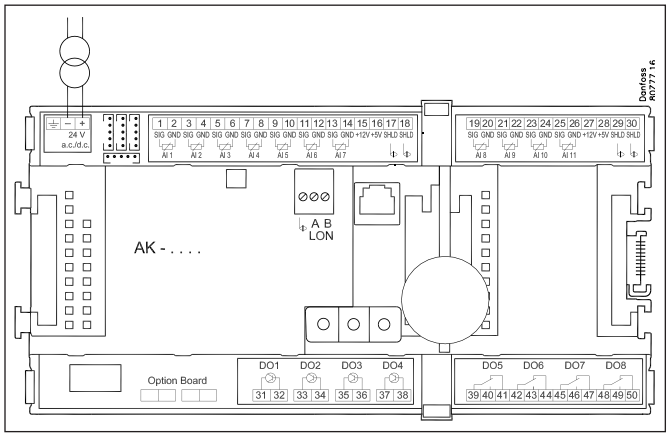
- Adapted apply to CO2 systems
- Gas pressure control
- Receiver control
- Heat recovery for tap water
- Coordination between high and low pressure adjustments
- Option for parallel compression

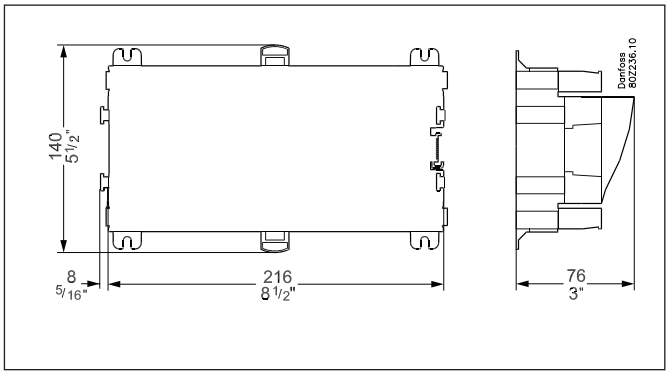
Function

- Capacity control of up to 3 compressors on high pressure (2 if adjusted with parallel compression)
- Capacity control of high-pressure group alone. Here, the receiver control and pressure control must be active
- Capacity control of up to 2 compressors on low pressure
- Capacity control of up to 4 fans
- Up to 3 unloaders for each compressor
- Speed control of one or two compressors
- Up to 6 safety inputs for each compressor
- Option for capacity limitation to minimize consumption peaks
- When the compressor does not start, signals can be transmitted to other controllers so that the electronic expansion valves will be closed
- Control of liquid injection into suction line
- Safety monitoring of high pressure / low pressure / discharge temperature
- Floating reference with regard to outside temperature
- Additional cooling capacity (extra compressor). The function will raise the pressure in the gas cooler when the cut-in compressor capacity was 100% for more than 5 minutes.

Example





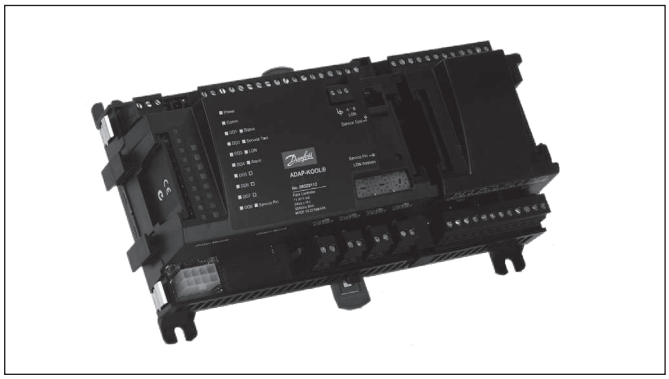


Ordering

Type	Function	Application	Language	Code no.
AK-PC 772	Controller for capacity control of compressors and condensers. With high pressure control	A small CO2 plant with booster	English, German, French, Dutch, Italian	**080Z0200**
Miscellaneous				
Extension modules for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying variables such as suction pressure			EKA 163B, EKA 164B, AK-MMI	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

Additional information available:
Manual: RS8GU--

AK-PC 781

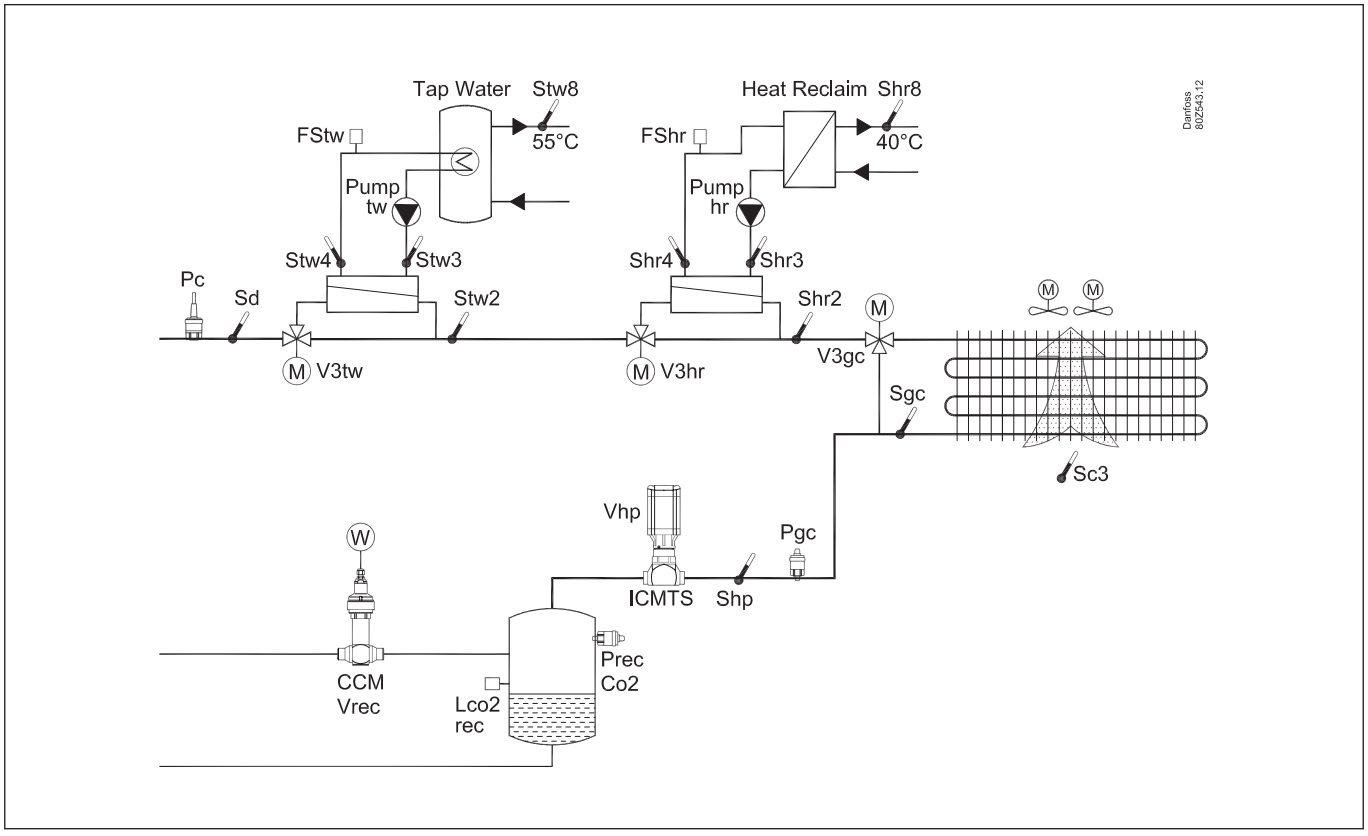


Application
The AK-PC 781 is a complete regulating unit for capacity control of compressors and condensers in refrigeration systems.
The controller uses oil management, heat recovery functions and CO_2 gas pressure control.

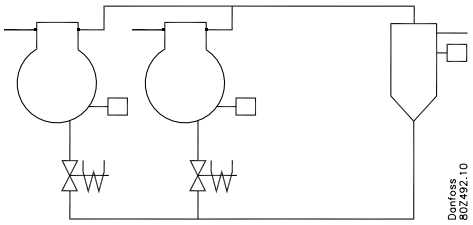
Advantages
- Integrated oil management
- Suitable for use in CO_2 systems
- Gas pressure control
- Receiver control
- Option for paralle compression

Function
- Capacity regulation of up to 8 compressors
- Capacity regulation of up to 8 fans
- shared or individual control of all oil valves
- control of oil separators
- heat recovery for tap water
- heat recovery for space heating
- control of gas cooler
- receiver pressure control

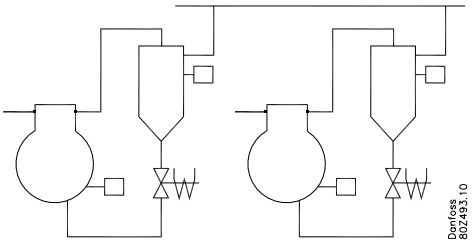
CO_2
When the refrigerant in the system is CO_2, the higher pressure and temperature make it possible to recover heat for tap water and heating. The excess heat is removed using a gas cooler.
Regulation is carried out during transcritical and subcritical states and the controller will control the gas pressure/condensing pressure so that the system achieves the optimum COP when the recovered heat is taken into account.



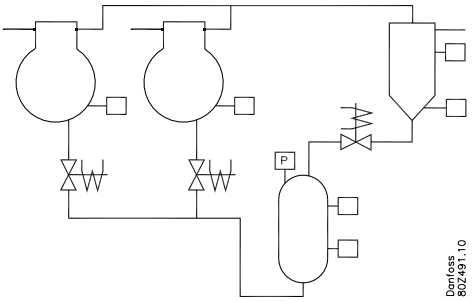
Example oil management:



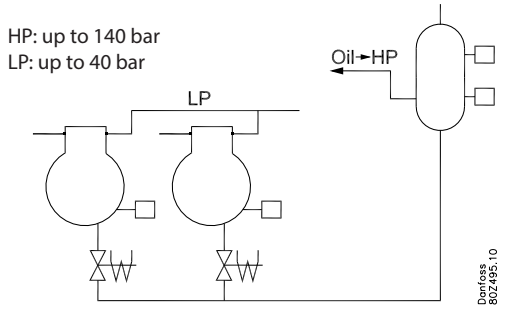
Shared separator for several compressors



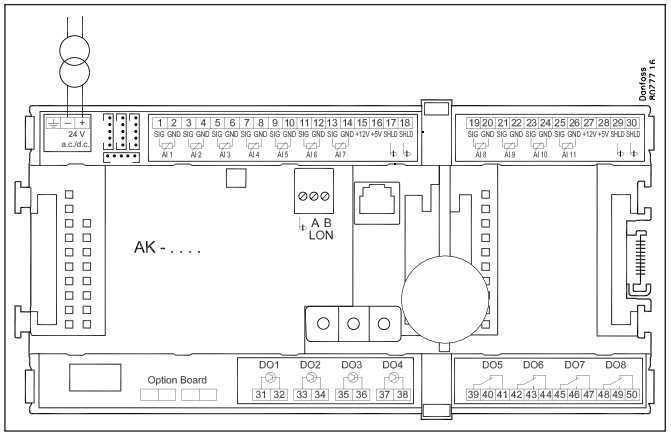
One separator per compressor

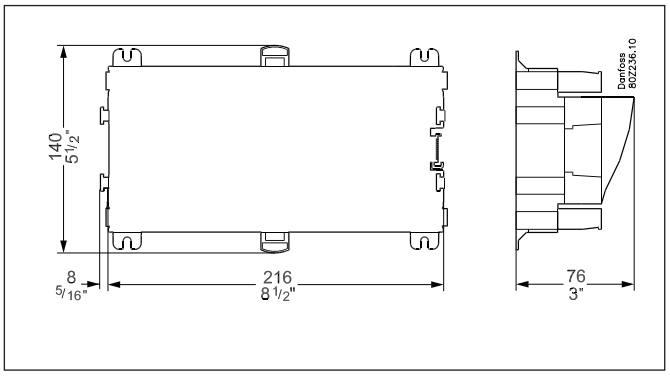


Shared separator for several compressors and receiver control



Receiver control with HP and LP circuits



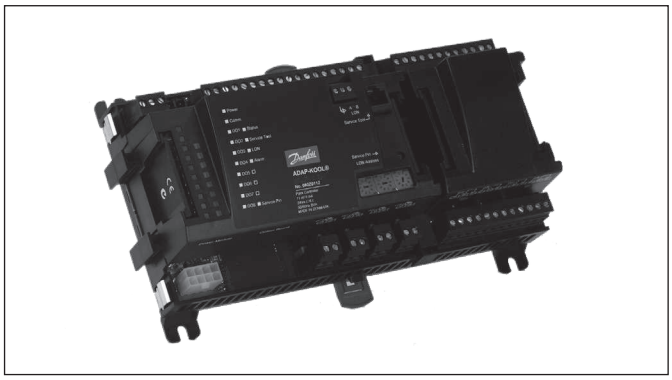


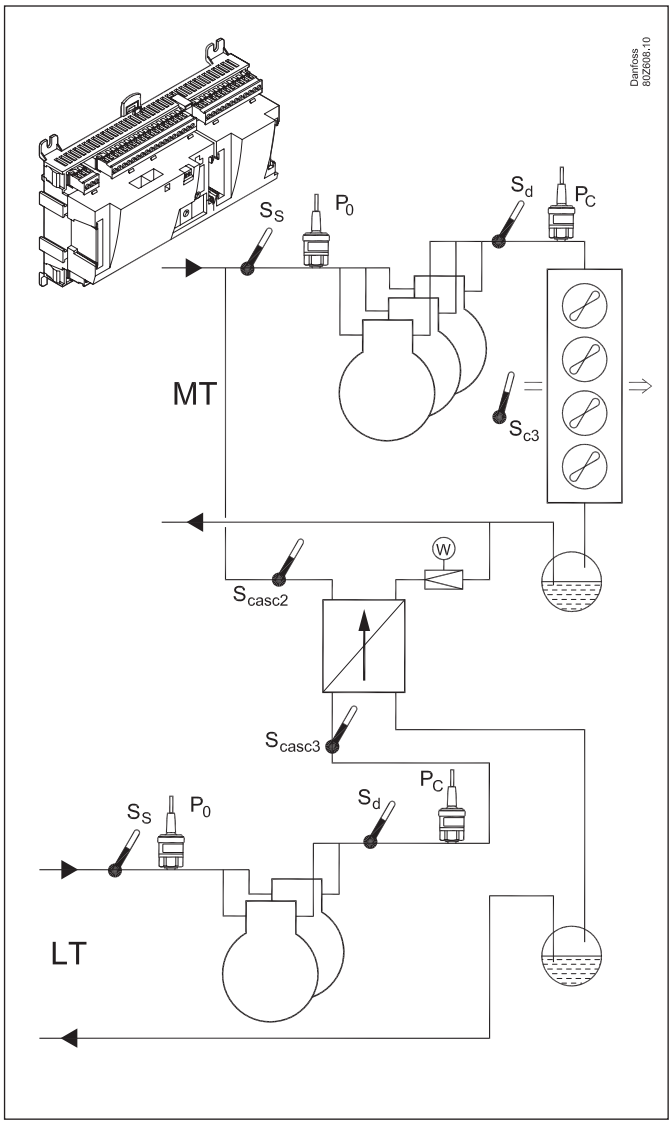
Ordering

Type	Functional description	Application	Language	Code no.
AK-PC 781	Controller for capacity control of compressors and condensers With oil management	Up to 8 compressors, 8 fans, and 120 inputs and outputs	English, German, French, Italian, Dutch, Spanish, Portuguese, Danish, Finnish, Russian, Czech, Polish, Chinese	**080Z0186**
Miscellaneous				
Extension modules for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying variables such as suction pressure			EKA 163B, EKA 164B, MMIGRS2	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

Additional information available:
Manual: RS8GG--

AK-PC 783





Application

AK-PC 783 is complete regulating units for capacity control of compressors and condensers in refrigeration plants with cascade function.

The controller controls the high-pressure circuit, low-pressure circuit and cascade circuit.

The controller is with oil management, simple heat recovery function and coordination between the high-pressure control and low-pressure control.

In addition to capacity control the controllers can give signals to other controllers about the operating condition, e.g. forced closing of expansion valves, alarm signals and alarm messages.

The controller's main function is to control compressors and condensers so that operation all the time takes place at the energy-optimum pressure conditions. Both suction pressure and condensing pressure are controlled by signals from pressure transmitters.

Capacity control is carried out by suction pressure P0 on the two circuits.

Cascade control is performed in accordance with the two temperature sensors, Scasc2 and Scasc3.

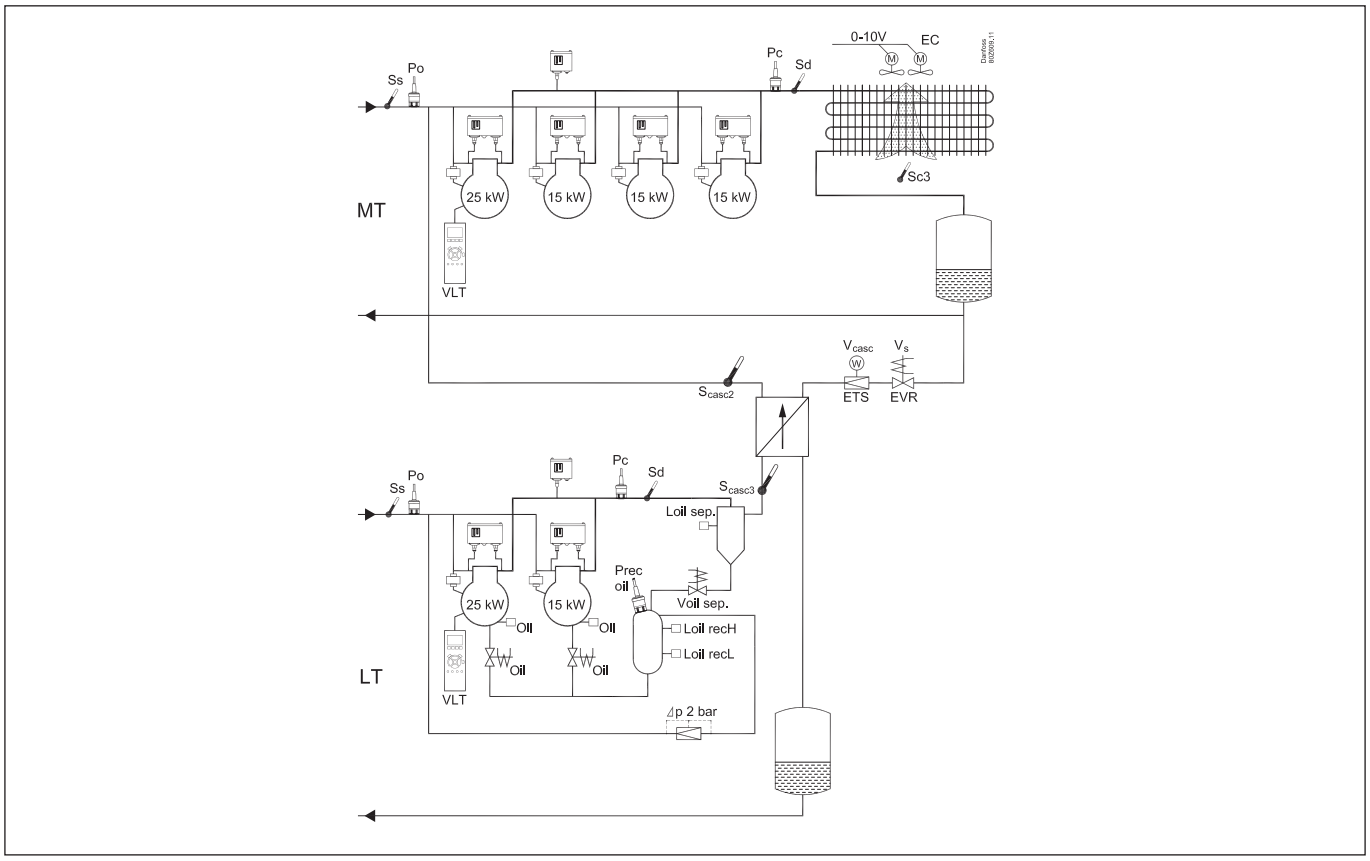
Advantage

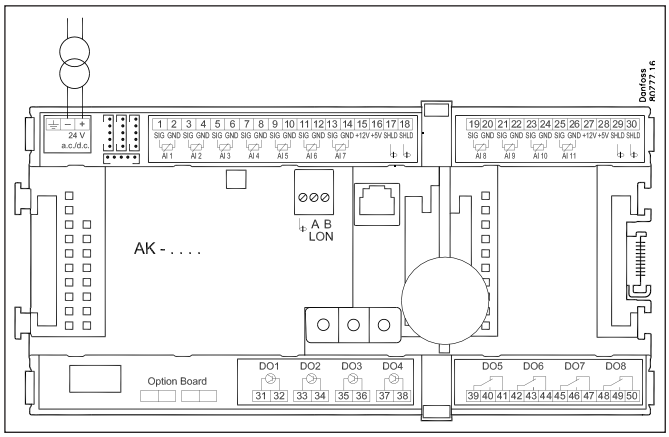
- Cascade control
- Control of CO_2 pump system
- Coordination between high and low pressure controls
- Heat recovery function

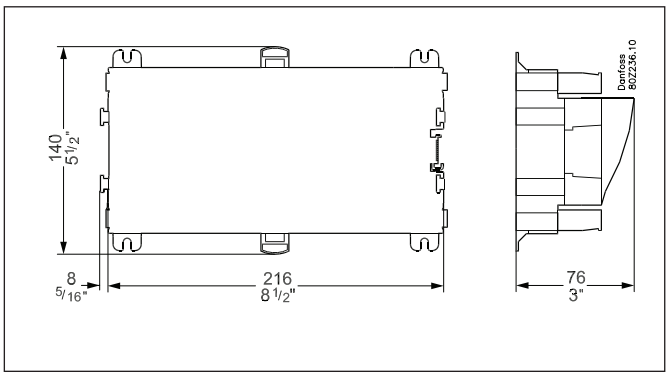
Function

- Capacity control of up to 8 compressors (Max. 4 on each circuits or 5 on MT + 3 on LT)
- Up to 3 unloaders for each compressor
- Speed control of one or two compressors
- Up to 3 screw compressors
- Digital scroll compressor
- Oil equalisation function on MT circuit
- Oil management. Either shared or individual for all of the compressor's oil valves in the LT circuit. Receiver pressure control.
- Up to 6 safety inputs for each compressor
- Option for capacity limitation to minimize consumption peaks
- Capacity control of up to 8 fans on the condenser
- Control of fans with EC motors
- Safety monitoring of fans
- When the compressor does not start, signals can be transmitted to other controllers so that the electronic expansion valves will be closed
- Control of liquid injection into suction line
- Control of liquid injection into screw compressor
- Control of liquid injection in heat exchanger (cascade)
- Safety monitoring of high pressure / low pressure / discharge temperature
- Floating reference with regard to outside temperature
- Plus some completely separate functions that are totally independent of the regulation – such as alarm, thermostat ,pressure and PI-regulating functions.

Example





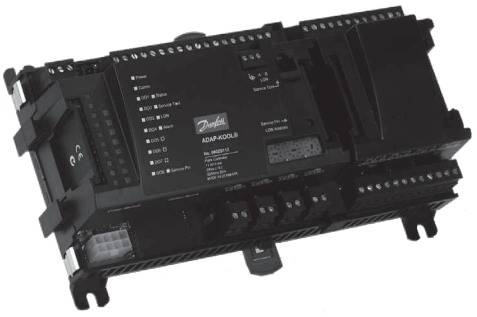


Ordering

Type	Functional description	Application	Language	Code no.
AK-PC 783	Controller for capacity control of MT compressors, condensers, LT compressors and cascade heat exchangers. With oil management	Capacity control on cascade plant	English, German, French, Italian, Dutch, Spanish, Portuguese,	**080Z0196**
Miscellaneous				
Extension modules for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying variables such as suction pressure			EKA 163B, EKA 164B, AK-MMI	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

Additional information available:
Manual: RS8GN--

AK-CH 650 / AK-CH 650A

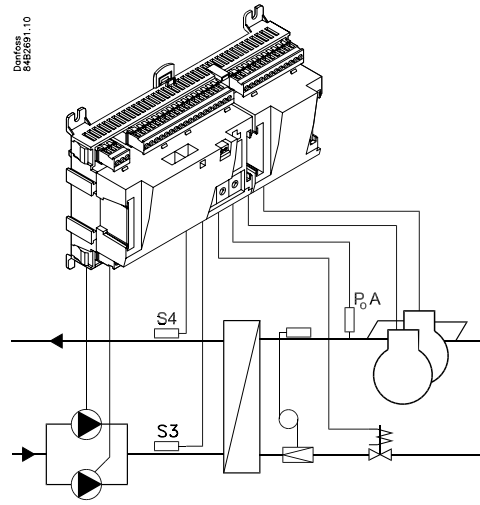


Application
The AK-CH 650 is used to control chiller capacity.
The AK-CH 650A is for chiller control with two suction groups.
This controller can regulate compressors, fans, pumps, defrosting sequences, and heat exchanger injection start/stop.
(AK-PC 420 is recommended if complete dry refrigeration control is required, including a three-way valve for the condenser.)

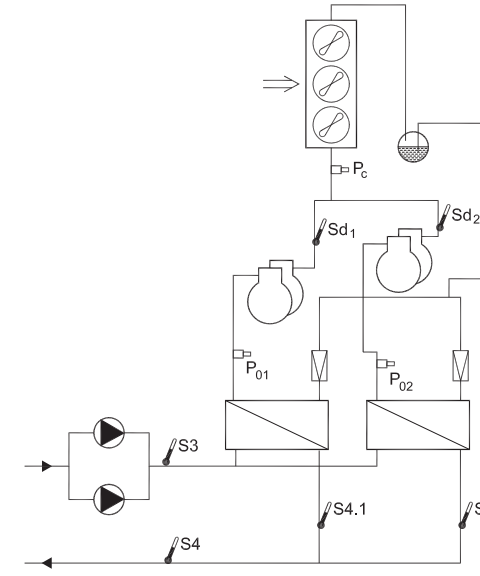
Advantages
- Optimisation of charge temperature for the most heavily loaded refrigeration area
- Condenser optimisation with regard to ambient temperature
- Versatile hardware platform with extension modules
- Fast set-up using predefined configurations

Control
- The compressor capacity is controlled by the charge temperature S4. The reference level can be overridden by a day/night signal, an external 0–10 V signal or a temperature signal, or it can be optimised automatically for the most heavily loaded refrigeration area.
- The fan capacity is controlled by the condensing pressure Pc or the media temperature S7 (dry refrigeration). The reference can be optimised according to the ambient temperature and altered for heat recovery.
- The Ss and Sd sensors are used to monitor overheating of the suction pipe and pressure pipe temperatures.

Additional functions
- Control of up to 6 compressors. (A-version 2 x 4 pcs)
- Compressors of the same or different sizes
- Speed control of one or two compressors
- Equalisation of compressor operating hours
- Anti-cycling timers for individual compressors
- Up to six safety inputs per compressor
- Compressor capacity limits via two digital inputs
- Step or speed control of up to eight fans
- AK-CH 650A can speed control the pumps
- Fan monitoring
- Injection start/stop signal for heat exchangers
- Control and monitoring of two twin pumps with automatic rotation
- Defrost control governed by an internal schedule, digital input, or network signal
- Defrost stop governed by temperature and/or time
- Alarm monitoring of low suction pressure P0 (frost protection), high condensing pressure, and high brine temperature.
- Monitoring for external frost protection
- Five digital inputs for alarm monitoring
- Five thermostats and pressure switches for control and/or monitoring
- Five 0–10 V d.c. voltage inputs for signal monitoring



AK-CH 650



AK-CH 650A

Example:

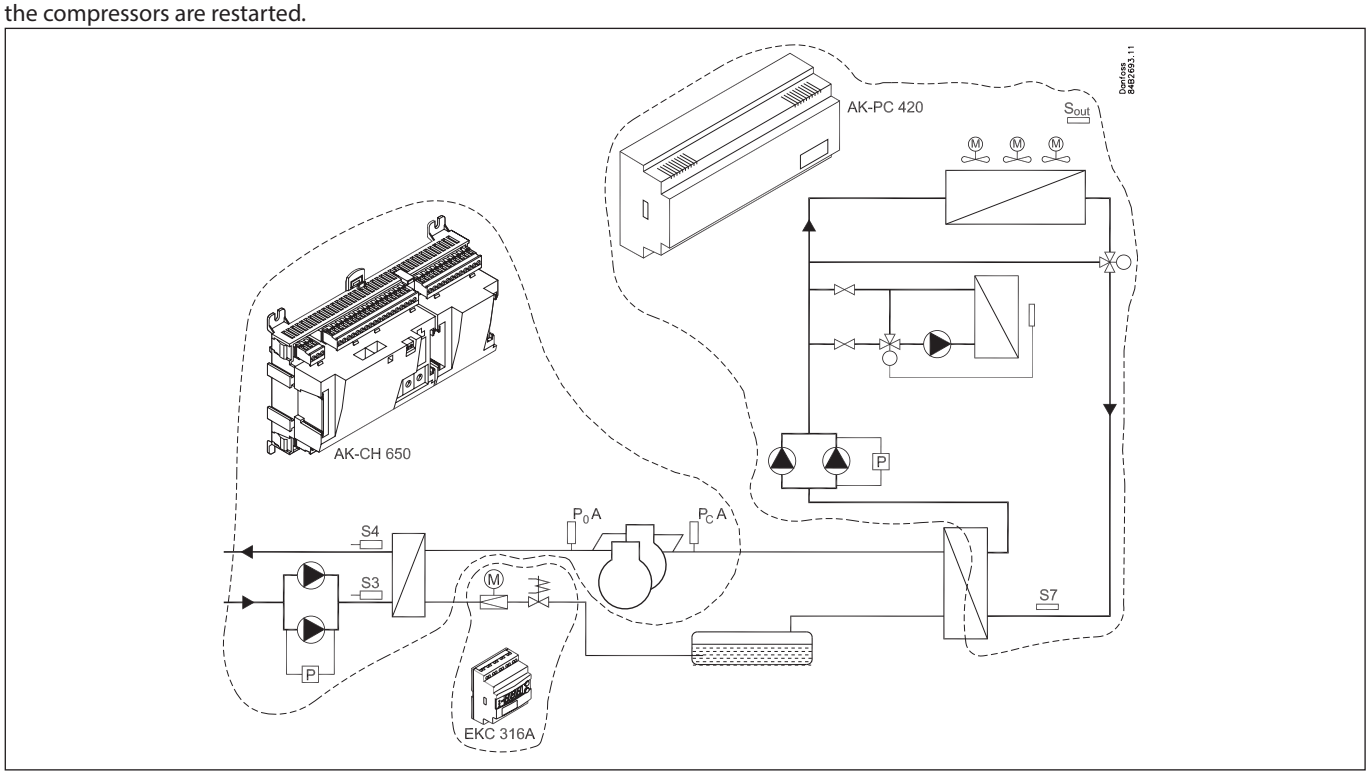
Compressors
The compressor capacity is controlled by charge temperature S4 and suction pressure P0 for frost protection.
Three compressors are used, with speed control of the first compressor. Pc is used for high pressure monitoring.

Pumps
Two twin pumps operated in time-based rotation. The pumps are monitored by a differential pressure switch. If a pump fault occur, the controller switches automatically to the other pump.

Defrosting
For defrosting, the compressors are stopped and the connected refrigeration areas are defrosted by brine circulation. Defrosting is stopped at the S3 temperature, followed by a drip-off delay before the compressors are restarted.

Condenser / dry cooler
The AK-PC 420 is used for:
- Fan speed control
- Three-way valve control
- Pump control
- Heat recovery control
- Capacity control using the condensing pressure signal Pc

Injection
The EKC 316A is used for optimum control of superheating. This is an expansion valve with a stepper motor.

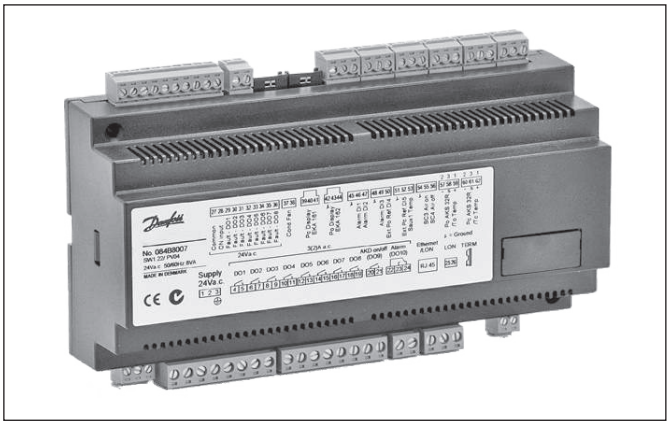


Ordering data

Type	Functional description	Application	Language	Code
AK-CH 650	Controller for capacity control of compressors and condensers	Water chiller controller	English, German, French, Italian, Dutch	**080Z0131**
			English, Spanish, Portuguese	**080Z0132**
			English, Danish	**080Z0133**
AK-CH 650A		Water chiller control of 2 suction groups	English, German, French, Italian, Dutch	**080Z0136**
			English, Danish, Finnish	**080Z0138**
Miscellaneous				
Extension modules for additional connections				**See Accessories Accessories - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying variables such as suction pressure			EKA 163B, EKA 164B	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

Additional information available:
AK-CH 650: Manual: RS8ER
AK-CH 650A: Manual: RS8GK

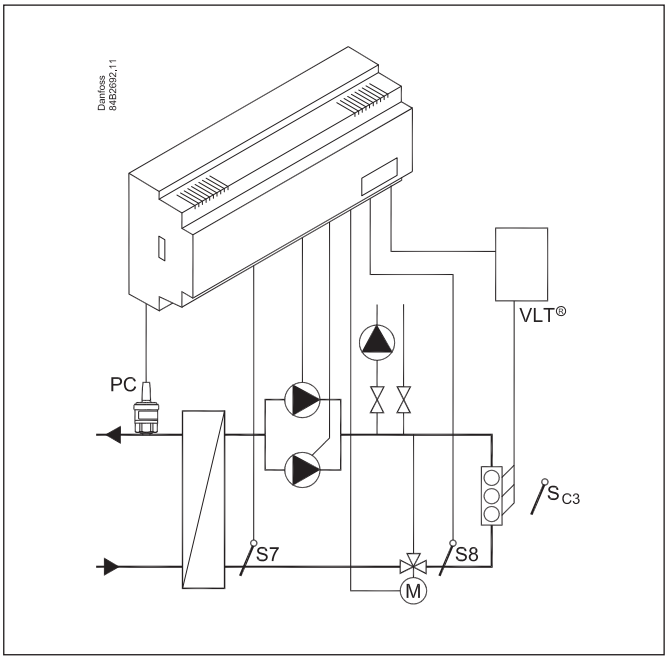
AK-PC 420



Application
The AK-PC 420 is a complete capacity controller for a dry cooler, including fans, a three-way valve, pumps and heat recovery.

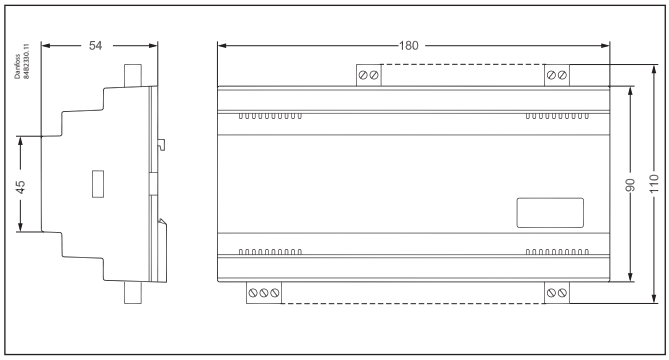
Advantages
- Complete dry cooler capacity control
- Selectable control sensor (S7/Pc and/or S8)
- Single-loop or dual-loop control for optimum operation of all types of systems
- Fan speed control
- Fan switching with either sequential or rotating operating mode
- Reference value coupled to ambient temperature

Control
- Capacity control is based on the condensing pressure Pc or the brine return temperature S7.
- The reference temperature is a fixed setting with optional override by the ambient temperature or an external 0–10 V signal. There is a separate reference value for heat recovery.
- With single-loop control, capacity adjustment of the three-way valve and fans is performed using Pc or S7.
- With dual-loop control, individual capacity adjustment of the two circuits is performed for the three-way valve via Pc/S7 and for the fans via S8. This ensures that even difficult systems with long tubes can be handled optimally.



Functional description
- Control and monitoring of up to six fans using step or speed control
- Sequential or rotating fan operation
- Three-way valve control
- Reference temperature override by ambient temperature Sc3 or 0–10 V d.c. signal
- Separate reference temperature for heat recovery with override by 0–10 V d.c. signal
- Input for start and output for enabling heat recovery
- Control and monitoring of two twin pumps with rotating operation
- Safety function for high condensing pressure
- Alarm relay
- External control start/stop

Operation
The unit can be operated by data communication or by a connected display unit (type EKA 164). Additional readout can be provided by an EKA 163 unit.



Ordering data

Type	Functional description	Ordering data
AK-PC 420	Capacity controller for dry cooler	**084B8008**
EKA 163B	Display unit	**084B8574**
EKA 164B	Display unit with operation buttons	**084B8575**
	Cable for display unit 2 m, qty 1	**084B7298**
	Cable for display unit 6 m, qty 1	**084B7299**
EKA 174	Data communication module, LON RS 485 (with galvanic isolation)	**084B7124**
EKA 178B	Data communication module, Modbus (with galvanic isolation)	**084B8571**

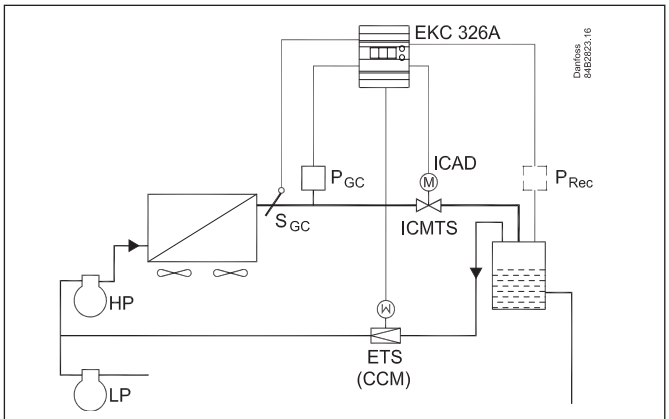
Additional information available:
Manual: RS8EL

EKC 326A

Application
This controller is used in systems with a gas cooler and CO_2 refrigerant.
It regulates the pressure in the gas cooler (condenser) to optimise the COP of the system.

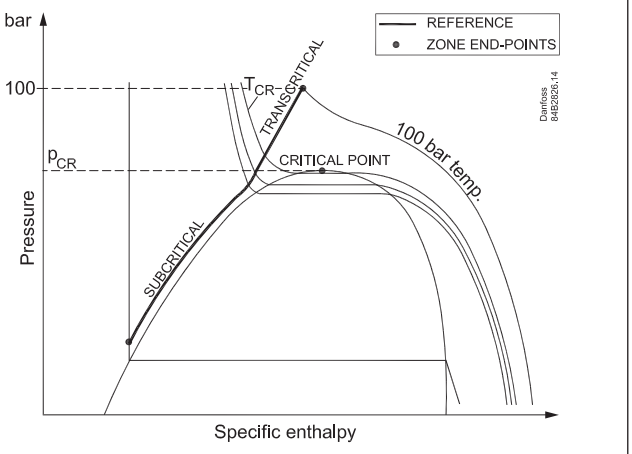
The controller supports:
- Transcritical CO_2 refrigeration systems (booster, cascade, high pressure)
- Transcritical CO_2 heat pump systems
- Transcritical CO_2 refrigeration systems with heat recovery
- Transcritical CO_2 chiller systems
- Extra capacity in warm periods. The cooling performance of the system can be improved by shifting the set point ('extra compressor')

Advantages
- Maximum COP
  The controller ensures that the system achieves maximum performance by maintaining the optimal pressure in the gas cooler when regulation occurs in the transcritical region.
- The controller always optimises operation to a subcritical state.
- Receiver pressure regulation is based on the measured receiver pressure.
- Heat recovery with adjustable reference pressure, 0–10 V
- Optimum heat pump operation



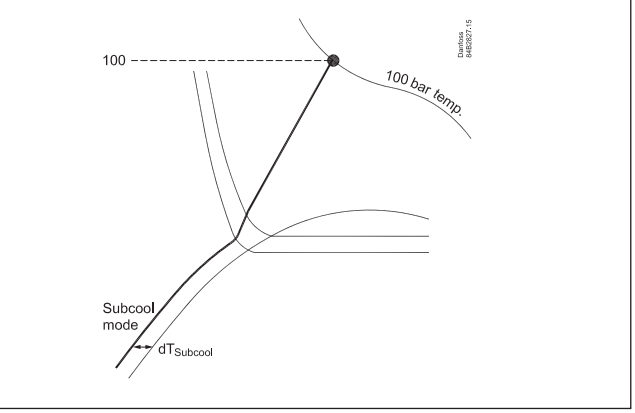
System description
The pressure in the gas cooler is controlled by the valve. The controller requires inputs from a pressure transmitter (P_{GC}) and a temperature sensor (S_{GC}). Both devices must be fitted on the outlet immediately after the gas cooler.
The valve is an ICMTS valve, which is specifically designed for the prevailing pressure conditions in a transcritical CO_2 system. The motor section of the valve is an ICAD actuator, which is controlled by a 0–10 V signal from the controller.

If it is necessary to maintain a constant receiver pressure, a valve (ETS) and pressure transmitter (P_{rec}) can be fitted. The gas from the receiver bypasses to the inlet side of the high pressure compressor.

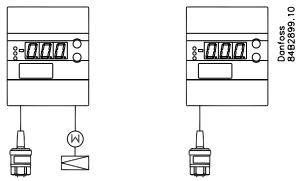


Functional description
Maximum COP control
The controller maintains the optimal pressure in the transcritical region based on the measured pressure and temperature.

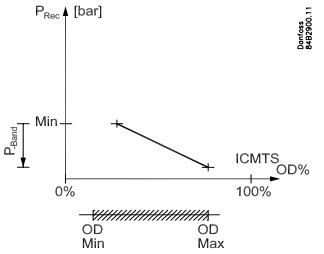
Subcooling
dP or dT subcooling can be used in the subcritical region (dT subcooling is standard).



Receiver control
The receiver pressure can be regulated to a set reference point. This requires the installation of an ETS valve and a pressure transmitter.
If only monitoring is required (no control function), the valve is not necessary. In this case, only the pressure transmitter should be fitted.

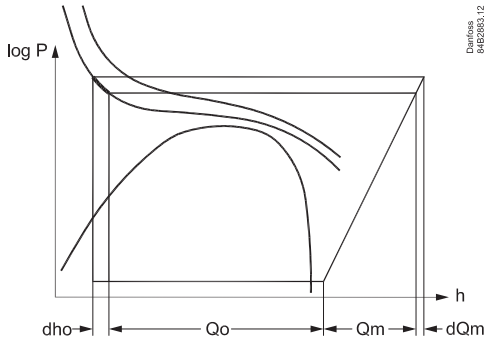


Avoiding excessively low receiver pressure
A limit value can be set, and the ICMTS valve is opened if the pressure falls below the set value. The valve is opened gradually through the associated P band. It is opened to the value set in parameter n32 (Vhp OD max).

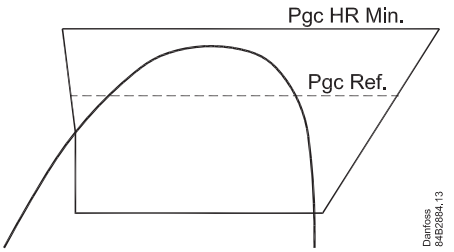


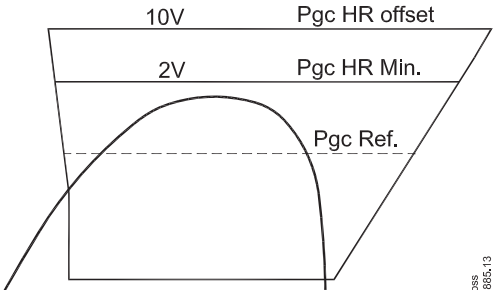
Extra refrigeration capacity ('extra compressor')
This function improves the refrigeration capacity of the system by increasing the pressure in the gas cooler.
It is activated by a switch function.

The cooling performance increases to Q0 + dh0.
This function also increases the load on the compressor motor as the pressure increases. The power consumption increases to Qm + dQm.



Heat recovery or heat pump
This function increases the gas pressure to a set value. This value corresponds to a certain temperature.
The value can be fixed, or it can vary according to a 0–10 V input signal as follows:
A signal level of 1.5 V or higher can activate the function and increase the reference level to the set value.
If a variable reference is required, a signal with a range of 2 to 10 V can be connected.
This function can be used in both ranges: subcritical and transcritical.





Menu survey

SW =2.0x

Function	Para-meter	Min.	Max.	Factory setting
Normal display				
Shows the current pressure after the gas cooler Pushing both buttons briefly will display the reference Pushing the bottom button briefly will display Prec.	-		bar	
Start / stop				
Start / stop of regulation	r12	OFF (0)	On (1)	On (1)
Ramp for reference after heat recovery	r65	0.1	20	1
Displacement of the Pgc minimum reference (n89) during heat recovery. (Displacement value at 10 V)	r68	0 bar	100 bar	0
Alarm Settings				
Alarm limit for Pgc Min.	A65	0 bar	200 bar	40
Permitted Pgc reference variation 0 = no alarm function (recommended)	A66	0 bar	50 bar	0
Permitted Prec reference variation 0 = no alarm function (recommended)	A67	0 bar	50 bar	0
Delay time for 'A94' Pgc reference alarm	A68	5 min.	360 min	15
Delay time for 'A95' Prec reference alarm	A69	5 min.	360 min	15
Regulating parameters				
Actuator type for receiver control 0=ETS12,5/25 / CCM10/20, 1=ETS50 / CCM30, 2=ETS100 / CCM40, 3=ETS250, 4=ETS400, 5=User defined (set: n37 and n38) 6=CCMT2/4/8	n03	0	6	0
P: Amplification factor Kp	n04	0.5	20	2.0
I: Integration time Tn	n05	10 s	600 s	75
Max. opening degree. of the valve	n32	0	100	100
Number of steps from 0-100% opening degree (x10) **	n37	0	500	262
Number of steps per second	n38	0	300	250
Max. permitted receiver pressure, Prec	n58	10 bar	200 bar	60
P-belt beyond PrecMax for valve to close	n59	0 bar	60 bar	0
P: Amplification factor Kp for receiver	n60	0.5	20	5
I: Integration time Tn for receiver	n61	10	600	75
The gas cooler's max. pressure This is where you set the maximum pressure permitted in the gas cooler. If the pressure reaches this value, the valve is fully open.	n69	7	200	90
P-band under n69, so the valve is fully open if the pressure is n69.	n70	0	60	5
Min. pressure in the receiver This function is only used if the pressure transmitter Prec is mounted.	n71	7	60	30
P-band to force open the valve if the receiver pressure is too low	n72	0	60	3
Subcooling is required to be regulated according to temperature Set the desired subcooling in K.	n79	1 K	30 K	1
The gas cooler's min. pressure	n81	7	200 bar	45
Min. permissible opening degree for ICMTS	n87	0	100%	0
Extra capacity when the contact is closed. (The Pgc reference is increased with this value)	n88	0 bar	200 bar	0
Minimum permitted Pgc reference during heat recovery (AI > 2 V). The value can be increased further using the r68 function.	n89	7 bar	200 bar	7
Do you require receiver pressure control: Off=no, On=yes	n90	Off	On	On
Prec. reference for receiver pressure control	n91	7 bar	200 bar	35
Receiver pressure control. Maximum opening degree for ETS	n92	0%	100%	100
Receiver pressure control. Smallest opening degree for ETS	n93	0%	100%	0
Define the reference curve point at 100 bar.	n99	35°C	55°C	39

Miscellaneous				
Digital input signal - DI 0: The input is not used 1: External main switch 2: additional cooling capacity	o02	0	2	0
Controller's address	o03*	0	240	-
ON/OFF switch (service-pin message)	o04*	-	-	-
Set supply voltage frequency	o12	50Hz (0)	60 Hz (1)	0
Pressure transmitter range Pgc - min.	o20	-1 bar	5 bar	-1
Pressure transmitter range Pgc - max.	o21	6 bar	199 bar	159
Pressure transmitter range Prec - min.	o47	-1 bar	5 bar	-1
Pressure transmitter range Prec - max.	o48	6 bar	199 bar	59

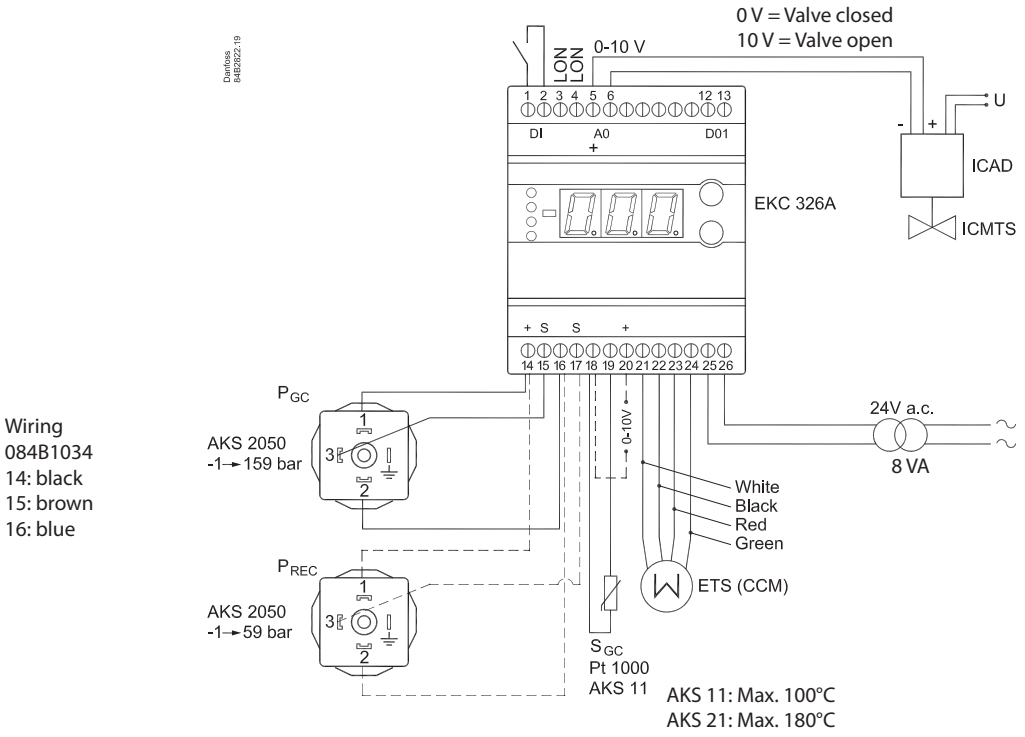
* This setting is only possible if a data communication module is fitted in the controller.
** The controller display is limited to three digits, but the setting is a four-digit value Only the three most significant digits are shown. For example, a value of 2500 is shown as 250.

Service		
Signal on AI the input	u07	V
Read status of input DI	u10	on/off
Read ETS/CCM valves opening degree	u24	%
Calculated reference for regulation (desired pressure in the gas cooler)	U03	bar
The output signal to the ICMTS valve converted into opening degree	U04	%
The temperature in the gas cooler. Measured using temperature sensor Sgc.	U05	°C
The pressure in the gas cooler. Measured using pressure transmitter Pgc.	U06	bar
The pressure in the receiver. Measured using pressure transmitter Prec, but only if it is mounted.	U07	bar

Technical data

Supply voltage	24 V a.c. +/-15% 50/60 Hz (the supply voltage is galvanically separated from the input and output signals)	
Power consumption	Controller	8 VA
Input signal	Pressure transmitter	Ratiometric, AKS 2050
	Pressure transmitter	Ratiometric, AKS 2050
	Digital input from external contact function	
	Voltage signal	0-10 V Ri = 100 k ohm Signal range = 2-10 V
	Sensor input	1 Pt 1000 ohm
Alarm relay	1 SPST	250 V a.c. AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Actuator	ICAD mounted on ICMTS	Voltage signal 0-10 mA
	ETS or CCM	Step motor
Data communication	An EKA 174 data communication module can be connected	
Ambient conditions	-10 to +55°C, during operations -40 to +70°C, during transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Terminals	max. 2.5 mm^2 multicore	
Approvals	EMC acc. EN 61000-6-3 and EN 61000-4-(2-6,8,11) LVD acc. EN 60730-1 and EN 60730-2-9	

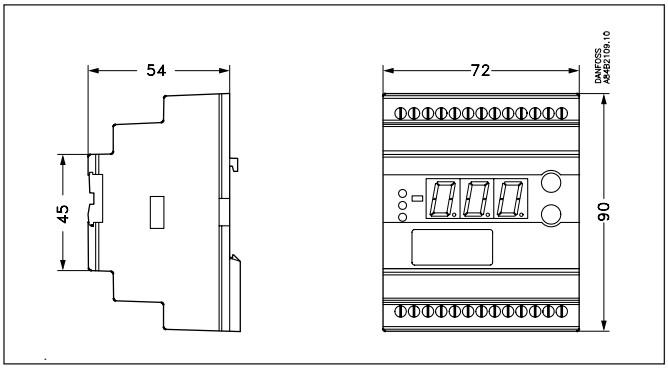
Wiring



Ordering data

Type	Functional description	Code
EKC 326A	Gas pressure controller	**084B7252**
EKA 174	Data communication module (Lon RS 485) with galvanic isolation (accessory item)	**084B7124**

Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.



Additional information available:
Manual: RS8FM

Compressor and Condenser Speed Control

Introduction

Energy savings
Continuously variable speed control with an VLT® drive enables intelligent capacity control. It creates stability while balancing the capacity to the actual load, resulting in improved system COP and significant energy savings. Intelligent compressor control and condenser fan control are essential elements of every optimised refrigeration system.

Improved control and product quality
Pressure stabilisation and optimisation result in less ice formation on evaporators for optimal air flow and air temperature, as well as reduced temperature pull-down for increased product quality. Condensing pressure stabilisation reduces refrigerant migration, which in turn reduces the amount of refrigerant needed in the system.

VLT® Refrigeration drive FC 103

VLT® Refrigeration drive FC 103 with variable speed drives are engineered to optimise performance in refrigeration systems. They are recommended for use in ADAP-KOOL® systems for the following purposes:
- Pack or compressor control
- Pumps
- HVAC (centrifugal fans and pumps)
- Condensers

VLT® Refrigeration drive FC 103 variable speed drives provide a variety of benefits in refrigeration systems.

ADAP-KOOL® system integration
Thanks to the LON data communication module, FC 103 variable speed drives can easily be integrated in ADAP-KOOL® systems to enable:
- Monitoring of energy consumption
- Alarm monitoring and alarm generation
- Monitoring the actual capacity of pumps, compressors and fans
- Remote data access using a modem or gateway
- Remote commissioning by uploading or downloading parameter files, which significantly simplifies installation

Noise reduction in many ways
FC 103 variable speed technology significantly reduces the noise level of condenser fan motors.
With their excellent RFI filtering in accordance with international standards (EN 55011 class 1A or 1B), FC 103 drives also protect the environment against electrical noise.

Longer lifetime
Control wiht FC 103 drives reduces the total number of start/stop cycles and mechanical wear of rotating components.

Easy to install and use
With their built-in current limiting capability, FC 103 drives eliminate the need for special starting devices. They protect motor against overloads and overheating and have a built-in crankcase heater function. Integrating an FC 103 drive in your facility is easy thanks to the time saving, user-friendly configuration and installation procedures. In addition, the built-in PI controller can directly regulate specific applications.

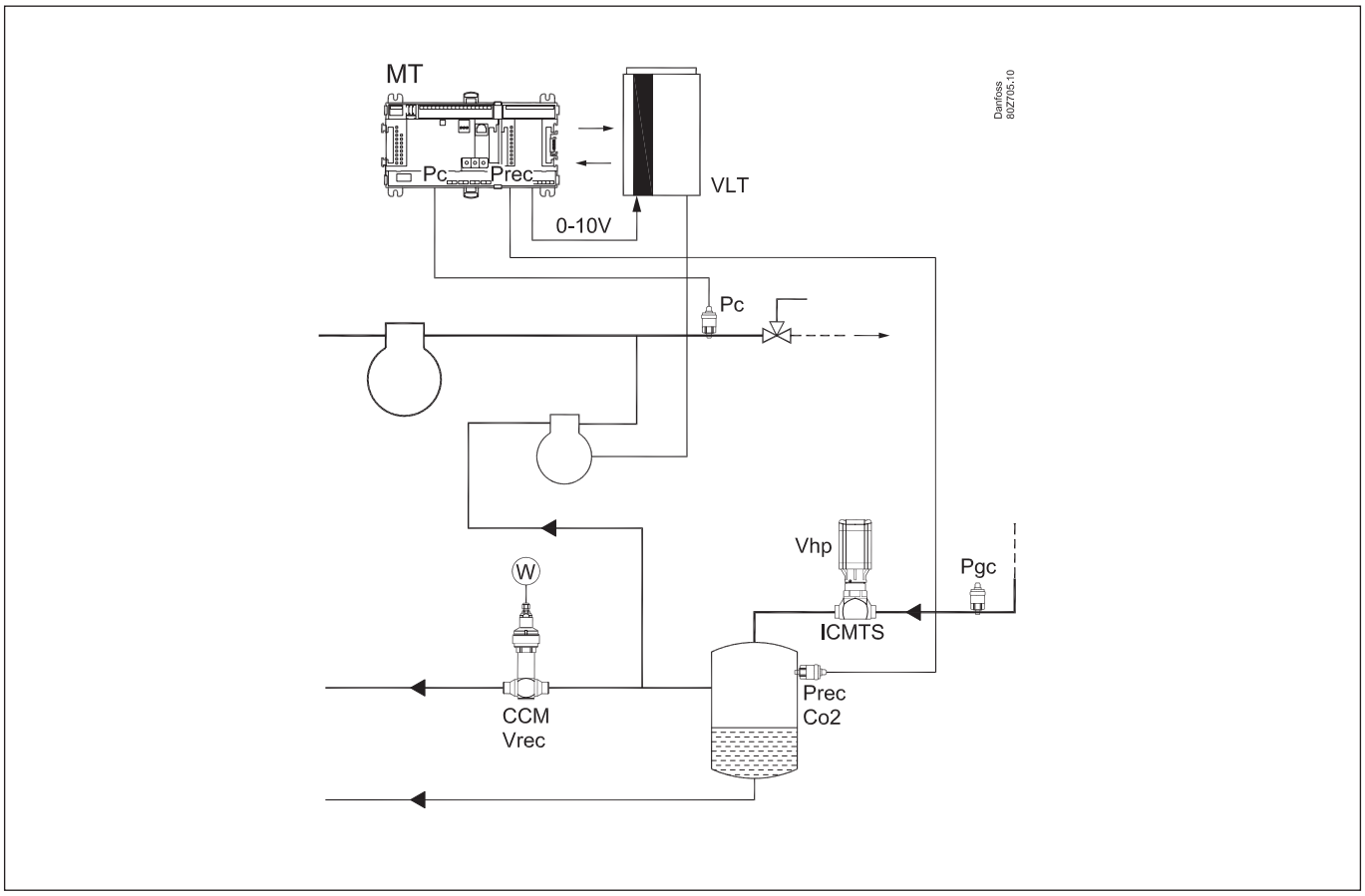
FC 103 drives can easily be used with standard AK-PC pack controllers for continuously variable speed control and energy optimisation of condenser fans and/or compressors and matching the available capacity to load variations.
In HVAC applications peripheral to the refrigeration system, they can be used with AHU fans and circulation pumps to maximise energy savings and improve system efficiency.
The frequency converter software has a built-in compressor control function. This function can regulate three compressors: one with variable speed drive and the other two with fixed speed.

The frequency converter is housed in a compact enclosure with a local control panel. It is available in versions with IP 20, IP 21, IP 54, IP 55 and IP 66 enclosures.

Power range
3 x 200 – 240 V..... 1.1 – 45 kW
3 x 380 – 480 V.....1.1 – 250 kW
3 x 525 – 600 V ..... 1.1 – 90 kW
Can accept up to 110% overload.

Optimal adjustment
In order for the FC 103 to be adjusted optimally for its actual purpose, Danfoss has developed a configurator.
You can find the configurator on Danfoss' website.

COP optimization of CO_2 systems



The frequency converter is suitable for controlling a compressor used for parallel compression.
Here is an example with a capacity controller type AK-PC 772.

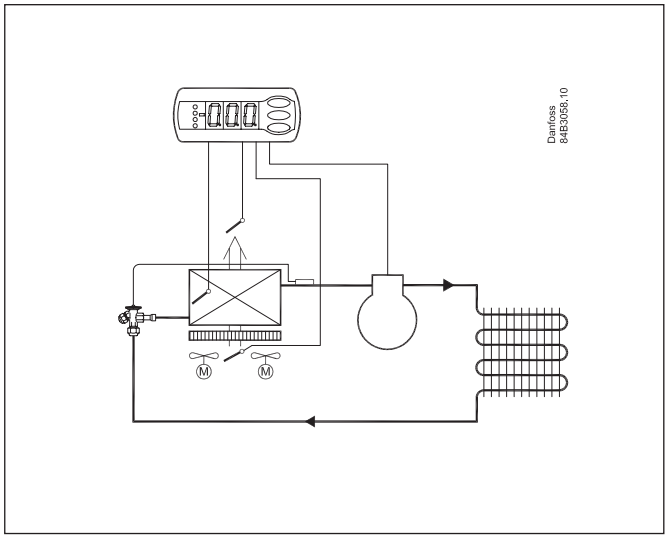
Evaporator Controllers with Thermostatic Expansion Valves (TEVs)

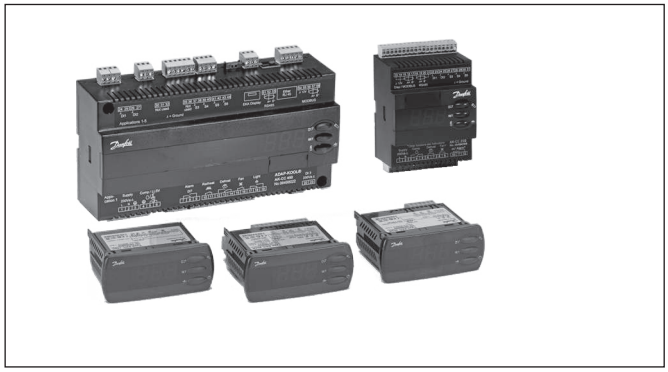
Introduction

Thermostatic expansion valves are used in conventional refrigeration systems and refrigeration appliances with limited energy saving potential where the injection of liquid refrigerant into the evaporator is controlled by refrigerant superheating. Consequently, thermostatic expansion valves are especially suitable for liquid injection in 'dry' evaporators where the superheating at the evaporator outlet is proportional to the evaporator load.

Evaporator controllers for regulating refrigeration appliances with thermostatic expansion valves or compressor are capable of regulating different types of functions in order to fulfil any evaporator control requirement. These controllers have functions for regulating or monitoring temperature, defrosting, doors, rail heating, lighting, and fan operation.

With remote communication as part of the ADAP-KOOL® refrigeration control system, evaporator controllers provide monitoring and control functions for display cases and cold rooms, including alarm monitoring, to improve the performance of refrigeration systems.





The controllers improve operating routines with a cost optimised design for most common applications.

Front mounted controllers feature easy panel installation thanks to integrated mounting brackets. These controllers have high-performance 16 A relays that enable direct connection of heavy loads, such as compressors or defrosters.
In addition, all of these controllers have a built-in 230 V a.c. power supply and support various types of sensors (Pt1000, NTC and PTC).

They feature enhanced service life and reliability thanks to their IP 65 rating, which prevent damage from water spray.

Factory calibration ensures that the measuring accuracy of the controllers with a Pt1000 sensor is better than that required by EN 441-13 without any subsequent calibration, thus ensuring compliance with HACCP.

EKC 302 and AK-CC 350 is DIN-Rail mounting versions.
This controller has a better processor and a circuit that detects the supply voltage sinus wave cycle.
When connecting a load that is pure resistive controller can connect to the relay when the current and voltage crosses zero transition in sinus wave cycle.
The coupling means permits a higher current load on the relay.
The function **can not** be used if the controller is to connect with relays / contactors.

The AK-CC 450 controller is used in applications with TEV valves where additional hardware or functions are required. This controller can simultaneously regulate temperature, defrosting, door frame heating, rail heating, lighting, and fans.

Comparison of controllers in this section

Temperature control of refrigeration appliances and cold storage rooms

Type	ERC 211	ERC 213	ERC 214	EKC 202A		EKC 302A	EKC 202B	EKC 302B	EKC 202C	EKC 202C-MS	EKC 202D	EKC 302D	EKC 202D1	AK-CC 210	AK-CC 250A	AK-CC 350	AK-CC 450
Relays	1	3	4	2		2	3	3	4	4	4	4	4	4	4	4	6
Compressor/valve current [A]	10 (16*)	10 (16*)	10 (16*)	10	10	10 (16*)	10	10 (16*)	10	10	10	10 (16*)	10	10	10	10 (16*)	½
Defrost current [A]		8	8	4			10	6 (10*)	10	10	10	6 (10*)	10	10	10	6 (10*)	4
Fan current [A]		3	3				6	6 (10*)	6	6	6	6 (10*)	6	6	6	6 (10*)	4
Alarm/lighting/Misc. current [A]		2	2		4	4		4	4	4	4	4	4	4	4	4	4
Second compressor current [A]																	4
Analog inputs	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	6
Digital inputs	1	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	3
Pt1000 sensor																	
PTC sensor																	
NTC sensor																	
Programming key option																	
Data communication option																	
Fixed MODBUS data communication																	
DIN Rail mounting																	
Real time clock																	
HACCP compliance via system																	
HACCP function																	
Application selection switch																	
Weighted sensor output																	
Coordinated defrost																	
Quick setup (o62)																	
Coordinated defrost via system																	

Current specifications and relay sizes:
10: 10 (6) A. The relay is a 16 A relay.
6: 6 (3) A. The relay is an 8 A relay.
4: 4 (1) A. The relay is an 8 A relay.
Due to PCB track capacities and derating factors, the specified values must not be exceeded.

*) A higher load is permitted if the load is connected directly on the controller's relay and the zero crossing control is enabled.

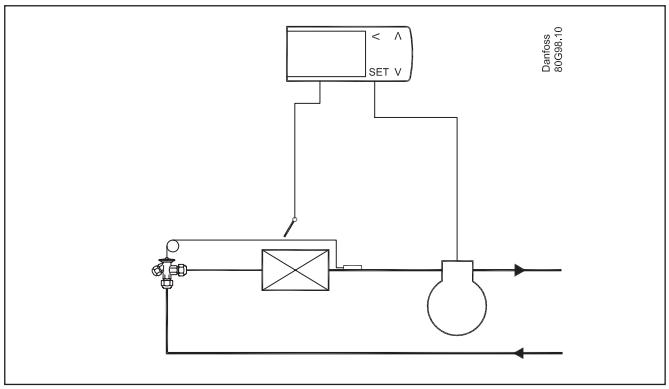
Precise temperature control

Type	EKC 361	EKC 368
Application	Cold storage rooms for fruit, etc. Work areas in the food industry	Delicatessen appliances Cold storage rooms for meat products

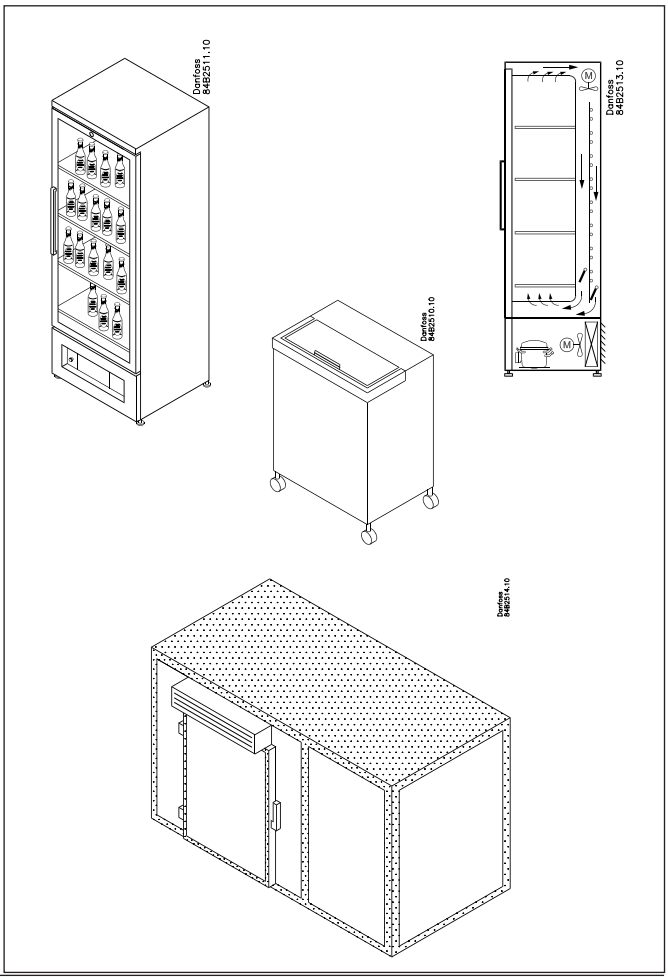
ERC 211, ERC 213, ERC 214

Application
- Temperature controller for refrigeration appliances and cold rooms.
- Defrost control
- Front panel mounting

Advantages
- Integrated refrigeration system functions
- Defrost on demand in 1:1 systems
- Buttons and gasket integrated in front panel
- IP 65 rating for front panel
- Digital input any one of the following:
  - Door alarm
  - Defrost start
  - Regulation start/stop
  - Night operation
  - Switching between two temperature references
  - Fast cool down
- Instant programming using programming key
- HACCP
  Factory calibration assures measurement accuracy exceeding the requirements of the EN 441-13 standard without subsequent calibration (Pt1000 sensor).



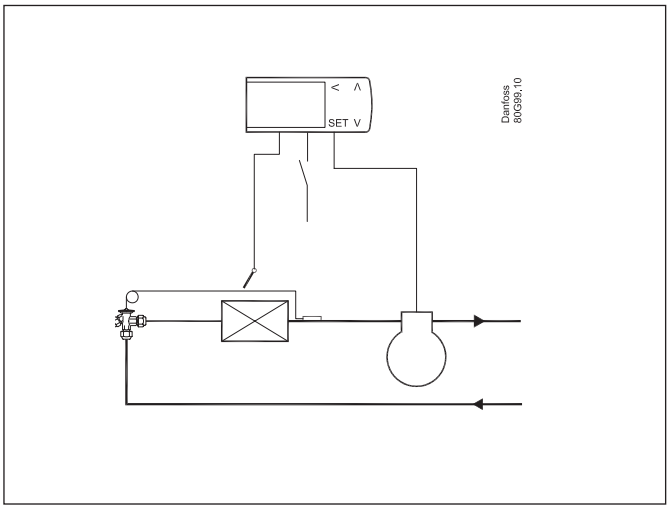
Control
The controller contains a temperature regulator that can accept an input signal from a single temperature sensor.
The sensor can be located in the cold air flow after the evaporator or in the warm air flow just ahead the evaporator.
The controller regulates defrosting using natural defrost or electrical defrosting. Renewed cut-in after defrosting can occur based on time or temperature.
The defrost temperature can be measured directly using an S5 sensor.
One, two or three relays enable or disable the required functions as determined by the application:
- Refrigeration (compressor or solenoid valve)
- Defrost
- Alarm
- Fan
- Light



The various applications are described on the next page.

Controller versions
There are three controllers in the series:
ERC 211 model for simple regulation systems with one relay
ERC 213 model with several functions and three relays
ERC 214 model with even more functions and four relays.

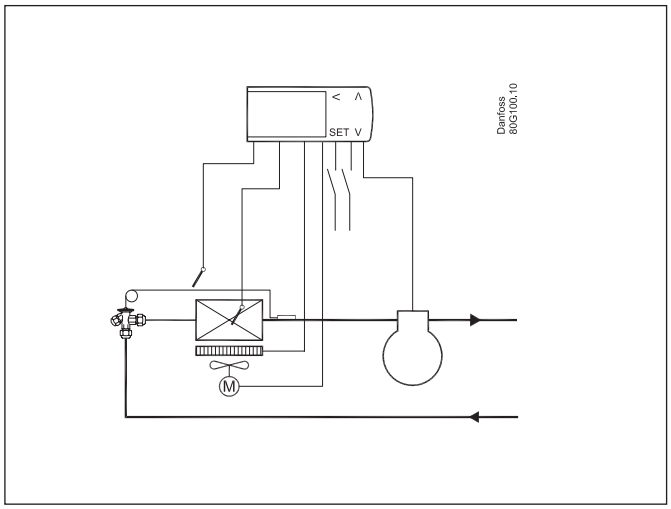
None of these models supports data communication.
If data communication or additional functions is/are required, see the EKC 202 or AK-CC 210 / 250 series.



ERC 211
Controller with one relay output and one temperature sensor and one digital input.
Alternatively, the digital input is used for a signal from a temperature sensor on the condenser.

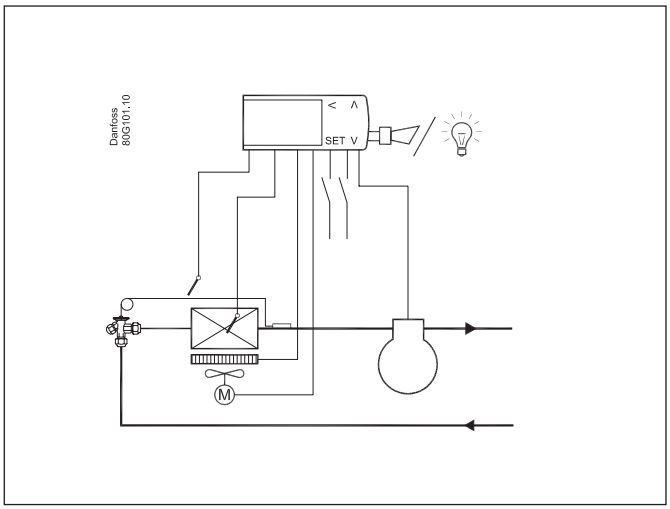
Temperature control with compressor start/stop operation.
Natural defrosting with compressor stopped
As an alternative to compressor start/stop control, a solenoid valve can be fitted in the liquid line.

Heating function
The controller can also be used as a simple on/off thermostat for heating applications.



ERC 213
Controller with three relay outputs and two temperature sensor and two digital input.
Alternatively, the digital input is used for a signal from a temperature sensor on the condenser.

Temperature control with compressor start/stop or a solenoid valve
Defrost sensor
Electrical defrost / gas defrost / alarm relay
Control of fan.



ERC 214
Controller with four relay outputs, two temperature sensors, and two digital inputs.
Alternatively, the digital input is used for a signal from a temperature sensor on the condenser.

Temperature control with compressor start/stop or a solenoid valve
Defrost sensor
Electrical defrost / gas defrost
Alarm relay / light relay
Control of fan.

Parameter Name - ERC 211	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5
Configuration	**cFg**									
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	1
Predefined applications *AP0, AP1, AP2, AP3, AP4*	o61	AP0	AP5		AP0	AP1	AP2	AP3	AP4	AP5
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K, Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	n10
Reference/Thermostat	**r--**									
Temperature Setpoint	r00	-100.0	200.0	C/F	2.0	8.0	4.0	4.0	40.0	2.0
Differential	r01	0.1	20.0	K	2.0	2.0	2.0	2.0	2.0	2.0
Min Set Point limitation	r02	-100.0	200.0	C/F	-35.0	4.0	2.0	2.0	20.0	-35.0
Max Set Point limitation	r03	-100.0	200.0	C/F	50.0	20.0	6.0	6.0	60.0	50.0
Display offset (correction value in display temperature)	r04	-10.0	10.0	K	0.0	0.0	0.0	0.0	0.0	0.0
Display Unit (°C/°F)	r05	-C	-F		-C	-C	-C	-C	-C	-C
Calibration of Sair (offset for air temperature calibration)	r09	-20.0	20.0	K	0.0	0.0	0.0	0.0	0.0	-
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	-
Night Set back (offset temperature during night mode)	r13	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	0.0
Thermostat reference displacement offset temperature	r40	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	-
Pull-down duration	r96	0	960	min	0	-	0	0	-	-
Pull-down limit temperature	r97	-100.0	200.0	C/F	0.0	-	0.0	0.0	-	-
Alarm	**A--**									
Delay for temperature alarm during normal conditions	A03	0	240	min	30	45	45	45	30	30
Delay for temperature alarm during pull-down/start-up/defrost	A12	0	240	min	60	60	90	90	60	60
High temperature alarm limit (Cabinet/Room)	A13	-100.0	200.0	C/F	8.0	16	10	10	80	8.0
Low temperature alarm limit	A14	-100.0	200.0	C/F	-30.0	0.0	0.0	0.0	10	-30.0
DI1 delay (time delay for selected DI1 function)	A27	0	240	min	30	30	30	30	30	30
Condenser high alarm limit	A37	0	200	C/F	80	80	80	80	-	-
Condenser high block limit	A54	0	200	C/F	85	85	85	85	-	-
Voltage protection enable	A72	no	yES		no	no	no	no	no	no
Minimum cut-in voltage	A73	0	270	V	0	0	0	0	0	0
Minimum cut-out voltage	A74	0	270	V	0	0	0	0	0	0
Maximum voltage	A75	0	270	V	270	270	270	270	270	270
Defrost	**d--**									
Defrost Method *no=no defrost, nAt=natural*	d01	no	nAt		no	*no*	*nAt*	*nAt*	*no*	no
Defrost stop temperature	d02	0.0	50.0	C/F	6.0	-	-	8	-	6.0
Defrost interval	d03	0	240	hours	8	-	6	6	-	8
Max defrost time	d04	0	480	min	30	-	45	60	-	30
Defrost delay at power up (or DI signal)	d05	0	240.0	min	0	-	0	0	-	-
Drip delay	d06	0	60	min	0	-	0	0	-	-
Defrost stop sensor configuration ***non=time, Air=Sair (air temperature)***	d10	non	Air		non	-	*non*	*Air*	-	non
Compressor accumulated runtime to start defrost *0=OFF*	d18	0	96	hours	0	-	0	0	-	-
Defrost delay after pull-down *0=OFF*	d30	0	960	min	0	-	0	0	-	-
Compressor	**c--**									
Compressor minimum ON time	C01	0	30	min	0	0	0	0	0	0.0
Compressor minimum OFF time	C02	0	30	min	2	2	2	2	2	2.0
Compressor OFF delay at door open	C04	0	15	min	0	0	0	0	0	1
Zero crossing selection	C70	no	yES		yES	yES	yES	yES	yES	YES

Parameter Name - ERC 211	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5
Others	**o--**									
Delay of outputs at startup	o01	0	600	min	5	5	5	5	5	*5*
DI1 configuration *oFF=not used, Sdc=status display output, doo=door alarm with resumption, doA=door alarm without resumption, SCH = main switch, nig=day/ night mode, rFd=reference displacement, EAL=external alarm, dEF=defrost, Pud=pull-down, Sc=condenser sensor*	o02	oFF	Sc		oFF	oFF	oFF	oFF	oFF	oFF
Serial address	o03	0	247		0	0	0	0	0	-
Password	o05	no	999		no	no	no	no	no	no
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K, Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	-
Cooling/Heating *rE=refrigeration (cooling)* *Ht=heating*	o07	rE	Ht		rE	rE	rE	rE	Ht	0(rE)
Display Resolution *0.1=steps of 0.1 °C* *0.5=steps of 0.5 °C,* *1.0=steps of 1.0 °C*	o15	0.1	1.0		0.1	0.1	0.1	0.1	0.1	*0.1*
Relay 1 counter (1 count=100 cycles of operation)	o23	0	999		0	0	0	0	0	-
Predefined applications	o61	AP0	AP5		AP0	*AP1*	*AP2*	*AP3*	*AP4*	-
Save settings as factory WARNING: The earlier factory settings are overwritten	o67	no	yES		no	no	no	no	no	-
Display at defrost *Air=actual air temperature, FrE=freezed temperature,* *-d-="-d-" is displayed*	o91	Air	-d-		-d-	-	-d-	-d-	-	*-d-*
Polarity	**P--**									
DI1 input polarity *nc=normally closed,* *no=normally open*	P73	nc	no		no	no	no	no	no	no
Key board lock enable	P76	no	yES		no	no	no	no	no	-
Read outs	**u--**									
Controller Status *S0=Cooling ON/Heating ON,* *S2=wait for compressor ON time to elapse,* *S3=wait for compressor OFF time to elapse-restart time, S4=drip OFF delay after defrost,* *S10=cooling stop, S11=cooling stopped by thermostat/heating OFF, S14=defrosting state,* *S15=fan delay state after defrost, S17=door open (DI input), S20=emergency cooling,* *S25=manual control of outputs, S30=Continous cycle/Pull-down, S32=delay of outputs at power up*	u00	S0	S32		--					
Air temperature (Sair)	u01	-100.0	200.0	C/F	---					
Read the present regulation reference	u02	-100.0	200.0	C/F	---					
DI1 input	u10	oFF	on		---					
Status of night operation	u13	oFF	on		---					
Condenser temperature (Sc)	U09	-100.0	200.0	C/F	---					
Compressor relay status	u58	oFF	on		---					
Firmware version readout	u80	000	999		---					

Note: hidden parameters are greyed

Parameter Name - ERC 213	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Configuration	**cFg**										
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	1	1
Predefined applications *AP0, AP1, AP2, AP3, AP4, AP5*	o61	AP0	AP5		AP0	AP1	AP2	AP3	AP4	AP5	AP6
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K, Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	n10	n10
Reference/Thermostat	**r--**										
Temperature Setpoint	r00	-100.0	200.0	C/F	2.0	4.0	2.0	-24.0	2.0	-24.0	2.0
Differential	r01	0.1	20.0	K	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Min Set Point limitation	r02	-100.0	200.0	C/F	-35.0	2.0	0.0	-26.0	0.0	-26.0	-35.0
Max Set Point limitation	r03	-100.0	200.0	C/F	50.0	6.0	4.0	-20.0	4.0	-20.0	50.0
Display offset (correction value in display temperature)	r04	-10.0	10.0	K	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Display Unit (°C/°F)	r05	-C	-F		-C	-C	-C	-C	-C	-C	-C
Calibration of Sair (offset for air temperature calibration)	r09	-20.0	20.0	K	0.0	0.0	0.0	0.0	0.0	0.0	-
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	1	-
Night Set back (offset temperature during night mode)	r13	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thermostat reference displacement offset temperature	r40	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	0.0	-
Pull-down duration	r96	0	960	min	0	0	0	0	0	0	-
Pull-down limit temperature	r97	-100.0	200.0	C/F	0.0	0.0	0.0	0.0	0.0	0.0	-
Alarm	**A--**										
Delay for temperature alarm during normal conditions	A03	0	240	min	30	45	30	30	30	30	30
Delay for temperature alarm during pull-down/start-up/defrost	A12	0	240	min	60	90	60	60	60	60	60
High temperature alarm limit (Cabinet/Room)	A13	-100.0	200.0	C/F	8.0	10.0	8.0	-15.0	8.0	-15.0	8.0
Low temperature alarm limit	A14	-100.0	200.0	C/F	-30.0	0.0	-2.0	-30.0	-2.0	-30.0	-30.0
DI1 delay (time delay for selected DI1 function)	A27	0	240	min	30	30	30	30	30	30	30
DI2 delay (time delay for selected DI2 function)	A28	0	240	min	30	30	30	30	30	30	30
Condenser high alarm limit	A37	0	200	C/F	80	80	80	80	80	80	-
Condenser high block limit	A54	0	200	C/F	85	85	85	85	85	85	-
Voltage protection enable	A72	no	yES		no	no	no	no	no	no	no
Minimum cut-in voltage	A73	0	270	V	0	0	0	0	0	0	0
Minimum cut-out voltage	A74	0	270	V	0	0	0	0	0	0	0
Maximum voltage	A75	0	270	V	270	270	270	270	270	270	270
Defrost	**d--**										
Defrost Method *no=no defrost, nAt=natural, EL=electrical, gAS=hot gas*	d01	no	gAS		EL	*nAt*	*EL*	*EL*	*EL*	*EL*	EL
Defrost stop temperature	d02	0.0	50.0	C/F	6.0	-	-	-	6.0	6.0	6.0
Defrost interval	d03	0	240	hours	8	6	8	12	8	12	8
Max defrost time	d04	0	480	min	30	45	15	15	30	30	30
Defrost delay at power up (or DI signal)	d05	0	240.0	min	0	0	0	0	0	0	-
Drip delay	d06	0	60	min	0	0	0	0	0	0	*5*
Fan delay after defrost	d07	0	60	min	0	0	0	0	0	0	*5*
Fan start temperature after defrost	d08	-50.0	0.0	C/F	-5.0	-	-	-	-5.0	-5.0	-
Fan during defrost	d09	oFF	on		on	*on*	*on*	*on*	on	on	on
Defrost stop sensor configuration *non=time, Air=Sair (air temperature), dEF=S5 (defrost sensor)*	d10	non	dEF		non	*non*	*non*	*non*	*dEF*	*dEF*	non
Compressor accumulated runtime to start defrost *0=OFF*	d18	0	96	hours	0	0	0	0	0	0	-
Defrost on demand *20.0=OFF*	d19	0.0	20.0	K	20.0	-	-	-	20.0	20.0	-
Defrost delay after pull-down *0=OFF*	d30	0	960	min	0	0	0	0	0	0	-

	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Fan control	**F--**										
Fan at compressor cutout *FFc=fan follow compressor,* *FAo=fan always ON, FPL= fan pulsating*	F01	FFc	FPL		FAo	FAo	FAo	FAo	FAo	FAo	FAo
Fan stop evaporator temperature *50.0=OFF*	F04	-50.0	50.0	C/F	50.0	-	-	-	50.0	50.0	-
Fan ON Cycle	F07	0	15	min	2	2	2	2	2	2	*2*
Fan OFF cycle	F08	0	15.0	min	2	2	2	2	2	2	*2*
Compressor	**c--**										
Compressor minimum ON time	C01	0	30	min	0	0	0	0	0	0	0
Compressor minimum OFF time	C02	0	30	min	2	2	2	2	2	2	2
Compressor OFF delay at door open	C04	0	15	min	0	0	0	0	0	0	*1*
Zero crossing selection	C70	no	yES		yES	yES	yES	yES	yES	yES	*yES*
Others	**o--**										
Delay of outputs at startup	o01	0	600	min	5	5	5	5	5	5	5
DI1 configuration *oFF=not used, Sdc=status display output, doo=door alarm with resumption, doA=door alarm without resumption, SCH = main switch, nig=day/ night mode, rFd=reference displacement, EAL=external alarm, dEF=defrost, Pud=pull-down, Sc=condenser sensor*	o02	oFF	Sc		oFF	oFF	oFF	oFF	oFF	oFF	oFF
Serial address	o03	0	247		0	0	0	0	0	0	-
Password	o05	no	999		no	no	no	no	no	no	no
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K,* *Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	n10	-
Display Resolution *0.1=steps of 0.1 °C* *0.5=steps of 0.5 °C,* *1.0=steps of 1.0 °C*	o15	0.1	1.0		0.1	0.1	0.1	0.1	0.1	0.1	*0.1*
Relay 1 counter (1 count=100 cycles of operation)	o23	0	999		0	0	0	0	0	0	-
Relay 2 counter (1 count=100 cycles of operation)	o24	0	999		0	0	0	0	0	0	-
Relay 3 counter (1 count=100 cycles of operation)	o25	0	999		0	0	0	0	0	0	-
DI2 configuration *oFF=not used, Sdc=status display output, doo=door alarm with resumption, doA=door alarm without resumption, SCH=main switch, nig=day/night mode, rFd=reference displacement, EAL=external alarm, dEF=defrost, Pud=pull-down*	o37	oFF	Pud		oFF	oFF	oFF	oFF	oFF	oFF	oFF
Predefined applications	o61	AP0	AP5		AP0	*AP1*	*AP2*	*AP3*	*AP4*	*AP5*	-
Save settings as factory WARNING: The earlier factory settings are overwritten	o67	no	yES		no	no	no	no	no	no	-
DO2 config *(dEF=Defrost; ALA=alarm)*	o71	dEF	ALA		dEF	ALA	dEF	dEF	dEF	dEF	dEF
Display at defrost *Air=actual air temperature, FrE=freezed temperature,* *-d-="-d-" is displayed*	o91	Air	-d-		-d-	-d-	-d-	-d-	-d-	-d-	*-d-*
Polarity	**P--**										
DI1 input polarity *nc=normally closed,* *no=normally open*	P73	nc	no		no	no	no	no	no	no	no
DI2 input polarity *nc=normally closed,* *no=normally open*	P74	nc	no		no	no	no	no	no	no	no
Invert alarm relay *0=normal, 1=invert relay action*	P75	0	1		0	0	-	-	-	-	-
Key board lock enable	P76	no	yES		no	no	no	no	no	no	-

	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Read outs	**u--**										
Controller Status *S0=Cooling ON/Heating ON, S2=wait for compressor ON time to elapse, S3=wait for compressor OFF time to elapse-restart time, S4=drip OFF delay after defrost, S10=cooling stop, S11=cooling stopped by thermostat/ heating OFF, S14=defrosting state, S15=fan delay state after defrost, S17=door open (DI input), S20=emergency cooling, S25=manual control of outputs, S30=continous cycle/Pull-down, S32=delay of outputs at power up*	u00	S0	S32		--						
Air temperature (Sair)	u01	-100.0	200.0	C/F	---						
Read the present regulation reference	u02	-100.0	200.0	C/F	---						
Defrost temperature (S5)	u09	-100.0	200.0	C/F	---	-	-	-			
DI1 input	u10	oFF	on		---						
Status of night operation	u13	oFF	on		---						
DI2 input	u37	oFF	on		---						
Condenser temperature (Sc)	U09	-100.0	200.0	C/F	---						
Compressor relay status	u58	oFF	on		---						
Fan relay status	u59	oFF	on		---						
Defrost relay status	u60	oFF	on		---						
Alarm relay status	u62	oFF	on		---						
Light relay status	u63	oFF	on		---						
Firmware version readout	u80	000	999		---						

Note: hidden parameters are greyed

Parameter Name - ERC 214	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Configuration	**cFg**										
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	1	1
Predefined applications *AP0, AP1, AP2, AP3, AP4, AP5*	o61	AP0	AP5		AP0	AP1	AP2	AP3	AP4	AP5	AP6
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K, Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	n10	n10
DO4 configuration *Lig=light, ALA=alarm*	o36	Lig	ALA		Lig	Lig	Lig	Lig	Lig	Lig	Lig
Reference/Thermostat	**r--**										
Temperature Setpoint	r00	-100.0	200.0	C/F	2.0	4.0	2.0	-24.0	2.0	-24.0	2.0
Differential	r01	0.1	20.0	K	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Min Set Point limitation	r02	-100.0	200.0	C/F	-35.0	2.0	0.0	-26.0	0.0	-26.0	-35.0
Max Set Point limitation	r03	-100.0	200.0	C/F	50.0	6.0	4.0	-20.0	4.0	-20.0	50.0
Display offset (correction value in display temperature)	r04	-10.0	10.0	K	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Display Unit (°C/°F)	r05	-C	-F		-C	-C	-C	-C	-C	-C	-C
Calibration of Sair (offset for air temperature calibration)	r09	-20.0	20.0	K	0.0	0.0	0.0	0.0	0.0	0.0	-
Main switch *-1=service, 0=OFF, 1=ON*	r12	-1	1		1	1	1	1	1	1	-
Night Set back (offset temperature during night mode)	r13	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thermostat reference displacement offset temperature	r40	-50.0	50.0	K	0.0	0.0	0.0	0.0	0.0	0.0	-
Pull-down duration	r96	0	960	min	0	0	0	0	0	0	-
Pull-down limit temperature	r97	-100.0	200.0	C/F	0.0	0.0	0.0	0.0	0.0	0.0	-
Alarm	**A--**										
Delay for temperature alarm during normal conditions	A03	0	240	min	30	45	30	30	30	30	30
Delay for temperature alarm during pull-down/start-up/defrost	A12	0	240	min	60	90	60	60	60	60	60
High temperature alarm limit (Cabinet/Room)	A13	-100.0	200.0	C/F	8.0	10.0	8.0	-15.0	8.0	-15.0	8.0
Low temperature alarm limit	A14	-100.0	200.0	C/F	-30.0	0.0	-2.0	-30.0	-2.0	-30.0	-30.0
DI1 delay (time delay for selected DI1 function)	A27	0	240	min	30	30	30	30	30	30	30
DI2 delay (time delay for selected DI2 function)	A28	0	240	min	30	30	30	30	30	30	30
Condenser high alarm limit	A37	0	200	C/F	80	80	80	80	80	80	-
Condenser high block limit	A54	0	200	C/F	85	85	85	85	85	85	-
Voltage protection enable	A72	no	yES		no	no	no	no	no	no	no
Minimum cut-in voltage	A73	0	270	V	0	0	0	0	0	0	0
Minimum cut-out voltage	A74	0	270	V	0	0	0	0	0	0	0
Maximum voltage	A75	0	270	V	270	270	270	270	270	270	270
Defrost	**d--**										
Defrost Method *no=no defrost, nAt=natural, EL=electrical, gAS=hot gas*	d01	no	gAS		EL	*nAt*	*EL*	*EL*	*EL*	*EL*	EL
Defrost stop temperature	d02	0.0	50.0	C/F	6.0	-	-	-	6.0	6.0	6.0
Defrost interval	d03	0	240	hours	8	6	8	12	8	12	8
Max defrost time	d04	0	480	min	30	45	15	15	30	30	30
Defrost delay at power up (or DI signal)	d05	0	240.0	min	0	0	0	0	0	0	-
Drip delay	d06	0	60	min	0	0	0	0	0	0	*5*
Fan delay after defrost	d07	0	60	min	0	0	0	0	0	0	*5*
Fan start temperature after defrost	d08	-50.0	0.0	C/F	-5.0	-	-	-	-5.0	-5.0	-
Fan during defrost	d09	oFF	on		on	*on*	*on*	*on*	on	on	on
Defrost stop sensor configuration *non=time, Air=Sair (air temperature), dEF=S5 (defrost sensor)*	d10	non	dEF		non	*non*	*non*	*non*	*dEF*	*dEF*	non
Compressor accumulated runtime to start defrost *0=OFF*	d18	0	96	hours	0	0	0	0	0	0	-
Defrost on demand *20.0=OFF*	d19	0.0	20.0	K	20.0	-	-	-	20.0	20.0	-
Defrost delay after pull-down *0=OFF*	d30	0	960	min	0	0	0	0	0	0	-

	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Fan control	**F--**										
Fan at compressor cutout *FFc=fan follow compressor, FAo=fan always ON, FPL= fan pulsating*	F01	FFc	FPL		FAo	FAo	FAo	FAo	FAo	FAo	FAo
Fan stop evaporator temperature *50.0=OFF*	F04	-50.0	50.0	C/F	50.0	-	-	-	50.0	50.0	-
Fan ON Cycle	F07	0	15	min	2	2	2	2	2	2	*2*
Fan OFF cycle	F08	0	15.0	min	2	2	2	2	2	2	*2*
Compressor	**c--**										
Compressor minimum ON time	C01	0	30	min	0	0	0	0	0	0	0
Compressor minimum OFF time	C02	0	30	min	2	2	2	2	2	2	2
Compressor OFF delay at door open	C04	0	15	min	0	0	0	0	0	0	*1*
Zero crossing selection	C70	no	yES		yES	yES	yES	yES	yES	yES	*yES*
Others	**o--**										
Delay of outputs at startup	o01	0	600	min	5	5	5	5	5	5	*5*
DI1 configuration *oFF=not used, Sdc=status display output, doo=door alarm with resumption, doA=door alarm without resumption, SCH = main switch, nig=day/ night mode, rFd=reference displacement, EAL=external alarm, dEF=defrost, Pud=pull-down, Sc=condenser sensor*	o02	oFF	Sc		oFF	oFF	oFF	oFF	oFF	oFF	oFF
Serial address	o03	0	247		0	0	0	0	0	0	-
Password	o05	no	999		no	no	no	no	no	no	0
Sensor type selection *n5=NTC 5 K, n10=NTC 10 K, Ptc=PTC, Pt1=Pt1000*	o06	n5	Pt1		n10	n10	n10	n10	n10	n10	-
Display Resolution *0.1=steps of 0.1 °C 0.5=steps of 0.5 °C, 1.0=steps of 1.0 °C*	o15	0.1	1.0		0.1	0.1	0.1	0.1	0.1	0.1	*0.1*
Relay 1 counter (1 count=100 cycles of operation)	o23	0	999		0	0	0	0	0	0	-
Relay 2 counter (1 count=100 cycles of operation)	o24	0	999		0	0	0	0	0	0	-
Relay 3 counter (1 count=100 cycles of operation)	o25	0	999		0	0	0	0	0	0	-
Relay 4 counter (1 count=100 cycles of operation)	o26	0	999		0	0	0	0	0	0	-
DO4 configuration *ALA=alarm, Lig=light*	o36	ALA	Lig		Lig	Lig	Lig	Lig	Lig	Lig	-
DI2 configuration *oFF=not used, Sdc=status display output, doo=door alarm with resumption, doA=door alarm without resumption, SCH=main switch, nig=day/night mode, rFd=reference displacement, EAL=external alarm, dEF=defrost, Pud=pull-down*	o37	oFF	Pud		oFF	oFF	oFF	oFF	oFF	oFF	oFF
Light Control *on=always on, dAn=day/night, doo=based on door action*	o38	on	doo		on	on	on	on	on	on	on
Predefined applications	o61	AP0	AP5		AP0	*AP1*	*AP2*	*AP3*	*AP4*	*AP5*	-
Save settings as factory WARNING: The earlier factory settings are overwritten	o67	no	yES		no	no	no	no	no	no	-
Display at defrost *Air=actual air temperature, FrE=freezed temperature, -d-="-d-" is displayed*	o91	Air	-d-		-d-	-d-	-d-	-d-	-d-	-d-	*-d-*
Polarity	**P--**										
DI1 input polarity *nc=normally closed, no=normally open*	P73	nc	no		no	no	no	no	no	no	no
DI2 input polarity *nc=normally closed, no=normally open*	P74	nc	no		no	no	no	no	no	no	no
Invert alarm relay *0=normal, 1=invert relay action*	P75	0	1		0	0	0	0	0	0	-
Key board lock enable	P76	no	yES		no	no	no	no	no	no	-

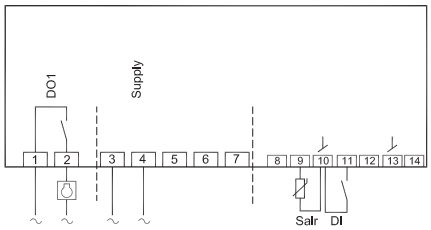
	Code	Min	Max	Unit	App. 0 (Def.)	App. 1	App. 2	App. 3	App. 4	App. 5	App. 6
Read outs	**u--**										
Controller Status *S0=Cooling ON/Heating ON, S2=wait for compressor ON time to elapse, S3=wait for compressor OFF time to elapse-restart time, S4=drip OFF delay after defrost, S10=cooling stop S11=cooling stopped by thermostat/heating OFF, S14=defrosting state, S15=fan delay state after defrost, S17=door open (DI input), S20=emergency cooling, S25=manual control of outputs, S30=Continous cycle/Pull-down, S32=delay of outputs at power up*	u00	S0	S32		--						
Air temperature (Sair)	u01	-100.0	200.0	C/F	---						
Read the present regulation reference	u02	-100.0	200.0	C/F	---						
Defrost temperature (S5)	u09	-100.0	200.0	C/F	---	-	-	-			
DI1 input	u10	oFF	on		---						
Status of night operation	u13	oFF	on		---						
DI2 input	u37	oFF	on		---						
Condenser temperature (Sc)	U09	-100.0	200.0	C/F	---						
Compressor relay status	u58	oFF	on		---						
Fan relay status	u59	oFF	on		---						
Defrost relay status	u60	oFF	on		---						
Alarm relay status	u62	oFF	on		---						
Light relay status	u63	oFF	on		---						
Firmware version readout	u80	000	999		---						

Note: hidden parameters are greyed

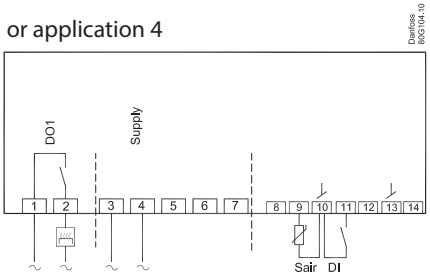
Alarm status	Alarm code
Air temperature sensor (Sair) error	E29
Defrost sensor (S5) error	E27
Condenser sensor (Sc) error	E30
High temperature alarm	A01
Low temperature alarm	A02
High voltage alarm	A99
Low voltage alarm	AA1
High condenser temperature alarm	A61
Door alarm	A04
Standby alarm	A45
DI external alarm	A15

Wiring

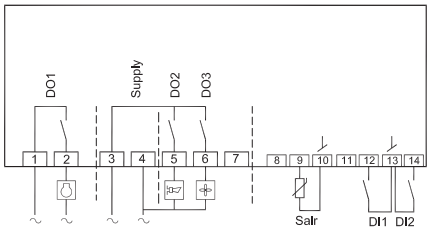
ERC 211
Application 1, 2 and 3



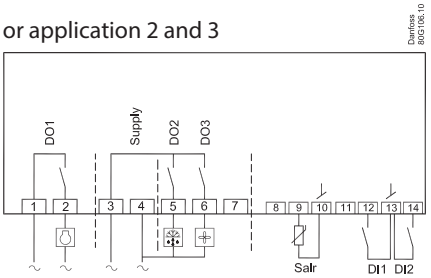
or application 4



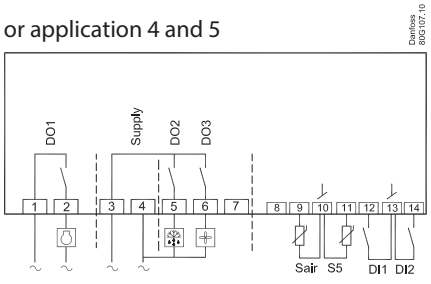
ERC 213
Application 1



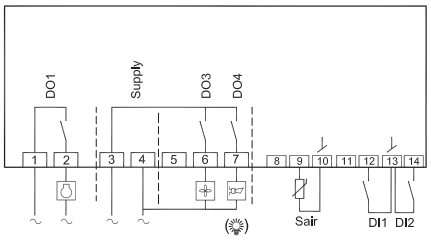
or application 2 and 3



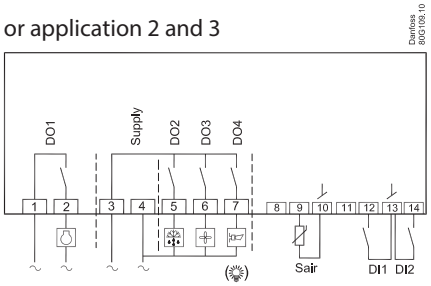
or application 4 and 5



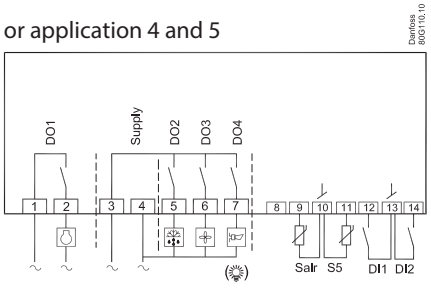
ERC 214
Application 1



or application 2 and 3



or application 4 and 5



Power supply
230 V AC or 115 V AC See controller.

Sensors
Sair is the thermostat sensor.

S5 is a defrost sensor and is used if defrost is stopped based on temperature.
Sc (not shown) is an extra sensor for measuring a temperature such as the condenser temperature.
This sensor can be connected instead of the digital input DI1.

Digital on/off signals
A cut-in input activates a function. The possible functions are described in menu o02 and menu o37.

Relays
The general configurations are:

Relay 1
Refrigeration. The contact cuts in when the controller demands refrigeration.

Relay 2
Defrost. The contact cuts in while defrosting is in progress.
Alarm.The relay is cut out when the controller is de-energised. The setting in menu P75 will define whether it is cut in or cut out when there is an alarm situations

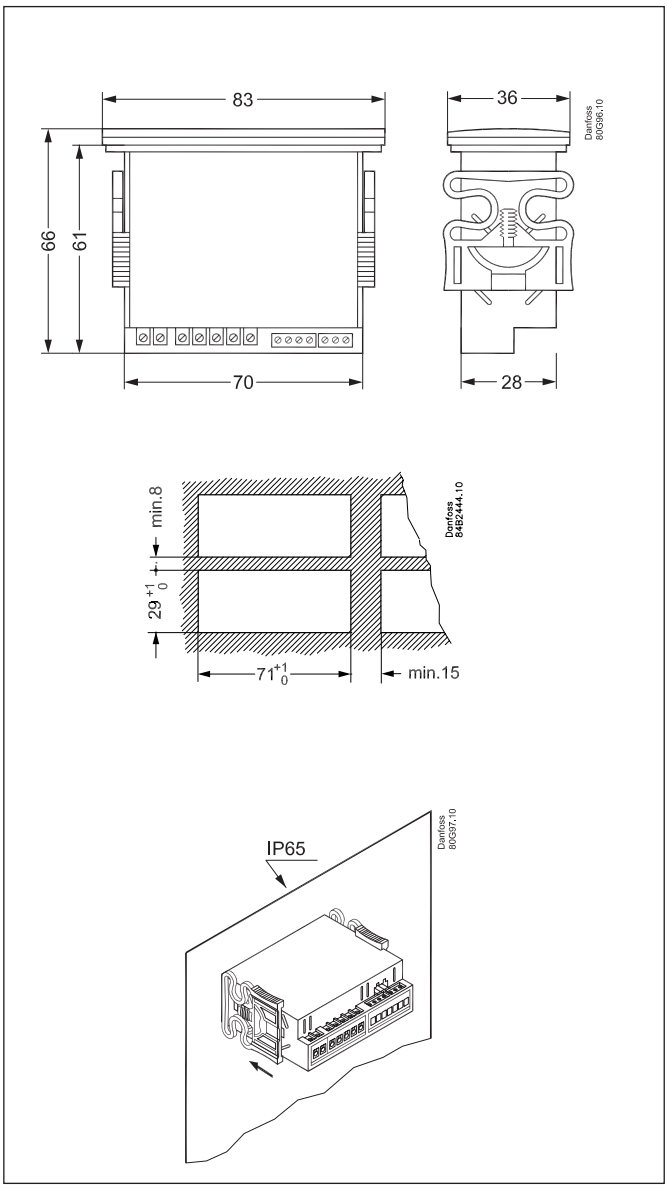
Relay 3
Fan.

Relay 4
Alarm. The relay is cut out when the controller is de-energised. The setting in menu P75 will define whether it is cut in or cut out when there is an alarm situations
Light. The contact cuts in when the controller demands light.

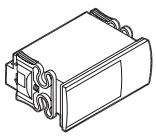
Electrical interference
Cables for sensors and DI inputs must be kept separate from other electrical cables:
- Use separate cable trays
- Maintain a distance of at least 10 cm between cables
- Avoid connecting long cables to the DI input

Technical data

Power supply	115 V a.c. / 230 V a.c. 50-60 Hz, galvanic isolated. Low voltage regulated power supply
Rated power	Less than 0.7 VA
Inputs	4 inputs: 2 analogue, 1 analogue/digital and 1 digital
Sensors	NTC 5000 ohm at 25°C NTC 10000 ohm at 25°C PTC 1000 ohm (EKS 111) Pt 1000
Accuracy	Measuring range: -40 – 105°C (-40 – 221°F)
	Controller accuracy: ± 1 K below -35°C, ± 0.5 K between -35 – 25°C, ± 1 K above 25°C
Relays/outputs	DO1 Compressor relay: 16 A, 16(16) A, EN 60730 10 FLA/60LRA @230 V, UL60730 16 FLA/72LRA @115 V, UL60730
	DO2 Defrost relay: 8 A, 2 FLA/12 LRA, UL60730 8 A, 2 (2 A), EN60730
	DO3 Fan relay: 3 A, 2 FLA/12 LRA, UL60730 3 A, 2 (2 A), EN60730
	DO4 Alarm/Light relay: 2 A
Display	LED display, 3 digits, decimal point and multi functionality icons, °C + °F scale
Operating conditions	-10 – 55°C (14 – 131°F), 90% Rh
Storage conditions	-40 – 70°C (-40 – 158°F), 90% Rh
Enclosure	Front : IP65 (Gasket integrated) Rear: IP00
Environmental	Pollution degree II, non condensing
Resistance to heat and fire	Category D (UL94-V0)
EMC category	Category I
Approvals	UL recognition (US & Canada) (UL 60730) ENEC (EN 60730) CQC CE (LVD & EMC Directive) EAC (GHOST) NSF ROHS2.0

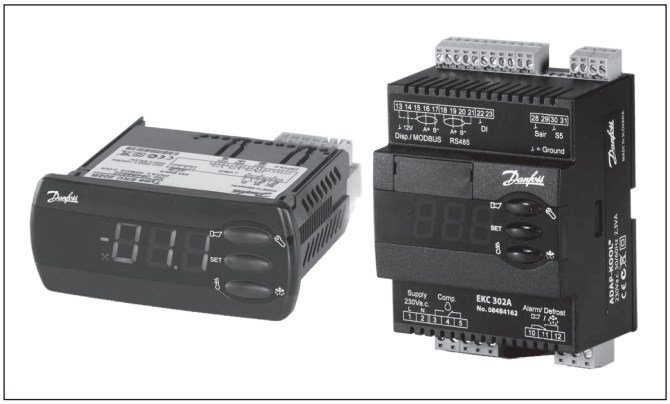


Ordering

Type		Function	Relay	Supply	Code no.
ERC 211		Temperature controller, RED LED	1	115 V a.c.	**080G3290**
				230 V a.c.	**080G3293**
ERC 213			3	115 V a.c.	**080G3291**
				230 V a.c.	**080G3294**
ERC 214			4	115 V a.c.	**080G3292**
				230 V a.c.	**080G3295**
EKA 183A		Programming key with adapter - ERC 21X			**080G9740**

Additional information available:
Manual: DKRCC.ES.RL0.H

EKC 202A / B / C, EKC 302A / B



Application
- This controller is used for temperature control of refrigeration appliances and cold rooms in supermarkets
- Control of defrost, fans, alarm and lighting
- EKC 202 is for front panel mounting
- EKC 302 is for DIN Rail mounting

Advantages
- Integrated refrigeration system functions

- Defrost on demand in 1:1 systems

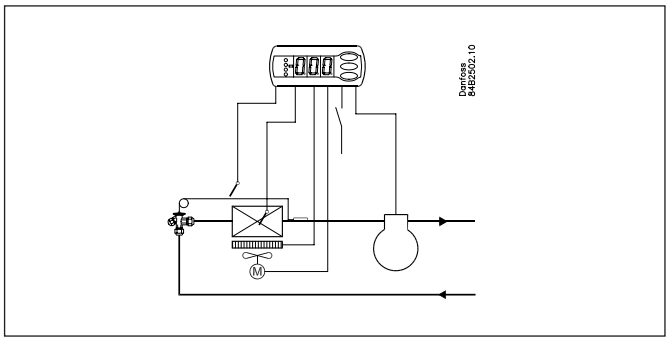
- Buttons and gasket integrated in front panel

- IP 65 rating for front panel (EKC 202)

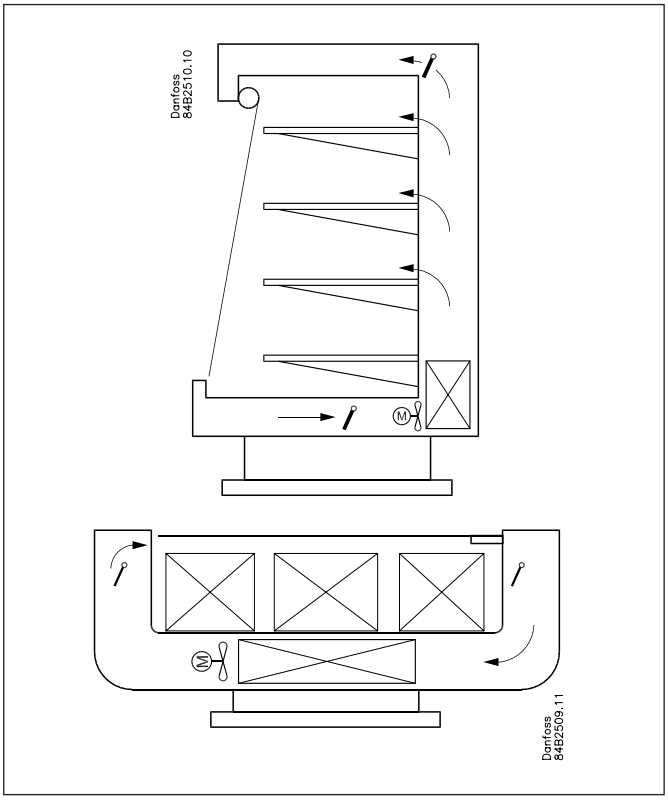
- Digital input any one of the following:
  - Door contact function with alarm
  - Defrost start
  - Regulation start/stop
  - Night operation
  - Switching between two temperature references
  - Case cleaning

- Instant programming using programming key

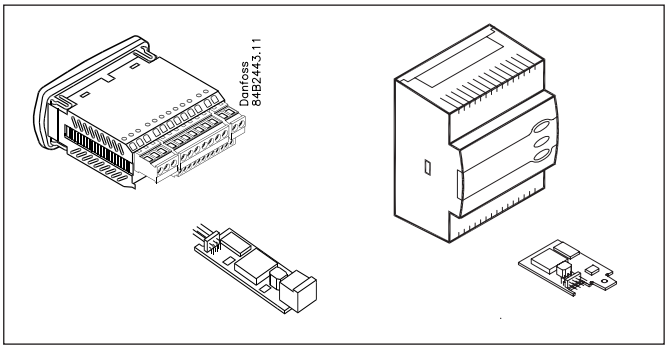
- HACCP
  Factory calibration assures measurement accuracy exceeding the requirements of the EN 441-13 standard without subsequent calibration (Pt1000 sensor).



Extra module
- The controller can be retrofitted with a plug-in module if necessary for the application.
  The controller has a connector to receive the plug-in module.
  - *Battery module (EKC 202)*
    This module provides back-up power to the controller if the supply voltage is interrupted for more than four hours. This ensures reliable operation of the clock function during a power failure.
  - *Data communication*
    If PC-based operation is necessary, a data communication module must be fitted to the controller.
  - Coordinated defrost via data communication



Regulation
The controller contains a temperature regulator that can accept an input signal from a single temperature sensor.
The sensor can be located in the cold air flow after the evaporator or in the warm air flow just ahead the evaporator.
The controller regulates defrosting using natural defrost or electrical defrosting. Renewed cut-in after defrosting can occur based on time or temperature.
The defrost temperature can be measured directly by using a defrost sensor.
The required functions needed for the application are cut in and out by two to four relays:
- Refrigeration (compressor or solenoid valve)
- Defrost
- Fan
- Alarm
- Lighting

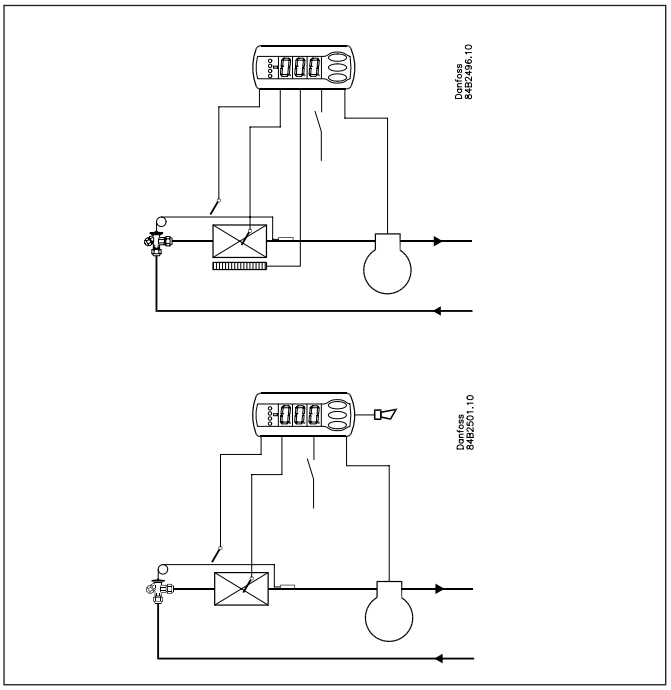


The various applications are described on the next page.

EKC 202A / EKC 302A
Controller with two relay outputs, two temperature sensors, and a digital input.

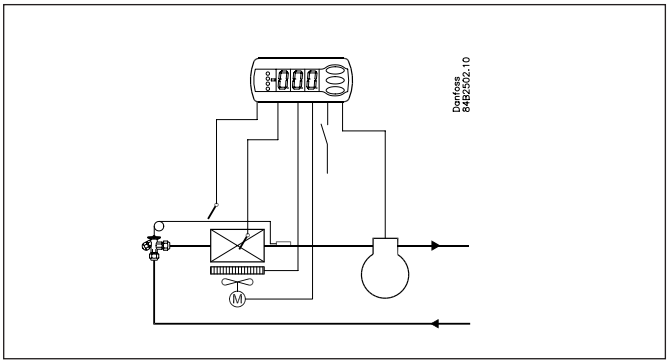
Temperature control with compressor start/stop or a solenoid valve
Defrost sensor
Electrical defrost / gas defrost

Alarm function
If an alarm function is required, relay 2 can be used for this purpose.
Defrost is performed by air circulation in this case, since the fans operate continuously.



EKC 202B / EKC 302B
Controller with three relay outputs, two temperature sensors, and a digital input.

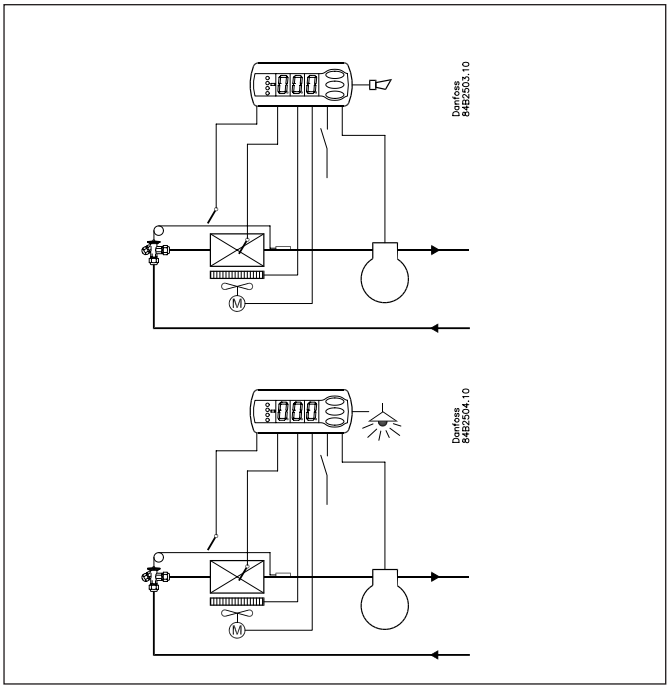
Temperature control with compressor start/stop or a solenoid valve
Defrost sensor
Electrical defrost / gas defrost
Relay output 3 is used for fan control.



EKC 202C
Controller with four relay outputs, two temperature sensors, and a digital input.

Temperature control with compressor start/stop or a solenoid valve
Defrost sensor
Electrical defrost / gas defrost
Fan control

Relay output 4 can be used for an alarm function or a lighting function.



Menu overview

EKC 202: SW = 1.3x
EKC 302: SW = 1.0x

Parameters		Controller						
Function	**Codes**	**EKC 202A / 302A**	**EKC 202B /302B**	**EKC 202C**	**Min.-value**	**Max.-value**	**Factory setting**	**Actual setting**
Normal operation								
Temperature (set point)	---				-50°C	50°C	2°C	
Thermostat								
Differential	r01				0,1 K	20 K	2 K	
Max. limitation of set point setting	r02				-49°C	50°C	50°C	
Min. limitation of set point setting	r03				-50°C	49°C	-50°C	
Adjustment of temperature indication	r04				-20 K	20 K	0.0 K	
Temperature unit (°C/°F)	r05				°C	°F	°C	
Correction of the signal from Sair	r09				-10 K	10 K	0 K	
Manual service(-1), stop regulation(0), start regulation (1)	r12				-1	1	1	
Displacement of reference during night operation	r13				-10 K	10 K	0 K	
Activation of reference displacement r40	r39				OFF	on	OFF	
Value of reference displacement (activation by r39 or DI)	r40				-50 K	50 K	0 K	
Alarm								
Delay for temperature alarm	A03				0 min	240 min	30 min	
Delay for door alarm	A04				0 min	240 min	60 min	
Delay for temperature alarm after defrost	A12				0 min	240 min	90 min	
High alarm limit	A13				-50°C	50°C	8°C	
Low alarm limit	A14				-50°C	50°C	-30°C	
Alarm delay DI1	A27				0 min	240 min	30 min	
High alarm limit for condenser temperature (o70)	A37				0°C	99°C	50°C	
Compressor								
Min. ON-time	c01				0 min	30 min	0 min	
Min. OFF-time	c02				0 min	30 min	0 min	
Compressor relay must cutin and out inversely (NC-function)	c30				0 / OFF	1 / on	0 / OFF	
External relays (Zero crossing control – only EKC 302) Must be 'ON' when connecting to external relays	c70				OFF	On	On	
Defrost								
Defrost method (none/EL/gas)	d01				no	gas	EL	
Defrost stop temperature	d02				0°C	25°C	6°C	
Interval between defrost starts	d03				0 hours	48 hours	8 hours	
Max. defrost duration	d04				0 min	180 min	45 min	
Displacement of time on cutin of defrost at start-up	d05				0 min	240 min	0 min	
Drip off time	d06				0 min	60 min	0 min	
Delay for fan start after defrost	d07				0 min	60 min	0 min	
Fan start temperature	d08				-15°C	0°C	-5°C	
Fan cutin during defrost 0: Stopped 1: Running 2: Running during pump down and defrost	d09				0	2	1	
Defrost sensor (0=time, 1=S5, 2=Sair)	d10				0	2	0	
Max. aggregate refrigeration time between two defrosts	d18				0 hours	48 hours	0 hours	
Defrost on demand - S5 temperature's permitted variation during frost build-up. On central plant choose 20 K (=off)	d19				0 K	20 K	20 K	
Fans								
Fan stop at cutout compressor	F01				no	yes	no	
Delay of fan stop	F02				0 min	30 min	0 min	
Fan stop temperature (S5)	F04				-50°C	50°C	50°C	
Real time clock								
Six start times for defrost. Setting of hours. 0=OFF	t01-t06				0 hours	23 hours	0 hours	
Six start times for defrost. Setting of minutes. 0=OFF	t11-t16				0 min	59 min	0 min	
Clock - Setting of hours	t07				0 hours	23 hours	0 hours	
Clock - Setting of minute	t08				0 min	59 min	0 min	
Clock - Setting of date	t45				1	31	1	
Clock - Setting of month	t46				1	12	1	
Clock - Setting of year	t47				0	99	0	
Miscellaneous								
Delay of output signals after start-up	o01				0 s	600 s	5 s	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=change reference (r40 will be activated) 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=Inject off when open.	o02				0	11	0	
Network address	o03				0	240	0	
On/Off switch (Service Pin message)	o04				OFF	ON	OFF	
Access code 1 (all settings)	o05				0	100	0	
Used sensor type (Pt /PTC/NTC)	o06				Pt	ntc	Pt	
Display step = 0.5 (normal 0.1 at Pt sensor)	o15				no	yes	no	
Max hold time after coordinated defrost	o16				0 min	60 min	20	
Configuration of light function (relay 4) 1=ON during day operation. 2=ON / OFF via data communication. 3=ON follows the DI-function, when DI is selected to door function or to door alarm	o38				1	3	1	
Activation of light relay (only if o38=2)	o39				OFF	ON	OFF	

Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	o46				0	2	0	
Access code 2 (partly access)	o64				0	100	0	
EKC 202 only. Save the controllers present settings to the programming key. Select your own number.	o65				0	25	0	
EKC 202 only. Load a set of settings from the programming key (previously saved via o65 function)	o66				0	25	0	
Replace the controllers factory settings with the present settings	o67				OFF	On	OFF	
Re alternative application for the S5 sensor (maintain the setting at 0 if it is used as defrost sensor, otherwise 1 = product sensor and 2 = condenser sensor with alarm)	o70				0	2	0	
Select application for relay 4: 1=defrost/light, 2= alarm	o72	defrost / Alarm		Light / Alarm	1	2	2	
Service								
Temperature measured with S5 sensor	u09							
Status on DI1 input. on/1=closed	u10							
Status on night operation (on or off) 1=closed	u13							
Read the present regulation reference	u28							
Status on relay for cooling (Can be controlled manually, but only when r12=-1)	u58							
Status on relay for fans (Can be controlled manually, but only when r12=-1)	u59							
Status on relay for defrost. (Can be controlled manually, but only when r12=-1)	u60							
Temperature measured with Sair sensor	u69							
Status on relay 4 (alarm, defrost, light). (Can be controlled manually, but only when r12=-1)	u71							

Factory settings
If you need to restore the factory settings, proceed as follows:
- Remove power from the controller
- Hold the upper and lower button pressed while restoring power

Fault code display		Alarm code display		Status code display	
E1	Fault in controller	A 1	High temperature alarm	S0	Regulating
E6	Change battery + check clock	A 2	Low temperature alarm	S1	Waiting for end of the coordinated defrost
E 27	S5 sensor error	A 4	Door alarm	S2	ON-time Compressor
E 29	Sair sensor error	A 5	Max. Hold time	S3	OFF-time Compressor
		A 15	DI 1 alarm	S4	Drip-off time
		A 45	Standby mode	S10	Refrigeration stopped by main switch
		A 59	Case cleaning	S11	Refrigeration stopped by thermostat
		A 61	Condenser alarm	S14	Defrost sequence. Defrosting
				S15	Defrost sequence. Fan delay
				S16	Refrigeration stopped because of open DI input
				S17	Door open (open DI input)
				S20	Emergency cooling
				S25	Manual control of outputs
				S29	Case cleaning
				S32	Delay of output at start-up
				non	The defrost temperature cannot be displayed. There is stop based on time
				-d-	Defrost in progress / First cooling after defrost
				PS	Password required. Set password

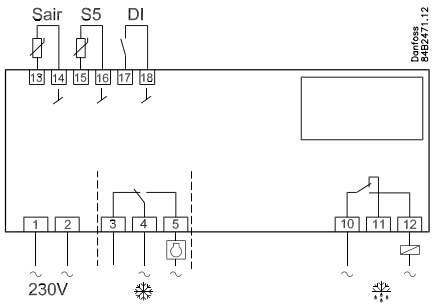
Start-up:

Regulation begins when power is applied.

1 Review the list of factory settings. Change the parameter settings as necessary.
2 For network operation. Set the address in o03 and transmit it to the gateway or system unit with setting o04.

Wiring

EKC 202A



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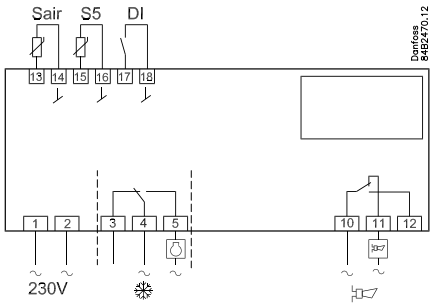
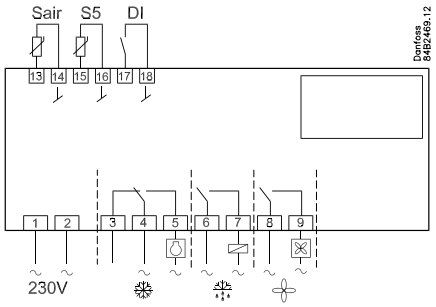
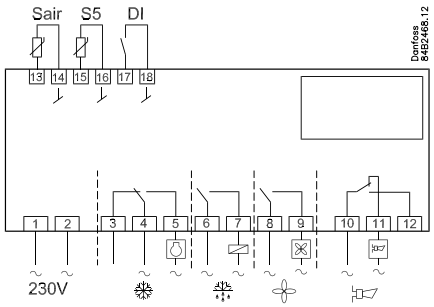


EKC 202B



EKC 202C



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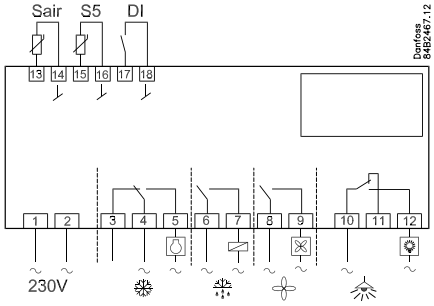
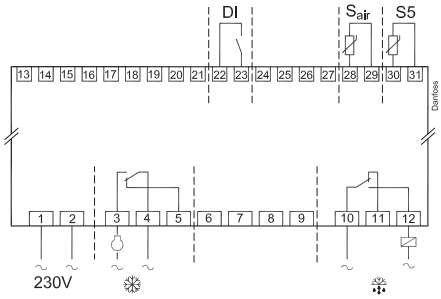


EKC 302A



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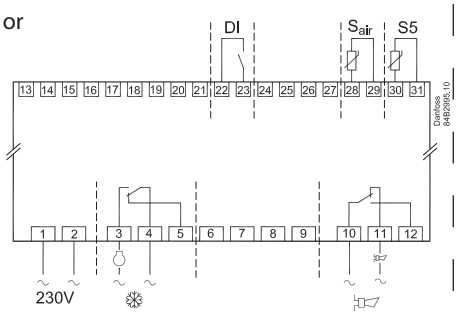
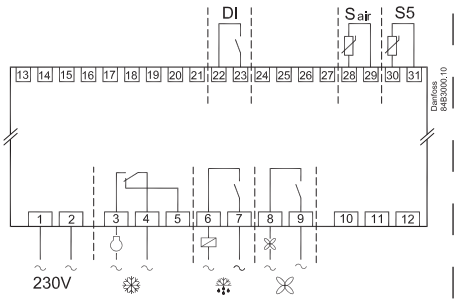


EKC 302B



Power supply
230 V a.c.

Sensors
Sair is thermostat sensors.
S5 is a defrost sensor and is used if defrost has to be stopped based on temperature. It may however also be used as product sensor or condenser sensor.

Digital On/Off signal
A cut-in input will activate a function. The possible functions are described in menu o02.

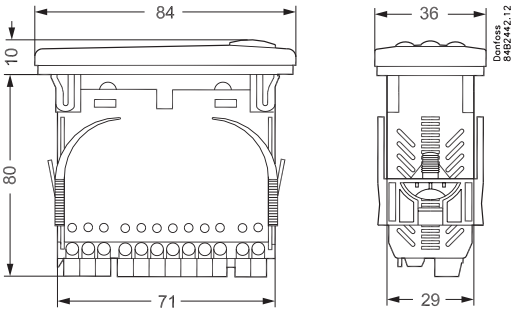
Relays
The general connections are:
Refrigeration. The contact will cut in when the controller demands refrigeration
Defrost.
Fan.
Alarm. The relay is cut out during normal operation and cuts in in alarm situations and when the controller is dead (de-energised)
Light. The contact will cut in when the controller demands light.

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

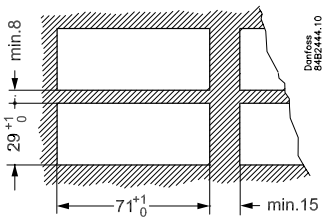
Technical data

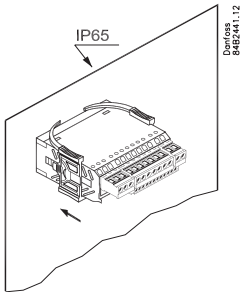
Supply voltage	230 V a.c. +10/-15 %. 2.5 VA, 50/60 Hz			
Sensors 3 pcs off either	Pt 1000 or PTC 1000 ohm or NTC-M2020 (5000 ohm / 25°C)			
Accuracy	Measuring range	-60 to +99°C		
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C		
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad		
Display	LED, 3-digits			
External display	EKA 163A / EKA 164A			
Digital inputs	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer			
Electrical connection cable	Max.1,5 mm² multi-core cable Max. 1 mm² on sensors and DI inputs			
Relays* 			IEC60730	
	EKC 202	DO1	10 (6) A & (5 FLA, 30 LRA)	
		DO2	10 (6) A & (5 FLA, 30 LRA)	
		DO3	6 (3) A & (3 FLA, 18 LRA)	
		DO4**	4 (1) A, Min. 100 mA**	
	EKC 302	DO1	10 (6) A & (5 FLA, 30 LRA)	1)
			16 (8) A & (10 FLA, 60 LRA)	2)
		DO2	6 (3) A & (3 FLA, 18 LRA)	1)
			10 (6) A & (5 FLA, 30 LRA)	2)
		DO3	6 (3) A & (3 FLA, 18 LRA)	1)
			10 (6) A & (5 FLA, 30 LRA)	2)
		DO4**	4 (1)A Min. 100 mA**	
Data communication	EKC 202: Via insert card EKC 302: Fixed MODBUS. Can be expanded with LON or MODBUS via insert card			
Environments	0 to +55°C, During operations -40 to +70°C, During transport			
	20 - 80% Rh, not condensed			
	No shock influence / vibrations			
Density	EKC 202: IP 65 from front. Buttons and packing are imbedded in the front. EKC 302: IP 20			
Escapement reserve for the clock	4 hours			
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with EKC 202: UL approval acc. UL 60730 LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. EN 61000-6-3 and EN 61000-6-2 and EN 61000-4-(2-6,8,11)			

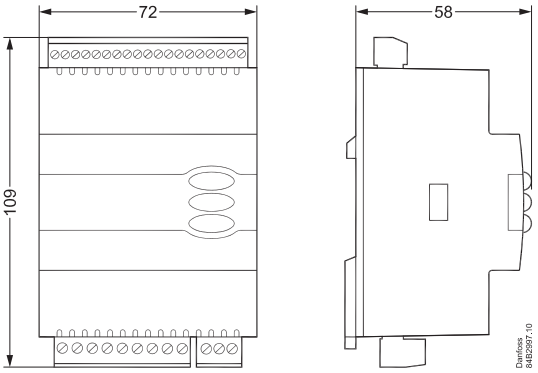
* EKC 202: DO1 and DO2 are 16 A relays. DO3 and DO4 are 8 A relays. Above max. load must be kept.
EKC 302: DO1 are 20 A relays. DO2 and DO3 are 16 A relays. DO4 are 10 A relays. The max. load listed above must be observed when connecting without zero-crossing control. When connecting with zero-crossing control, the load must be increased to the value indicated by 2)
** Gold plating ensures make function with small contact loads
1) With external relay (c70=ON) (zero-crossing control disabled)
2) Without external relay (c70=OFF) (zero-crossing control enabled)
Relay contact and controller supply **must** use same phase and the load (compressor) must phase compensated to Cos φ = 1.



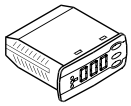
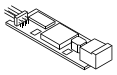
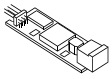
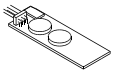
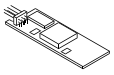
Weight = 200 g





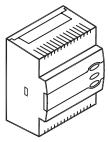
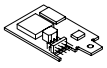
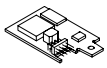


Ordering

Type		Function	Supply voltage	Code no.
EKC 202A		Refrigeration controller	**230 V**	**084B8521**
EKC 202B		Refrigeration controller with fan function		**084B8522**
EKC 202C		Refrigeration controller for electric defrost		**084B8523**
EKA 178A		Data communication module. MOD-bus		**084B8564**
EKA 179A		Data communication module. RS 485- LON		**084B8565**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure		**0848577**
EKA 182A		Copy key EKC - EKC		**084B8567**

Additional information available:
Manual: RS8DZ

Ordering

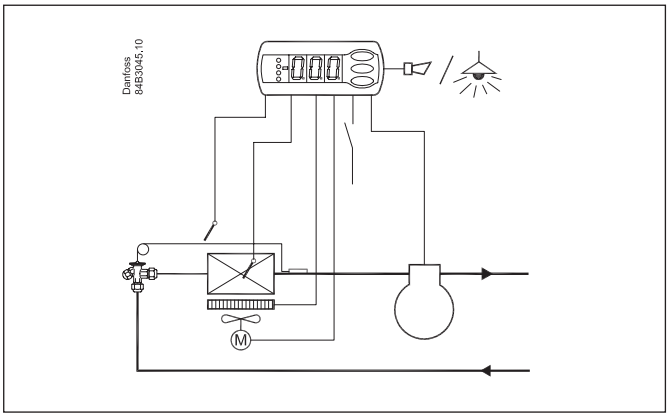
Type		Function	Supply voltage	Code no.
EKC 302A		Refrigeration controller with MODBUS data communication	230 V	**084B4162**
EKC 302B		Refrigeration controller r with fan function and MODBUS data communication		**084B4163**
EKA 175		Data communication module LON RS485		**084B8579**
EKA 178B		Data communication module MODBUS		**084B8571**
EKA 163A		External display option		**084B8562**
EKA 164A		External operation option		**084B8563**

Additional information available:
Manual: RS8DZ

EKC 202C-MS

Application
- The controller is used for temperature control refrigeration appliances and cold room in supermarkets
- The controller has the same functionalities as the EKC 202C, but is adjusted for sensor readings from NTC sensors.
- Versatility is designed in for use in new installations as well as service replacement in existing installations.

Advantages
- Multi-application support in a single unit
- Can receive signals from known NTC sensors
- Easy data communication retrofit



EKC 202C-MS
Controller with four relay outputs, two temperature sensors and digital input.

Temperature control at start/stop of compressor / solenoid valve
Defrost sensor
Electrical defrost / gas defrost
Control of fan

Relay output 4 can be used for an alarm function or for a light function.

Sensors
One or two NTC sensors of the same type must be connected.

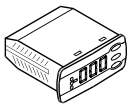
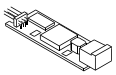
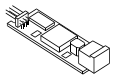
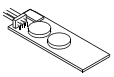
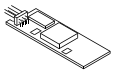
The following can be selected:
NTC 5000 Ω @ 25°C. M2020 (Danfoss Type = EKS 211)
NTC 10000 Ω @ 25°C. Beta 3435 (Danfoss Type = EKS 221)
NTC 3000 Ω @ 25°C
NTC 2500 Ω @ 0°C
NTC 10000 Ω @ 25°C
NTC 2000 Ω @ 25°C

Set the type in menu o06.

Sensor values

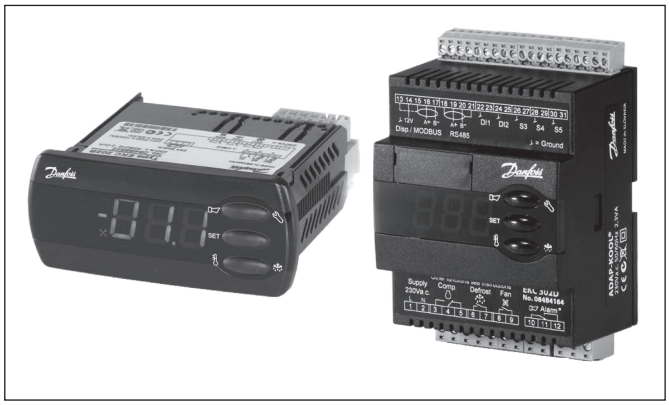
Type	NTC 5000 Ω @ 25°C (M2020)	NTC 10000 Ω @ 25°C (Beta 3435)	NTC 3000 Ω @ 25°C	NTC 2500 Ω @ 0°C	NTC 10000 Ω @ 25°C	NTC 2000 Ω @ 25°C
Danfoss NTC	*EKS 211*	*EKS 221*	-	-	-	-
°C	Ω	Ω	Ω	Ω	Ω	Ω
30	4029	8313	2417	-	8300	1651
25	**5000**	**10000**	**3000**	883	**10000**	**2000**
20	6246	12091	3747	1074	12271	2437
15	7855	14695	4712	1313	15146	2987
10	9951	17958	5970	1616	18809	3682
5	12696	22068	7617	2000	23504	4571
0	16330	27278	9798	**2492**	29564	5716
−5	21166	33922	12700	3124	37441	7198
−10	27681	42450	16608	3947	47754	9133
−15	36503	53468	21902	5019	61357	11644
−20	48614	67801	29168	6434	79440	14961
−25	65333	86580	39200	8306	103676	19402
−30	88766	111364	53259	10822	136428	25388
−35	121795	144324	73077	14217	181078	33505
−40	169157	188500	101490	18848	242495	44657
Alternatives		Carel: HP/WF/WP/INF Dixell: NS/NG/NX/NY/NT Eliwell: SN8 Lae: SN4K..P	Frigo: M841	Wurm: TRK 277	Wurm: T2000	Lae: SN2K..P
o06	n01	n02	n03	n04	n05	n06

Ordering

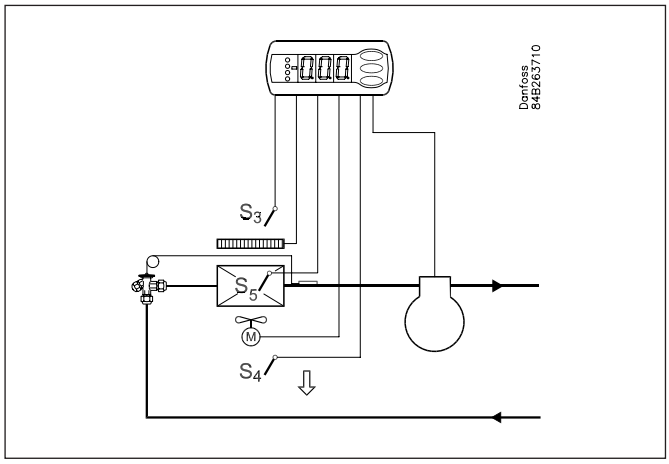
Type		**Function**	**Code no.**
EKC 202C-MS		Refrigeration controller	**084B8543**
EKA 178A		Data communication module MOD-bus	**084B8564**
EKA 179A		Data communication module RS 485 - LON	**084B8565**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure	**084B8577**
EKA 182A		Copy key EKC - EKC	**084B8567**

Additional information available:
Manual: RS8GH

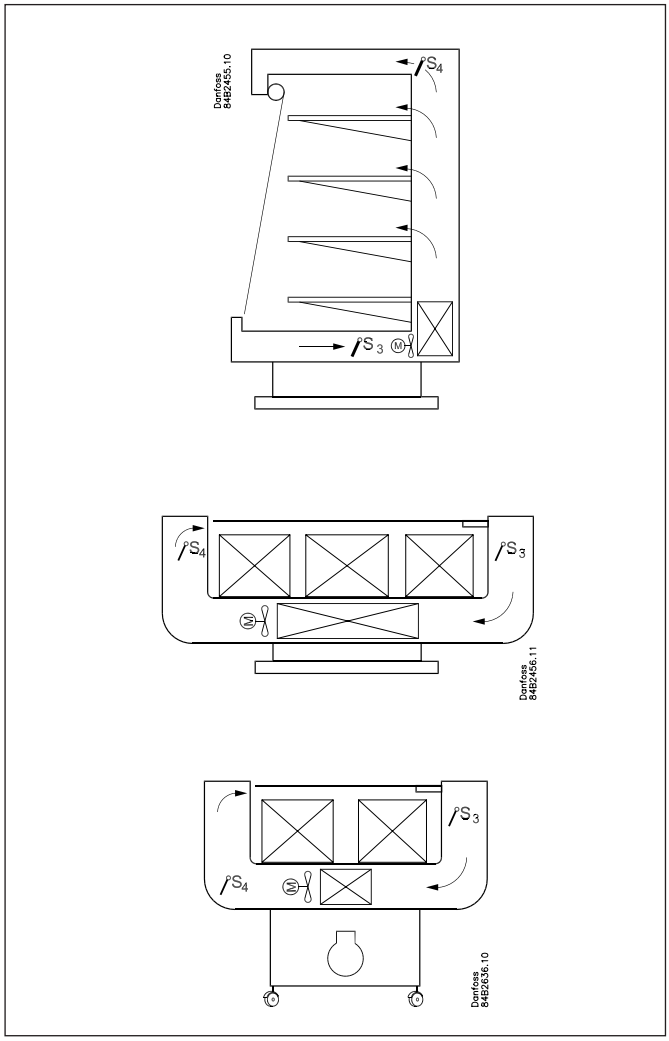
EKC 202D, EKC 302D



Application
- This controller is used for temperature control of refrigeration appliances in supermarkets.
- With support for many predefined applications, it gives you a variety of options in a single unit. Versatility is designed in for use in new installations as well as service replacement in existing installations.
- EKC 202 is for front panel mounting
- EKC 302 is for DIN Rail mounting

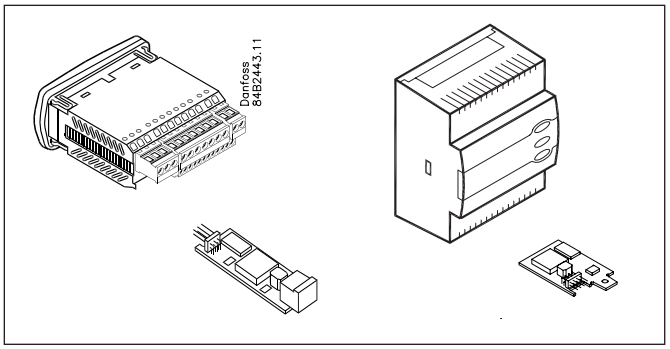


Advantages
- Several applications in the same unit
- The controller has integrated refrigeration-technical functions, so that it can replace a whole collection of thermostats and timers
- Buttons and seal imbedded in the front
- Easy to remount data communication
- Fixed MODBUS data communication on the DIN model, however LON RS 485 can be retrofitted
- Two temperature references
- Digital inputs for various functions
- Clock function with super cap backup



Control
The controller contains a temperature control that can receive signals from one or two temperature sensors.
The thermostat sensors can be placed in the cold air flow after the evaporator, in the warm air flow just before the evaporator, or in both locations. A setting determines the effects of the two sensors on the control loop.
The defrost temperature can be measured directly from an S5 sensor or indirectly from the S4 measurement. The necessary functions are cut in and out by four relays according to the requirements of the application. The options are:
- Refrigeration (compressor or relay)
- Fan
- Defrost
- Rail heat
- Alarm
- Lighting

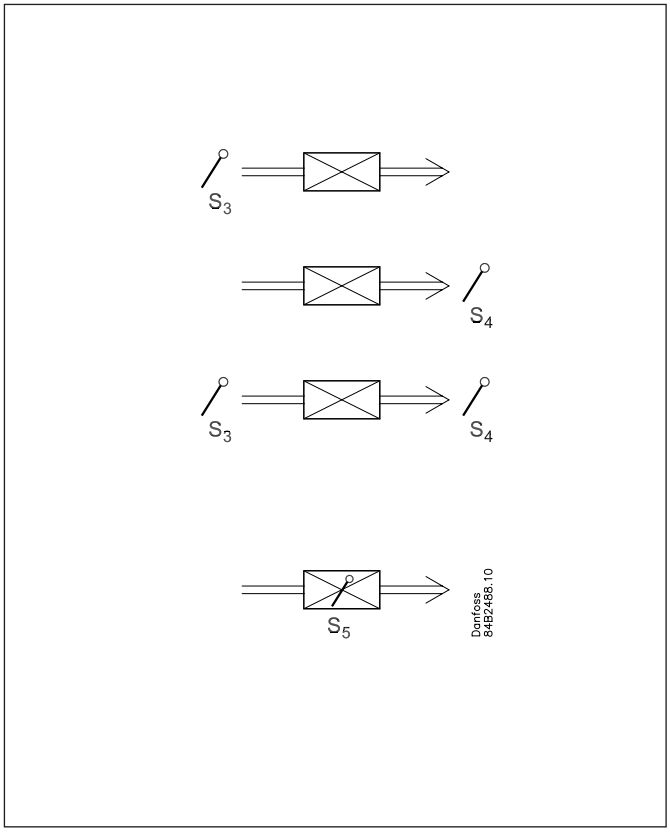
Extra module



• The controller can afterwards be fitted with an insertion module if the application requires it.
The controller has been prepared with a plug, so the module simply has to be pushed in.

- Battery module (EKC 202)
The module guarantees voltage to the controller if the supply voltage should drop out for more than four hours. The clock function can thus be protected during a power failure.
- Data communication
If you require operation from a PC, a data communication module has to be placed in the EKC 202D controller. The EKC 302D has a fixed MODBUS, but can be retrofitted with an additional data communication module.
- Coordinated defrost via data communication

Sensors
One or two thermostat sensors can be connected to the controller, depending on the application requirements.



Sensor in the air stream ahead of the evaporator:
this arrangement is used primarily with area-based control.

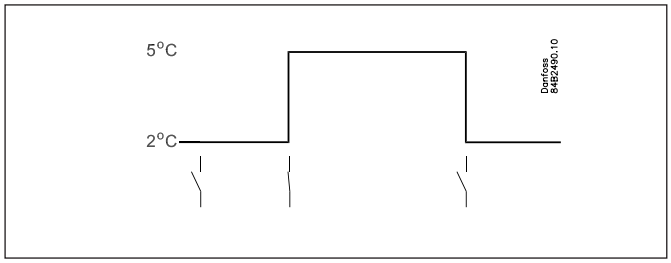
Sensor in the air stream after the evaporator:
this arrangement is used primarily when refrigeration is controlled and there is a risk of excessively temperatures near the product.

Sensors before and after the evaporator:
this arrangement lets you adapt the thermostat, the alarm thermostat and the display to the actual application. The signal to the control thermostat, alarm thermostat and display is the weighted average of the two temperatures. For example, with 50% weighting each sensor makes an equal contribution.
The control thermostat, alarm thermostat and display signals can be configured independently.

Defrost sensor
The best indication of the evaporator temperature is obtained from a defrost sensor mounted directly on the evaporator. In this case the defrost function can use this signal to minimise the duration and energy consumption of the defrost cycle.

If a defrost sensor is not required, time-controlled defrosting can be used or S4 can be selected.

Changing the temperature reference
This may be desirable in applications such as an on/off appliance used in various product groups. The temperature reference can easily be changed by a contact signal on a digital input. This signal raises the normal thermostat setting by a predefined amount. The alarm limits are also offset accordingly.



Application
The following is a brief summary of the application area of this controller.

The relay outputs are defined by a configuration setting to align the controller interface to the selected application.

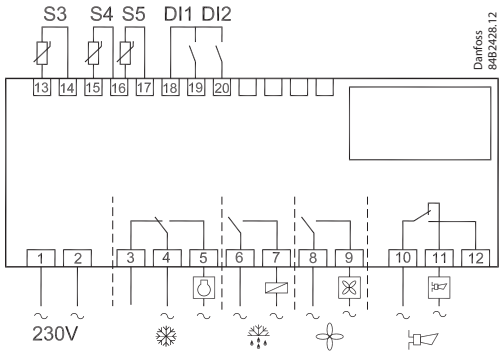
S3 and S4 are temperature sensors. One or both of these sensors may be used, depending on the application. S3 is located in the air flow before the evaporator, and S4 in the air flow after the evaporator.
A percentage setting determines the relative contributions of the sensors to the control function. S5 is a defrost sensor located on the evaporator.
DI1 and DI2 are contact functions that can be used for any of the following purposes: door function, alarm function, defrost start, external main switch, night operation, change thermostat reference, appliance cleaning, forced refrigeration, or coordinated defrost. See the functions of parameters o02 and o37.

Refrigeration control with one compressor
The functions are adapted to small refrigeration systems, which may be refrigeration appliances or cold rooms.
Three of the relays control refrigeration, defrost and the fans, while the fourth relay can be used for an alarm function, lighting control, or rail heat control.
- The alarm function can be linked to a contact function from a door switch. An alarm is generated if the door remains open longer than allowed.
- Lighting control can also be linked to a contact function from a door switch. The light is switched on when the door is opened and remains on for two minutes after the door is closed.
- The rail heat function can be used in refrigeration or freezer appliances or for the door heater of a freezer room.

The fans can be stopped during defrosting, and they can also track the open/closed state of a door switch.

There are several other functions for the alarm function, as well as the lighting control, rail heat control and fan control. See the corresponding parameter settings.

1



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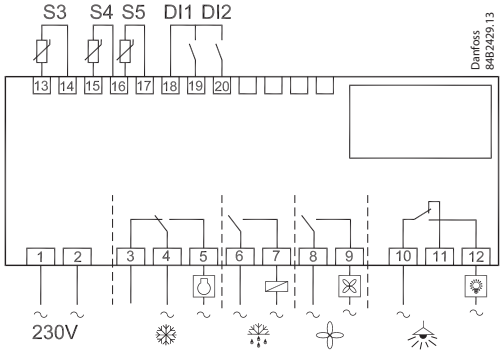

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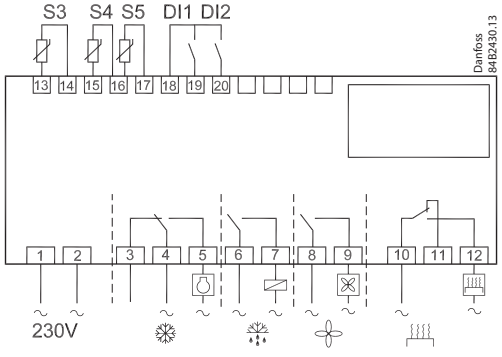
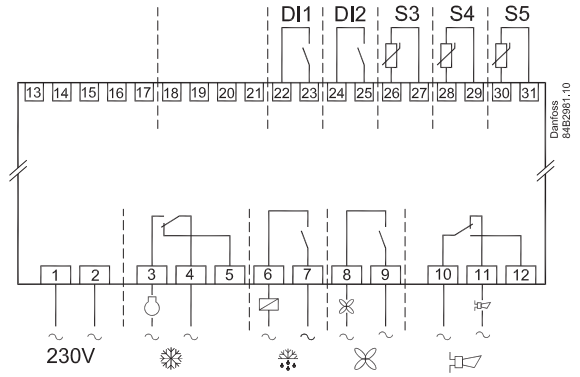


Connection options for EKC 302D (DIN rail model)

1



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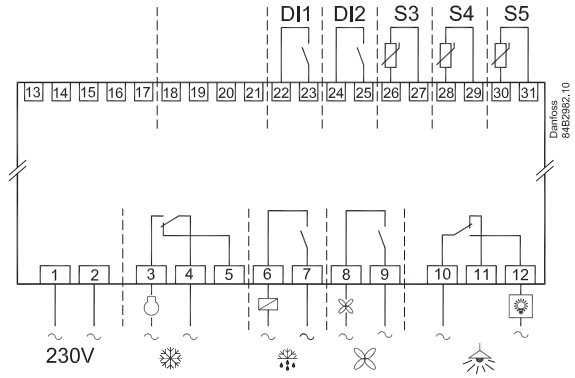
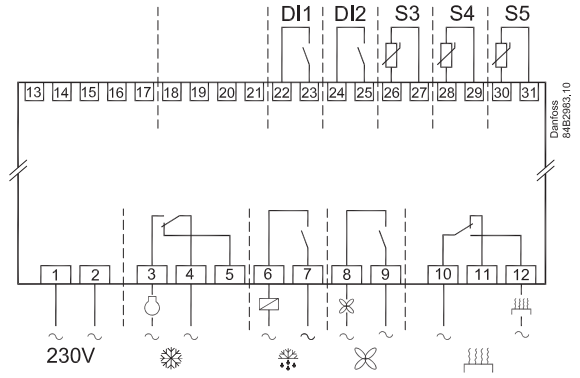


3



Menu overview

EKC 202D: SW = 2.2x
EKC 302D: SW = 1.0x

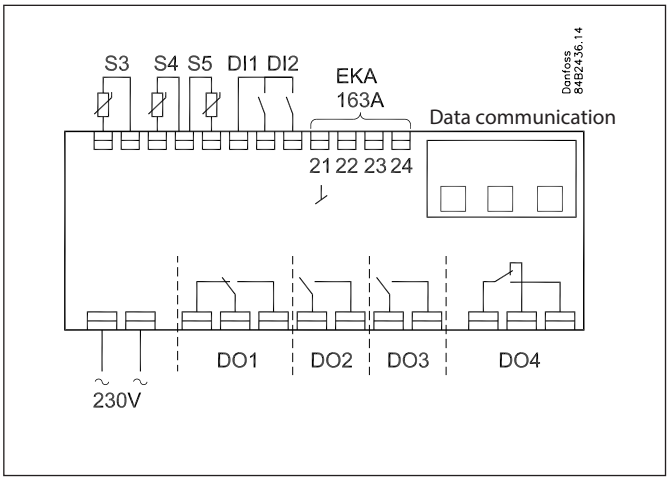
Parameters			EL-diagram number			Min.-value	Max.-value	Factory setting	Actual setting
Function		**Codes**	**1**	**2**	**3**				
Normal operation									
Temperature (set point)		---				-50.0°C	50.0°C	2.0°C	
Thermostat									
Differential	***	r01				0.0 K	20.0K	2.0 K	
Max. limitation of setpoint setting	***	r02				-49.0°C	50°C	50.0°C	
Min. limitation of setpoint setting	***	r03				-50.0°C	49.0°C	-50.0°C	
Adjustment of temperature indication		r04				-20.0 K	20.0 K	0.0 K	
Temperature unit (°C/°F)		r05				°C	°F	°C	
Correction of the signal from S4		r09				-10.0 K	+10.0 K	0.0 K	
Correction of the signal from S3		r10				-10.0 K	+10.0 K	0.0 K	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12				-1	1	0	
Displacement of reference during night operation		r13				-10.0 K	10.0 K	0.0 K	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15				0%	100%	100%	
Activation of reference displacement r40		r39				OFF	ON	OFF	
Value of reference displacement (activate via r39 or DI)		r40				-50.0 K	50.0 K	0.0 K	
Alarm									
Delay for temperature alarm		A03				0 min	240 min	30 min	
Delay for door alarm	***	A04				0 min	240 min	60 min	
Delay for temperature alarm after defrost		A12				0 min	240 min	90 min	
High alarm limit	***	A13				-50.0°C	50.0°C	8.0°C	
Low alarm limit	***	A14				-50.0°C	50.0°C	-30.0°C	
Alarm delay DI1		A27				0 min	240 min	30 min	
Alarm delay DI2		A28				0 min	240 min	30 min	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36				0%	100%	100%	
Compressor									
Min. ON-time		c01				0 min	30 min	0 min	
Min. OFF-time		c02				0 min	30 min	0 min	
Compressor relay 1 must cutin and out inversely (NC-function)		c30				0 OFF	1 ON	0 OFF	
External relays (zero-crossing control – only EKC 302D) Must be 'ON' when connecting to external relays		c70				OFF	ON	ON	
Defrost									
Defrost method (none/EL/GAS/BRINE)		d01				no	bri	EL	
Defrost stop temperature		d02				0.0°C	25.0°C	6.0°C	
Interval between defrost starts		d03				0 hours	48 hours	8 hours	
Max. defrost duration		d04				0 min	180 min	45 min	
Displacement of time on cutin of defrost at start-up		d05				0 min	240 min	0 min	
Drip off time		d06				0 min	60 min	0 min	
Delay for fan start after defrost		d07				0 min	60 min	0 min	
Fan start temperature		d08				-15.0°C	0.0°C	-5.0°C	
Fan cutin during defrost 0: Stopped 1: Running 2: Running during pump down and defrost		d09				0	2	1	
Defrost sensor (0=time, 1=S5, 2=S4)		d10				0	2	0	
Pump down delay		d16				0 min	60 min	0 min	
Max. aggregate refrigeration time between two defrosts		d18				0 hours	48 hours	0 hours	
Defrost on demand - S5 temperature's permitted variation during frost build-up. On central plant choose 20 K (=off)		d19				0.0 K	20.0 k	20.0 K	
Fan									
Fan stop at cutout compressor		F01				no	yes	no	
Delay of fan stop		F02				0 min	30 min	0 min	
Fan stop temperature (S5)		F04				-50.0°C	50.0°C	50.0°C	
Real time clock									
Six start times for defrost. Setting of hours. 0=OFF		t01- t06				0 hours	23 hours	0 hours	
Six start times for defrost. Setting of minutes. 0=OFF		t11- t16				0 min	59 min	0 min	
Clock - Setting of hours	***	t07				0 hours	23 hours	0 hours	
Clock - Setting of minute	***	t08				0 min	59 min	0 min	
Clock - Setting of date	***	t45				1	31	1	
Clock - Setting of month	***	t46				1	12	1	
Clock - Setting of year	***	t47				0	99	0	
Miscellaneous									
Delay of output signals after start-up		o01				0 s	600 s	5 s	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling.		o02				1	11	0	
Network address (0= off)		o03				0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04		o04				OFF	ON	OFF	
Access code 1 (all settings)		o05				0	100	0	
Used sensor type (Pt /PTC/NTC)		o06				Pt	ntc	Pt	
Display step = 0.5 (normal 0.1 at Pt sensor)		o15				no	yes	no	
Max hold time after coordinated defrost		o16				0 min	60 min	20	

Select signal for display view. S4% (100%=S4, 0%=S3)		o17				0%	100%	100%	
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling.). 12=coordinated defrost)		o37				0	12	0	
Configuration of light function (relay 4) 1=ON during day operation. 2=ON / OFF via data communication. 3=ON follows the DI-function, when DI is selected to door function or to door alarm		o38				1	3	1	
Activation of light relay (only if o38=2)		o39				OFF	ON	OFF	
Rail heat On time during day operations		o41				0%	100%	100	
Rail heat On time during night operations		o42				0%	100%	100	
Rail heat period time (On time + Off time)		o43				6 min	60 min	10 min	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46				0	2	0	
Selection of EL diagram.	*	o61	**1**	**2**	**3**	1	3	1	
Access code 2 (partly access)	***	o64				0	100	0	
EKC 202D only: Save the controllers present settings to the programming key. Select your own number.		o65				0	25	0	
EKC 202D only: Load a set of settings from the programming key (previously saved via o65 function)		o66				0	25	0	
Replace the controllers factory settings with the present settings		o67				OFF	On	OFF	
Service									
Status codes		S0-S33							
Temperature measured with S5 sensor	***	u09							
Status on DI1 input. on/1=closed		u10							
Temperature measured with S3 sensor	***	u12							
Status on night operation (on or off) 1=closed	***	u13							
Temperature measured with S4 sensor	***	u16							
Thermostat temperature		u17							
Read the present regulation reference		u28							
Status on DI2 output. on/1=closed		u37							
Temperature shown on display		u56							
Measured temperature for alarm thermostat		u57							
Status on relay for cooling	**	u58							
Status on relay for fan	**	u59							
Status on relay for defrost	**	u60							
Status on relay for railheat	**	u61							
Status on relay for alarm	**	u62							
Status on relay for light	**	u63							

* Can only be set when regulation is stopped (r12 = 0)
** Can be controlled manually, but only when r12 is -1
*** Access code 2 allows only restricted access to these menus

Factory settings
If you need to restore the factory settings, proceed as follows:
- Remove power from the controller
- Hold the upper and the lower buttons pressed while restoring power

Wiring



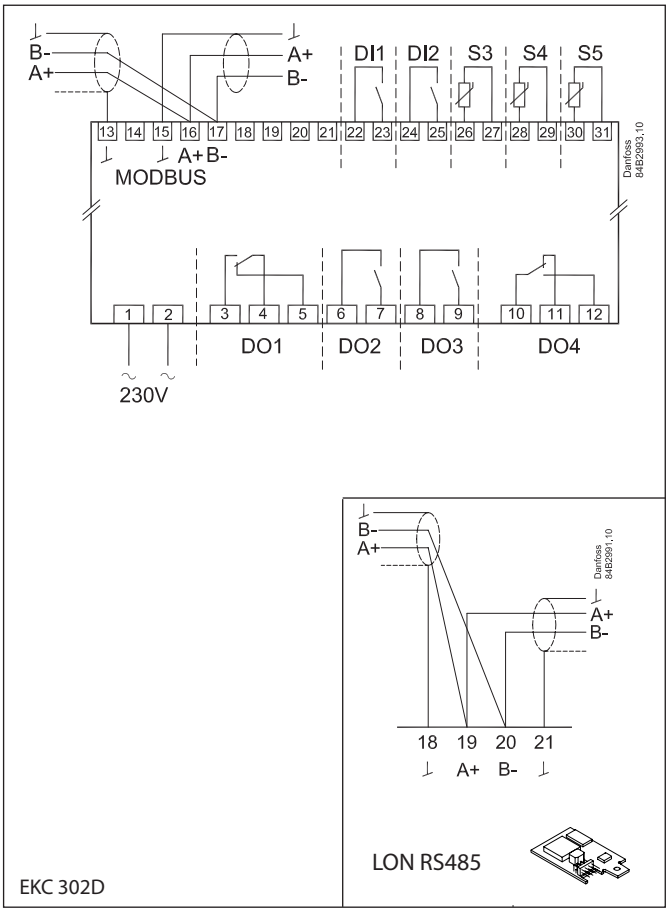
Power supply
230 V a.c.

Sensors
S3 and S4 are thermostat sensors.
A setting determines whether S3 or S4 or both of them are to be used.
S5 is a defrost sensor and is used if defrost has to be stopped based on temperature.

Digital On/Off signals
A cut-in input will activate a function. The possible functions are described in menus o02 and o37.

External display
Connection of display type EKA 163A or EKA 164A.

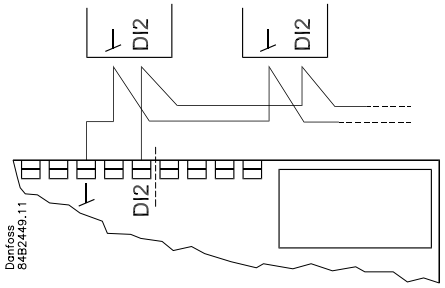
Relays
The general uses are mentioned here. See also el-diagram where the different applications are shown.
DO1: Refrigeration. The relay will cut in when the controller demands refrigeration
DO2: Defrost. The relay will cut in when defrost is in progress
DO3: Fans
The relay will cut in when the fans have to operate
DO4: For either alarm, rail heat or light
Alarm: Cf. diagram. The relay is cut in during normal operation and cuts out in alarm situations and when the controller is dead (de-energised)
Rail heat: The relay cuts in when rail heat is to operate
Light: The relay cuts in when the light has to be switched on



Data communication
EKC 202D: MODBUS or LON-RS485 via insert cards.
EKC 302D: Fixed MODBUS or LON-RS485/MODBUS via insert card.
If data communication is used, it is important that the installation of the data communication cable is performed correctly.
See separate literature No. RC8AC…

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

Coordinated defrost with wiring interconnect

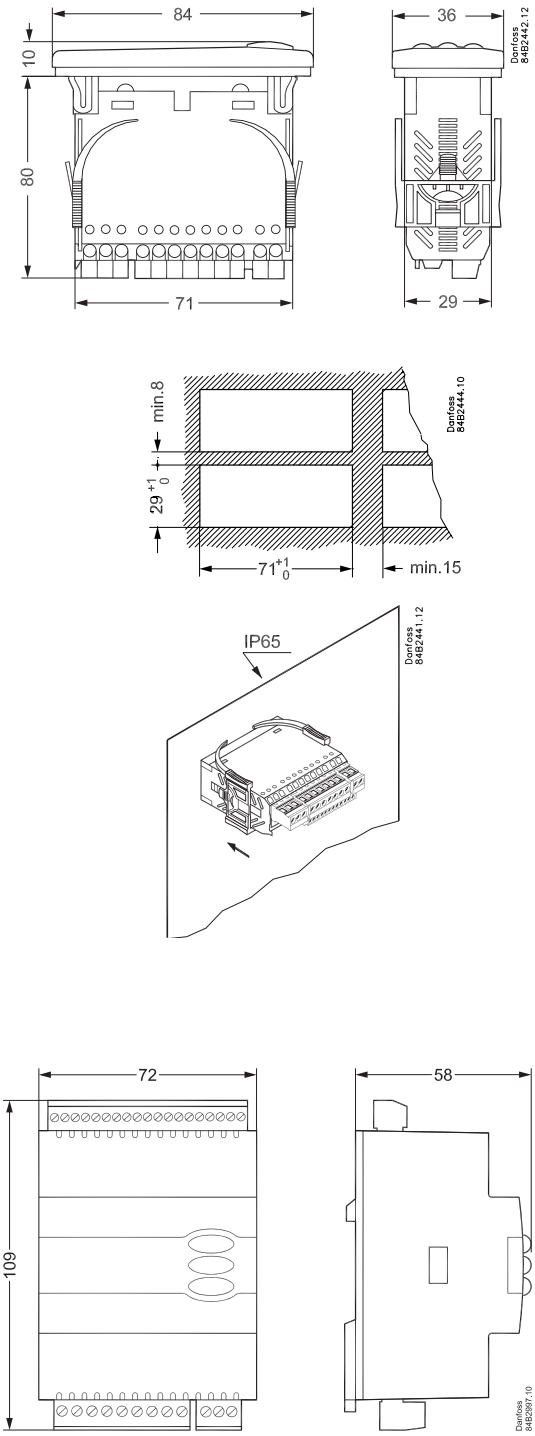


The following controllers can be connected in this manner:
EKC 202D /302D series and
AK-CC 210 and AK-CC 250
Max. 15

Refrigeration is resumed when all controllers have de-asserted the defrost signal.

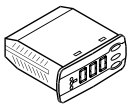
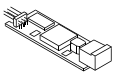
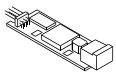
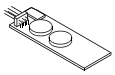
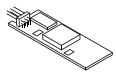
Technical data

Supply voltage	230 V a.c. +10/-15 %. 2.5 VA, 50/60 Hz			
Sensors 3 pcs off either	Pt 1000 or PTC 1000 ohm or NTC-M2020 (5000 ohm / 25°C)			
Accuracy	Measuring range	-60 to +99°C		
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C		
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad		
Display	LED, 3-digits			
External display	EKA 163A / EKA 164A			
Digital inputs	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer			
Electrical connection cable	Max.1,5 mm² multi-core cable Max. 1 mm² on sensors and DI inputs			
Relays*			IEC60730	
	EKC 202D	DO1	10 (6) A & (5 FLA, 30 LRA)	
		DO2	10 (6) A & (5 FLA, 30 LRA)	
		DO3	6 (3) A & (3 FLA, 18 LRA)	
		DO4**	4 (1) A, Min. 100 mA**	
	EKC 302D	DO1	10 (6) A & (5 FLA, 30 LRA)	1)
			16 (8) A & (10 FLA, 60 LRA)	2)
		DO2	6 (3) A & (3 FLA, 18 LRA)	1)
			10 (6) A & (5 FLA, 30 LRA)	2)
		DO3	6 (3) A & (3 FLA, 18 LRA)	1)
			10 (6) A & (5 FLA, 30 LRA)	2)
		DO4**	4 (1)A Min. 100 mA**	
Data communication	EKC 202D: Via insert card EKC 302D: Fixed MODBUS. Can be expanded with LON or MODBUS via insert card			
Environments	0 to +55°C, During operations -40 to +70°C, During transport			
	20 - 80% Rh, not condensed			
	No shock influence / vibrations			
Density	EKC 202D: IP 65 from front. Buttons and packing are imbedded in the front. EKC 302D: IP 20			
Escapement reserve for the clock	4 hours			
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with. EKC 202D: UL approval acc. UL 60730 LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. 61000-6-3 and EN 61000-6-2, 4-(2-6,8,11)			

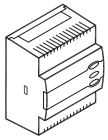
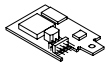
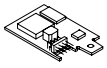


* EKC 202D: DO1 and DO2 are 16 A relays. DO3 and DO4 are 8 A relays. Above max. load must be kept.
EKC 302D: DO1 is 20 A relay. DO2 and DO3 are 16 A relays. DO4 is a 10 A relay. The max. load listed above must be observed when connecting without zero-crossing control. When connecting with zero-crossing control, the load must be increased to the value indicated by 2)
** Gold plating ensures make function with small contact loads
1) With external relay (c70=ON) (zero-crossing control disabled)
2) Without external relay (c70=OFF) (zero-crossing control enabled)
Relay contact and controller supply **must** use same phase and the load (compressor) must phase compensated to Cos φ = 1.

Ordering data

Type		Function	Voltage supply	Code no.
EKC 202D		Refrigeration controller without data communication but prepared for mounting of one module	230 V a.c.	**084B8536**
EKA 178A		Data communication module MOD-bus		**084B8564**
EKA 179A		Data communication module LON RS 485		**084B8565**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure		**084B8577**
EKA 182A		Copy key EKC - EKC		**084B8567**
EKA 163A		External display option		**084B8562**
EKA 164A		External operation option		**084B8563**

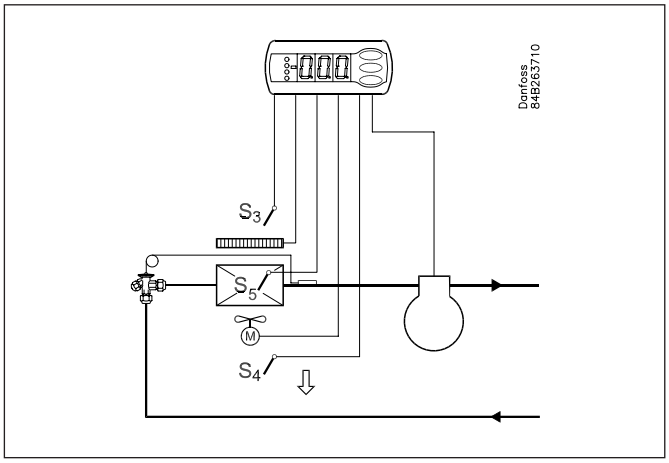
Additional information available:
Manual: RS8EE

Type		Function	Code no.
EKC 302D		Refrigeration controller with MODBUS data communication	**084B4164**
EKA 175		Data communication module LON RS485	**084B8579**
EKA 178B		Data communication module MODBUS	**084B8571**
EKA 163A		External display option	**084B8562**
EKA 164A		External operation option	**084B8563**

Additional information available:
Manual: RS8EE

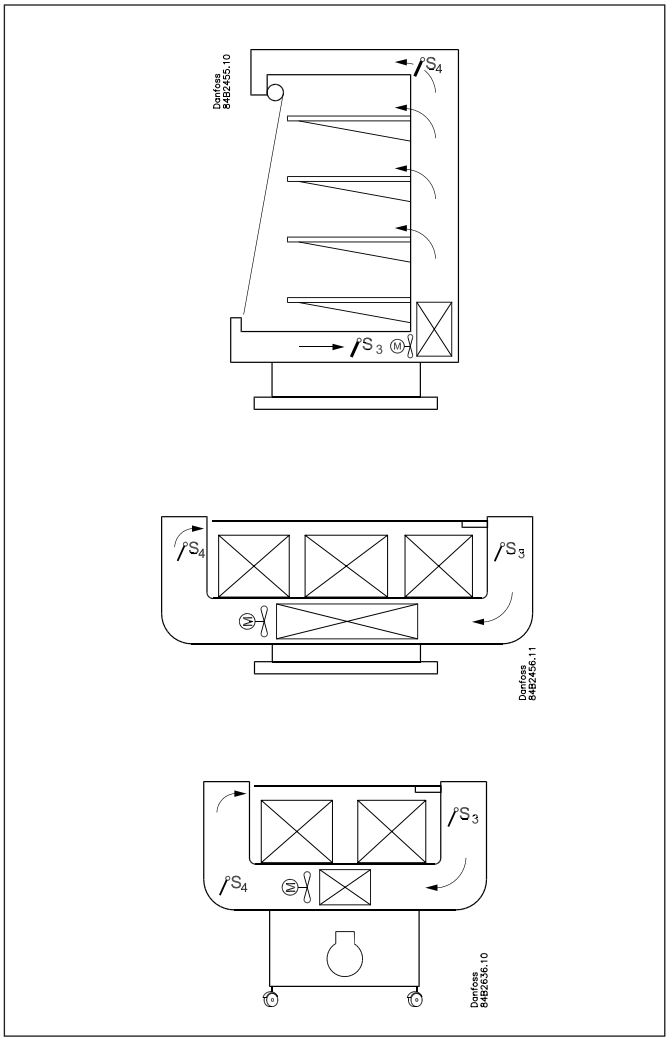
EKC 202D1

Application
- This controller is used for temperature control of refrigeration appliances in supermarkets.
- With support for many predefined applications, it gives you a variety of options in a single unit. Versatility is designed in for use in new installations as well as service replacement in existing installations.



Advantages
- Multi-application support in a single unit
- Integrated refrigeration functions enable the controller to replace a host of thermostats and timers
- Buttons and gasket integrated in front panel
- Easy data communication retrofit
- Quick set-up
- Two temperature references
- Digital inputs for various functions
- Clock function with super cap backup

Operating principle
The controller contains a temperature regulator that can receive signals from one or two temperature sensors.
The thermostat sensors can be placed in the cold air flow after the evaporator, in the warm air flow just before the evaporator, or in both locations. A setting determines the effects of the two sensors on the control loop.
The defrost temperature can be measured directly from an S5 sensor or indirectly from the S4 measurement. The necessary functions are cut in and out by four relays according to the requirements of the application. The options are:
- Refrigeration (compressor or relay)
- Fan
- Defrost
- Rail heat
- Alarm
- Lighting



Sensors
One or two thermostat sensors can be connected to the controller, depending on the application requirements.

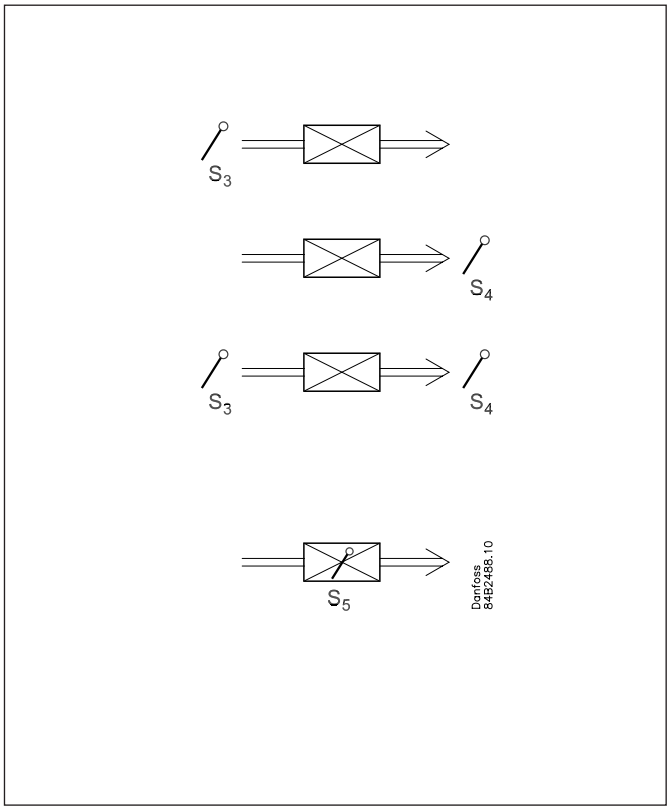
A sensor in the air before the evaporator: S3
this arrangement is used primarily with area-based control.

A sensor in the air after the evaporator: S4
this arrangement is used primarily when refrigeration is controlled and there is a risk of excessively temperatures near the product.

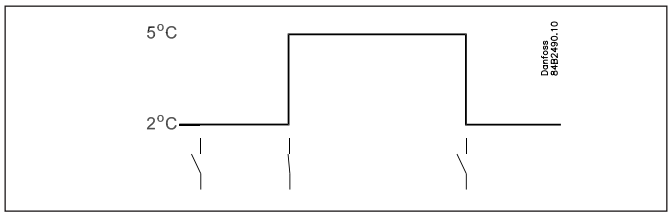
A sensor before and after the evaporator: S3 + S4
this arrangement lets you adapt the thermostat, the alarm thermostat and the display to the actual application. The signal to the control thermostat, alarm thermostat and display is the weighted average of the two temperatures. For example, with 50% weighting each sensor makes an equal contribution.
The signals to the control thermostat, alarm thermostat and display can be set independently.

Defrost sensor: S5
The best indication of the evaporator temperature is obtained from a defrost sensor mounted directly on the evaporator. In this case the defrost function can use this signal to minimise the duration and energy consumption of the defrost cycle.

If a defrost sensor is not required, time-controlled defrosting can be used or S4 can be selected.

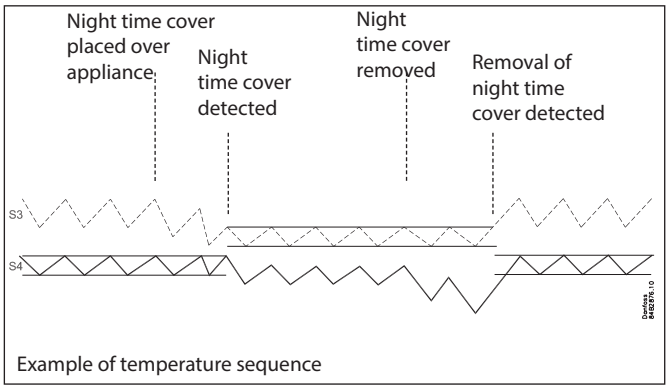


Changing the temperature reference
This may be desirable in applications such as an on/off appliance used in various product groups. The temperature reference can easily be changed by a contact signal on a digital input. This signal raises the normal thermostat setting by a predefined amount. The alarm limits are also offset accordingly.



Night time cover function
The controller has a function that automatically detects when a night time cover has been placed over the refrigeration appliance. This function requires the use of both an S3 and S4 sensor.
When the night time cover is placed over the appliance, heat intake and thus the need for increased cooling are reduced. The temperature difference between S3 and S4 will be reduced, and the controller will change to night operation mode once this difference becomes less than the set difference (night time cover difference).

Example:
During day operation there is a temperature difference of e.g. 8 K between S3 and S4.
During operating with a night time cover the difference drops to e.g. 3 K.
r75 Cover diff must be set to a value between the two values. In this case, 5.5 k.



Example of temperature sequence

Applications

The following is a brief summary of the application area of this controller.

The relay outputs are defined by a configuration setting to align the controller interface to the selected application.

S3 and S4 are temperature sensors. One or both of these sensors may be used, depending on the application. S3 is located in the air flow before the evaporator, and S4 in the air flow after the evaporator.
A percentage setting determines the relative contributions of the sensors to the control function. S5 is a defrost sensor located on the evaporator.
DI1 and DI2 are contact functions that can be used for any of the following purposes: door function, alarm function, defrost start, external main switch, night operation, change thermostat reference, appliance cleaning, forced refrigeration, or coordinated defrost. See the functions of parameters o02 and o37.

Refrigeration control with one compressor

The functions are adapted to small refrigeration systems, which may be refrigeration appliances or cold rooms.
Three of the relays control refrigeration, defrost and the fans, while the fourth relay can be used for an alarm function, lighting control, or rail heat control.

- The alarm function can be linked to a contact function from a door switch. An alarm is generated if the door remains open longer than allowed.
- Lighting control can also be linked to a contact function from a door switch. The light is switched on when the door is opened and remains on for two minutes after the door is closed.
- The rail heat function can be used in refrigeration or freezer appliances or for the door heater of a freezer room.

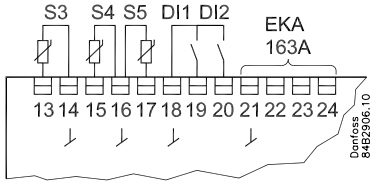
The fans can be stopped during defrosting, and they can also track the open/closed state of a door switch.

There are several other functions for the alarm function, as well as the lighting control, rail heat control and fan control. See the corresponding parameter settings.

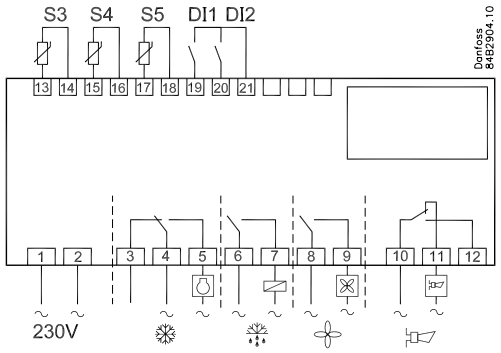
The connections shown in applications 1, 2 and 3 are the recommended connections if an extra display is **not** installed.

If an extra display (type EKA 163A) is connected, terminal 21 **must** be used for the display, and **solely** for the display.

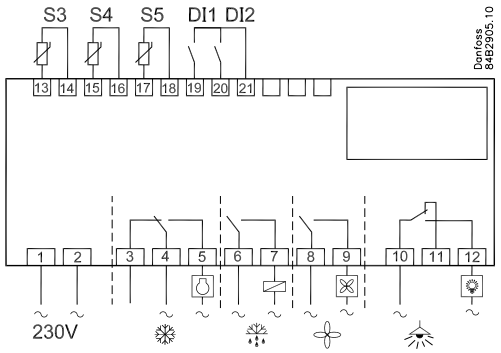
The remaining connections can be made as follows:



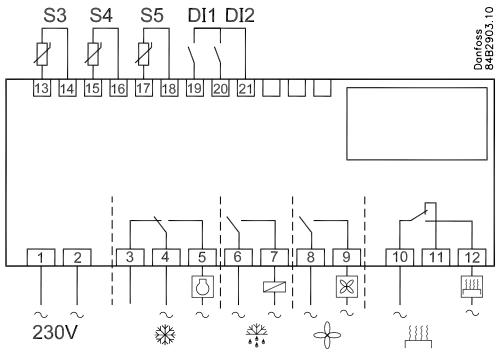
1



2



3



Menu overview

SW = 1.5x

Parameters			EL-diagram number			Min.-value	Max.-value	Factory setting	Actual setting
Function		**Codes**	**1**	**2**	**3**				
Normal operation									
Temperature (set point)		---				-50.0°C	50.0°C	2.0°C	
Thermostat									
Differential	***	r01				0.0 K	20.0K	2.0 K	
Max. limitation of setpoint setting	***	r02				-49.0°C	50°C	50.0°C	
Min. limitation of setpoint setting	***	r03				-50.0°C	49.0°C	-50.0°C	
Adjustment of temperature indication		r04				-20.0 K	20.0 K	0.0 K	
Temperature unit (°C/°F)		r05				°C	°F	°C	
Correction of the signal from S4		r09				-10.0 K	+10.0 K	0.0 K	
Correction of the signal from S3		r10				-10.0 K	+10.0 K	0.0 K	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12				-1	1	0	
Displacement of reference during night operation		r13				-10.0 K	10.0 K	0.0 K	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15				0%	100%	100%	
Activation of reference displacement r40		r39				OFF	ON	OFF	
Value of reference displacement (activate via r39 or DI)		r40				-50.0 K	50.0 K	0.0 K	
Thermostat sensor S4% can be selected under night operation with night time cover.		r61				0%	100%	100%	
Temperature difference for night time cover (0 K = not detected)		r75				0 K	20 K	0 K	
Alarm									
Delay for temperature alarm		A03				0 min	240 min	30 min	
Delay for door alarm	***	A04				0 min	240 min	60 min	
Delay for temperature alarm after defrost		A12				0 min	240 min	90 min	
High alarm limit	***	A13				-50.0°C	50.0°C	8.0°C	
Low alarm limit	***	A14				-50.0°C	50.0°C	-30.0°C	
Alarm delay DI1		A27				0 min	240 min	30 min	
Alarm delay DI2		A28				0 min	240 min	30 min	
Definition of alarm sensor 1: Combination of S3 and S4 (A36, A13 and A14 must be set) 2: Separate values for S3 and S4 (A13, A14, A56 and A57 must be set)		A33				1	2	1	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36				0%	100%	100%	
High alarm limit for S3		A56				-50.0°C	50.0°C	8.0°C	
Low alarm limit for S3		A57				-50.0°C	50.0°C	-30.0°C	
Compressor									
Min. ON-time		c01				0 min	30 min	0 min	
Min. OFF-time		c02				0 min	30 min	0 min	
Compressor relay 1 must cutin and out inversely (NC-function)		c30				0 OFF	1 ON	0 OFF	
Defrost									
Defrost method (none/EL/GAS/BRINE)		d01				no	bri	EL	
Defrost stop temperature		d02				0.0°C	25.0°C	6.0°C	
Interval between defrost starts		d03				0 hours	240 hours	8 hours	
Max. defrost duration		d04				0 min	180 min	45 min	
Displacement of time on cutin of defrost at start-up		d05				0 min	240 min	0 min	
Drip off time		d06				0 min	60 min	0 min	
Delay for fan start after defrost		d07				0 min	60 min	0 min	
Fan start temperature		d08				-50.0°C	0.0°C	-50.0°C	
Fan cutin during defrost 0: Stopped 1: Running 2: Runs during pump down and defrosting.		d09				0	2	1	
Defrost sensor (0=time, 1=S5, 2=S4)		d10				0	2	0	
Pump down delay		d16				0 min	60 min	0 min	
Max. aggregate refrigeration time between two defrosts		d18				0 hours	48 hours	0 hours	
Defrost on demand - S5 temperature's permitted variation during frost build-up. On central plant choose 20 K (=off)		d19				0.0 K	20.0 k	20.0 K	
Minimum defrost time		d24				0 min	180 min	0 min	
Fan									
Fan stop at cutout compressor		F01				no	yes	no	
Delay of fan stop		F02				0 min	30 min	0 min	
Fan stop temperature (S5)		F04				-50.0°C	50.0°C	50.0°C	
Real time clock									
Six start times for defrost. Setting of hours. 0=OFF		t01- t06				0 hours	23 hours	0 hours	
Six start times for defrost. Setting of minutes. 0=OFF		t11- t16				0 min	59 min	0 min	
Clock - Setting of hours	***	t07				0 hours	23 hours	0 hours	
Clock - Setting of minute	***	t08				0 min	59 min	0 min	
Clock - Setting of date	***	t45				1	31	1	
Clock - Setting of month	***	t46				1	12	1	
Clock - Setting of year	***	t47				0	99	0	
Miscellaneous									
Delay of output signals after start-up		o01				0 s	600 s	5 s	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling. 12=S5B		o02				1	12	0	

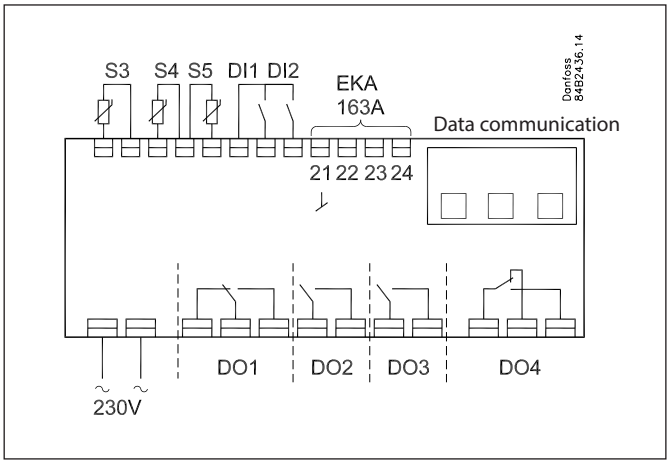
Network address		o03				0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04		o04				OFF	ON	OFF	
Access code 1 (all settings)		o05				0	100	0	
Used sensor type (Pt /PTC/NTC)		o06				Pt	ntc	Pt	
Display step = 0.5 (normal 0.1 at Pt sensor)		o15				no	yes	no	
Max hold time after coordinated defrost		o16				0 min	60 min	20 min	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17				0%	100%	100%	
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse signal). 5=ext. main switch 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling . 12=coordinated defrost)		o37				0	12	0	
Configuration of light function (relay 4) 1=ON during day operation. 2=ON / OFF via data communication. 3=ON follows the DI-function, when DI is selected to door function or to door alarm		o38				1	3	1	
Activation of light relay (only if o38=2)		o39				OFF	ON	OFF	
Rail heat On time during day operations		o41				0%	100%	100%	
Rail heat On time during night operations		o42				0%	100%	100%	
Rail heat period time (On time + Off time)		o43				6 min	60 min	10 min	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46				0	2	0	
Selection of EL diagram.	*	o61	**1**	**2**	**3**	1	3	1	
Transfer a set of pre-settings	*	o62				0	10	0	
Access code 2 (partly access)	***	o64				0	100	0	
Save the controllers present settings to the programming key. Select your own number.		o65				0	25	0	
Load a set of settings from the programming key (previously saved via o65 function)	*	o66				0	25	0	
Replace the controllers factory settings with the present settings		o67				OFF	On	OFF	
Service									
Status codes		S0-S33							
Temperature measured with S5 sensor	***	u09							
Status on DI1 input. on/1=closed		u10							
Temperature measured with S3 sensor	***	u12							
Status on night operation (on or off) 1=closed	***	u13							
Temperature measured with S4 sensor	***	u16							
Thermostat temperature		u17							
Read the present regulation reference		u28							
Status on DI2 output. on/1=closed		u37							
Temperature shown on display		u56							
Measured temperature for alarm thermostat		u57							
Status on relay for cooling	**	u58							
Status on relay for fan	**	u59							
Status on relay for defrost	**	u60							
Status on relay for rail heat	**	u61							
Status on relay for alarm	**	u62							
Status on relay for light	**	u63							
Temperature measured with S5B sensor	***	u75							
Status of night time cover detection (On = night time cover has been detected)		U08							

*) Can only be set when regulation is stopped (r12=0)
**) Can be controlled manually, but only when r12=-1
***) With access code 2 the access to these menues will be limited

Note
With the use of the o62 for quick selection of settings, the sensor type will be set to "NTC" in 9 of the 10 pre-settings.

Factory setting
If you need to return to the factory-set values, it can be done in this way:
- Cut out the supply voltage to the controller
- Keep the top and bottom buttons depressed at the same time as you reconnect the supply voltage

Wiring



Power supply
230 V a.c.

Sensors
S3 and S4 are thermostat sensors.
A setting determines whether S3, S4, or both sensors are used.
S5 is a defrost sensor and is used if defrost is stopped based on temperature.

Digital on/off signals
A cut-in input activates a function. The available functions are shown in menus o02 and o37.

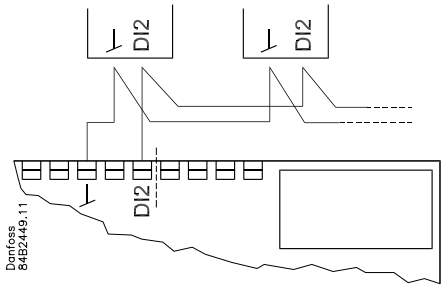
External display
An EKA 163A display can be connected.

Relays
The general uses are mentioned here. See also the page where the different applications are shown.
DO1: Refrigeration. The relay cuts in when the controller requests refrigeration.
DO2: Defrost. The relay is activated during defrosting.
DO3: Fans.
The relay cuts in when the fans must run.
DO4: Alarm, rail heat, or lighting.
Alarm: see diagram. The relay is cut in during normal operation and cuts out in alarm situations and when the controller is de-energised.
Rail heat: the relay cuts in when rail heating is needed.
Lighting: the relay cuts in when light is needed.

Data communication
The controller is available in several versions where data communication can be carried out with one of the following systems: MODBUS or LON-RS485.
If a data bus or network is used, proper installation of the bus or network cables is important.
See document RC8AC...

Electrical interference
Cables for sensors, DI inputs and data communication **must** be kept separate from other electrical cables:
- Use separate cable trays
- Keep cables separated by at least 10 cm
- Avoid long cables on DI inputs

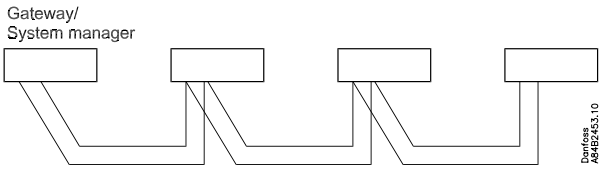
Coordinated defrost with wiring interconnect



The following controllers can be connected in this manner:
EKC 202D/302D serie and
AK-CC 210 and AK-CC 250
(But max. 15 controllers)

Refrigeration is resumed when all controllers have de-asserted the defrost signal.

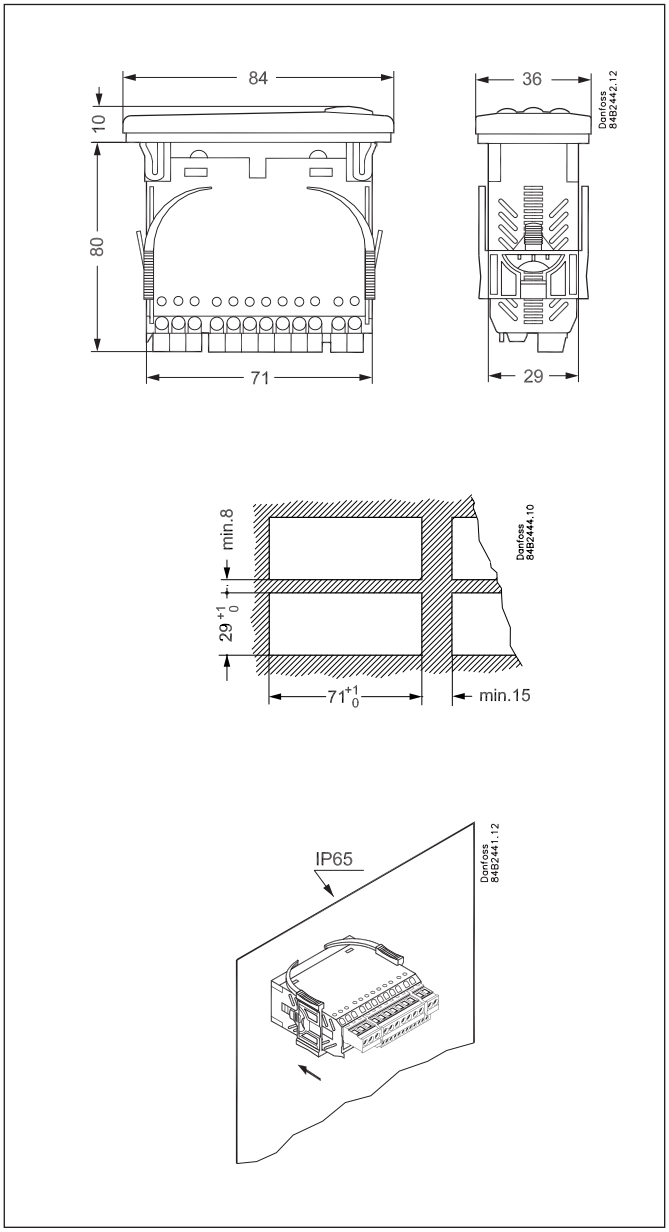
Coordinated defrost with data communication



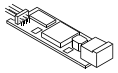
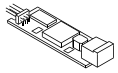
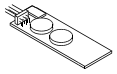
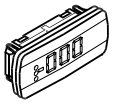
Technical data

Supply voltage	230 V a.c. +10/-15 %. 2.5 VA, 50/60 Hz	
Sensors 3 pcs off either	Pt 1000 or PTC 1000 ohm or NTC-M2020 (5000 ohm / 25°C)	
Accuracy	Measuring range	-60 to +99°C
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C (The level of accuracy below -25°C is more than doubled during the use of NTC sensors)
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad
Display	LED, 3-digits	
External display	EKA 163A	
Digital inputs	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer	
Electrical connection cable	Max.1.5 mm² multi-core cable	
Relays*		CE (250 V a.c.)
	DO1. Refrigeration	10 (6) A
	DO2. Defrost	10 (6) A
	DO3. Fan	6 (3) A
	DO4. Alarm, light or rail heat	4 (1) A Min. 100 mA**
Environments	0 to +55°C, During operations -40 to +70°C, During transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	
Density	IP 65 from front. Buttons and packing are imbedded in the front.	
Escapement reserve for the clock	4 hours	
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. EN 61000-6-3 and EN 61000-6-2	

* DO1 and DO2 are 16 A relays. DO3 and DO4 are 8 A relays. Max. load must be kept.
** Gold plating ensures make function with small contact loads



Ordering

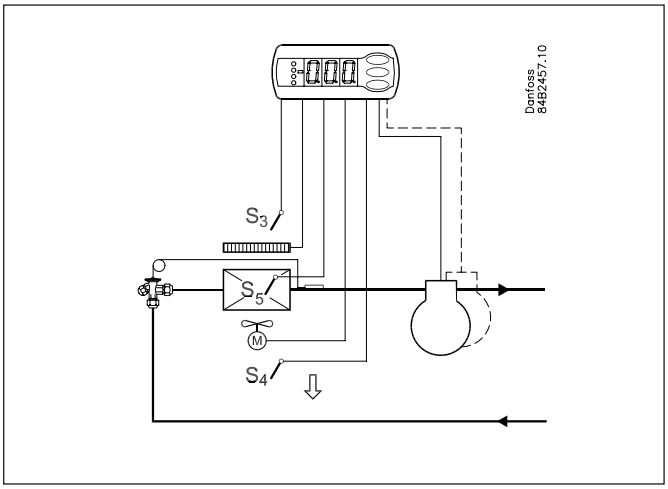
Type		Function	Voltage supply	Number	Code no.
EKC 202D1		Refrigeration controller without data communication but prepared for mounting of one module	230 V a.c.	1	**084B8554**
				30	**084B8654**
EKA 178A		Data communication module MOD-bus			**084B8564**
EKA 179A		Data communication module LON RS 485			**084B8565**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure			**084B8577**
EKA 163A		External display			**084B8562**

Additional information available:
Manual: RS8FL

AK-CC 210

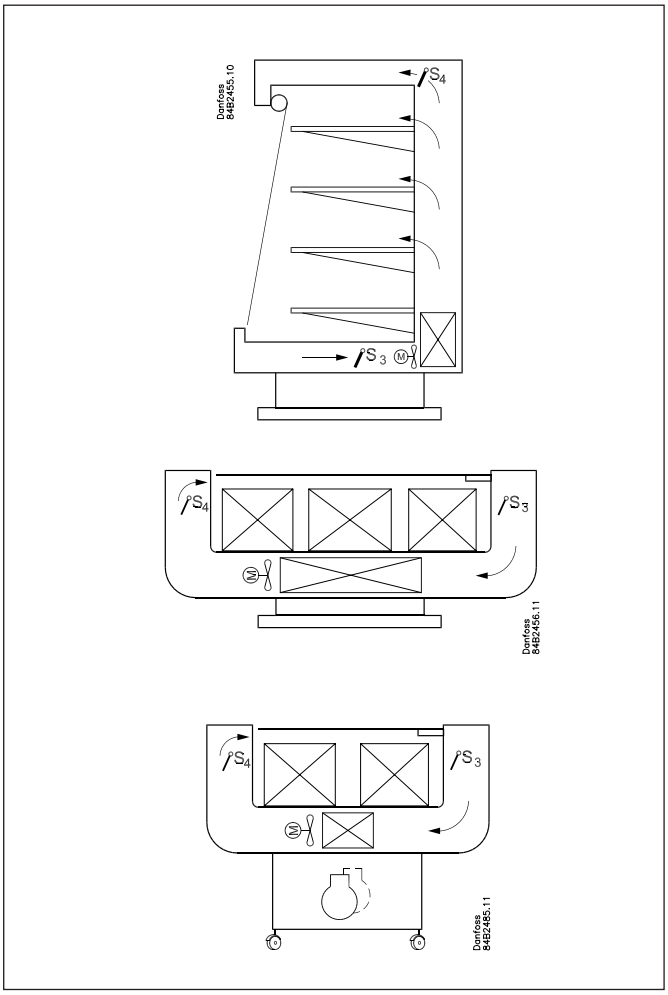
Application

- This controller is used for temperature control of refrigeration appliances in supermarkets.
- It incorporates many predefined applications to provide many options in a single unit. Versatility is designed in for use in new installations as well as service replacement in existing installations.



Advantages

- Multi-application support in a single unit
- Integrated refrigeration functions enable the controller to replace a host of thermostats and timers
- Buttons and gasket integrated in front panel
- Can control two compressors
- Easy data communication retrofit
- Quick setup
- Two temperature references
- Digital inputs for various functions
- Clock function with backup
- HACCP compliance
  - Temperature monitoring and registration of periods with excessively high temperature
  - Factory calibration assures measurement accuracy exceeding the requirements of the EN 441-13 standard without subsequent calibration (Pt1000 sensor)



Control

The controller contains a temperature regulator that can receive signals from one or two temperature sensors.
The thermostat sensors can be placed in the cold air flow after the evaporator, in the warm air flow just before the evaporator, or in both locations. A setting determines the effects of the two sensors on the control loop.
The defrost temperature can be measured directly from an S5 sensor or indirectly from the S4 measurement. The necessary functions are cut in and out by four relays according to the requirements of the application. The options are:

- Refrigeration (compressor or relay)
- Fan
- Defrost
- Rail heat
- Alarm
- Lighting
- Fans for hot gas defrosting
- Refrigeration 2 (compressor 2 or relay 2)

Sensors
One or two thermostat sensors can be connected to the controller, depending on the application requirements.

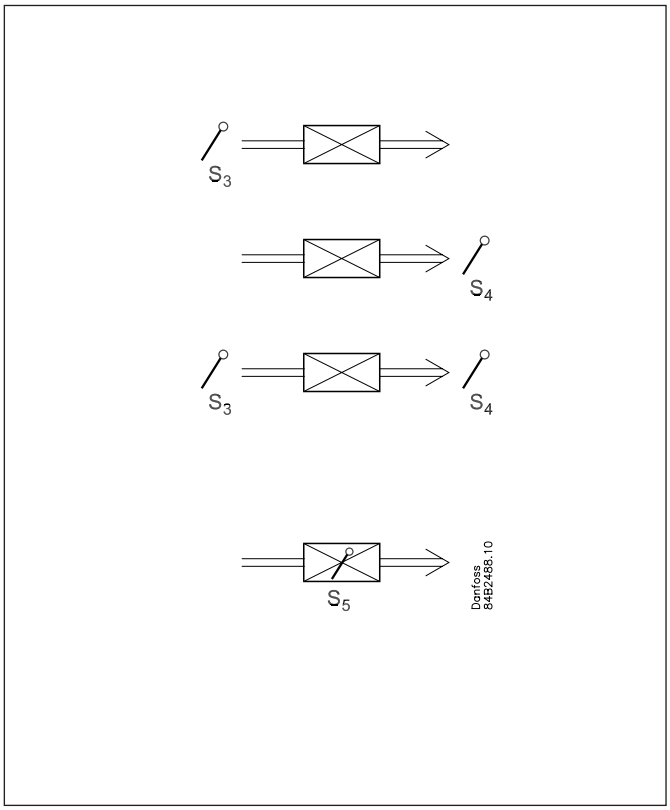
Sensor in the air stream ahead of the evaporator:
this arrangement is used primarily with area-based control.

Sensor in the air stream after the evaporator:
this arrangement is used primarily when refrigeration is controlled and there is a risk of excessively temperatures near the product.

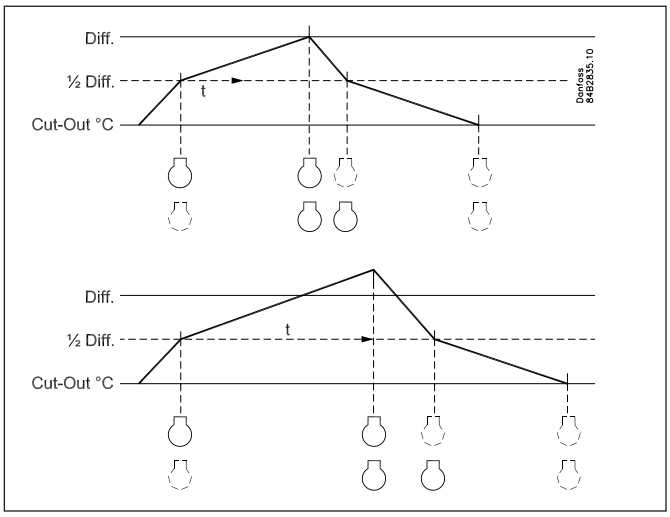
Sensors before and after the evaporator:
this arrangement lets you adapt the thermostat, the alarm thermostat and the display to the actual application. The signal to the control thermostat, alarm thermostat and display is the weighted average of the two temperatures. For example, with 50% weighting each sensor makes an equal contribution.
The control thermostat, alarm thermostat and display signals can be configured independently.

Defrost sensor
The best indication of the evaporator temperature is obtained from a defrost sensor mounted directly on the evaporator. In this case the defrost function can use this signal to minimise the duration and energy consumption of the defrost cycle.

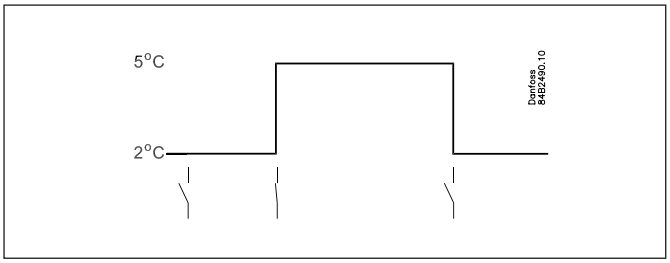
If a defrost sensor is not required, time-controlled defrosting can be used or S4 can be selected.



Controlling two compressors
This control is used for controlling two compressors of the same size. The principle for control is that one of the compressors connects at ½ the differential of the thermostat, and the other at the full differential. When the thermostat cuts in the compressor with the fewest operating hours is started. The other compressor will only start after a set time delay, so that the load will be divided between them. The time delay has a higher priority than the temperature.
When the air temperature has dropped by half the differential the one compressor will stop, the other will continue working and not stop until the required temperature is achieved.
The compressors used must be of a type that is capable of starting up against a high pressure.



Changing the temperature reference
This may be desirable in applications such as an on/off appliance used in various product groups. The temperature reference can easily be changed by a contact signal on a digital input. This signal raises the normal thermostat setting by a predefined amount. The alarm limits are also offset accordingly.



Applications

Here is a survey of the controller's field of application.

A setting will define the relay outputs so that the controller's interface will be targeted to the chosen application.

S3 and S4 are temperature sensors. The application will determine whether either one or the other or both sensors are to be used. S3 is placed in the air flow before the evaporator. S4 after the evaporator.
A percentage setting will determine according to what the control is to be based. S5 is a defrost sensor and is placed on the evaporator.
DI1 and DI2 are contact functions that can be used for one of the following functions: door function, alarm function, defrost start, external main switch, night operation, change of thermostat reference, appliance cleaning, forced refrigeration or coordinated defrost. See the functions in settings o02 and o37.

Refrigeration control with one compressor

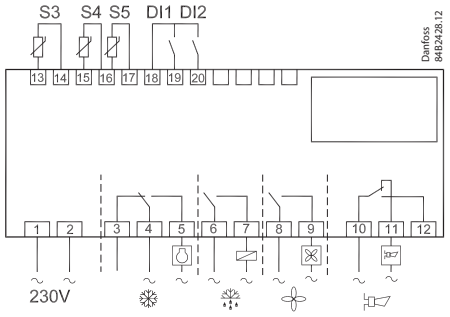
The functions are adapted to small refrigeration systems which either may be refrigeration appliances or cold rooms.
The three relays can control the refrigeration, the defrost and the fans, and the fourth relay can be used for either alarm function, light control or rail heat control

- The alarm function can be linked up with a contact function from a door switch. If the door remains open longer than allowed there will be an alarm.
- The light control can also be linked up with a contact function from a door switch. An open door will switch on the light and it will remain lit for two minutes after the door has been closed again.
- The rail heat function can be used in refrigeration or freezing appliances or on the door's heating element for frost rooms.

The fans can be stopped during defrost and they may also follow a door switch's open/close situation.

There are several other functions for the alarm function as well as the light control, rail heat control and fans. Please refer to the respective settings.

1



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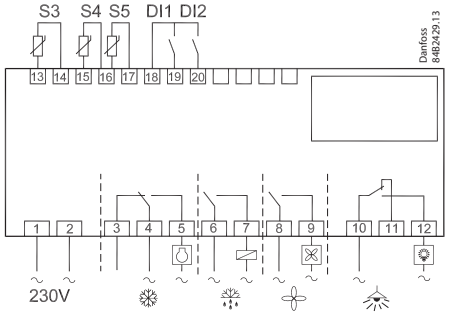

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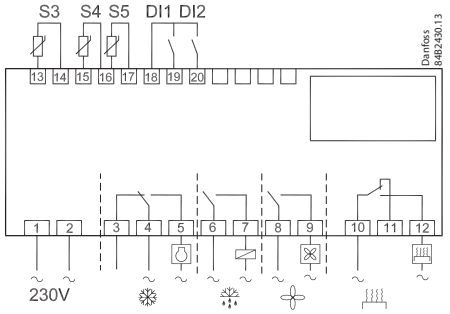
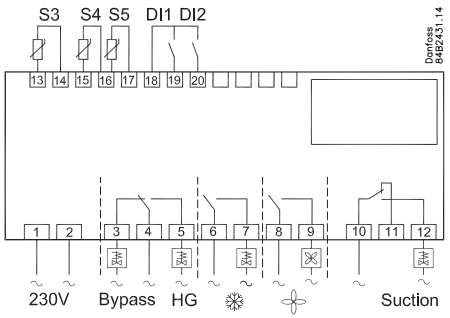


Hot gas defrost

This type of connection can be used on systems with hotgas defrost, but only in small systems in, say, supermarkets – the functional content has **not** been adapted to systems with large charges. Relay 1's change-over function can be used by the bypass valve and/or the hotgas valve.
Relay 2 is used for refrigeration.

4



Refrigeration control with two compressors

This group of applications can be used if the controller is to cut two compressors in and out.
The functions can be compared with wiring diagrams 1 to 3, but instead of controlling fans the relay is here used for compressor 2.

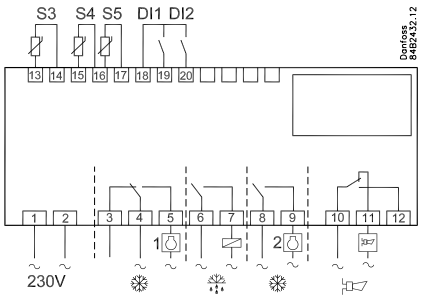
The two compressors must be of the same size. When the controller demands refrigeration it will first cut in the compressor with the shortest operating time. After the time delay the second compressor will be cut in.

When the temperature has dropped to "the middle of the differential", the compressor with the longest operation time will be cut out.
If the running compressor does not manage to reduce the temperature to the cutout point, the other compressor will be cut in again. This happens when the temperature reaches the top part of the differential. If the temperature is instead "stuck" in the differential for two hours, there will be a change-over between the two compressors so that the operating time can be equalised.
The two compressors must be of a type that can start up against a high pressure.

The compressors's settings for "Min On time" and "Min Off time" will always have top priority during normal regulation. But if one of the override functions is activated, the "Min On time" will be disregarded.

If the controller is to cut 2 compressor and 1 fan in and out, relay 4 must cut the fan in and out.
This function is activated in application 10.

5



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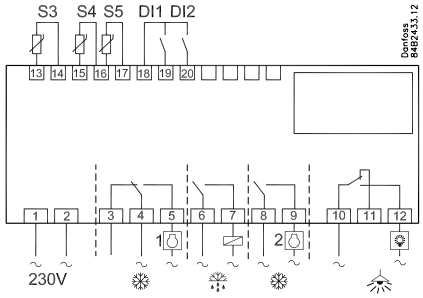

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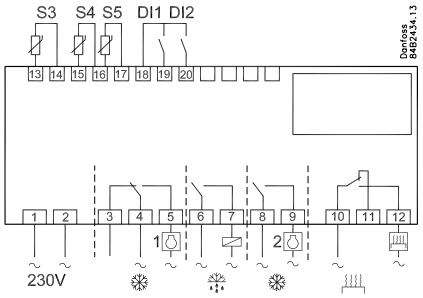

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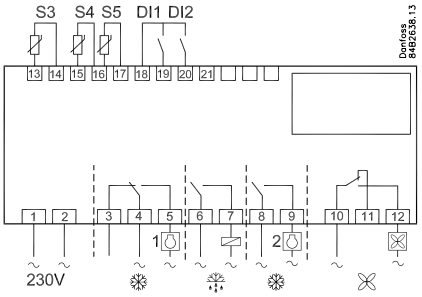
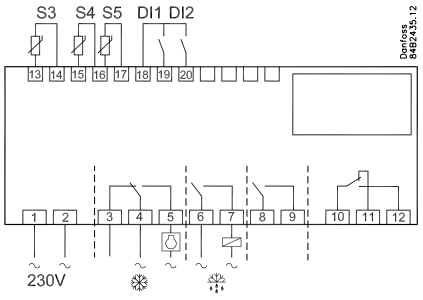


Simple refrigeration with defrost

This application can be used where there is only regulation of refrigeration and defrost.

8

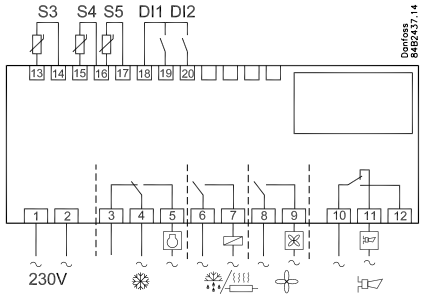


Heating function

This application is the same as under 1, but a heating function has been added which protects the unit against too low temperature. The defrost function's heating element is here used for heating.

This application is used where the temperature can go below the set cutout temperature for the refrigeration. To ensure that the temperature will not become too low the heating element is activated x degrees below the reference value.
The S3 sensor must be mounted. It supplies the signal when there is heating.

9



Menu survey

SW = 2.3x

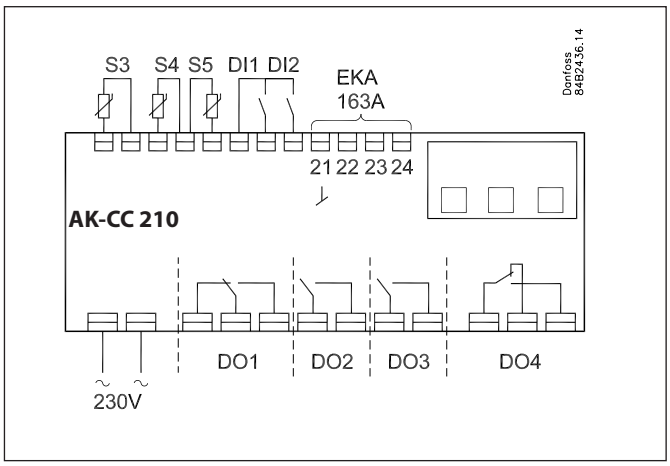
Parameters			EL-diagram number										Min.-	Max.-	Factory	Actual
Function		**Codes**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**value**	**value**	**setting**	**setting**
Normal operation																
Temperature (set point)		---											-50.0°C	50.0°C	2.0°C	
Thermostat																
Differential	***	r01											0.1 K	20.0K	2.0 K	
Max. limitation of setpoint setting	***	r02											-49.0°C	50°C	50.0°C	
Min. limitation of setpoint setting	***	r03											-50.0°C	49.0°C	-50.0°C	
Adjustment of temperature indication		r04											-20.0 K	20.0 K	0.0 K	
Temperature unit (°C/°F)		r05											°C	°F	°C	
Correction of the signal from S4		r09											-10.0 K	+10.0 K	0.0 K	
Correction of the signal from S3		r10											-10.0 K	+10.0 K	0.0 K	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12											-1	1	0	
Displacement of reference during night operation		r13											-10.0 K	10.0 K	0.0 K	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15											0%	100%	100%	
The heating function is started a number of degrees below the thermostats cutout temperature		r36											-15.0 K	-3.0 K	-15.0 K	
Activation of reference displacement r40		r39											OFF	ON	OFF	
Value of reference displacement (activate via r39 or DI)		r40											-50.0 K	50.0 K	0.0 K	
Alarm																
Delay for temperature alarm		A03											0 min	240 min	30 min	
Delay for door alarm	***	A04											0 min	240 min	60 min	
Delay for temperature alarm after defrost		A12											0 min	240 min	90 min	
High alarm limit	***	A13											-50.0°C	50.0°C	8.0°C	
Low alarm limit	***	A14											-50.0°C	50.0°C	-30.0°C	
Alarm delay DI1		A27											0 min	240 min	30 min	
Alarm delay DI2		A28											0 min	240 min	30 min	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36											0%	100%	100%	
Compressor																
Min. ON-time		c01											0 min	30 min	0 min	
Min. OFF-time		c02											0 min	30 min	0 min	
Time delay for cutin of comp.2		c05											0 sec	999 sec	0 sec	
Compressor relay 1 must cutin and out inversely (NC-function)		c30											0 OFF	1 ON	0 OFF	
Defrost																
Defrost method (none/EL/GAS/BRINE)		d01											no	bri	EL	
Defrost stop temperature		d02											0.0°C	25.0°C	6.0°C	
Interval between defrost starts		d03											0 hours	240 hours	8 hours	
Max. defrost duration		d04											0 min	180 min	45 min	
Displacement of time on cutin of defrost at start-up		d05											0 min	240 min	0 min	
Drip off time		d06											0 min	60 min	0 min	
Delay for fan start after defrost		d07											0 min	60 min	0 min	
Fan start temperature		d08											-15.0°C	0.0°C	-5.0°C	
Fan cutin during defrost 0: Stopped 1: Running 2: Running during pump down and defrost		d09											0	2	1	
Defrost sensor (0=time, 1=S5, 2=S4)		d10											0	2	0	
Pump down delay		d16											0 min	60 min	0 min	
Drain delay		d17											0 min	60 min	0 min	
Max. aggregate refrigeration time between two defrosts		d18											0 hours	48 hours	0 hours	
Defrost on demand - S5 temperature's permitted variation during frost build-up. On central plant choose 20 K (=off)		d19											0.0 K	20.0 k	20.0 K	
Delay of hot gas defrost		d23											0 min	60 min	0 min	
Fan																
Fan stop at cutout compressor		F01											no	yes	no	
Delay of fan stop		F02											0 min	30 min	0 min	
Fan stop temperature (S5)		F04											-50.0°C	50.0°C	50.0°C	
HACCP																
Actual temperature measurement for the HACCP function		h01														
Last registered peak temperature		h10														
Selection of function and sensor for the HACCP function. 0 = no HACCP function. 1 = S4 used (maybe also S3). 2 = S5 used		h11											0	2	0	
Alarm limit for the HACCP function		h12											-50.0°C	50.0°C	8.0°C	
Time delay for the HACCP alarm		h13											0 min.	240 min.	30 min.	
Select signal for the HACCP function. S4% (100% = S4, 0% = S3)		h14											0%	100%	100%	
Real time clock																
Six start times for defrost. Setting of hours. 0=OFF		t01-t06											0 hours	23 hours	0 hours	
Six start times for defrost. Setting of minutes. 0=OFF		t11-t16											0 min	59 min	0 min	
Clock - Setting of hours	***	t07											0 hours	23 hours	0 hours	
Clock - Setting of minute	***	t08											0 min	59 min	0 min	
Clock - Setting of date	***	t45											1	31	1	
Clock - Setting of month	***	t46											1	12	1	
Clock - Setting of year	***	t47											0	99	0	
Miscellaneous																
Delay of output signals after start-up		o01											0 s	600 s	5 s	

			1	2	3	4	5	6	7	8	9	10				
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost.		o02											1	11	0	
Network address		o03											0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04		o04											OFF	ON	OFF	
Access code 1 (all settings)		o05											0	100	0	
Used sensor type (Pt /PTC/NTC)		o06											Pt	ntc	Pt	
Display step = 0.5 (normal 0.1 at Pt sensor)		o15											no	yes	no	
Max hold time after coordinated defrost		o16											0 min	60 min	20	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17											0%	100%	100%	
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation 7=change reference (activate r40). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost.). 12=coordinated defrost)		o37											0	12	0	
Configuration of light function (relay 4) 1=ON during day operation. 2=ON / OFF via data communication. 3=ON follows the DI-function, when DI is selected to door function or to door alarm		o38											1	3	1	
Activation of light relay (only if o38=2)		o39											OFF	ON	OFF	
Rail heat On time during day operations		o41											0%	100%	100	
Rail heat On time during night operations		o42											0%	100%	100	
Rail heat period time (On time + Off time)		o43											6 min	60 min	10 min	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46											0	2	0	
Selection of EL diagram.	*	o61											1	10	1	
Download a set of predetermined settings.	*	o62											0	6	0	
Access code 2 (partly access)	***	o64											0	100	0	
Save the controllers present settings to the programming key. Select your own number.		o65											0	25	0	
Load a set of settings from the programming key (previously saved via o65 function)		o66											0	25	0	
Replace the controllers factory settings with the present settings		o67											OFF	On	OFF	
Service																
Status codes		S0-S33														
Temperature measured with S5 sensor	***	u09														
Status on DI1 input. on/1=closed		u10														
Temperature measured with S3 sensor	***	u12														
Status on night operation (on or off) 1=closed	***	u13														
Temperature measured with S4 sensor	***	u16														
Thermostat temperature		u17														
Read the present regulation reference		u28														
Status on DI2 output. on/1=closed		u37														
Temperature shown on display		u56														
Measured temperature for alarm thermostat		u57														
Status on relay for cooling	**	u58														
Status on relay for fan	**	u59														
Status on relay for defrost	**	u60														
Status on relay for railheat	**	u61														
Status on relay for alarm	**	u62														
Status on relay for light	**	u63														
Status on relay for valve in suction line	**	u64														
Status on relay for compressor 2	**	u67														

*) Can only be set when regulation is stopped (r12=0)
**) Can be controlled manually, but only when r12=-1
***) With access code 2 the access to these menus will be limited

Factory setting
If you need to return to the factory-set values, it can be done in this way:
- Cut out the supply voltage to the controller
- Keep both buttons depressed at the same time as you reconnect the supply voltage

Wiring



Application adaptation

The controller can be adapted to ten different applications by simple parameter selection.

Application no	Output				Input				
	DO1	DO2	DO3	DO4	DI1	DI2	S3	S4	S5
1	●	●	●	●	●	●	●	●	●
2	●	●	●	●	●	●	●	●	●
3	●	●	●	●	●	●	●	●	●
4	*1	*2	●	*3	●	●	●	●	●
5	●	●	●	●	●	●	●	●	●
6	●	●	●	●	●	●	●	●	●
7	●	●	●	●	●	●	●	●	●
8	●	●			●	●	●	●	●
9	●	●	●	●	●	●	●	●	●
10	●	●	●	●	●	●	●	●	●

*1: Hot gas valve and bypass valve
*2: Liquid line solenoid valve
*3: Suction line solenoid valve

Power supply

230 V a.c.

Sensors

S3 and S4 are thermostat sensors.
A setting determines whether S3, S4, or both sensors are used.
S5 is a defrost sensor and is used if defrost is stopped based on temperature.

Digital on/off signals

A cut-in input activates a function. The available functions are shown in menus o02 and o37.

Relays

The general uses are described here.

DO1: Refrigeration. The relay cuts in when the controller requests refrigeration.

DO2: Defrost. The relay is activated during defrosting.

DO3: Fans or refrigeration 2

Fans: the relay cuts in when fan operation is necessary

Refrigeration 2: the relay cuts in when refrigeration level 2 is needed

DO4: Alarm, rail heat, lighting, or hot gas defrost

Alarm: see diagram. The relay is cut in during normal operation and cuts out in alarm situations and when the controller is de-energised.

Rail heat: the relay cuts in when rail heating is needed.

Lighting: the relay cuts in when light is needed.

Hot gas defrost: see diagram. The relay cuts in when defrosting is needed.

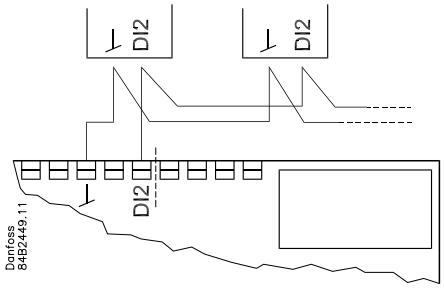
Data communication

The control function can be performed using data communication.
If data communication is used, proper installation of the data communication cables is important.
See document RC8AC…

Electrical interference

Cables for sensors, DI inputs and data communication **must** be kept separate from other electrical cables:
- Use separate cable trays
- Keep cables separated by at least 10 cm
- Avoid long cables on DI inputs

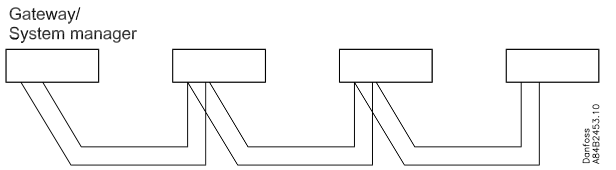
Coordinated defrost with wiring interconnect



The following controllers can be connected in this manner:
EKC 202D /302D serie and
AK-CC 210 and AK-CC 250
(max. 15)

Refrigeration is resumed when all controllers have de-asserted the defrost signal.

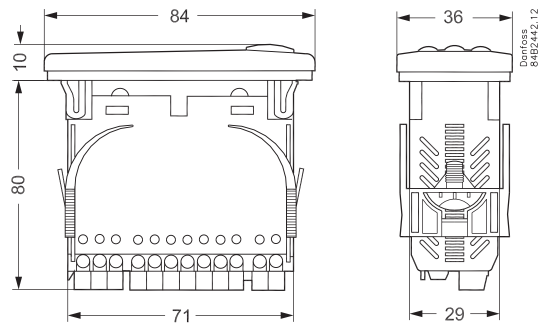
Coordinated defrost with data communication

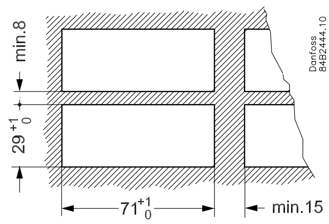


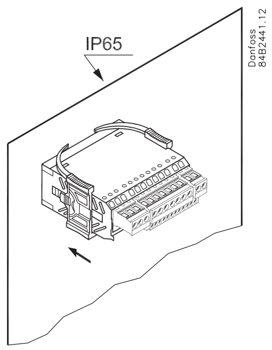
Technical data

Supply voltage	230 V a.c. +10/-15 %. 2.5 VA, 50/60 Hz		
Sensors 3 pcs off either	Pt 1000 or PTC 1000 ohm or NTC-M2020 (5000 ohm / 25°C)		
Accuracy	Measuring range	-60 to +99°C	
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C	
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad	
Display	LED, 3-digits		
External display	EKA 163A		
Digital inputs	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer		
Electrical connection cable	Max.1,5 mm² multi-core cable		
Relays*		CE (250 V a.c.)	UL *** (240 V a.c.)
	DO1. Refrigeration	10 (6) A	10 A Resistive 5FLA, 30LRA
	DO2. Defrost	10 (6) A	10 A Resistive 5FLA, 30LRA
	DO3. Fan	6 (3) A	6 A Resistive 3FLA, 18LRA 131 VA Pilot duty
	DO4. Alarm	4 (1) A Min. 100 mA**	4 A Resistive 131 VA Pilot duty
Environments	0 to +55°C, During operations -40 to +70°C, During transport		
	20 - 80% Rh, not condensed		
	No shock influence / vibrations		
Density	IP 65 from front. Buttons and packing are imbedded in the front.		
Escapement reserve for the clock	4 hours		
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. EN61000-6-3 and EN 61000-6-2		

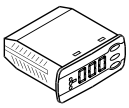
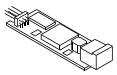
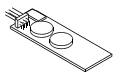
* DO1 and DO2 are 16 A relays. DO3 and DO4 are 8 A relays. Max. load must be kept.
** Gold plating ensures make function with small contact loads
*** UL-approval based on 30000 couplings







Ordering

Type		Function	Power supply	Code no.
AK-CC 210		Refrigeration controller without data communication but prepared for mounting of one module	230 V a.c.	**084B8520**
			115 V a.c.	**084B8534**
EKA 178A		Data communication module MOD-BUS		**084B8564**
EKA 179A		Data communication module LON RS 485		**084B8565**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure		**084B8577**

Additional information available:
Manual: RS8EP

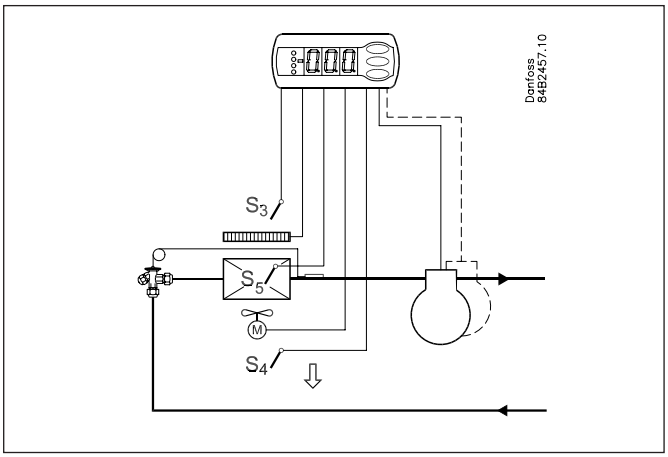
AK-CC 250A

Application

- The controller is used for temperature control refrigeration appliances in supermarkets
- The controller has the same functionalities as the AK-CC 210, but with the following deviations:
  - Fixed MODBUS data communication
  - The AK-CC 250A receives signals from Pt 1000 or PTC sensors
  - An external display can be connected, but only if the controller is a 'stand alone' unit and does not have data communication for system units
  - Flexibility has been planned both for new installations and for service in the refrigeration trade

In addition:

- It is not possible to mount a module with another type of data communication
- The menus are the same with the exception of o04, which has been removed.
- Menu o06 (sensor definition) has been added



Controller with four relay outputs, three temperature sensors and two digital inputs.

Advantages

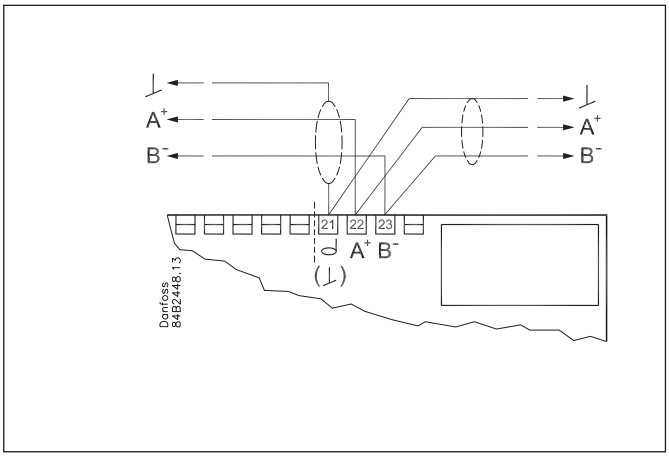
Easy to maintain because of:

- Several applications in the same device
- Can receive signals from known PTC sensors

Sensors

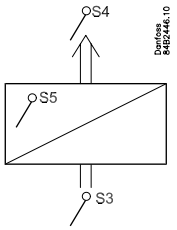
It is possible to connect one, two or three sensors, as long as they are all of the same type.
Select one of the following:

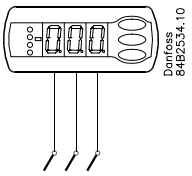
- Pt 1000 ohm at 0°C (Danfoss Type = AKS 11, AKS 12, AKS 21)
- PTC 1000 Ω (nominel 990 Ω) (Danfoss Type = EKS 111)
- PTC 1000 Ω @ 25°C



MODBUS data communication is built-in.
It is not possible to retrofit another type of data communication.

Sensor overview

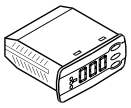
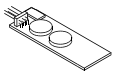
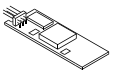




o06
Pt: Pt 1000 Ω @ 0°C (AKS 11, AKS 12, AKS 21)
P01: PTC 1000 Ω (nominel 990 Ω) = EKS 111
P02: PTC 1000 Ω @ 25°C (nominel 1000 Ω)

	AK-CC 250A		
	Pt 1000 @ 0°C	PTC 1000 Ω	PTC 1000 Ω @ 25°C
	AKS 11, AKS 12, AKS 21	KTY81-121 *EKS 111*	KTY81-110
°C	Ω	Ω	Ω
30	1167.7	1029	1040
25	1097.3	**990**	**1000**
20	1077.9	951	961
15	1058.5	914	923
10	1039.0	877	886
5	1019.5	841	850
0	**1000.0**	807	815
−5	980.4	773	781
−10	960.9	740	747
−15	941.2	708	715
−20	921.6	677	684
−25	901.9	647	653
−30	882.2	617	624
−35	862.5	589	595
−40	842.7	562	567
	Carel: TSH/TST/TSM/TSQ/PT1 Dixell: PMG/PMP/PMT	Carel: 03/06/015 Dixell: S6 Eliwell: SN6/SN7 Lae: ST1K.CP	Frigo: VX6
o06	Pt	P01	P02

Ordering

Type		Function	Code no.
AK-CC 250A		Refrigeration controller with MODBUS data communication. For Pt 1000 or PTC sensors	**084B8528**
EKA 181C		Battery module that will protect the clock in case of lengthy power failure	**084B8577**
EKA 182A		Copy key EKC - EKC	**084B8567**
EKA 163A		External display option for stand alone	**084B8562**
EKA 164A		External operation option for stand alone	**084B8563**

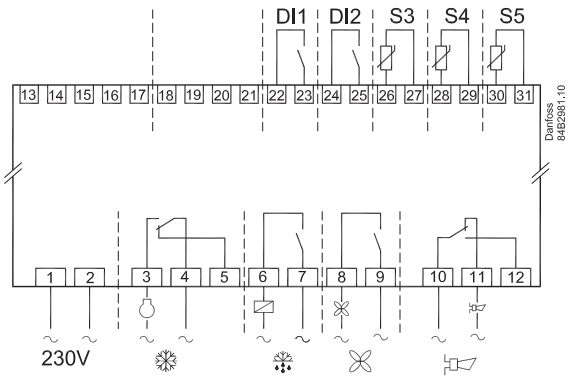
Additional information available:
Manual: RS8GC

AK-CC 350

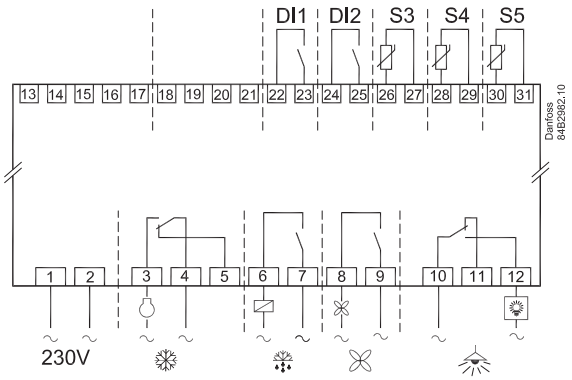
This controller is a variant of AK-CC 210 with the following differences:
- DIN-rail mounting
- Option for higher load to relay
- Fixed MODBUS data communication

Connection / application number

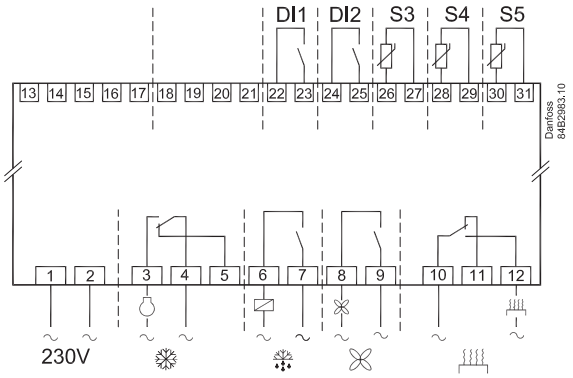
1



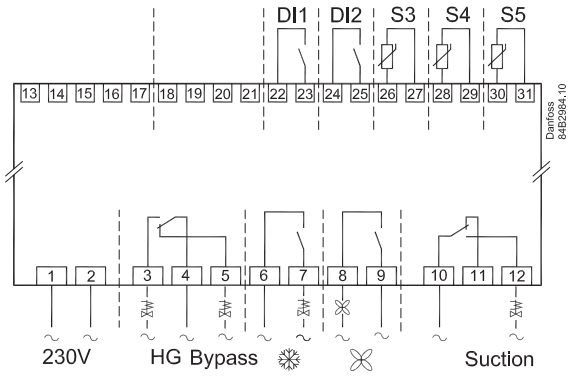
2



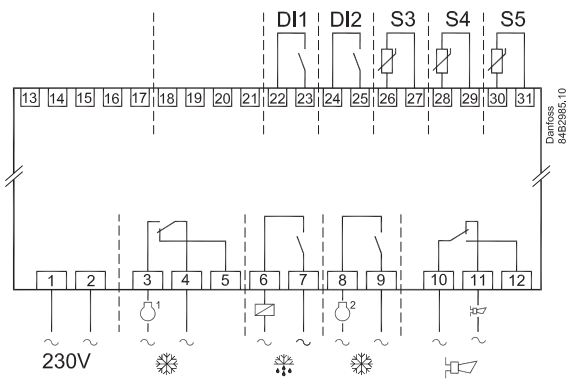
3



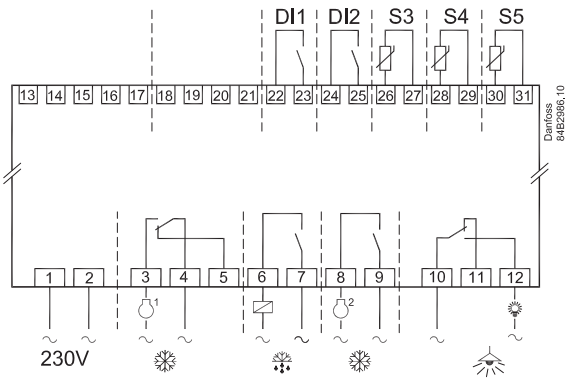
4



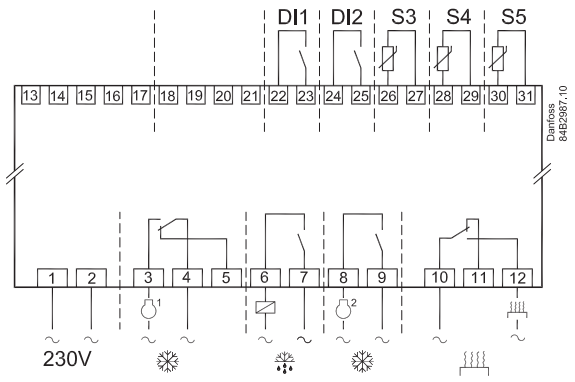
5



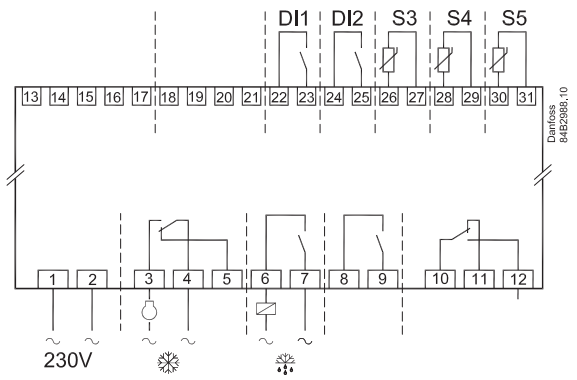
6



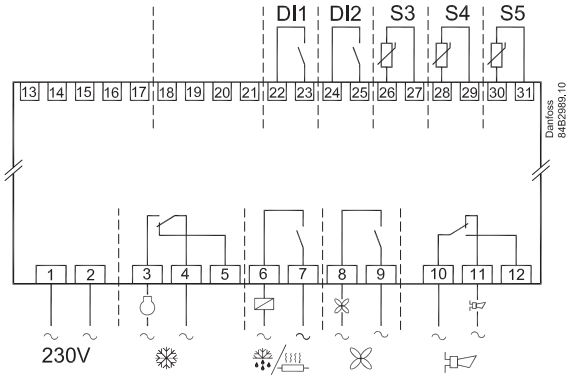
7



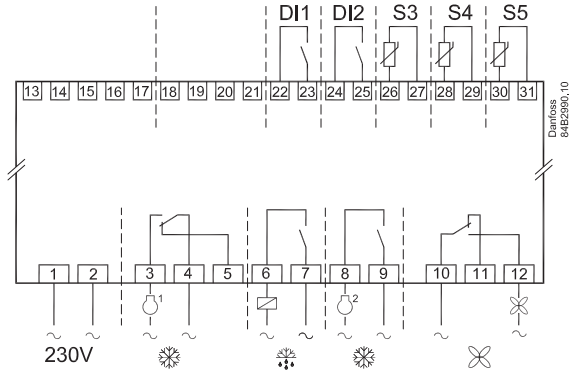
8

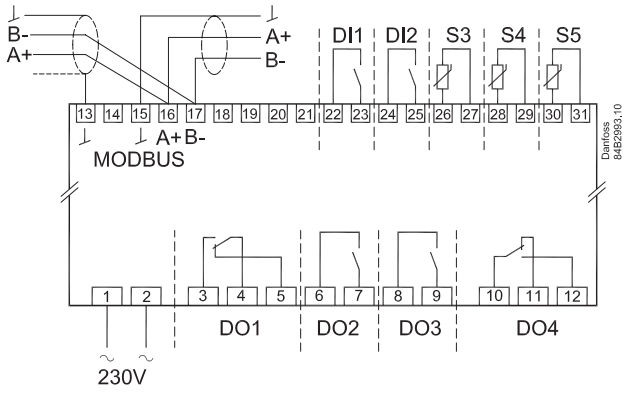


9



10

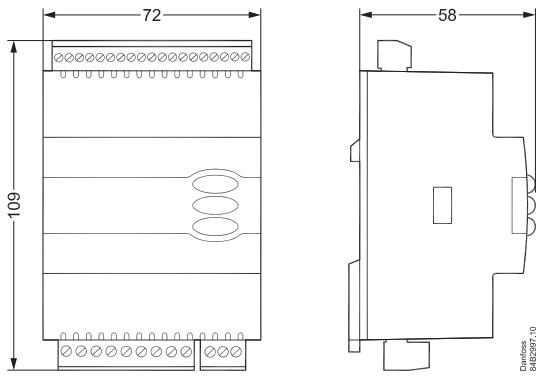




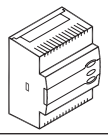
Relay load

DO1	10 (6) A & (5 FLA, 30 LRA)	1)
	16 (8) A & (10 FLA, 60 LRA)	2)
DO2	6 (3) A & (3 FLA, 18 LRA)	1)
	10 (6) A & (5 FLA, 30 LRA)	2)
DO3	6 (3) A & (3 FLA, 18 LRA)	1)
	10 (6) A & (5 FLA, 30 LRA)	2)
DO4	4 (1)A Min. 100 mA**	

DO1 is 20 A relay. DO2 and DO3 are 16 A relays. DO4 is a 10 A relay. The max. load listed above must be observed when connecting without zero-crossing control. When connecting with zero-crossing control, the load must be increased to the value indicated by 2)
** Gold plating ensures make function with small contact loads

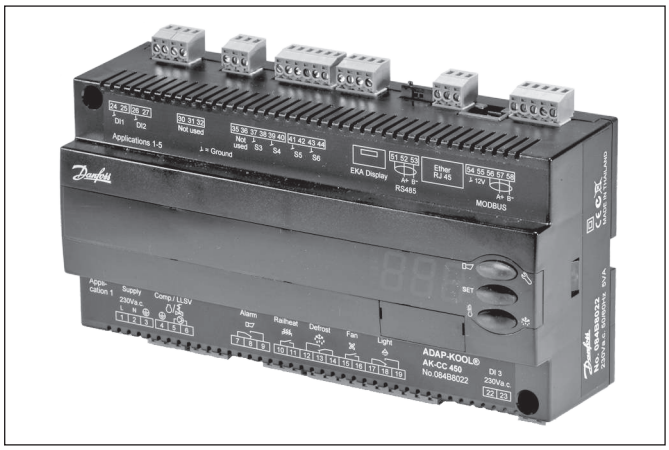


Ordering

Type		Function	Code no.
AK-CC 350		Refrigeration controller with MODBUS data communication	**084B4165**

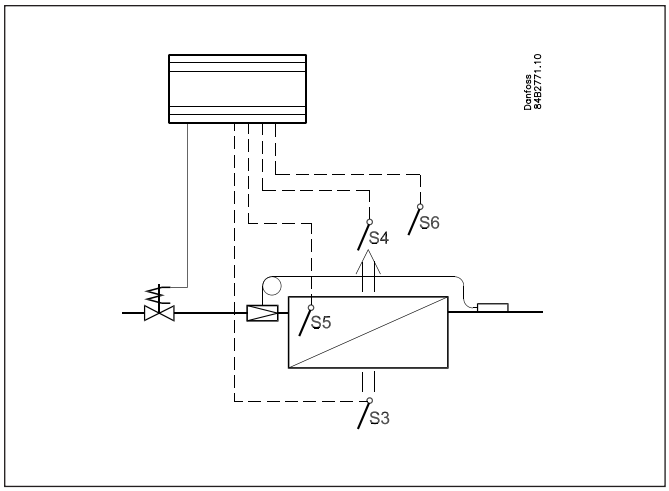
Additional information available:
Manual: RS8EQ

AK-CC 450

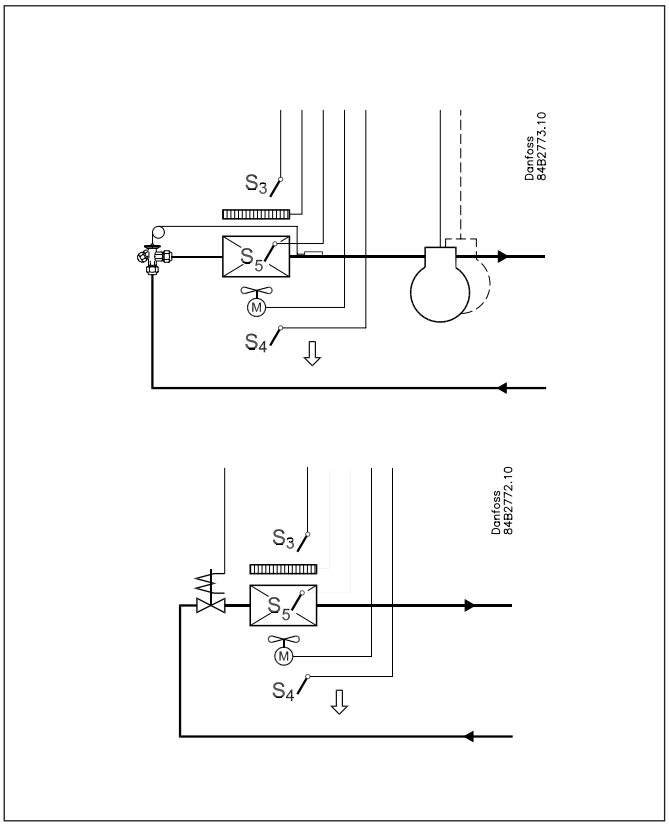


Application
Complete, highly versatile refrigeration appliance control for adaptation to all types of refrigeration appliances and cold storage rooms.
- For use with brine cooling
- For use with a thermostatic expansion valve

Advantages
- Energy optimisation of the entire refrigeration appliance
- A single controller for several different refrigeration appliances
- Integrated front-panel display
- Quick set-up with predefined settings
- Built-in data communication support
- Built-in clock function with power backup



Operating principle
The appliance temperature is detected by one or two temperature sensors located in the air flow before the evaporator (S3) or after the evaporator (S4). Configuration settings for the control thermostat, alarm thermostat and display reading determine how the two sensor values affect the individual functions.
In addition product sensor S6, which can optionally be fitted in the appliance, can be used to detect the temperature near the appropriate product in a certain location in the appliance.
The evaporator temperature is detected by sensor S5, which can be used as a defrost sensor.
In addition to the solenoid valve output, the controller has five relay outputs defined by selected uses.



Functional description
- Day/night thermostat with on/off or modulated operating mode
- Product sensor S6 with separate alarm limits
- Switching between thermostat settings in response to a digital input
- Defrost start controlled by a schedule, digital input or network input
- Natural, electrical or hot gas defrost
- Time-controlled and/or temperature-controlled defrost stop
- Defrost coordination with multiple controllers
- Pulsed fan operation when thermostat is cut out
- Case cleaning function for documentation of HACCP procedures
- Rail heat control by day/night signal, load or dew point
- Door function
- Controlling two compressors
- Controlling night blinds
- Lighting control
- Heater thermostat
- Factory calibration assures measurement accuracy exceeding the requirements of the EN 441-13 standard without subsequent calibration (Pt1000 sensor).
- Integrated Modbus communication with the option of fitting a LonWorks, DANBUSS or Ethernet communication card

Applications

The following is a brief summary of the application options for this controller.
The inputs and outputs are configured by settings to adapt the operating interface of the controller to the selected application.

Applications 1 - 5 and 9

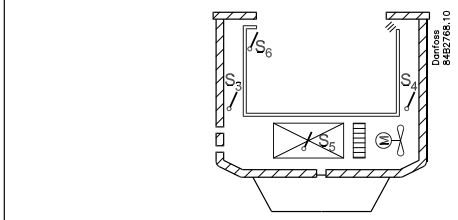
The configurations shown here are suitable for use with standard appliances or cold storage rooms with one valve, one evaporator and one refrigeration section.
The sensors are used in the conventional manner.
The output functions depend on the intended application.

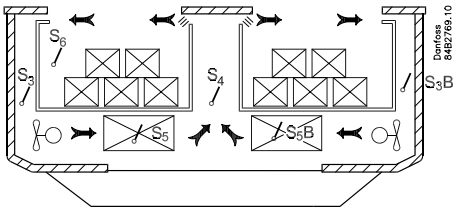
Applications 6 and 8

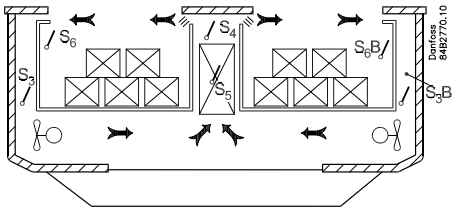
These options are suitable for refrigeration appliances with one valve, two evaporators and two refrigeration sections.
There are two defrost sensors – one for each evaporator.
Application 6
Here the S4 sensor is always used for temperature control and alarm monitoring.
The two S3 values are used to display the temperatures of the individual cooling sections.
Application 6 has an alarm relay.
Application 8
Here the S4 sensor is always used for temperature control.
The two S3 sensors are used for alarm monitoring and displaying the temperatures of the individual cooling sections. There are separate alarm delays.
Application 8 has a rail heat relay.

Application 7

This configuration is suitable for refrigeration appliances with one valve, one evaporator and two cooling sections.
Here the S4 sensor is always used for temperature control.
The two S3 sensors are used for alarm monitoring and displaying the temperatures of the individual cooling sections. There are separate alarm delays. There are two product sensors S6 – one for each cooling section.







Application	DO1	DO2	DO3	DO4	DO5	DO6	DI1	DI2	DI3	AI1	AI2	AI3	AI4	AI5	AI6
1							●	●	●			S3	S4	S5	S6
2		Blinds					●	●	●			S3	S4	S5	S6
3	1		2				●	●	●			S3	S4	S5	S6
4		suction		hotgas			●	●	●			S3	S4	S5	S6
5			heat				●	●	●			S3	S4	S5	S6
6			B	A			●	●	●	S3B	S5B	S3A	S4	S5	S6
7							●	●	●	S3B	S6B	S3A	S4	S5	S6A
8			B	A			●	●	●	S3B	S5B	S3	S4	S5	S6
9	1		2				●	●	●			S3	S4	S5	S6

Digital inputs

Three digital inputs are available, with many use options for all settings. The two inputs are connection inputs and the third is a 230 V input.

Applications

The following is a brief summary of the application area of this controller.

The relay outputs are defined by a configuration setting to align the controller interface to the selected application.

S3 and S4 are temperature sensors. One or both of these sensors may be used, depending on the application. S3 is located in the air flow before the evaporator, and S4 in the air flow after the evaporator.
A percentage setting determines the control basis. S5 is a defrost sensor located on or between the fins of the evaporator.
S6 is a product sensor.
DI1, DI2 and DI3 are contact functions that can be used for any of the following purposes: door function, alarm function, defrost start, external main switch, night operation, change thermostat reference, appliance cleaning, forced refrigeration, or coordinated defrost. DI3 has a 230 V input. See the functions of settings o02, o37 and o84.

General:
All eight applications are intended for commercial refrigeration systems in the form of refrigeration appliances or cold storage rooms.
They all have outputs for:
- Solenoid valve or compressor
- Fan
- Defrost
- Lighting

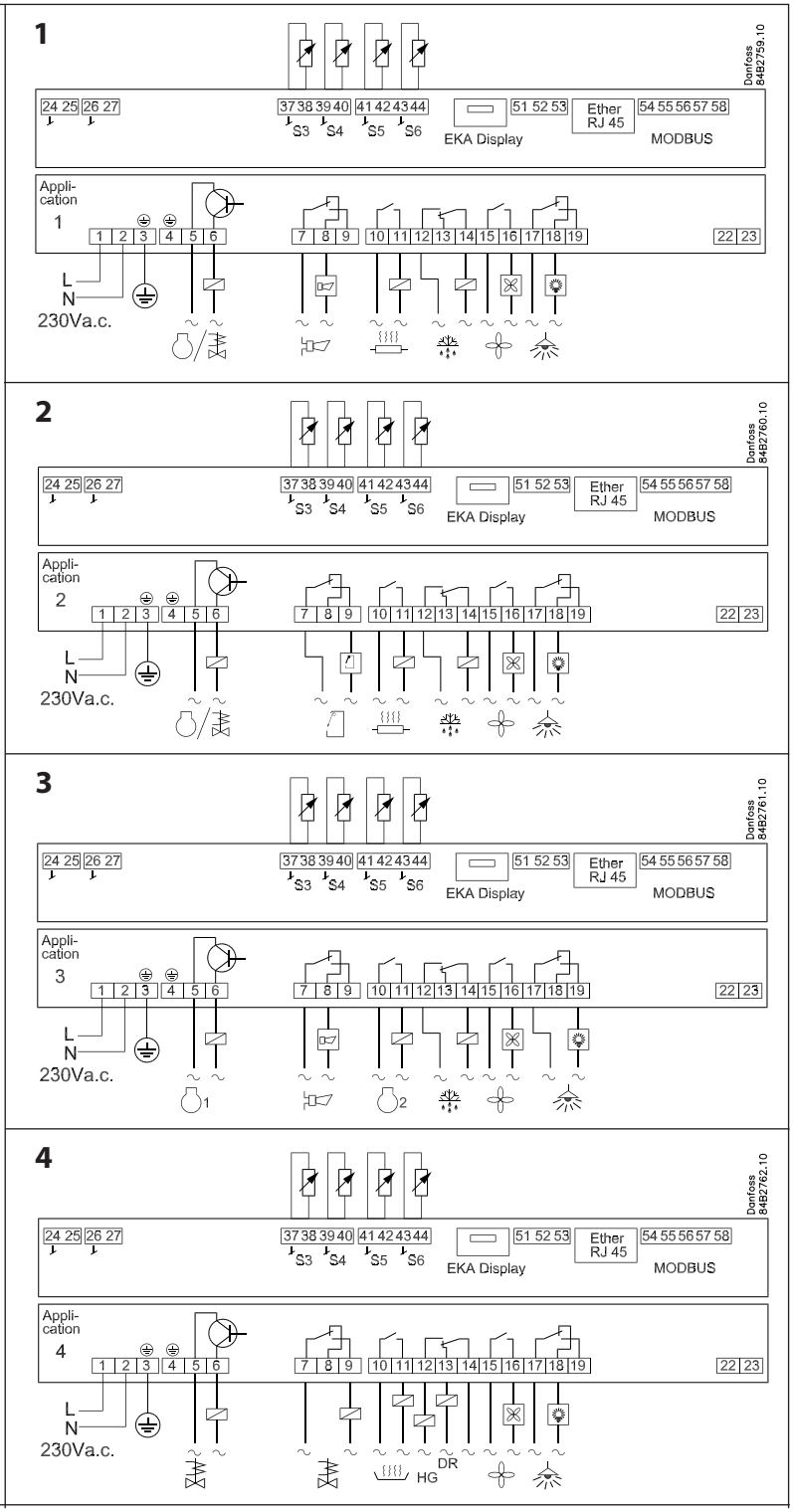
In addition, they have different uses and thus different inputs and outputs.

Application 1
Standard applications.

Application 2
Controlling night blinds
The night blinds track the status of the lighting function. The blinds are open when the light is switched on and closed when the light is switched off. In addition, a digital input provides the option of forced opening of the blinds so the appliance can be filled with products.

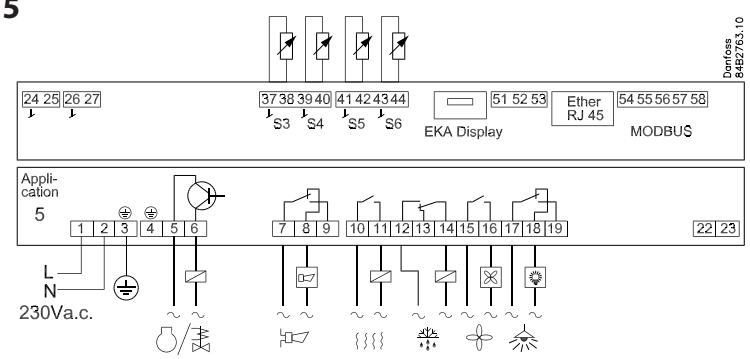
Application 3
Two-compressor operation.
The two compressors must be of the same size. On start-up (after defrosting, operational stop, etc.), the compressors are started with a preset time offset. One compressor starts at half of the differential value to provide optimum adaptation of the compressor capacity to the current load in the appliance or room. There is automatic runtime equalisation during cyclic operation.
For a more detailed description, see the manual.

Application 4
Hot gas defrosting.
Hot gas defrosting is suitable for commercial appliances or cold rooms with a limited system charge.
One relay controls the main valve in the suction line.
A changeover relay controls the hot gas valve and the drain valve.
This means there is no time delay between the end of hot gas defrosting and the start of draining.



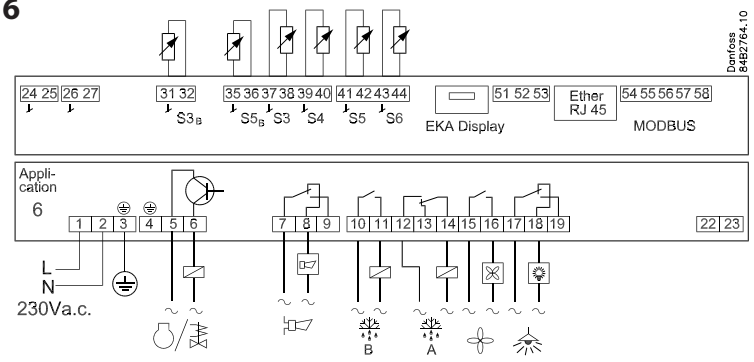
Application 5
Heater thermostat
A heater thermostat is typically used if the temperature needs to be controlled within relatively narrow limits, such as in cutting rooms. To avoid simultaneous cooling and heating, the heating thermostat can be configured as an offset relative to cut-out limit of the refrigeration thermostat.

5



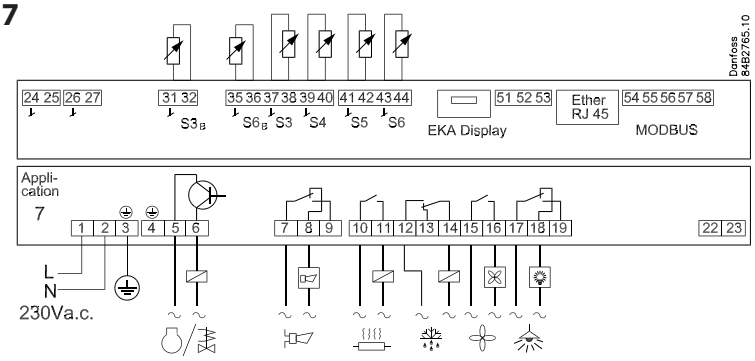
Application 6
Two cooling sections with two defrost outputs
This application is for refrigeration appliances with one valve, two evaporators, and two refrigeration sections. The temperature is controlled and constantly alarm monitored according to the S4 temperature.
Each S3 sensor sends a signal to the display for the associated section.

6



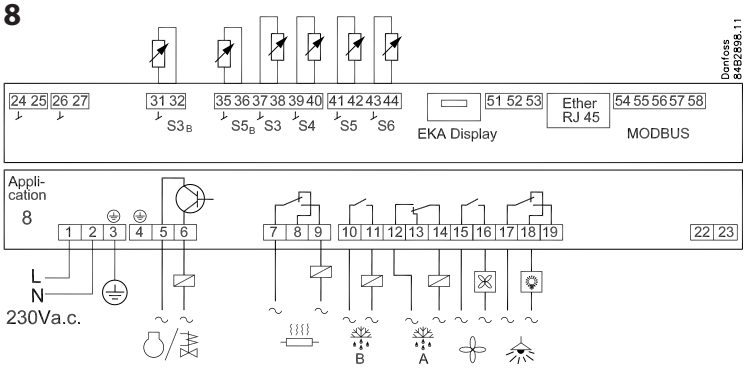
Application 7
Two cooling sections with individual alarm and display via S3
This application is for refrigeration appliances with one valve, one evaporator, and two refrigeration sections. The temperature is always controlled according to the S4 temperature.
There are two S3 sensors. The S3 sensors in the cooling sections are used for individual alarm monitoring and display readings.
There is a separate alarm delay for each cooling section.

7



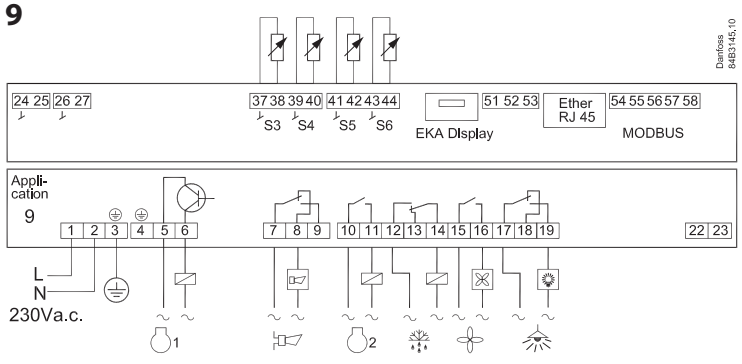
Application 8
Two cooling sections with two defrost outputs
This application is for refrigeration appliances with one valve, two evaporators, and two refrigeration sections. The temperature is always controlled according to the S4 temperature.
There are two S3 sensors. The S3 sensors in the cooling sections are used for individual alarm monitoring and display readings.
There is a separate alarm delay for each cooling section.
• Rail heat

8



Application 9
Thermostat band-determined compressor operation.
Runs in thermostat band 1 with sequential "two-compressor" operation; first compressor 1, and then compressor 2.
In thermostat band 2, compressor 2 can be de-selected so that only compressor 1 is used.
There are separate thermostat differences and defrost stop definitions for the two thermostat bands.

9



Menu survey

SW = 1.8x

Parameter			EL-diagram									Min.-value	Max.-value	Factory setting	Actual setting
Function		Code	1	2	3	4	5	6	7	8	9				
Normal operation															
Temperature (setpoint)		- - -	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Thermostat															
Differential		r01	1	1	1	1	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting		r02	1	1	1	1	1	1	1	1	1	-49°C	50°C	50	
Min. limitation of setpoint setting		r03	1	1	1	1	1	1	1	1	1	-50°C	49°C	-50	
Adjustment of temperature indication		r04	1	1	1	1	1	1	1	1	1	-10	10	0	
Temperature unit (°C/°F)		r05	1	1	1	1	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4		r09	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S3		r10	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12	1	1	1	1	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation		r13	1	1	1	1	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Pulse width modulating (PWM)		r14	1	1	1	1	1	1	1	1	1	1	2	1	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15	1	1	1	1	1				1	0 %	100 %	100	
Time between melt periods		r16	1	1	1	1	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods		r17	1	1	1	1	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential use r01 for application 1-8. r93 for application 9		r21	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Correction of the signal from S3B		r53						1	1	1		-10 K	10 K	0	
Correction of the signal from S6		r59	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S6B		r60							1			-10 K	10 K	0	
Definition and weighting, if applicable, of thermostat sensors when night cover is on. (100%=S4, 0%=S3)		r61	1	1	1	1	1				1	0 %	100 %	100	
Heat function Neutral zone between refrigeration and heat function		r62					1					0 K	50 K	2	
Time delay at switch between refrigeration and heat function		r63					1				1	0 min.	240 min.	0	
Differential for thermostat band 2		r93									1	0.1	20 K	2 K	
Alarms															
Delay for temperature alarm		A03	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm		A04	1	1	1	1	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost		A12	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1		A13	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 1		A14	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for thermostat 2		A20	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 2		A21	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 1		A22	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 1		A23	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 2		A24	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 2		A25	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
S6 alarm time delay With setting = 240 the S6 alarm will be omitted		A26	1	1	1	1	1	1	1	1	1	0 min.	240 min.	240	
Alarm time delay or signal on the DI1 input		A27	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input		A28	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36	1	1	1	1	1				1	0 %	100 %	100	
Delay for S6 (product sensor alarm) after defrost		A52	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
Delay for S3B alarm during normal regulation		A53							1	1		0 min.	240 min.	90	
Compressor															
Min. ON-time		c01	1	1	1	1	1	1	1	1	1	0 min.	30 min.	0	
Min. OFF-time		c02	1	1	1	1	1	1	1	1	1	0 min.	30 min.	0	
Time delay for cutin of comp.2		c05			1						1	0 sec	999 sec	5	
Step Mode 1= Sequential, 2=Cyclic		c08			1							1	2	2	
Comp.2 can run in thermostat band 2 0: No 1: Yes		c85									1	0	1	0	
Comp. on time when sensor fault		c86									1	0 min	240 min	15	

Continued		code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Comp. off time when sensor fault		c87									1	0 min	240 min	30	
Defrost															
Defrost method: 0=none, 1= EL, 2= Gas, 3 = Brine		d01	1	1	1	1	1	1	1	1	1	0/No	3/bri	1/EL	
Defrost stop temperature		d02	1	1	1	1	1	1	1	1	1	0°C	50°C	6	
Interval between defrost starts		d03	1	1	1	1	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration		d04	1	1	1	1	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cutin of defrost at start-up		d05	1	1	1	1	1	1	1	1	1	0 min.	240 min.	0	
Drip off time		d06	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost		d07	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature		d08	1	1	1	1	1	1	1	1	1	-50 °C	0 °C	-5	
Fan cutin during defrost 0: stopped 1: Running 2: Running during pump down and defrost		d09	1	1	1	1	1	1	1	1	1	0	2	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4, 3= (Application 1-5 and 7: Both S5A and S6A. Application 6 and 8: individual S5A and S5B)		d10	1	1	1	1	1	1	1	1	1	0	3	0	
Pump down delay		d16	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Drain delay (used at hot gas defrost only)		d17				1						0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts		d18	1	1	1	1	1	1	1	1	1	0 hrs	48 hrs	0/OFF	
Heat in drip tray. Time from defrosting stops to heating in the drip tray is switched off		d20				1						0 min.	240 min.	30	
Delay time before opening hot gas valve		d23				1						0 min	60 min	0	
Rail heat during defrost 0: off 1: on 2: Pulsing		d27	1	1					1	1		0	2	2	
Defrost stop temp. thermostat band 2		d28									1	0°C	50°C	6	
Max. defrost duration thermostat band 2		d29									1	0 min	360 min	45	
Regulation parameter for refrigeration															
Period time at PWM		n63	1	1	1	1	1	1	1	1	1	30 sec.	900 sec.	300	
Max. opening degree at PWM		n64	1	1	1	1	1	1	1	1	1	0%	100%	100	
Min. opening degree at PWM		n65	1	1	1	1	1	1	1	1	1	0%	90%	0	
Expert setting. Windup at PWM		n66	1	1	1	1	1	1	1	1	1	0.2	1.0	1.0	
Expert setting. Kp at PWM		n67	1	1	1	1	1	1	1	1	1	0.5	10.0	4.0	
Expert setting. Tn at PWM		n68	1	1	1	1	1	1	1	1	1	60 sec	1800 sec	300	
Fan															
Fan stop temperature (S5)		F04	1	1	1	1	1	1	1	1	1	-50°C	50°C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cuts out only, 2= Only at thermostat cut outs during night operation		F05	1	1	1	1	1	1	1	1	1	0	2	0	
Period time for fan pulsation (on-time + off-time)		F06	1	1	1	1	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of period time		F07	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Real time clock															
Six start times for defrost. Setting of hours. 0=OFF		t01 - t06	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF		t11 - t16	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours		t07	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Clock - Setting of minute		t08	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date		t45	1	1	1	1	1	1	1	1	1	1 day	31 day	1	
Clock - Setting of month		t46	1	1	1	1	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year		t47	1	1	1	1	1	1	1	1	1	0 year	99 year	0	
Miscellaneous															
Delay of output signals after start-up		o01	1	1	1	1	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=Thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 15=application shutdown		o02	1	1	1	1	1	1	1	1	1	0	15	0	

Continued		Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Network address (0= off)		o03	1	1	1	1	1	1	1	1	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at LON 485 only and DANBUSS)		o04	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Access code 1 (all settings)		o05	1	1	1	1	1	1	1	1	1	0	100	0	
Used sensor type : 0=Pt1000, 1=Ptc1000,		o06	1	1	1	1	1	1	1	1	1	0/Pt	1/Ptc	0/Pt	
Software Version		o08	1	1	1	1	1	1	1	1	1	100	999		
Max hold time after coordinated defrost		o16	1	1	1	1	1	1	1	1	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17	1	1	1	1	1					0 %	100 %	100	
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation 7=Thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost.). 12=night cover, 13=coordinated defrost). 15=application shutdown		o37	1	1	1	1	1	1	1	1	1	0	15	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=Light control with a DI-input, 4=As "2", but light switch on and night cover will open if the network cut out for more than 15 minutes.		o38	1	1	1	1	1	1	1	1	1	1	4	1	
Activation of light relay (only if o38=2) On=light		o39	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat On time during day operations		o41	1	1					1	1		0 %	100 %	100	
Rail heat On time during night operations		o42	1	1					1	1		0 %	100 %	100	
Rail heat period time (On time + Off time)		o43	1	1					1	1		6 min.	60 min.	10	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46	1	1	1	1	1	1	1	1	1	0	2	0	
Selection of EL diagram.	*	o61	1	1	1	1	1	1	1	1	1	1	8	1	
Download a set of predetermined settings.	*	o62	1	1	1	1	1	1	1	1	1	0	6	0	
Access code 2 (partial access)	***	o64	1	1	1	1	1	1	1	1	1	0	100	0	
Replace the controllers factory settings with the present settings		o67	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Input signal on DI3. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation, 7=Thermostat band changeover (activate r21). 8=Not used. 9=Not used. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 13=Not used. 14=Refrigeration stopped (forced closing)). 15= application shutdown		o84	1	1	1	1	1	1	1	1	1	0	15	0	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function		o85	1	1					1	1		0	2	0	
Dew point value where the rail heat is minimum		o86	1	1					1	1		-10°C	50°C	8	
Dew point value where the rail heat is 100% on		o87	1	1					1	1		-9°C	50°C	17	
Lowest permitted rail heat effect in %		o88	1	1					1	1		0 %	100 %	30	
Time delay from "open door" refrigeration is started		o89	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Fan operation on stopped refrigeration (forced closing): 0 = Stopped (defrosting permitted) 1= Running (defrosting permitted) 2=Stopped (defrosting not permitted) 3= Running (defrosting not permitted)		o90	1	1	1	1	1	1	1	1	1	0	3	1	
Definition of readings on lower button: 1=defrost stop temperature, 2=S6 temperature, 3=S5_B temperature. 4= Readout of S3B temperature		o92	1	1	1	1	1	1	1	1	1	1	4	1	
Display of temperature 1= u56 Air temperature 2= u36 product temperature		o97	1	1	1	1	1	1	1	1	1	1	2	1	
Light and night blinds defined 0: Light is switch off and night blind is open when the main switch is off 1: Light and night blind is independent of main switch		o98	1	1	1	1	1	1	1	1	1	0	1	0	

Continued		Code	1	2	3	4	5	6	7	8	9	Min.	Max.	Fac.	Actual
Configuration of alarm relay The alarm relay will be activated upon an alarm signal from the following groups: 1 - High temperature alarms 2 - Low temperature alarms 4 - Sensor error 8 - Digital input is activated for alarm 16 - Defrost alarms 32 - Miscellaneous The groups that are to activate the alarm relay must be set by using a numerical value which is the sum of the groups that must be activated. (E.g. a value of 5 will activate all high temperature alarms and all sensor errors). 0 = Cancel relay function		P41	1		1		1	1	1		1	0	63	47	
Service															
Temperature measured with S5 sensor		u09	1	1	1	1	1	1	1	1	1				
Status on DI1 input. on/1=closed		u10	1	1	1	1	1	1	1	1	1				
Actual defrost time (minutes)		u11	1	1	1	1	1	1	1	1	1				
Temperature measured with S3 sensor		u12	1	1	1	1	1	1	1	1	1				
Status on night operation (on or off) 1=on		u13	1	1	1	1	1	1	1	1	1				
Temperature measured with S4 sensor		u16	1	1	1	1	1	1	1	1	1				
Thermostat temperature		u17	1	1	1	1	1	1	1	1	1				
Run time of thermostat (cooling time) in minutes		u18	1	1	1	1	1	1	1	1	1				
Temperature measured with S6 sensor (product temperature)		u36	1	1	1	1	1	1	1	1	1				
Status on DI2 output. on/1=closed		u37	1	1	1	1	1	1	1	1	1				
Air temperature. Weighted S3 + S4		u56	1	1	1	1	1				1				
Measured temperature for alarm thermostat		u57	1	1	1	1	1	1	1	1	1				
Status on relay for cooling	**	u58	1	1	1	1	1	1	1	1	1				
Status on relay for fan	**	u59	1	1	1	1	1	1	1	1	1				
Status on relay for defrost	**	u60	1	1	1		1	1	1	1	1				
Status on relay for rail heat	**	u61	1	1					1	1					
Status on relay for alarm	**	u62	1		1		1	1	1		1				
Status on relay for light	**	u63	1	1	1	1	1	1	1	1	1				
Status on relay for valve in suction line	**	u64				1									
Status on relay for compressor 2	**	u67			1						1				
Temperature measured with S5B sensor		u75						1		1					
Temperature measured with S3B sensor		u76						1	1	1					
Temperature measured with S6B sensor		u79							1						
Status on relay for hot gas- / drain valve	**	u80				1									
Status on relay for heating element in drip tray	**	u81				1									
Status on relay for night blinds	**	u82		1											
Status on relay for defrost B	**	u83						1		1					
Status on relay for heat function	**	u84					1								
Readout of the actual rail heat effect		u85	1	1					1	1					
1: Thermostat 1 operating, 2: Thermostat 2 operating		u86	1	1	1	1	1	1	1	1	1				
Status on high voltage input DI3		u87	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut in value		u90	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut out value		u91	1	1	1	1	1	1	1	1	1				
Readout the brine PWM OD%		U02	1	1	1	1	1	1	1	1	1				

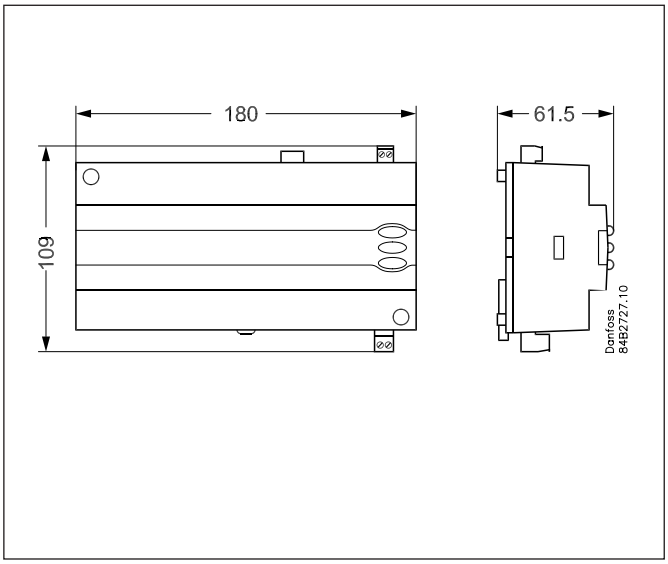
*) Can only be set when regulation is stopped (r12=0)
**) Can be controlled manually, but only when r12=-1
***) With access code 2 the access to these menus will be limited

Forced control
If you need to force-control an output, you should set r12 to -1 (manual mode). You should then select the relevant relay function, e.g. u58. Go to the function by pressing the middle button. Select On.

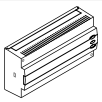
Technical data

Supply voltage	230 V a.c. +10%/-15% 50/60 Hz, 5 VA		
Sensors	Pt1000 or PTC 1000 ohm (all four (6) sensors must be of the same type)		
Accuracy	Measuring range	-60 to +120°C	
	Controller	±1 K below -35°C ±0.5 K from -35 to +25°C ±1 K above +25°C	
	Pt1000 sensor	±0.3 K at 0°C ±0.005 K per degree	
Display	LED, 3 digits		
External display	EKA 163B or 164B (any version of EKA 163A or 164A)		
Digital inputs DI1, DI2	Signal from contact function Contacts must be gold plated Maximum allowable cable length 15 m Use an auxiliary relay with a longer cable		
Digital input DI3	230 V a.c.		
Wiring	1.5 mm² (max.) stranded conductor		
Solid state output	DO1 (for coil)	Max. 240 V a.c.; min. 28 V AC Max. 0.5 A leakage < 1 mA 1 coil maximum	
Relays*		CE (250 V a.c.)	
	DO3, DO4	4 (3) A	
	DO2, DO5, DO6	4 (3) A	
Ambient conditions	0 to +55°C (operating) -40 to +70°C (transport)		
	20 to 80% RH, non condensing		
	No shock load or vibration		
Penetration resistance	IP 20		
Mounting	DIN rail or wall		
Weight	0.4 kg		
Data communication	Fixed / built in		MOD-bus
	Extension options		LON RS 485
			DANBUSS
			TCP/IP (OEM)
			MOD-bus
	The controller cannot be connected to a type m2 monitoring unit.		
Clock power backup	4 hours		
Approvals	Compliant with the EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested in accordance with EN 61000-6-3 and EN 61000-6-2		

* DO3 and DO4 are 16 A relays. DO2, DO5 and DO6 are 8 A relays. Do not exceed the maximum rated load.



Ordering

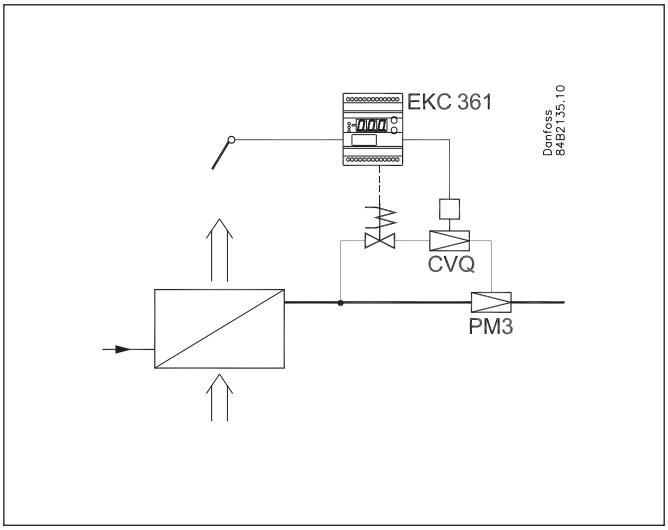
Type		Function	Code no.
AK-CC 450		Case controller with MODBUS data communication Sensor connections are with screw terminals	**084B8022**
EKA 175		Data communication module LON RS 485	**084B8579**
EKA 178B		Data communication module MODBUS	**084B8571**
EKA 176		Data communication module DANBUSS + Gateway	**084B8583**
EKA 176A		Data communication module DANBUSS + AK-PI 200	**084B8591**
EKA 163B		External display with plug for direct connection	**084B8574**
EKA 164B		External display with operation buttons and plug for direct connections	**084B8575**
EKA 163A		External display with screw terminals	**084B8562**
EKA 164A		External display with operation buttons and screw terminals	**084B8563**

Additional information available:
Manual: RS8EU

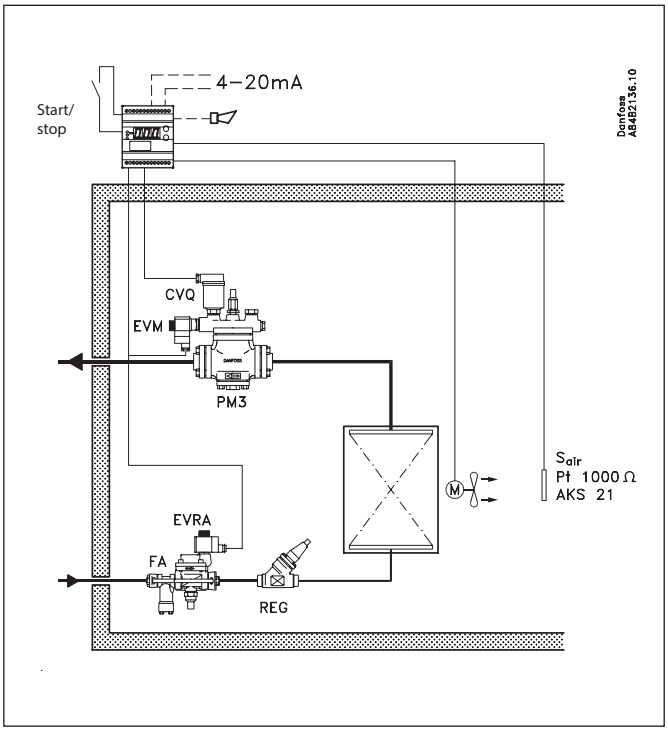
EKC 361

Application
This controller and valve can be used when there are stringent requirements for accurate temperature control in connection with refrigeration.
For example:
- Cold rooms for fruit and food products
- Refrigerating systems
- Work areas in the food industry
- Process cooling of liquids

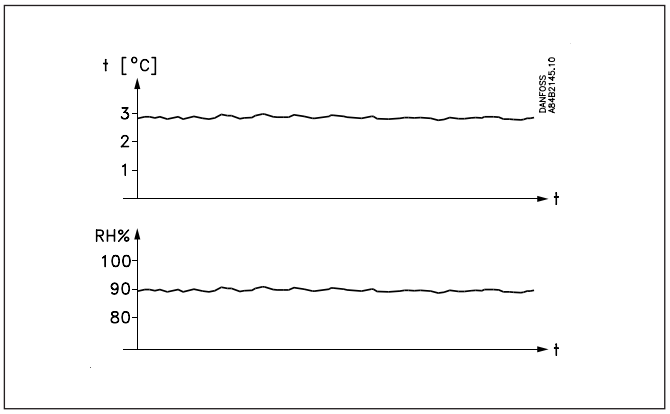
Advantages
- The temperature is maintained with an accuracy of ±0.25°C or better after transient events
- The evaporator temperature is kept as high as possible to maintain high relative humidity and minimise losses
- Transient events can be controlled with an adaptive function. The options are:
  - Short response time with overshoot allowed
  - Longer response time with reduced overshoot
  - Response with no overshoot
- PID control
- p_0 limitation



Functional description
- Modulated temperature control
- Digital on/off input for ICS/PM regulation start/stop or forced ICM closure
- Alarm if preset alarm limits are exceeded
- Relay output for fan
- Relay output for solenoid valves
- Analog input signal can offset the temperature reference
- Analog output signal corresponding to the temperature selected for continuous display. Note: not possible with ICM valve selection

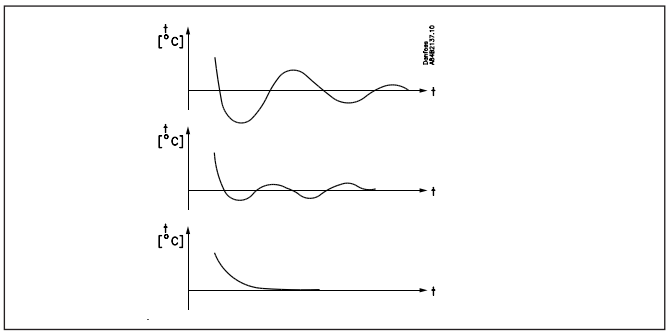


Precise temperature control
With this system with the controller, pilot valve and main valve designed for optimum performance in the refrigeration system, the refrigerated products can be stored with temperature fluctuations less than ±0.25°C.

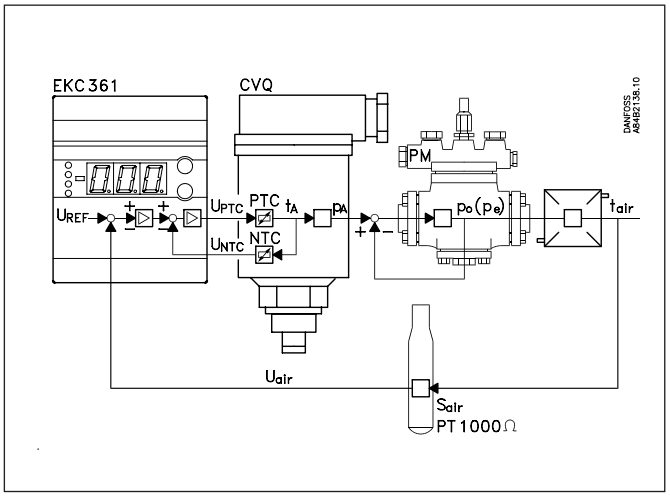


High relative humidity
The evaporating temperature is constantly adjusted to match the refrigeration demand and is always kept as high as possible with very small temperature fluctuation, resulting in the highest possible relative humidity in the room.
This reduces product dessication to a minimum.

Rapid temperature attainment
With built-in PID control and a choice of three transient response options, the controller can be adjusted to deliver the best possible temperature performance with the specific refrigerating system concerned. See parameter n07.
- **Fastest** possible cooling
- Cooling with **reduced** undershoot
- Cooling where undershoot is **undesirable**



ICS/PM regulation with CVQ
The controller receives a signals from the room sensor S_{air}. For the best possible regulation, this room sensor should be located at the air outlet of the evaporator. The controller maintains the room temperature at the desired level.
An inner control loop between the controller and the actuator constantly monitors the temperature (or pressure) in the actuator pressure vessel. This results in a highly stable control system.
If the is a difference between the desired and detected temperatures, the controller immediately sends more or fewer pulses to the actuator in order to counteract the error. Changing the number of pulses affects the temperature of the pressure vessel and thus its pressure. As the charging pressure and the evaporating pressure p_0 are directly related, a change in the charging pressure causes the opening degree of the valve to change. The combined ICS/PM and CVQ system maintains a constant pressure in the evaporator regardless of any pressure changes that may occur on the suction side (at the outlet of the ICS/PM valve).

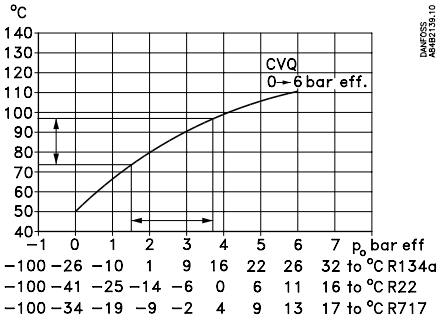


Evaporating pressure limitation (p_0 limitation)
The inner control loop mentioned above also maintains the evaporating pressure within defined limits. This protects the system against excessively low supply air temperatures.
This approach offers the following advantages:

- High-temperature systems can be connected to low-temperature compressor units
- Protection against evaporator icing
- Frost protection for liquid coolers

The evaporating pressure is determined by the allowable temperature in the actuator.

Actuator temperature



Regulation with ICM
If the ICM is selected as the valve, the system still controls the ICM in order to maintain the S_{air} temperature at the configured setpoint.
This arrangement does not have an inner control loop.
The valve is a direct-operating, pressure-independent valve for controlling the media temperature (S_{air}).

Menu overview

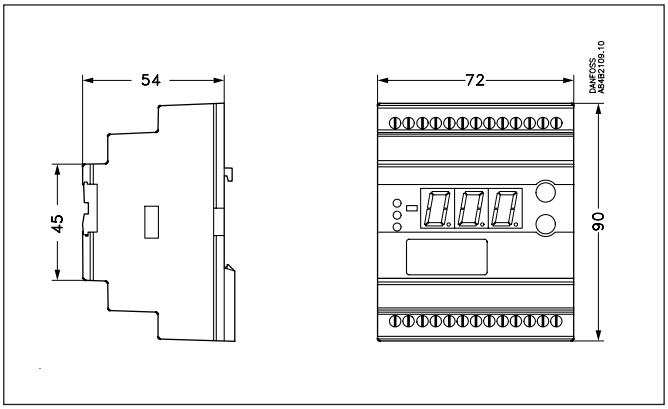
SW =1.5x

Functional description	Parameter	Min.	Max.	Factory setting
Standard display				
Shows the temperature of the selected sensor The ICM valve OD can also be selected	-		°C	
Reference				
Required room temperature setting	-	-70°C	160°C	10°C
Temperature unit	r05	°C	°F	°C
Temperature effect of input signal	r06	-50°C	50°C	0.0
Correction of signal from S_{air}	r09	-10.0°C	10.0°C	0.0
Correction of signal from S_{aux}	r10	-10.0°C	10.0°C	0.0
Refrigeration start/stop	r12	Off/0	On/1	On/1
Alarm				
Upper excursion (above the temperature setting)	A01	0	50 K	5.0
Lower excursion (below the temperature setting)	A02	0	50 K	5.0
Alarm's time delay	A03	0	180 min	30
Control parameters				
Maximum actuator temperature	n01	41°C	140°C	140
Minimum actuator temperature	n02	40°C	139°C	40
Actuator type (1: CVQ-1 to 5 bar, 2: CVQ 0 to 6 bar, 3: CVQ 1.7 to 8 bar, 4: CVMQ, 5: KVQ, 6: ICM)	n03	1	6	2
P: amplification factor Kp	n04	0.5	50	3
I: integration time Tn (600 = off)	n05	60 s	600 s	240
D: differentiation time Td (0 = off)	n06	0 s	60 s	10
Transient response 0: Ordinary control 1: Minimal overshoot 2: Zero overshoot	n07	0	2	2
OD (opening degree) upper limit – ICM only	n32	0%	100%	100
OD (opening degree) lower limit – ICM only	n33	0%	100%	0
Miscellaneous				
Controller address (0–120)	o03*	0	990	0
On/off switch (service pin message)	o04*	-	-	
Analog output signal: 0: no signal, 1: 4–20 mA, 2: 0–20 mA	o09	0	2	0
Analog input signal: 0: no signal, 1: 4–20 mA, 2: 0–20 mA	o10	0	2	0
Language (0: English, 1: German, 2: French, 3: Danish, 4: Spanish, 6: Swedish). If the language setting is changed, the new language will not be visible to the AKM program until parameter o04 has been enabled.	011*	0	6	0
Line voltage frequency	o12	50 Hz/0	60 Hz/1	0
Running display value selection	o17	Au/0	Air/1	Air/1
(Setting for function o09) Set the temperature value for the minimum output signal (0 or 4 mA)	o27	-70°C	160°C	-35
(Setting for function o09) Set the temperature value for the maximum output signal (20 mA)	o28	-70°C	160°C	15
Service				
Read the temperature of the S_{air} sensor	u01		°C	
Read the regulation reference	u02		°C	
Read the temperature of the S_{aux} sensor	u03		°C	
Read the valve actuator temperature	u04		°C	
Read the valve actuator reference temperature	u05		°C	
Read value of external current signal	u06		mA	
Read value of transmitted current signal	u08		mA	
Read status of DI input	u10		on/off	
ICM opening degree (only with ICM)	u24		%	

* This setting is only possible if a data communication module is fitted in the controller.

Technical data

Supply voltage	24 V a.c. ±15% 50/60 Hz, 80 VA (the supply voltage is galvanically isolated from the input and output signals)	
Power consumption	Controller Actuator	5 VA 75 VA
Input signals	Current signal	4–20 mA or 0–20 mA
	Digital input from external contact function	
Sensor input	2 Pt 1000 ohm	
Output signal	Current signal	4–20 mA or 0–20 mA Max. load: 200 ohm
Relay outputs	2 SPST	AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Alarm relay	1 SPST	
Actuator	Input	Temperature signal from sensor in actuator
	Output	Pulsed 24 V a.c. to actuator
Data communication	A data communication module can be connected	
Ambient temperature	During operation During transport	-10 to 55°C -40 to 70°C
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Terminals	max. 2.5 mm² stranded	
Approvals	Compliant with EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9 EMC tested in accordance with EN 61000-6-3 and EN 61000-4-(2-6,8,11)	

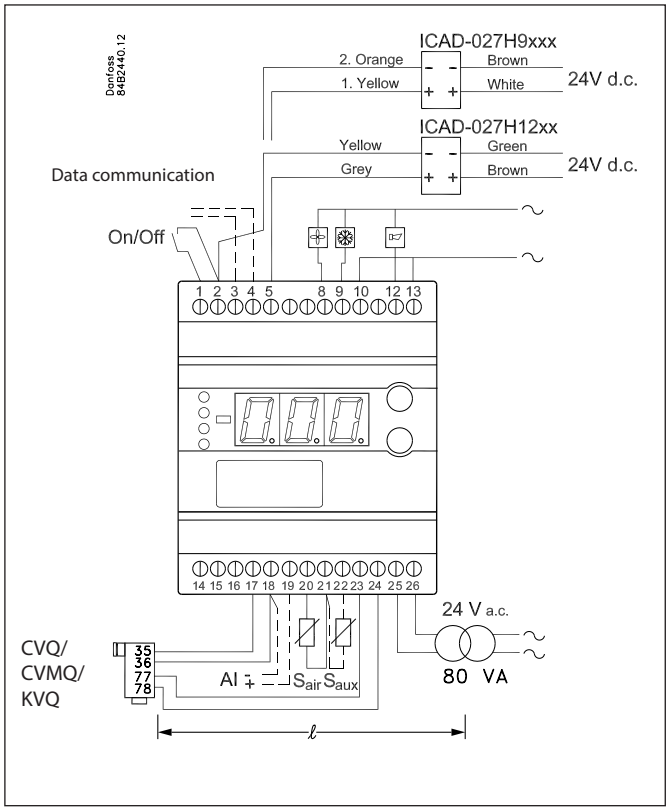


Ordering data

Type	Functional description	Code
EKC 361	Evaporating pressure controller	**084B7060**
EKA 174	Data communication module (accessories), (RS 485 module) with galvanic isolation	**084B7124**

Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC

Wiring

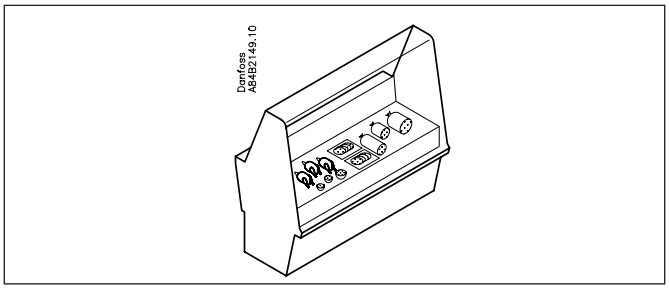


Additional information available:
Manual: DKRCI.PS.RP0.B

EKC 368

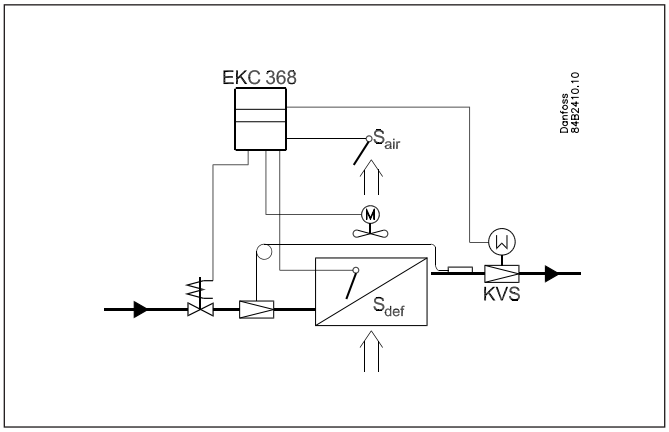
Application
Controller and valve for use when there are stringent requirements for the refrigeration of unpacked food products, such as:

- Delicatessen appliances
- Cold rooms for meat products
- Cold rooms for fruit and vegetables
- Containers
- Air conditioning systems



Advantages
- Wastage is reduced because the relative humidity near the products is kept as high as possible.
- The temperature is maintained with an accuracy of ±0.5°C or better after transient events
- Transient events can be controlled using the adaptive function to minimise temperature variations.
- Defrost sensor to minimise defrost time.
- PID control

System description
A KVS valve is used. The valve size depends on the required capacity.
A solenoid valve that closes when the controller stops refrigeration is fitted in the liquid line.
Sensor S_{air} must be located in the cold air flow after the evaporator.

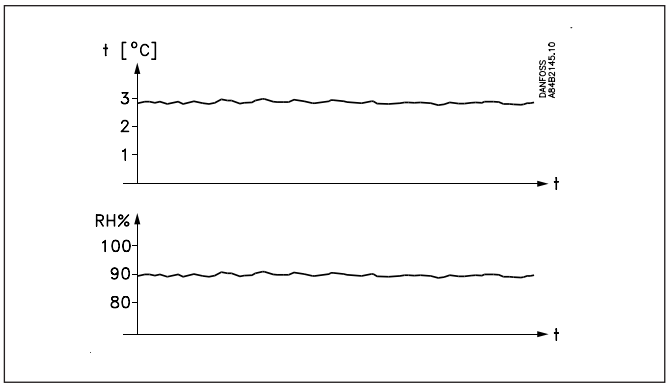


Functional description
- Modulated temperature control
- Defrost function: electrical, hot gas or natural
- Alarm if preset alarm limits are exceeded
- Relay outputs for defrost function, solenoid valve, fan, and alarm
- Input signal for offsetting the temperature reference

Front panel LEDs

	KVS signal
	Refrigeration
	Fan
	Defrost

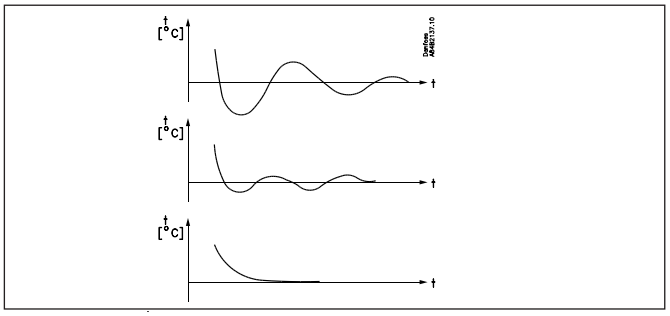
Precise temperature control
With this system in which controller and valve are adapted for optimum use in the refrigeration system, the refrigerated products can be stored with temperature fluctuations of less than ±0.5°C.



High relative humidity
The evaporating temperature is constantly adapted to the refrigeration demand and is kept as high as possible with very small temperature fluctuations, so the relative humidity in the room is maintained as high as possible.
This reduces product dessication to a minimum.

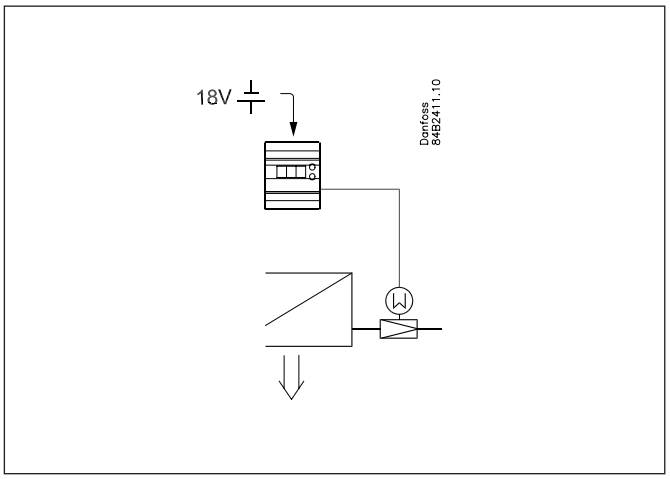
Rapid temperature attainment
With built-in PID control and a choice of three transient response options, the controller can be adjusted to deliver the best possible temperature performance with the specific refrigerating system concerned.

- **Fastest** possible cooling
- Cooling with reduced overshoot
- Cooling where overshoot is **undesirable**



Valve
The valve is an evaporating pressure valve and is available in several capacity sizes.
The valve is mounted on a stepper motor that receives impulses from the controller.
The controller is adapted to this valve, so only a few valve settings are necessary.

The valve opening degree is maintained in case of power failure. If the application requires the valve to open in this situation, a battery can be connected to the controller.



Menu overview

SW: 1.6x

Functional description	Parameter	Min.	Max.	Factory setting
Standard display				
Shows the room sensor temperature	-		°C	
Press the lower button briefly to see the defrost sensor temperature	-		°C	
Reference				
Required room temperature setting	-	-70°C	160°C	10
Temperature unit	r05	°C	°F	°C
External contribution to the reference	r06	-50 K	50 K	0
Correction of signal from Sair sensor	r09	-10.0 K	10.0 K	0
Correction of the signal from Sdef	r11	-10.0 K	10.0 K	0
Refrigeration start/stop	r12	Off	On	On
Alarm				
Upper excursion (above the temperature setting)	A01	0	50 K	5
Lower excursion (below the temperature setting)	A02	0	50 K	5
Alarm's time delay	A03	0	180 min	30
Battery monitoring	A34	Off	On	Off
Defrost				
Defrost method (electrical/gas)	d01	Off	Gas	Off
Defrost stop temperature	d02	0	25°C	6
Maximum defrost duration	d04	0	180 min	45
Drip-off time	d06	0	20 min	0
Delay for fan start or defrost	d07	0	20 min	0
Fan start temperature	d08	-15°C	0°C	-5
Fan cut in during defrost (yes/no)	d09	no	yes	no
Temperature alarm delay after defrost	d11	0	199 min	90
Control parameters				
Actuator type: 1: KVS15, 2: KVS28-35, 3: KVS42-54 4: user defined via AKM (for Danfoss only) Menu setting possible only when r12 = off.	n03	1	4	1
P: amplification factor Kp	n04	1	50	4
I: integration time Tn (600 = off)	n05	60 s	600 s	120
D: differentiation time Td (0 = off)	n06	0 s	60 s	0
Transient response 0: Fast cooling 1: Cooling with reduced overshoot 2: Cooling where overshoot is undesirable	n07	0	2	1
Start-up time after hot gas defrost	n08	0 min	20 min	1
Miscellaneous				
Controller address	o03*	1	60	0
On/off switch (service pin message)	o04*	-	-	Off
Analog input signal: 0: no signal 1: 0–10 V 2: 2–10 V	o10	0	2	0
Line voltage frequency	o12	50 Hz	60 Hz	50
Service				
Read Sair sensor temperature	u01		°C	
Read the regulation reference	u02		°C	
Read value of external voltage signal	u07		V	
Read Sdef sensor temperature	u09		°C	
Read status of DI input	u10		on/off	
Read defrost duration	u11		m	
Valve opening degree	u23		%	

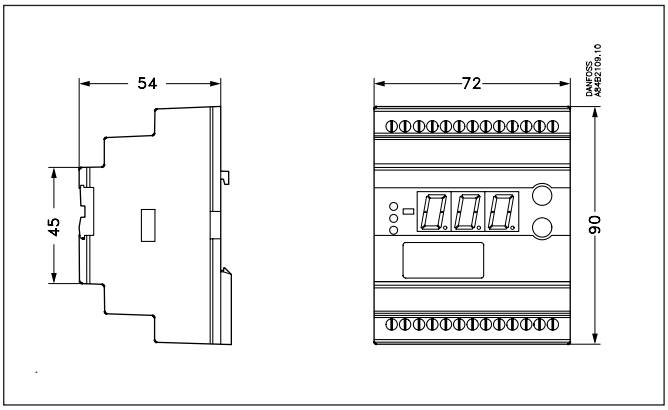
* This setting is only possible if a data communication module is fitted in the controller.

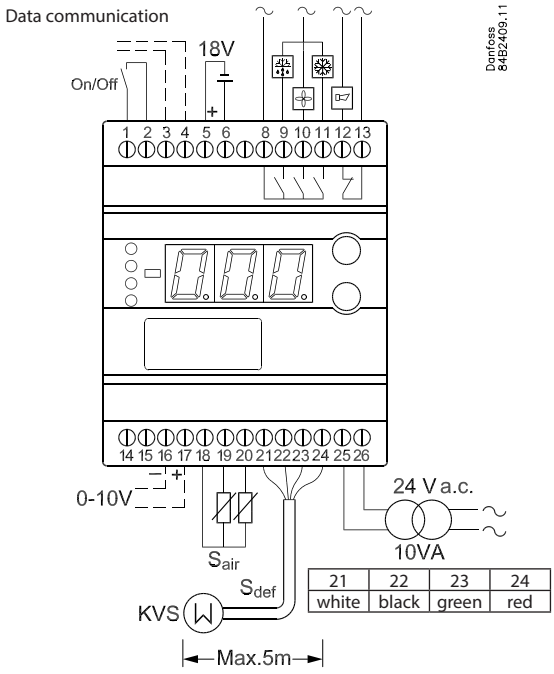
Factory settings
If you need to restore the factory settings, proceed as follows:
- Remove power from the controller
- Hold both buttons pressed while restoring power

Technical data

Supply voltage	24 V a.c. ±15% 50/60 Hz, 10 VA (the supply voltage is galvanically isolated from the input and output signals)	
Power consumption	Controller KVS stepper motor	5 VA 1.3 VA
Input signals	Voltage signal	0-10 V or 2-10 V
	Digital input from external contact function	
	Shorting terminals 18 and 20 (pulse signal) initiates defrost	
Sensor input	2 Pt 1000 ohm	
Relay outputs	3 ea. SPST	AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Alarm relay	1 SPST	
Stepper motor output	Pulsed 100 mA	
Data communication	A data communication module can be connected	
Ambient temperature	During operation During transport	-10 to 55°C -40 to 70°C
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Terminals	2.5 mm² (max.), stranded	
Approvals	Compliant with EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9 EMC tested in accordance with EN 61000-6-3 and EN 61000-4-(2-6,8,11)	

If battery backup is used:
battery specification: 18 V d.c., 100 mAh (min.)





(filter necessary at distances of 5 m or more)

Ordering data

Type	Functional description	Code
EKC 368	Evaporating pressure controller	**084B7079**
EKA 172	Real time clock	**084B7069**
EKA 175	Data communication module (accessories), (RS 485 module)	**084B8579**
EKA 174	Data communication module (RS 485 module) with galvanic isolation (accessory item)	**084B7124**
EKA 211	Filter 4 x 10 mH	**084B2238**

Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Additional information available:
Manual: RS8DG

Evaporator Controllers with Electrically Operated Expansion Valves (EEVs)

Introduction

The AKV pulse-width modulated electronic expansion valve has contributed to energy savings in supermarket refrigeration systems since its introduction, and it is constantly being refined to achieve even better efficiency. Investments in intelligent and adaptive controls yield reduced energy consumption and lower operating costs for supermarket refrigeration systems.

In order to achieve efficient and optimal liquid injection, installation of an electronic expansion valve and controller with adaptive control of superheating is necessary. Adaptive automatic refrigeration system control is possible because manual settings are not necessary; the system automatically finds the optimal superheat level for the actual operating conditions.

An electronic expansion valve is also necessary for further improvement of refrigeration system operation because it not only provides accurate control, but also transmits valuable information about refrigeration system load and performance.

In combination with the corresponding evaporator controller and other ADAP-KOOL® controllers, the AKV pulse-width modulated electronic expansion valve further increases energy savings by ensuring optimal suction and condensing pressures.

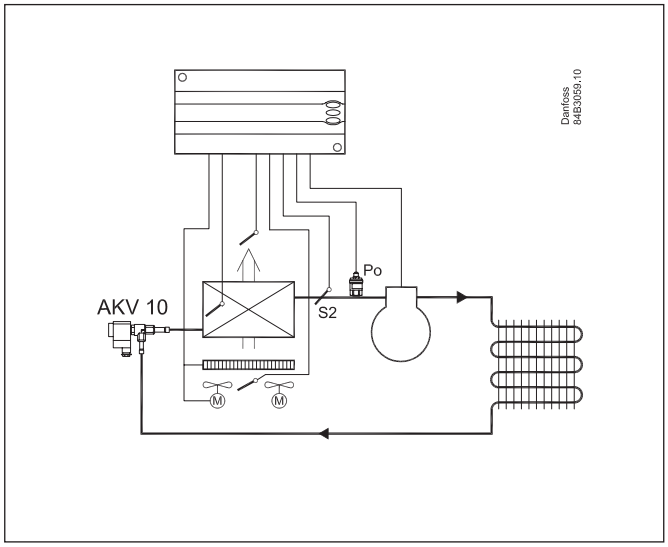
ADAP-KOOL® evaporator controls enable optimal refrigeration system operation, and at the same time they save energy and maintain food quality in display cases and cold rooms thanks to features such as defrost control and adaptive superheat control with the AKV electronic expansion valve.

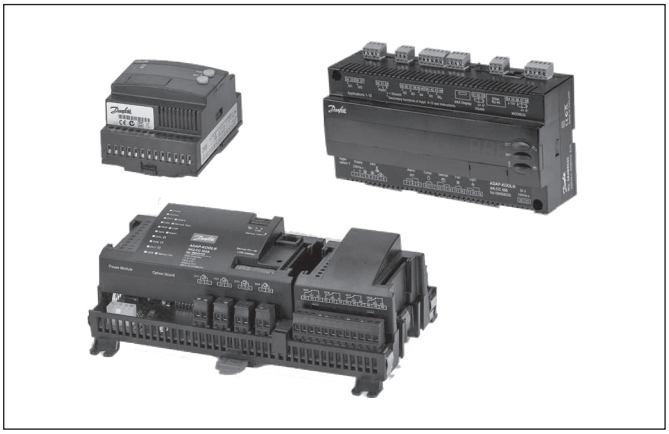
There are three different families of controllers with the following features:

1. The **AK-CC 550** series are dedicated evaporator controllers that can control one evaporator in a display case or cold room. They control temperature, fan, compressor, defrost, lighting, and rail heat or alarm. Advanced control features such as adaptive superheat control with an AKV electronic expansion valve, adaptive suction pressure control, modulated temperature control and defrost coordination help achieve energy savings and maintain food quality. It is extremely versatile and can be used in various types of refrigeration appliances.
   A software configuration parameter selects one of ten possible applications with predefined functions and connection points.

2. The **AK-CC 750** is a modular evaporator controller that can be used in case or cold room applications with up to four evaporators in a case string or a room. The AK-CC 750 incorporates a wide range of energy saving features such as intelligent fault detection and diagnosis.
   This controller features a new intelligent defrost function. By using the AKV valve as refrigerant mass flow meter, the controller can monitor ice formation on the evaporator. If the normal defrost schedule cannot cope with extra load conditions, the controller automatically adds an extra defrost cycle and thereby avoids expensive service calls for iced-up evaporators.

3) The **EKC** series is primarily used for the control of water chillers.





Comparison of controllers in this section

Controllers with complete refrigeration appliance management

Type	AK-CC 550A	AK-CC 550B	AK-CC 750
Number of evaporators	1		4
All general refrigerants	X		X
All general refrigerants + algorithm for CO_2	X		X
Supply = 230 V a.c.	X		
Supply = 24 V a.c.			X
Number of outputs	6		10 +
Rail heat	Ten different applications. See controller description.		X
Compressor 2			
Alarm			X
Lighting			X
AKV valve	230 V a.c		230 V a.c.
Sensor interface	Screw terminal		Screw terminal
Other connections possible	X		X
P0 measurement with AK32R pressure transmitter	X		X
P0 measurement with AKS 11 temperature sensor (S1)	X		
Fixed data communication with LON RS 485			X
Fixed data communication with MOD-bus	X		
LON RS 485 data communication module can be fitted	X		
MOD-bus data communication module can be fitted	X		
DANBUSS data communication module can be fitted	X		
Separate features: thermostat, pressure switch, alarm			X
1 temperature display at 2 cooling sections and 2 evaporators	X		
2 temperature display at 2 cooling sections and 2 evaporators		X	
Common alarm limits at 2 cooling sections and 1 evaporator	X		
Separate alarm limits at 2 cooling sections and 1 evaporator		X	

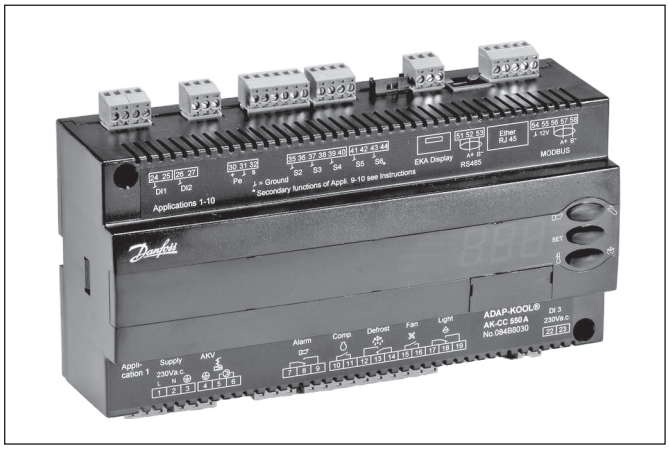
Water cooler controls

Type	EKC 312	EKC 315A	EKC 316A
Superheat control	X	X	X
Thermostat function		X	X
Also for air coolers, such as shop freezers	X	X	X
AKV valve		X	
Stepper motor valve	X		X

Level control

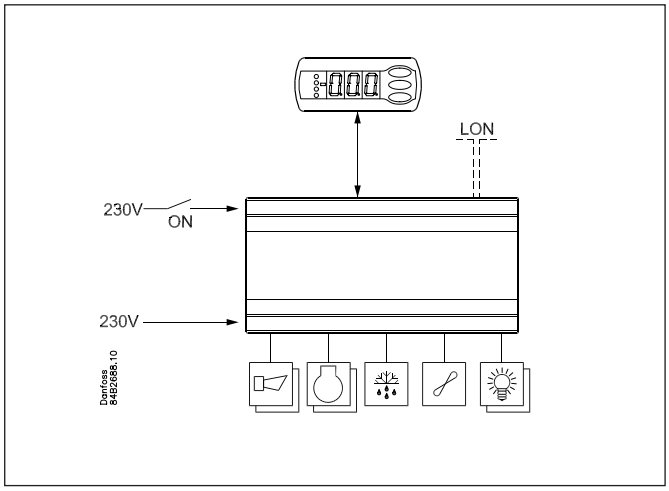
Type	EKE 347
Level control	X

AK-CC 550A



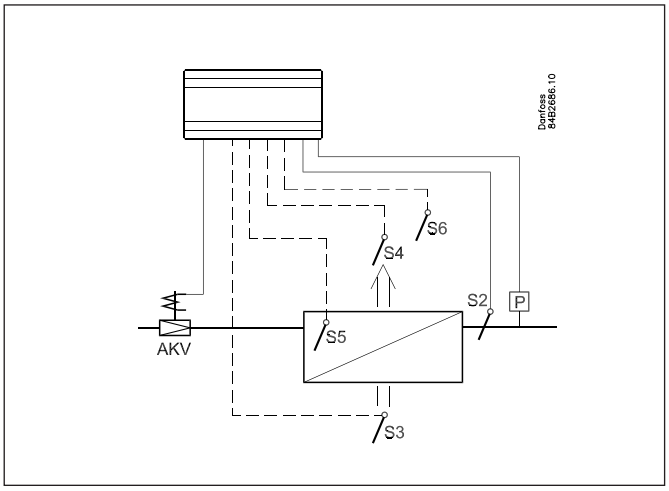
Application
Complete, highly versatile refrigeration appliance control for adaptation to all types of refrigeration appliances and cold storage rooms.

Advantages
- Complete refrigeration appliance control
- Energy optimisation of the entire refrigeration appliance
- Easy adaptation to refrigeration appliances or rooms by selection of a predefined application
- Fast set-up using predefined settings
- Can be used on CO_2 plants
- Built-in clock function with backup power



Operating principle

Sensors
The appliance temperature is detected by one or two temperature sensors located in the air flow before the evaporator (S3) or after the evaporator (S4). Configuration settings for the control thermostat, alarm thermostat and display reading determine how the two sensor values affect the individual functions.
In addition, an optional product sensor S6 in the appliance can be used to detect the temperature near the required product in a specific location in the appliance.
The evaporator temperature is detected by sensor S5, which can be used as a defrost sensor.



Injection
Liquid injection in the evaporator is controlled by a type AKV electronic injection valve. The controller regulates the opening degree of the valve to optimise evaporator operation under all conditions.
The superheat is measured with the pressure sensor Pe and temperature sensor S2.

Operation and data communication
The controller has built-in MOD-bus data communication support, which can be used for:
- network connection
- display connection
  An EKA 163 display can be connected if only readout capability is needed, or an EKA 164 display can be connected if setting capability is also needed.

If data communication and a display are required, the MOD-bus port should be used for the display and a separate data communication module should be fitted in the controller. This module may be a MOD-bus module or a LON RS 485 module.

Functional description

- Adaptive control of superheat for optimal evaporator use.
- Day/night thermostat with on/of or modulated operation
- Temperature and alarm monitoring based on S3 and/or S4 temperature
- Product sensor S6 with separate alarm limits
- Thermostat setting changeover via digital input
- Defrost start controlled by an internal schedule, digital input or network signal
- Natural, electrical, or hot gas defrosting
- Defrost stop controlled by time and/or S5 temperature
- Adaptive defrosting based on intelligent detection of evaporator performance
- Defrost coordination with multiple controllers
- Pulsed fan operation when thermostat is disconnected
- Appliance cleaning function for HACCP procedure documentation
- Appliance shut-down via DI-input or data communication
- Rail heat control according to day/night operation or current dew point
- Door function
- Controlling two compressors
- Controlling night curtain
- Lighting control according to day/night operation or network signal
- Heater thermostat
- Multi-function digital inputs

Application

Any one of ten pre-programmed controller applications can be selected with a configuration setting.

Output

The outputs are configured as follows according to the selected setting:

Output use		**Settings**									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Fan		■	■	■	■	■	■	■	■	■	■
Rail heat			■	■	■	■		■		■	■
Compressor		■	■	■		■					
Compressor 2						■					
Defrosting		■	■	■	■	■	■	■	■	■	■
Defrosting 2										■	
Suction line valve							■				
Heating element in drip tray							■	■			
Night curtain								■			
Heater thermostat									■		
Alarm		■		■	■				■		■
Lighting		■	■		■		■	■	■	■	■
AKV valve, 230 V AC		■	■	■	■	■	■	■	■	■	■

Sensors

Settings 1–8

Standard sensor use. See illustration.

Setting 9

Intended for special appliances with two compartments and two evaporators (the AKV valve feeds both evaporators).
The temperature is controlled by the S4 sensor.
Defrosting with the S5 sensor on evaporator A.
Sensor input S6 is used for the defrost sensor on evaporator B.
There is no product sensor.

Setting 10

Intended for special appliances with two compartments and one evaporator.
The temperature is controlled by the S4 sensor.
The temperature display and alarm monitoring use S3 and S3B.
There are common alarm limits for the two refrigeration section.
There is no product sensor.

Digital input.

Three digital inputs are available, with many use options for all settings. The two inputs are connection inputs and the third is a 230 V input.

Applications

The following is a brief summary of the application area of this controller.

The relay outputs are defined by a configuration setting to align the controller interface to the selected application.

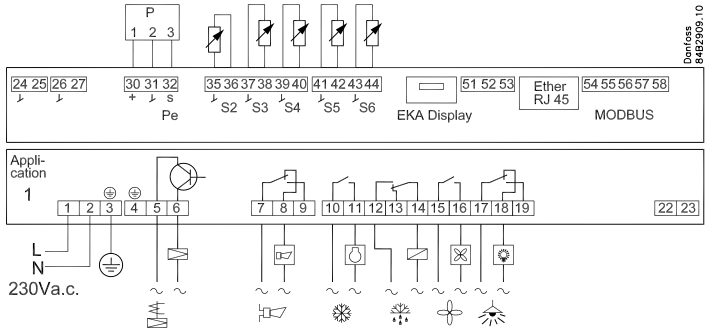
S3 and S4 are temperature sensors. One or both of these sensors may be used, depending on the application. S3 is located in the air flow before the evaporator, and S4 in the air flow after the evaporator.
A percentage setting determines the control basis. S5 is a defrost sensor located on or between the fins of the evaporator.
S6 is a product sensor, but it is used for a different purpose in applications 9 and 10.
DI1, DI2 and DI3 are contact functions that can be used for any of the following purposes: door function, alarm function, defrost start, external main switch, night operation, change thermostat reference, appliance cleaning, forced refrigeration, or coordinated defrost. DI3 has a 230 V input. See the functions for settings o02, o37, and o84.

General
All ten applications are configured for commercial refrigeration systems in the form of refrigeration appliances or cold storage rooms.
They all have outputs for:
- AKV valve
- Fan
- Defrost

In addition, they have different uses and thus different inputs and outputs.

Applications 1–4
Standard applications.
These applications are for standard use where the only essential difference is in the configurations of the following functions and outputs:
- Alarm
- Rail heat
- Compressors
- Lighting

1



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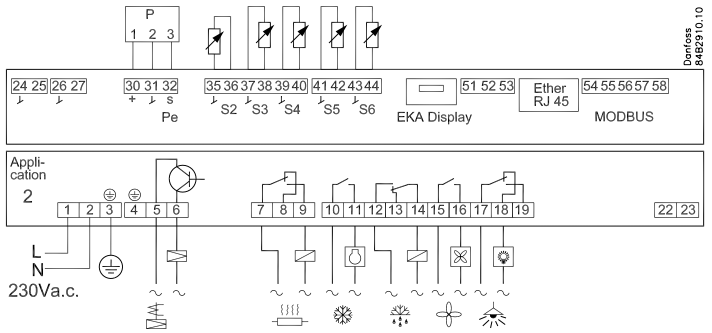

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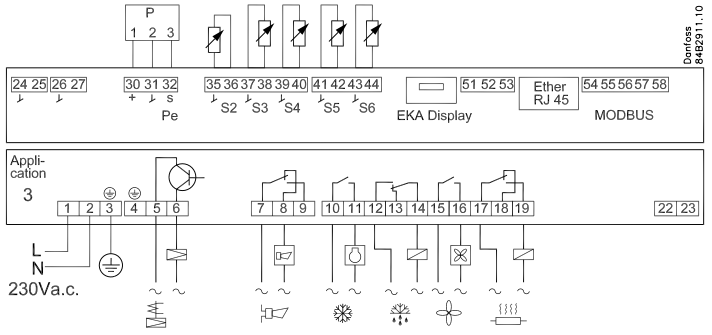

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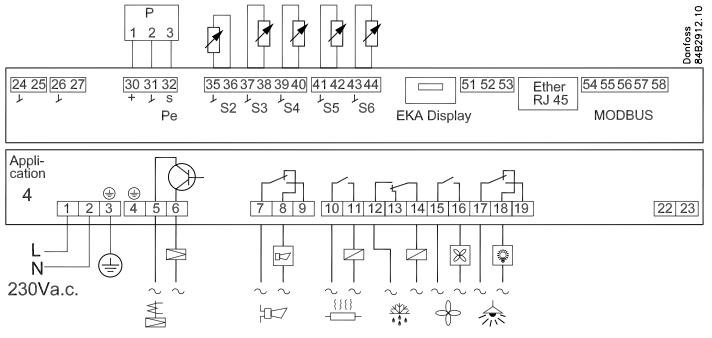


The following applications have certain special functions, which are briefly described below.

Application 5
Two-compressor operation.
The two compressors must be of the same size. On start-up (after defrosting, operational stop, etc.), the compressors are started with a preset time offset. One compressor starts at half of the differential value to provide optimum adaptation of the compressor capacity to the current load in the appliance or room. The operating hours of the compressors are equalised automatically.

Application 6
Hot gas defrosting.
Hot gas defrosting is suitable for commercial appliances or cold rooms with a limited system charge.
One relay controls the main valve in the suction line.
A changeover relay controls the hot gas valve and the drain valve.
This means there is no time delay between the end of hot gas defrosting and the start of draining.

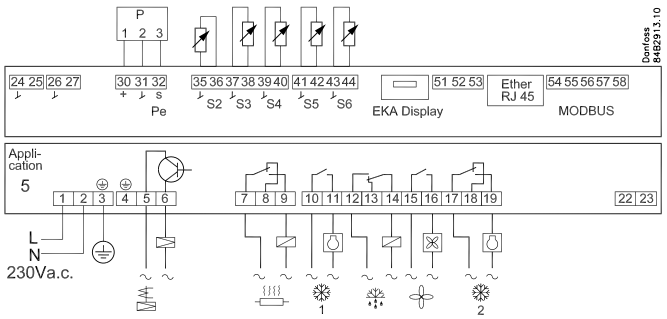
Application 7
Controlling night blinds
The night blinds track the status of the lighting function. The blinds are open when the light is switched on and closed when the light is switched off. In addition, a digital input provides the option of forced opening of the blinds so the appliance can be filled with products.

Application 8
Heater thermostat
A heater thermostat is typically used if the temperature needs to be controlled within relatively narrow limits, such as in cutting rooms. To avoid simultaneous cooling and heating, the heating thermostat can be configured as an offset relative to cut-out limit of the refrigeration thermostat.

Application 9
Two cooling sections with two defrost outputs
This application is for refrigeration appliances with one valve, two evaporators, and two refrigeration sections. The temperature is controlled and constantly monitored for alarm conditions using sensor S4. Here the product sensor is used as a defrost stop sensor for evaporator 2.

Application 10
Two cooling sections with individual alarm and display via S3
This application is for refrigeration appliances with one valve, one evaporator, and two refrigeration sections. The temperature is always controlled according to the S4 temperature. The product sensor is used as an extra S3 sensor for section 2. The S3 sensors in the cooling sections are used for individual alarm monitoring and display readings.

5



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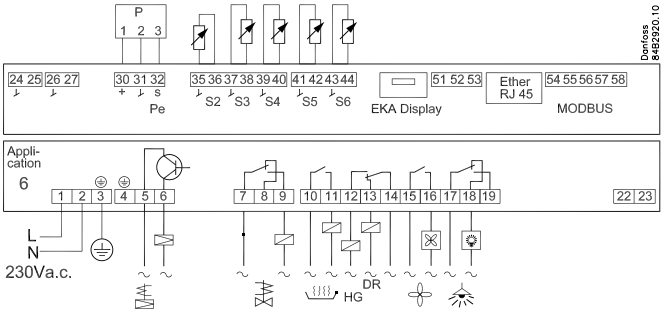

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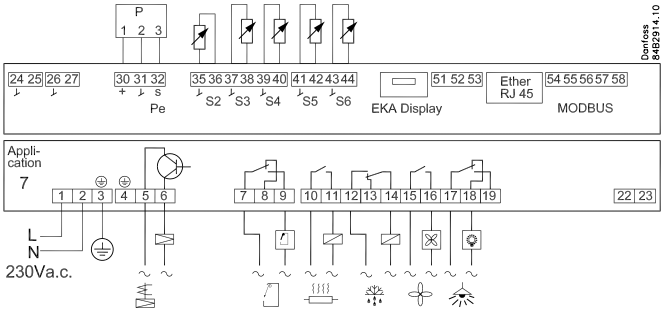

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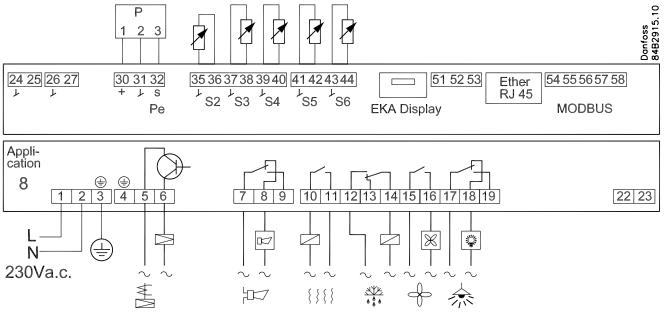

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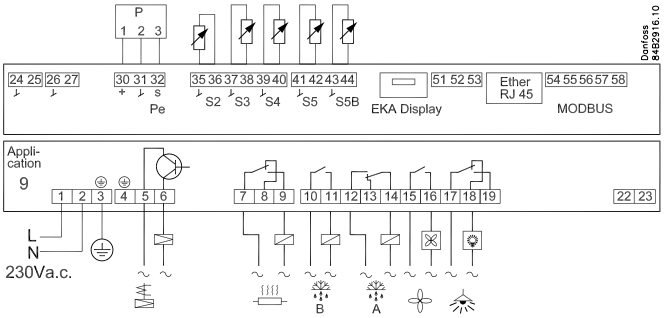

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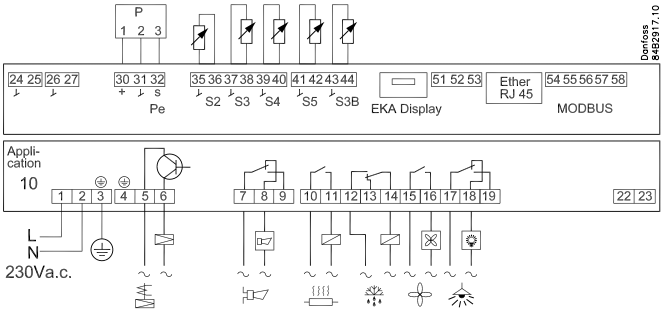


Menu survey

SW = 1.8x

Parameter			EL-diagram													
Function		Code	1	2	3	4	5	6	7	8	9	10	**Min.-value**	**Max.-value**	**Factory setting**	**Actual setting**
Normal operation																
Temperature (setpoint)		- - -	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Thermostat																
Differential		r01	1	1	1	1	1	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting		r02	1	1	1	1	1	1	1	1	1	1	-49°C	50°C	50	
Min. limitation of setpoint setting		r03	1	1	1	1	1	1	1	1	1	1	-50°C	49°C	-50	
Adjustment of temperature indication		r04	1	1	1	1	1	1	1	1	1	1	-10	10	0	
Temperature unit (°C/°F)		r05	1	1	1	1	1	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4		r09	1	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S3		r10	1	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12	1	1	1	1	1	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation		r13	1	1	1	1	1	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Modulating		r14	1	1	1	1	1	1	1	1	1	1	1	2	1	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15	1	1	1	1	1	1	1	1			0 %	100 %	100	
Time between melt periods		r16	1	1	1	1	1	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods		r17	1	1	1	1	1	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential use r01		r21	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Correction of the signal from S6		r59	1	1	1	1	1	1	1	1			-10 K	10 K	0	
Definition and weighting, if applicable, of thermostat sensors when night cover is on. (100%=S4, 0%=S3)		r61	1	1	1	1	1	1	1	1			0 %	100 %	100	
Heat function Neutral zone between refrigeration and heat function		r62								1			0 K	50 K	2	
Time delay at switch between refrigeration and heat function		r63								1			0 min.	240 min.	0	
Alarms																
Delay for temperature alarm		A03	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm		A04	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost		A12	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1		A13	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 1		A14	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for thermostat 2		A20	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 2		A21	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 1		A22	1	1	1	1	1	1	1	1			-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 1		A23	1	1	1	1	1	1	1	1			-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 2		A24	1	1	1	1	1	1	1	1			-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 2		A25	1	1	1	1	1	1	1	1			-50°C	50°C	-30	
S6 alarm time delay With setting = 240 the S6 alarm will be omitted		A26	1	1	1	1	1	1	1	1			0 min.	240 min.	240	
Alarm time delay or signal on the DI1 input		A27	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input		A28	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36	1	1	1	1	1	1	1	1			0 %	100 %	100	
Delay for S6 (product sensor alarm) after defrost		A52	1	1	1	1	1	1	1	1			0 min.	240 min.	90	
Compressor																
Min. ON-time		c01	1	1	1		1						0 min.	30 min.	0	
Min. OFF-time		c02	1	1	1		1						0 min.	30 min.	0	
Time delay for cutin of comp.2		c05					1						0 sec	999 sec	5	
Defrost																
Defrost method: 0=none, 1= EL, 2= Gas		d01	1	1	1	1	1	1	1	1	1	1	0/No	2/GAs	1/EL	
Defrost stop temperature		d02	1	1	1	1	1	1	1	1	1	1	0°C	50°C	6	
Interval between defrost starts		d03	1	1	1	1	1	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration		d04	1	1	1	1	1	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cutin of defrost at start-up		d05	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	0	
Drip off time		d06	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost		d07	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature		d08	1	1	1	1	1	1	1	1	1	1	-50 °C	0 °C	-5	
Fan cutin during defrost 0: Stopped 1: Running 2: Running during pump down and defrost		d09	1	1	1	1	1	1	1	1	1	1	0	2	1	

Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4, 3=Sx (Application 1-8 and 10: both S5 and S6. Application 9: S5 and S5B)		d10	1	1	1	1	1	1	1	1	1	1	0	3	0	
Pump down delay		d16	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Drain delay (used at hot gas defrost only)		d17						1					0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts		d18	1	1	1	1	1	1	1	1	1	1	0 hrs	48 hrs	0/OFF	
Heat in drip tray. Time from defrosting stops to heating in the drip tray is switched off		d20						1					0 min.	240 min.	30	
Adaptive defrost: 0=not active, 1=monitoring only, 2=skip allowed day, 3=skip allowed both day and night, 4=own assessment + all schedules		d21	1	1	1	1	1	1	1	1	1	1	0	4	0	
Time delay before opening of hot gas valve		d23						1					0 min	60 min	0	
Rail heat during defrost 0=off. 1=on. 2=Pulsating		d27		1	1	1	1		1		1	1	0	2	2	
Injection control function																
Max. value of superheat reference		n09	1	1	1	1	1	1	1	1	1	1	2°C	20°C	12	
Min. value of superheat reference		n10	1	1	1	1	1	1	1	1	1	1	2°C	20°C	3	
MOP temperature. Off if MOP temp. = 15.0 °C		n11	1	1	1	1	1	1	1	1	1	1	-50°C	15°C	15	
Period time of AKV pulsation Only for trained personnel		n13	1	1	1	1	1	1	1	1	1	1	3 sec	6 sec	6	
Fan																
Fan stop temperature (S5)		F04	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cuts out only, 2= Only at thermostat cut outs during night operation		F05	1	1	1	1	1	1	1	1	1	1	0	2	0	
Period time for fan pulsation (on-time + off-time)		F06	1	1	1	1	1	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of period time		F07	1	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Real time clock																
Six start times for defrost. Setting of hours. 0=OFF		t01 - t06	1	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF		t11 - t16	1	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours		t07	1	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Clock - Setting of minute		t08	1	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date		t45	1	1	1	1	1	1	1	1	1	1	1 day	31 day	1	
Clock - Setting of month		t46	1	1	1	1	1	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year		t47	1	1	1	1	1	1	1	1	1	1	0 year	99 year	0	
Miscellaneous																
Delay of output signals after start-up		o01	1	1	1	1	1	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 15=case shut down		o02	1	1	1	1	1	1	1	1	1	1	0	15	0	
Network address		o03	1	1	1	1	1	1	1	1	1	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at LON 485 and DANBUSS only)		o04	1	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Access code 1 (all settings)		o05	1	1	1	1	1	1	1	1	1	1	0	100	0	
Used sensor type : 0=Pt1000, 1=Ptc1000,		o06	1	1	1	1	1	1	1	1	1	1	0/Pt	1/Ptc	0/Pt	
Readout of software version		o08	1	1	1	1	1	1	1	1	1	1				
Max hold time after coordinated defrost		o16	1	1	1	1	1	1	1	1	1	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17	1	1	1	1	1	1	1	1			0 %	100 %	100	
Pressure transmitter working range – min. value		o20	1	1	1	1	1	1	1	1	1	1	-1 bar	5 bar	-1	
Pressure transmitter working range – max. value		o21	1	1	1	1	1	1	1	1	1	1	6 bar	200 bar	12	
Refrigerant setting: 1=R12. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F. 38=R1234ze. 39=R1234yf.		o30	1	1	1	1	1	1	1	1	1	1	0	39	0	

Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost.). 12=night cover, 13=coordinated defrost). 15=case shut down		o37	1	1	1	1	1	1	1	1	1	1	0	15	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=Light control with a DI-input, 4=As "2", but light switch on and night cover will open if the network cut out for more than 15 minutes.		o38	1	1		1		1	1	1	1	1	1	4	1	
Activation of light relay (only if o38=2) On=light		o39	1	1		1		1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat On time during day operations		o41		1	1	1	1		1		1	1	0 %	100 %	100	
Rail heat On time during night operations		o42		1	1	1	1		1		1	1	0 %	100 %	100	
Rail heat period time (On time + Off time)		o43		1	1	1	1		1		1	1	6 min.	60 min.	10	
Appliance cleaning. 0=no Appliance cleaning. 1=Fans only. 2=All output Off.	***	o46	1	1	1	1	1	1	1	1	1	1	0	2	0	
Selection of EL diagram.	*	o61	1	1	1	1	1	1	1	1	1	1	1	10	1	
Download a set of predetermined settings.	*	o62	1	1	1	1	1	1	1	1	1	1	0	6	0	
Access code 2 (partial access)	***	o64	1	1	1	1	1	1	1	1	1	1	0	100	0	
Replace the controllers factory settings with the present settings		o67	1	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Input signal on DI3. Function: (high voltage input) (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation, 7=thermostat band changeover (activate r21). 8=Not used. 9=Not used. 10=Appliance cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 13=Not used. 14=Refrigeration stopped (forced closing)). 15=case shut down		o84	1	1	1	1	1	1	1	1	1	1	0	15	0	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function		o85		1	1	1	1		1		1	1	0	2	0	
Dew point value where the rail heat is minimum		o86		1	1	1	1		1		1	1	-10°C	50°C	8	
Dew point value where the rail heat is 100% on		o87		1	1	1	1		1		1	1	-9°C	50°C	17	
Lowest permitted rail heat effect in %		o88		1	1	1	1		1		1	1	0 %	100 %	30	
Time delay from "open door" refrigeration is started		o89	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Fan operation at stopped cooling (forced closing): 0= Stopped (defrost allowed) 1= Running (defrost allowed) 2= Stopped (defrost not allowed) 3= Running (defrost not allowed)		o90	1	1	1	1	1	1	1	1	1	1	0	3	1	
1=defrost stop temperature, 2=S6 temperature, 3=S5_B temperature (application 9), 4=S3B (application 10)		o92	1	1	1	1	1	1	1	1	1	1	1	4	1	
Display of temperature 1= u56 Air temperature 2= u36 product temperature		o97	1	1	1	1	1	1	1	1	1	1	1	2	1	
Light and night blinds defined 0: Light is switch off and night blind is open when the main switch is off 1: Light and night blind is independent of main switch		o98	1	1	1	1	1	1	1	1	1	1	0	1	0	
Configuration of alarm relay The alarm relay will be activated upon an alarm signal from the following groups: 1 - High temperature alarms 2 - Low temperature alarms 4 - Sensor error 8 - Digital input enabled for alarm 16 - Defrosting alarms 32 - Miscellaneous 64 - Injection alarms The groups that are to activate the alarm relay must be set by using a numerical value which is the sum of the groups that must be activated. (E.g.: a value of 5 will activate all high temperature alarms and all sensor error and 0 will cancel the relay function).		P41	1		1	1				1		1	0	127	111	

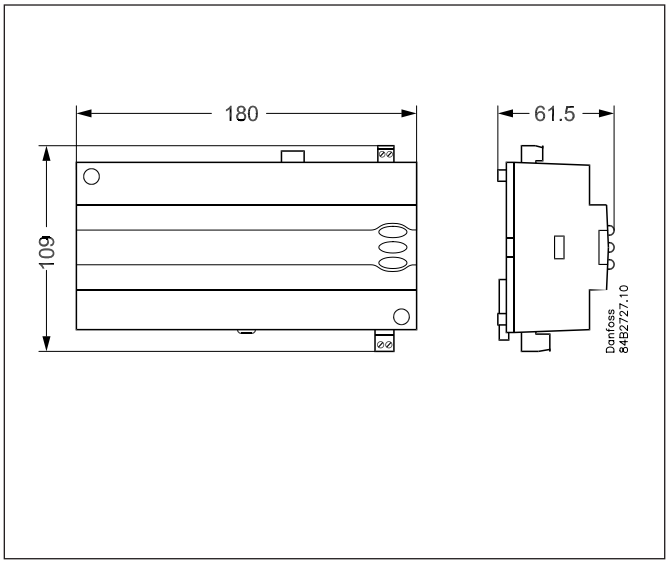
Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Service																
Temperature measured with S5 sensor		u09	1	1	1	1	1	1	1	1	1	1				
Status on DI1 input. on/1=closed		u10	1	1	1	1	1	1	1	1	1	1				
Actual defrost time (minutes)		u11	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S3 sensor		u12	1	1	1	1	1	1	1	1	1	1				
Status on night operation (on or off) 1=on		u13	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S4 sensor		u16	1	1	1	1	1	1	1	1	1	1				
Thermostat temperature		u17	1	1	1	1	1	1	1	1						
Run time of thermostat (cooling time) in minutes		u18	1	1	1	1	1	1	1	1	1	1				
Temperature of evaporator outlet temp.		u20	1	1	1	1	1	1	1	1	1	1				
Superheat across evaporator		u21	1	1	1	1	1	1	1	1	1	1				
Reference of superheat control		u22	1	1	1	1	1	1	1	1	1	1				
Opening degree of AKV valve	**	u23	1	1	1	1	1	1	1	1	1	1				
Evaporating pressure Po (relative)		u25	1	1	1	1	1	1	1	1	1	1				
Evaporator temperature To (Calculated)		u26	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S6 sensor (product temperature)		u36	1	1	1	1	1	1	1	1						
Status on DI2 output. on/1=closed		u37	1	1	1	1	1	1	1	1	1	1				
Air temperature . Weighted S3 and S4		u56	1	1	1	1	1	1	1	1	1	1				
Measured temperature for alarm thermostat		u57	1	1	1	1	1	1	1	1	1	1				
Status on relay for cooling	**	u58	1	1	1		1									
Status on relay for fan	**	u59	1	1	1	1	1	1	1	1	1	1				
Status on relay for defrost	**	u60	1	1	1	1	1		1	1	1	1				
Status on relay for railheat	**	u61		1	1	1	1		1		1	1				
Status on relay for alarm	**	u62	1		1	1				1		1				
Status on relay for light	**	u63	1	1		1		1	1	1	1	1				
Status on relay for valve in suction line	**	u64						1								
Status on relay for compressor 2	**	u67					1									
Temperature measured with S5B sensor		u75									1					
Temperature measured with S3B sensor		u76										1				
Status on relay for hot gas- / drain valve	**	u80						1								
Status on relay for heating element in drip tray	**	u81						1								
Status on relay for night blinds	**	u82							1							
Status on relay for defrost B	**	u83									1					
Status on relay for heat function	**	u84								1						
Readout of the actual rail heat effect		u85		1	1	1	1		1		1	1				
1: Thermostat 1 operating, 2: Thermostat 2 operating		u86	1	1	1	1	1	1	1	1	1	1				
Status on high voltage input DI3		u87	1	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut in value		u90	1	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut out value		u91	1	1	1	1	1	1	1	1	1	1				
Readout of status on the adaptive defrost 0: Off. Function is not activated and are zero set 1: Sensor error or S3/S4 are reversed. 2: Tuning is in progress 3: Normal 4: Light build-up of ice 5: Medium build-up of ice 6: Heavy build-up of ice		U01	1	1	1	1	1	1	1	1	1	1				
Number of defrosts carried out since the initial power up or since the resetting of the function		U10	1	1	1	1	1	1	1	1	1	1				
Number of defrosts skipped since the initial power up or since the resetting of the function		U11	1	1	1	1	1	1	1	1	1	1				

*) Can only be set when regulation is stopped (r12=0)
**) Can be controlled manually, but only when r12=-1
***) With access code 2 the access to these menus will be limited

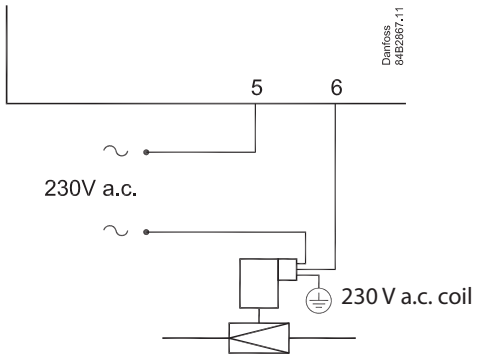
Technical data

Supply voltage	230 V a.c. +10/-15 %. 5 VA, 50/60 Hz		
Sensor S2, S6	Pt 1000		
Sensor S3, S4, S5	Pt 1000 or PTC 1000 ohm (All 3 must be of the same type)		
Accuracy	Measuring range	-60 to +120°C	
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C	
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad	
Measuring of Pe	Pressure transmitter	AKS 32R	
Display	LED, 3-digits		
External display	EKA 163B or 164B. (any EKA 163A or 164A)		
Digital inputs DI1, DI2	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer		
Digital input DI3	230 V a.c.		
Electrical connection cable	Max.1.5 mm² multi-core cable		
Solid state output	DO1 (for AKV coil)	Max. 240 V a.c. , Min. 28 V a.c. Max. 0.5 A Leak < 1 mA Max. 1 pcs. AKV	
Relays*		CE (250 V a.c.)	
	DO3, DO4	4 (3) A	
	DO2, DO5, DO6	4 (3) A	
Environments	0 to +55°C, During operations -40 to +70°C, During transport		
	20 - 80% Rh, not condensed		
	No shock influence / vibrations		
Density	IP 20		
Mounting	DIN-rail or wall		
Weight	0.4 Kg		
Data communication	Fixed		MODBUS
	Extension options		LON RS485
			TCP/IP
			MODBUS
			DANBUSS
	The controller cannot be hooked up with a monitoring unit type m2.		
Power reserve for the clock	4 hours		
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1 and EN 60730-2-9, A1, A2 EMC tested acc. EN 61000-6-2 and EN 61000-6-3		

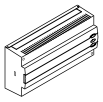
* DO3 and DO4 are 16 A relays. DO2, DO5 and DO6 are 8 A relays. Max. load must be observed.



AKV info !!

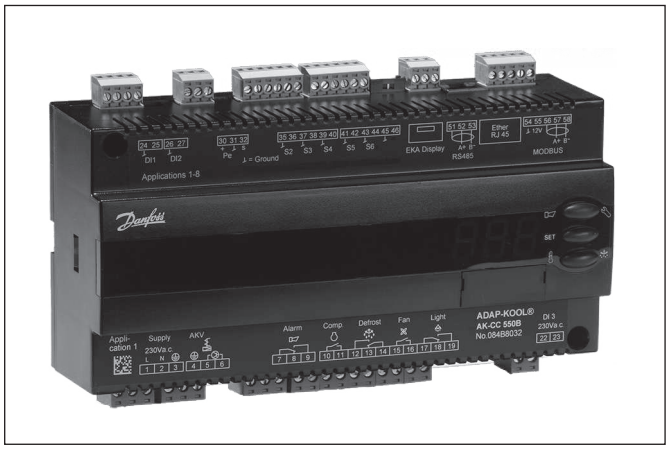


Ordering

Type		Function	Code no.
AK-CC 550A		Case controller with MODBUS data communication Sensor connections are with screw terminals	**084B8030**
EKA 175		Data communication module LON RS 485	**084B8579**
EKA 178B		Data communication module MODBUS	**084B8571**
EKA 176		Data communication module DANBUSS for Gateway	**084B8583**
EKA 176A		Data communication module DANBUSS for AK-PI 200	**084B8591**
EKA 163B		External display with plug for direct connection	**084B8574**
EKA 164B		External display with operation buttons and plug for direct connections	**084B8575**
EKA 163A		External display with screw terminals	**084B8562**
EKA 164A		External display with operation buttons and screw terminals	**084B8563**

Additional information available:
Manual: RS8FS

AK-CC 550B

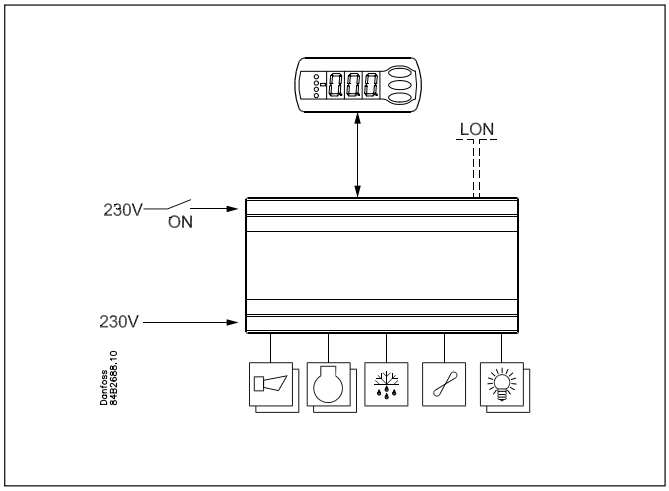


Application

Complete, highly versatile refrigeration appliance control for adaptation to all types of refrigeration appliances and cold storage rooms.
The controller is a variant of the AK-CC 550A and is targeted to refrigeration appliance with two sections where the alarms and displays must be made individually for each section.

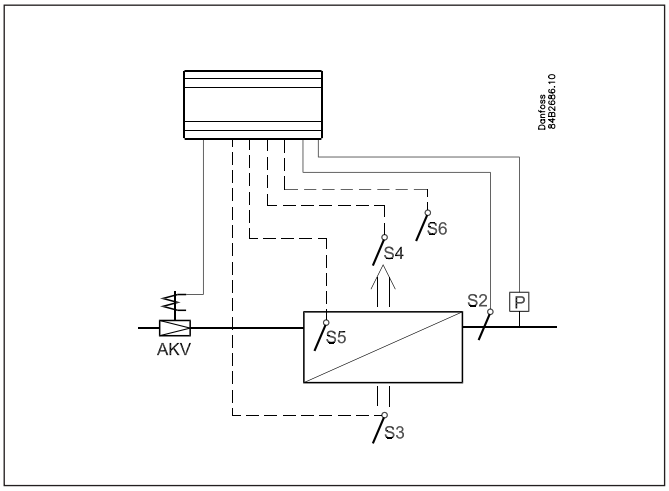
Advantages

- Complete refrigeration appliance control
- Energy optimisation of the entire refrigeration appliance
- Easy adaptation to refrigeration appliances or rooms by selection of a predefined application
- Fast set-up using predefined settings
- Can be used on CO_2 plants
- Built-in clock function with backup power



Operating principle

Sensors
The appliance temperature is detected by one or two temperature sensors located in the air flow before the evaporator (S3) or after the evaporator (S4). Configuration settings for the control thermostat, alarm thermostat and display reading determine how the two sensor values affect the individual functions.
In addition, an optional product sensor S6 in the appliance can be used to detect the temperature near the required product in a specific location in the appliance.
The evaporator temperature is detected by sensor S5, which can be used as a defrost sensor.



Injection
Liquid injection in the evaporator is controlled by a type AKV electronic injection valve. The controller regulates the opening degree of the valve to optimise evaporator operation under all conditions.
The superheat is measured with the pressure sensor Pe and temperature sensor S2.

Operation and data communication
The controller has built-in MOD-bus data communication support, which can be used for:

- network connection
- display connection
  An EKA 163 display can be connected if only readout capability is needed, or an EKA 164 display can be connected if setting capability is also needed.

If data communication and a display are required, the MOD-bus port should be used for the display and a separate data communication module should be fitted in the controller. This module may be a MOD-bus module or a LON RS 485 module.

Functional description

- Adaptive control of superheat for optimal evaporator use.
- Day/night thermostat with on/of or modulated operation
- Temperature and alarm monitoring based on S3 and/or S4 temperature
- Product sensor S6 with separate alarm limits
- Thermostat setting changeover via digital input
- Defrost start controlled by an internal schedule, digital input or network signal
- Natural, electrical, or hot gas defrosting
- Defrost stop controlled by time and/or S5 temperature
- Adaptive defrosting based on intelligent detection of evaporator performance
- Defrost coordination with multiple controllers
- Pulsed fan operation when thermostat is disconnected
- Appliance cleaning function for HACCP procedure documentation
- Appliance shut-down via DI-input or data communication
- Rail heat control according to day/night operation or current dew point
- Door function
- Controlling two compressors
- Controlling night curtain
- Lighting control according to day/night operation or network signal
- Heater thermostat
- Multi-function digital inputs

Application

Any one of ten pre-programmed controller applications can be selected with a configuration setting.

Output

The outputs are configured as follows according to the selected setting:

Output use		**Settings**									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Fan		■	■	■	■	■	■	■	■	■	■
Rail heat			■	■	■	■		■		■	■
Compressor		■	■	■		■					
Compressor 2						■					
Defrosting		■	■	■	■	■	■	■	■	■	■
Defrosting 2										■	
Suction line valve							■				
Heating element in drip tray							■	■			
Night curtain								■			
Heater thermostat									■		
Alarm		■		■	■				■		■
Lighting		■	■		■		■	■	■	■	■
AKV valve, 230 V AC		■	■	■	■	■	■	■	■	■	■

Sensors

Settings 1–8

Standard sensor use. See illustration.

Setting 9

Intended for special appliances with two compartments and two evaporators (the AKV valve feeds both evaporators).
The temperature is controlled by the S4 sensor.
There are common alarm limits but individual alarm delays for each section.
Defrosting with the S5 sensor on evaporator A and S5B on evaporator B.
There is no product sensor.

Setting 10

Intended for special appliances with two compartments and one evaporator.
The temperature is controlled by the S4 sensor.
The temperature display and alarm monitoring use S3 and S3B.
There are separate alarm limits and alarm delays for each refrigeration section.

Digital input.

Three digital inputs are available, with many use options for all settings. The two inputs are connection inputs and the third is a 230 V input.

Applications

The following is a brief summary of the application area of this controller.

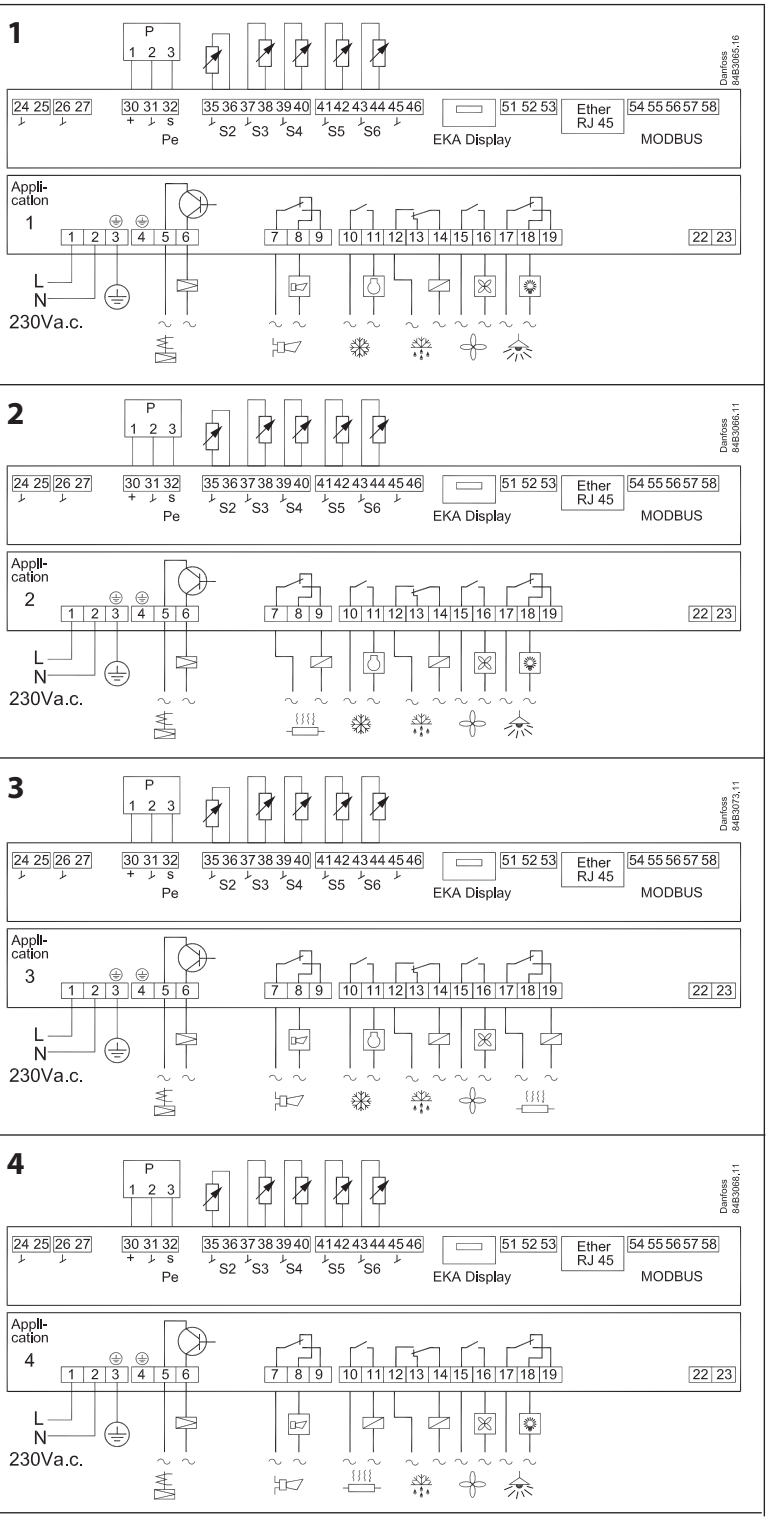
The relay outputs are defined by a configuration setting to align the controller interface to the selected application.

S3 and S4 are temperature sensors. One or both of these sensors may be used, depending on the application. S3 is located in the air flow before the evaporator, and S4 in the air flow after the evaporator.
A percentage setting determines the control basis. S5 is a defrost sensor located on or between the fins of the evaporator.
S6 is a product sensor, but it is used for a different purpose in applications 9 and 10.
DI1, DI2 and DI3 are contact functions that can be used for any of the following purposes: door function, alarm function, defrost start, external main switch, night operation, change thermostat reference, appliance cleaning, forced refrigeration, or coordinated defrost. DI3 has a 230 V input. See the functions for settings o02, o37, and o84.

General
All ten applications are configured for commercial refrigeration systems in the form of refrigeration appliances or cold storage rooms.
They all have outputs for:
- AKV valve
- Fan
- Defrost

In addition, they have different uses and thus different inputs and outputs.

Applications 1–4
Standard applications.
These applications are for standard use where the only essential difference is in the configurations of the following functions and outputs:
- Alarm
- Rail heat
- Compressors
- Lighting



The following applications have certain special functions, which are briefly described below.

Application 5
Two-compressor operation.
The two compressors must be of the same size.
On start-up (after defrosting, operational stop, etc.), the compressors are started with a preset time offset. One compressor starts at half of the differential value to provide optimum adaptation of the compressor capacity to the current load in the appliance or room. The operating hours of the compressors are equalised automatically.

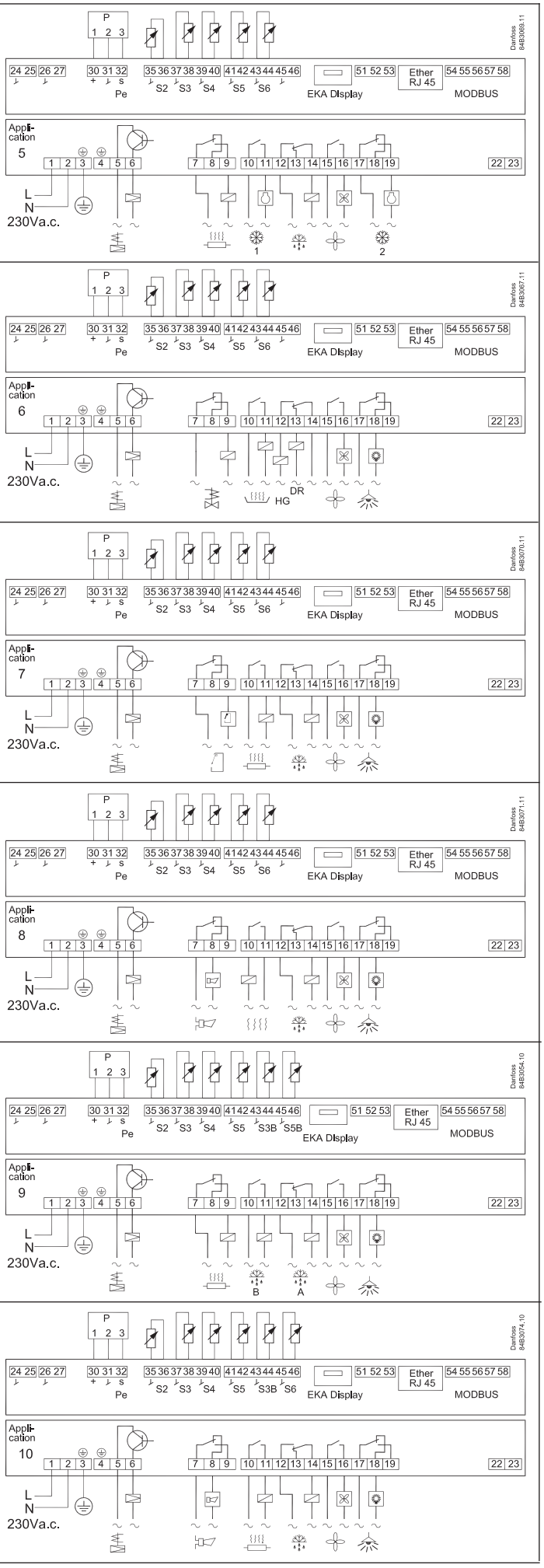
Application 6
Hot gas defrosting.
Hot gas defrosting is suitable for commercial appliances or cold rooms with a limited system charge.
One relay controls the main valve in the suction line.
A changeover relay controls the hot gas valve and the drain valve.
This means there is no time delay between the end of hot gas defrosting and the start of draining.

Application 7
Controlling night blinds
The night blinds track the status of the lighting function. The blinds are open when the light is switched on and closed when the light is switched off. In addition, a digital input provides the option of forced opening of the blinds so the appliance can be filled with products.

Application 8
Heater thermostat
A heater thermostat is typically used if the temperature needs to be controlled within relatively narrow limits, such as in cutting rooms.
To avoid simultaneous cooling and heating, the heating thermostat can be configured as an offset relative to cut-out limit of the refrigeration thermostat.

Application 9
Two refrigeration sections – two defrost outputs
This application is for refrigeration appliances with one valve, two evaporators and two refrigeration sections.
Alarm monitoring and display readings take place individually via the "S3" sensors in each refrigeration section.

Application 10
Two refrigeration sections – one defrosting output.
This application is for refrigeration appliances with one valve, one evaporator and two refrigeration sections.
Alarm monitoring and display readings take place individually via the "S3" sensors in each refrigeration section. Separate product sensor can be connected.



Menu survey

SW = 1.6x

Parameter			EL-diagram													
Function		Code	1	2	3	4	5	6	7	8	9	10	**Min.-value**	**Max.-value**	**Factory setting**	**Actual setting**
Normal operation																
Temperature (setpoint)		- - -	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Thermostat																
Differential		r01	1	1	1	1	1	1	1	1	1	1	0.1 K	20 K	2	
Max. limitation of setpoint setting		r02	1	1	1	1	1	1	1	1	1	1	-49°C	50°C	50	
Min. limitation of setpoint setting		r03	1	1	1	1	1	1	1	1	1	1	-50°C	49°C	-50	
Adjustment of temperature indication		r04	1	1	1	1	1	1	1	1	1	1	-10	10	0	
Temperature unit (°C/°F)		r05	1	1	1	1	1	1	1	1	1	1	0/°C	1/F	0/°C	
Correction of the signal from S4		r09	1	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Correction of the signal from S3 and S3B		r10	1	1	1	1	1	1	1	1	1	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)		r12	1	1	1	1	1	1	1	1	1	1	-1	1	0	
Displacement of reference during night operation		r13	1	1	1	1	1	1	1	1	1	1	-50 K	50 K	0	
Define thermostat function 1=ON/OFF, 2=Modulating		r14	1	1	1	1	1	1	1	1	1	1	1	2	1	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)		r15	1	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Time between melt periods		r16	1	1	1	1	1	1	1	1	1	1	0 hrs	10 hrs	1	
Duration of melt periods		r17	1	1	1	1	1	1	1	1	1	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential use r01		r21	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	2	
Correction of the signal from S6		r59	1	1	1	1	1	1	1	1		1	-10 K	10 K	0	
Definition and weighting, if applicable, of thermostat sensors when night cover is on. (100%=S4, 0%=S3)		r61							1				0 %	100 %	100	
Heat function Neutral zone between refrigeration and heat function		r62								1			0 K	50 K	2	
Time delay at switch between refrigeration and heat function		r63								1			0 min.	240 min.	0	
Alarms																
Delay for temperature alarm		A03	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Delay for door alarm		A04	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost		A12	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	90	
High alarm limit for thermostat 1		A13	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 1		A14	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for thermostat 2		A20	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	8	
Low alarm limit for thermostat 2		A21	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 1		A22	1	1	1	1	1	1	1	1		1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 1		A23	1	1	1	1	1	1	1	1		1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 2		A24	1	1	1	1	1	1	1	1		1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 2		A25	1	1	1	1	1	1	1	1		1	-50°C	50°C	-30	
S6 alarm time delay With setting = 240 the S6 alarm will be omitted		A26	1	1	1	1	1	1	1	1		1	0 min.	240 min.	240	
Alarm time delay or signal on the DI1 input		A27	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input		A28	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)		A36	1	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Delay for S6 (product sensor alarm) after defrost		A52	1	1	1	1	1	1	1	1		1	0 min.	240 min.	90	
Delay for temperature alarm S3B		A53									1	1	0 min.	240 min.	90	
Compressor																
Min. ON-time		c01	1	1	1		1						0 min.	30 min.	0	
Min. OFF-time		c02	1	1	1		1						0 min.	30 min.	0	
Time delay for cutin of comp.2		c05					1						0 sec	999 sec	5	
Defrost																
Defrost method: 0=none, 1= EL, 2= Gas		d01	1	1	1	1	1	1	1	1	1	1	0/No	2/GAs	1/EL	
Defrost stop temperature		d02	1	1	1	1	1	1	1	1	1	1	0°C	50°C	6	
Interval between defrost starts		d03	1	1	1	1	1	1	1	1	1	1	0 hrs/Off	240 hrs	8	
Max. defrost duration		d04	1	1	1	1	1	1	1	1	1	1	0 min.	360 min.	45	
Displacement of time on cutin of defrost at start-up		d05	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	0	
Drip off time		d06	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Delay for fan start after defrost		d07	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Fan start temperature		d08	1	1	1	1	1	1	1	1	1	1	-50 °C	0 °C	-5	

Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Fan cutin during defrost 0: Stopped 1: Running 2: Running during pump down and defrost		d09	1	1	1	1	1	1	1	1	1	1	0	2	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4, 3=Sx (Application 1-8 and 10: both S5 and S6. Application 9: S5 and S5B)		d10	1	1	1	1	1	1	1	1	1	1	0	3	0	
Pump down delay		d16	1	1	1	1	1	1	1	1	1	1	0 min.	60 min.	0	
Drain delay (used at hot gas defrost only)		d17						1					0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts		d18	1	1	1	1	1	1	1	1	1	1	0 hrs	48 hrs	0/OFF	
Heat in drip tray. Time from defrosting stops to heating in the drip tray is switched off		d20						1					0 min.	240 min.	30	
Adaptive defrost: 0=not active, 1=monitoring only, 2=skip allowed day, 3=skip allowed both day and night, 4=own assessment + all schedules		d21	1	1	1	1	1	1	1	1	1	1	0	4	0	
Injection control function																
Max. value of superheat reference		n09	1	1	1	1	1	1	1	1	1	1	2°C	20°C	12	
Min. value of superheat reference		n10	1	1	1	1	1	1	1	1	1	1	2°C	20°C	3	
MOP temperature. Off if MOP temp. = 15.0 °C		n11	1	1	1	1	1	1	1	1	1	1	-50°C	15°C	15	
Period time of AKV pulsation Only for trained personnel		n13	1	1	1	1	1	1	1	1	1	1	3 sec	6 sec	6	
Fan																
Fan stop temperature (S5)		F04	1	1	1	1	1	1	1	1	1	1	-50°C	50°C	50	
Pulse operation on fans: 0=No pulse operation, 1=At thermostat cuts out only, 2= Only at thermostat cut outs during night operation		F05	1	1	1	1	1	1	1	1	1	1	0	2	0	
Period time for fan pulsation (on-time + off-time)		F06	1	1	1	1	1	1	1	1	1	1	1 min.	30 min.	5	
On-time in % of period time		F07	1	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Real time clock																
Six start times for defrost. Setting of hours. 0=OFF		t01 - t06	1	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF		t11 - t16	1	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of hours		t07	1	1	1	1	1	1	1	1	1	1	0 hrs	23 hrs	0	
Clock - Setting of minute		t08	1	1	1	1	1	1	1	1	1	1	0 min.	59 min.	0	
Clock - Setting of date		t45	1	1	1	1	1	1	1	1	1	1	1 day	31 day	1	
Clock - Setting of month		t46	1	1	1	1	1	1	1	1	1	1	1 mon.	12 mon.	1	
Clock - Setting of year		t47	1	1	1	1	1	1	1	1	1	1	0 year	99 year	0	
Miscellaneous																
Delay of output signals after start-up		o01	1	1	1	1	1	1	1	1	1	1	0 sec	600 sec	5	
Input signal on DI1. Function: 0=not used. 1=status on DI1. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext.main switch. 6=night operation 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 15=appliance shutdown		o02	1	1	1	1	1	1	1	1	1	1	0	15	0	
Network address		o03	1	1	1	1	1	1	1	1	1	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at LON 485 and DANBUSS only)		o04	1	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Access code 1 (all settings)		o05	1	1	1	1	1	1	1	1	1	1	0	100	0	
Used sensor type : 0=Pt1000, 1=Ptc1000,		o06	1	1	1	1	1	1	1	1	1	1	0/Pt	1/Ptc	0/Pt	
Max hold time after coordinated defrost		o16	1	1	1	1	1	1	1	1	1	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17	1	1	1	1	1	1	1	1	1	1	0 %	100 %	100	
Pressure transmitter working range – min. value		o20	1	1	1	1	1	1	1	1	1	1	-1 bar	5 bar	-1	
Pressure transmitter working range – max. value		o21	1	1	1	1	1	1	1	1	1	1	6 bar	200 bar	12	
Refrigerant setting: 1=R12. 2=R22. 3=R134a. 4=R502. 5=R717. 6=R13. 7=R13b1. 8=R23. 9=R500. 10=R503. 11=R114. 12=R142b. 13=User defined. 14=R32. 15=R227. 16=R401A. 17=R507. 18=R402A. 19=R404A. 20=R407C. 21=R407A. 22=R407B. 23=R410A. 24=R170. 25=R290. 26=R600. 27=R600a. 28=R744. 29=R1270. 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A. 36=R513A. 37=R407F.		o30	1	1	1	1	1	1	1	1	1	1	0	37	0	

Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Input signal on DI2. Function: (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation 7=thermostat band changeover (activate r21). 8=alarm function when closed. 9=alarm function when open. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost.). 12=night cover, 13=coordinated defrost). 15=appliance shutdown		o37	1	1	1	1	1	1	1	1	1	1	0	15	0	
Configuration of light function: 1=Light follows day /night operation, 2=Light control via data communication via 'o39', 3=Light control with a DI-input, 4=As "2", but light switch on and night cover will open if the network cut out for more than 15 minutes.		o38	1	1		1		1	1	1	1	1	1	4	1	
Activation of light relay (only if o38=2) On=light		o39	1	1		1		1	1	1	1	1	0/Off	1/On	0/Off	
Rail heat On time during day operations		o41		1	1	1	1		1		1	1	0 %	100 %	100	
Rail heat On time during night operations		o42		1	1	1	1		1		1	1	0 %	100 %	100	
Rail heat period time (On time + Off time)		o43		1	1	1	1		1		1	1	6 min.	60 min.	10	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46	1	1	1	1	1	1	1	1	1	1	0	2	0	
Selection of EL diagram. See overview	*	o61	1	1	1	1	1	1	1	1	1	1	1	10	1	
Download a set of predetermined settings. See overview	*	o62	1	1	1	1	1	1	1	1	1	1	0	6	0	
Access code 2 (partial access)	***	o64	1	1	1	1	1	1	1	1	1	1	0	100	0	
Replace the controllers factory settings with the present settings		o67	1	1	1	1	1	1	1	1	1	1	0/Off	1/On	0/Off	
Input signal on DI3. Function: (high voltage input) (0=not used. 1=status on DI2. 2=door function with alarm when open. 3=door alarm when open. 4=defrost start (pulse-signal). 5=ext. main switch 6=night operation, 7=thermostat band changeover (activate r21). 8=Not used. 9=Not used. 10=case cleaning (pulse signal). 11=forced cooling at hot gas defrost, 12=night cover. 13=Not used. 14=Refrigeration stopped (forced closing)). 15=appliance shutdown		o84	1	1	1	1	1	1	1	1	1	1	0	15	0	
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function		o85		1	1	1	1		1		1	1	0	2	0	
Dew point value where the rail heat is minimum		o86		1	1	1	1		1		1	1	-10°C	50°C	8	
Dew point value where the rail heat is 100% on		o87		1	1	1	1		1		1	1	-9°C	50°C	17	
Lowest permitted rail heat effect in %		o88		1	1	1	1		1		1	1	0 %	100 %	30	
Time delay from "open door" refrigeration is started		o89	1	1	1	1	1	1	1	1	1	1	0 min.	240 min.	30	
Fan operation on stopped refrigeration (forced closing): 0 = Stopped (defrosting permitted) 1 = Running (defrosting permitted) 2 = Stopped (defrosting not permitted) 3 = Running (defrosting not permitted)		o90	1	1	1	1	1	1	1	1	1	1	0	3	1	
Definition of readings on lower button: 1=defrost stop temperature, 2=S6 temperature, 3=S3 temperature , 4=S4 temperature		o92	1	1	1	1	1	1	1	1	1	1	1	4	1	
Display of temperature 1= u56 Air temperature (set automatically to 1 at application 9) 2= u36 product temperature		o97	1	1	1	1	1	1	1	1	1	1	1	2	1	
Light and night blinds defined 0: Light is switch off and night blind is open when the main switch is off 1: Light and night blind is independent of main switch		o98	1	1	1	1	1	1	1	1	1	1	0	1	0	
Configuration of alarm relay The alarm relay will be activated upon an alarm signal from the following groups: 0 - Alarm relay not used 1 - High temperature alarms 2 - Low temperature alarms 4 - Sensor error 8 - Digital input enabled for alarm 16 - Defrosting alarms 32 - Miscellaneous 64 - Injection alarms The groups that are to activate the alarm relay must be set by using a numerical value which is the sum of the groups that must be activated. (E.g.: a value of 5 will activate all high temperature alarms and all sensor error.		P41	1		1	1				1		1	0	127	111	

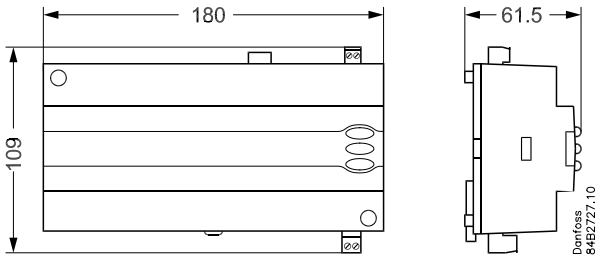
Continued		Code	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Fac.	Actual
Service																
Temperature measured with S5 sensor		u09	1	1	1	1	1	1	1	1	1	1				
Status on DI1 input. on/1=closed		u10	1	1	1	1	1	1	1	1	1	1				
Actual defrost time (minutes)		u11	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S3 sensor		u12	1	1	1	1	1	1	1	1	1	1				
Status on night operation (on or off) 1=on		u13	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S4 sensor		u16	1	1	1	1	1	1	1	1	1	1				
Thermostat temperature		u17	1	1	1	1	1	1	1	1						
Run time of thermostat (cooling time) in minutes		u18	1	1	1	1	1	1	1	1	1	1				
Temperature of evaporator outlet temp.		u20	1	1	1	1	1	1	1	1	1	1				
Superheat across evaporator		u21	1	1	1	1	1	1	1	1	1	1				
Reference of superheat control		u22	1	1	1	1	1	1	1	1	1	1				
Opening degree of AKV valve	**	u23	1	1	1	1	1	1	1	1	1	1				
Evaporating pressure Po (relative)		u25	1	1	1	1	1	1	1	1	1	1				
Evaporator temperature To (Calculated)		u26	1	1	1	1	1	1	1	1	1	1				
Temperature measured with S6 sensor (product temperature)		u36	1	1	1	1	1	1	1	1		1				
Status on DI2 output. on/1=closed		u37	1	1	1	1	1	1	1	1	1	1				
Air temperature . Weighted S3 and S4		u56	1	1	1	1	1	1	1	1	1	1				
Measured temperature for alarm thermostat		u57	1	1	1	1	1	1	1	1	1	1				
Status on relay for cooling	**	u58	1	1	1		1									
Status on relay for fan	**	u59	1	1	1	1	1	1	1	1	1	1				
Status on relay for defrost	**	u60	1	1	1	1	1		1	1	1	1				
Status on relay for railheat	**	u61		1	1	1	1		1		1	1				
Status on relay for alarm	**	u62	1		1	1				1		1				
Status on relay for light	**	u63	1	1		1		1	1	1	1	1				
Status on relay for valve in suction line	**	u64						1								
Status on relay for compressor 2	**	u67					1									
Temperature measured with S5B sensor		u75									1					
Temperature measured with S3B sensor		u76									1	1				
Status on relay for hot gas- / drain valve	**	u80						1								
Status on relay for heating element in drip tray	**	u81						1								
Status on relay for night blinds	**	u82							1							
Status on relay for defrost B	**	u83									1					
Status on relay for heat function	**	u84								1						
Readout of the actual rail heat effect		u85		1	1	1	1		1		1	1				
1: Thermostat 1 operating, 2: Thermostat 2 operating		u86	1	1	1	1	1	1	1	1	1	1				
Status on high voltage input DI3		u87	1	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut in value		u90	1	1	1	1	1	1	1	1	1	1				
Readout of thermostats actual cut out value		u91	1	1	1	1	1	1	1	1	1	1				
Readout of status on the adaptive defrost 0: Off. Function is not activated and are zero set 1: Sensor error or S3/S4 are reversed. 2: Tuning is in progress 3: Normal 4: Light build-up of ice 5: Medium build-up of ice 6: Heavy build-up of ice		U01	1	1	1	1	1	1	1	1	1	1				
Number of defrosts carried out since the initial power up or since the resetting of the function		U10	1	1	1	1	1	1	1	1	1	1				
Number of defrosts skipped since the initial power up or since the resetting of the function		U11	1	1	1	1	1	1	1	1	1	1				
Measured temperature for alarm thermostat in section B		U34									1	1				
Air temperature in section B		U35									1	1				

*) Can only be set when regulation is stopped (r12=0)
**) Can be controlled manually, but only when r12=-1
***) With access code 2 the access to these menus will be limited

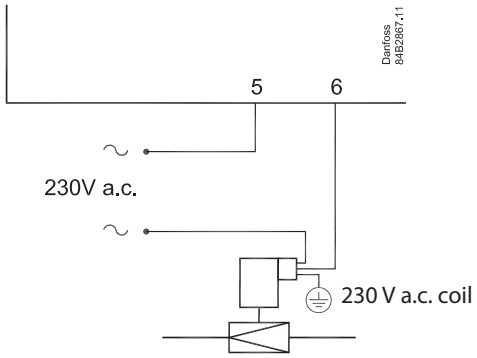
Technical data

Supply voltage	230 V a.c. +10/-15 %. 5 VA, 50/60 Hz		
Sensor S2	Pt 1000		
Sensor S3, S3B, S4, S5, S5B, S6	Pt 1000 or PTC 1000 ohm (All must be of the same type)		
Accuracy	Measuring range	-60 to +120°C	
	Controller	±1 K below -35°C ±0.5 K between -35 to +25°C ±1 K above +25°C	
	Pt 1000 sensor	±0.3 K at 0°C ±0.005 K per grad	
Measuring of Pe	Pressure transmitter	AKS 32R	
Display	LED, 3-digits		
External display	EKA 163B or 164B. (any EKA 163A or 164A)		
Digital inputs DI1, DI2	Signal from contact functions Requirements to contacts: Gold plating Cable length must be max. 15 m Use auxiliary relays when the cable is longer		
Digital input DI3	230 V a.c.		
Electrical connection cable	Max.1.5 mm^2 multi-core cable		
Solid state output	DO1 (for AKV coil)	Max. 240 V a.c. , Min. 28 V a.c. Max. 0.5 A Leak < 1 mA Max. 1 pcs. AKV	
Relays*		CE (250 V a.c.)	
	DO3, DO4	4 (3) A	
	DO2, DO5, DO6	4 (3) A	
Environments	0 to +55°C, During operations -40 to +70°C, During transport		
	20 - 80% Rh, not condensed		
	No shock influence / vibrations		
Density	IP 20		
Mounting	DIN-rail or wall		
Weight	0.4 Kg		
Data communication	Fixed		MODBUS
	Extension options		LON RS485
			TCP/IP
			MODBUS
			DANBUSS
	The controller cannot be hooked up with a monitoring unit type m2.		
Power reserve for the clock	4 hours		
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with LVD tested acc. EN 60730-1, EN 60730-2-1 and EN 60730-2-9 EMC tested acc. EN 61000-6-2 and EN 61000-6-3		

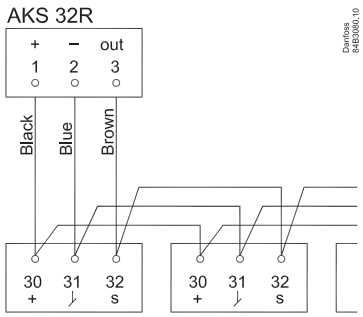
* DO3 and DO4 are 16 A relays. DO2, DO5 and DO6 are 8 A relays. Max. load must be observed.



AKV info !!

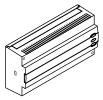


AKS 32R info



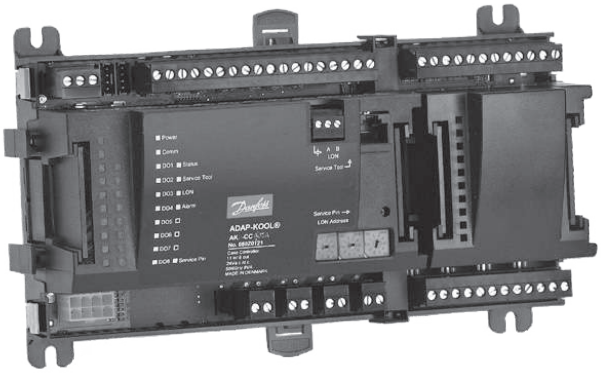
The signal from one pressure transmitter can be received by up to ten controllers.

Ordering

Type		Function	Code no.
AK-CC 550B		Case controller with MODBUS data communication	**084B8032**
EKA 175		Data communication module LON RS 485	**084B8579**
EKA 178B		Data communication module MODBUS	**084B8571**
EKA 176		Data communication module DANBUSS + Gateway	**084B8583**
EKA 176A		Data communication module DANBUSS + AK-PI 200	**084B8591**
EKA 163B		External display with plug for direct connection	**084B8574**
EKA 164B		External display with operation buttons and plug for direct connections	**084B8575**
EKA 163A		External display with screw terminals	**084B8562**
EKA 164A		External display with operation buttons and screw terminals	**084B8563**

Additional information available:
Manual: RS8GL

AK-CC 750



Application

AK-CC 750 controllers are complete regulating units which together with valves and sensors constitute complete evaporator controls for refrigeration appliances and freezing rooms in commercial refrigeration applications.

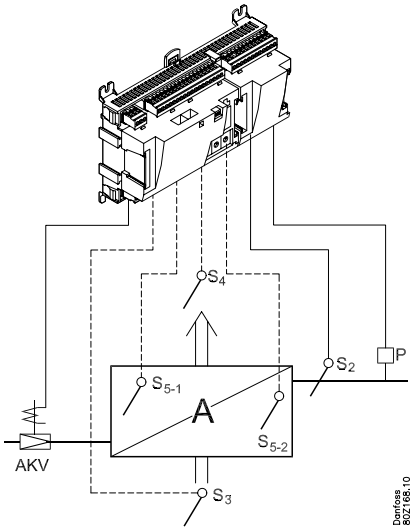
They generally replace all other automatic controls, including day and night thermostats, defrost, fan control, rail heat controls, alarm functions, lighting control, thermostatic valve control, solenoid valves, etc.

The controller has data network capability and is operated via a PC.

In addition to evaporator control, it can send signals to other controllers regarding operating conditions, such as forced closing of expansion valves, alarm signals, and alarm messages.

Advantages

- Controls of up to four evaporator sections
- Adaptive superheat control ensures optimum evaporator use under all operating conditions
- Electronic injection with AKV valve
- On/off or modulated temperature control
- Weighted average of control thermostat and alarm thermostat
- Defrost on demand based on evaporator capacity
- Appliance cleaning function
- Lighting control using door switch or network signal based on day/night operation
- Pulsed rail heat based on day/night operation
- Door alarm monitoring and lighting/refrigeration control based on door switch status
- Logging function for historical parameter values and alarm modes



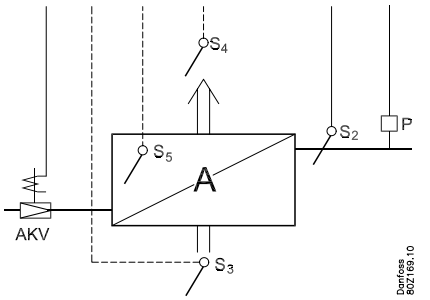
Control

The main function of the controller is to regulate the evaporator so the refrigeration system constantly operates with the best possible energy efficiency.

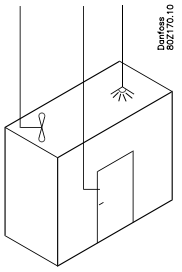
A specific function detects the need for defrosting and adapts the number of defrost cycles to avoid wasting energy on unnecessary defrost cycles and subsequent cooling cycles.

Adaptive defrosting

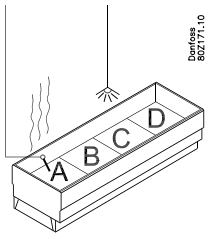
The AK-CC 750 includes an adaptive defrosting function. By using the AKV valve as mass flow sensor for the supply of refrigerant, the controller can monitor ice formation on the evaporator. If the load is too large for the standard defrost programme, the controller initiates additional automatic defrost cycles to eliminate the need for expensive service calls due to iced-up evaporators.



Evaporator control with one to four evaporators



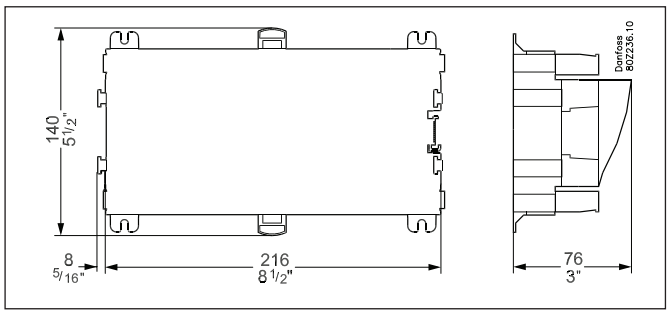
Controlling a cold room or freezer room

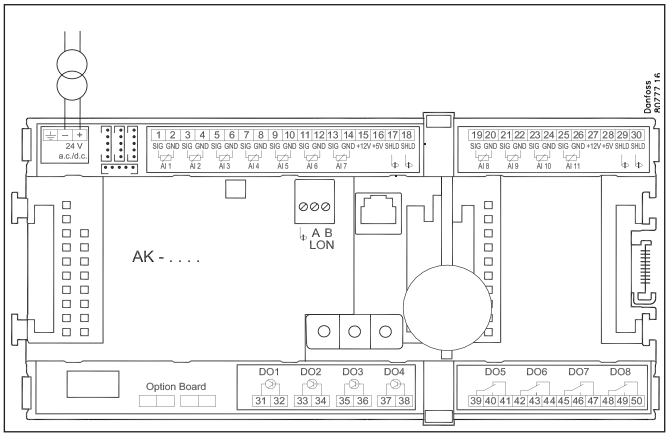


Controlling a refrigeration or freezer appliance

Technical data

Supply voltage	24 V d.c./a.c. ±20%	
Power consumption	AK-CC 750	8 VA
Analog inputs	Pt 1000 ohm / 0°C	Resolution: 0.1°C Accuracy: ±0.5°
	Pressure transmitter type AKS 32R / AKS 32 (1–5 V)	Resolution 1 mV Accuracy ±10 mV Maximum 5 pressure transmitters connected to one module
	Voltage signal 0–10 V	
	Contact function (on/off)	On when R < 20 ohm Off when R > 2K ohm (gold -plated contacts not necessary)
Relay outputs SPDT	AC-1 (resistive)	4 A
	AC-15 (inductive)	3 A
	U	Min. 24 V Max. 230 V Low and high voltage must not be connected to the same output group
Solid state outputs	Can be used for loads that are switched on and off frequently, such as: decompression, rail heating, fans and AKV valves	Max. 240 V AC; min. 48 V a.c. Max. 0.5 A, leakage < 1 mA Max. 1 AKV
Ambient temperature	During transport	-40 to 70°C
	During operation	-20 to 55°C, 0 to 95% RH (non condensing) No shock load or vibration
Enclosure	Material	PC/ABS
	Enclosure	IP 10 , VBG 4
	Mounting	For mounting on wall or DIN rail
Weight with screw terminals	Modules in 100- and 200- controller-series	approx. 200 g / 500 g / 600 g
Approvals	Compliant with EU Low Voltage Directive and EMC regulations	LVD tested according to EN 60730 EMC tested Immunity compliant with EN 61000-6-2 Emissions compliant with EN 61000-6-3
	UL file number	E31024 for CC E166834 for XM





Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Ordering data

Type	Functional description	Application	Language	Code
Controller				
AK-CC 750	Evaporator controller	One to four sections	English, German, French, Italian, Dutch, Spanish, Finnish Portuguese, Polish, Russian, Czech	**080Z0125**
Miscellaneous				
Expansion modules available for additional connections				**See Accessories section - AK modules**
Operating software for AK controllers			AK-ST 500	
Cable between PC and AK controller				
Cable between null modem cable and AK controller				
External display for connection to controller module. For displaying variables such as suction pressure			EKA 163B, EKA 164B	
Real time clock for use in controllers that require a clock function but do not have a data communication link.			AK-OB 101A	

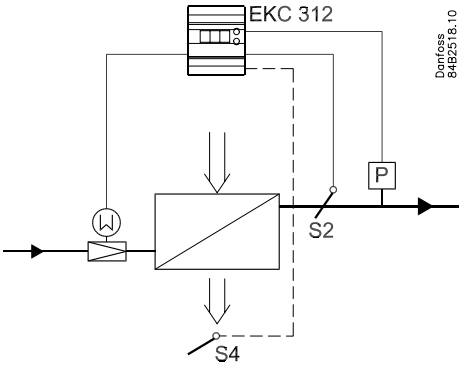
Additional information available:
Manual: RS8EM

EKC 312

Application
This controller/valve combination can be used in applications that require precise superheat control in connection with refrigeration.
For example:
- Processing plants (water chillers)
- Cold storage plants (air coolers)
- Air conditioning systems

Advantages
- Optimum evaporator charge, even with large variation in load and suction pressure
- Energy savings: adaptive regulation of refrigerant injection ensures optimum evaporator utilisation and thus high suction pressure
- Superheating is maintained at the lowest possible level

Functional description
- Superheat regulation
- MOP function
- On/off input for starting and stopping regulation
- PID control



System description
Evaporator superheating is controlled by a pressure transmitter P and a temperature sensor S2.
The expansion valve is equipped with a type ETS stepper motor.

For safety reasons, the liquid flow to the evaporator must be cut off if the controller experiences a power failure. The ETS valve is fitted with a stepper motor, which means that is remains open in such situations.

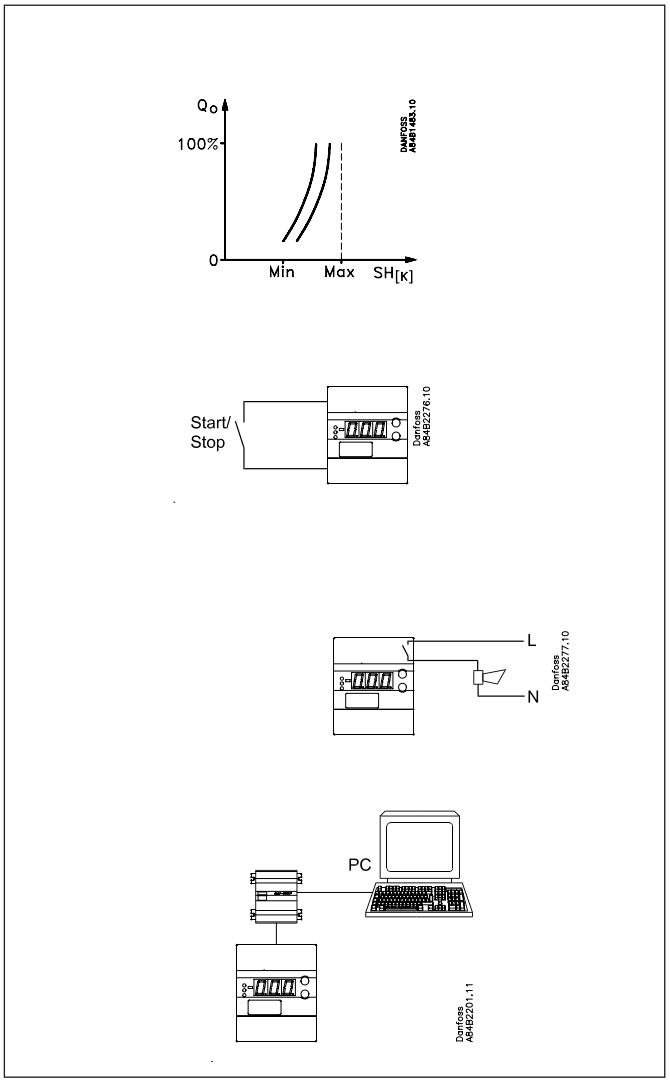
Superheat function
- Adaptive superheating

MOP
The MOP function limits the valve opening degree when the evaporating pressure is higher than the set MOP value.

External regulation start/stop
The controller can be started and stopped externally by a contact function connected to input terminals 1 and 2. Regulation is stopped when the contact is open. This must be done when the compressor is stopped. The controller then closes the solenoid valve to stop refrigerant flow to the evaporator.

Alarm relay
The alarm relay operates such that the contact is cut in when an alarm condition is present and when the controller is de-energised.

PC operation
The controller can be equipped with data communication capability so it can communicate with other products in the ADAP-KOOL® family of refrigeration controllers. With this arrangement, monitoring and data acquisition can be performed from a PC, either on site or in a service company.



Menu overview

SW: 1.2x

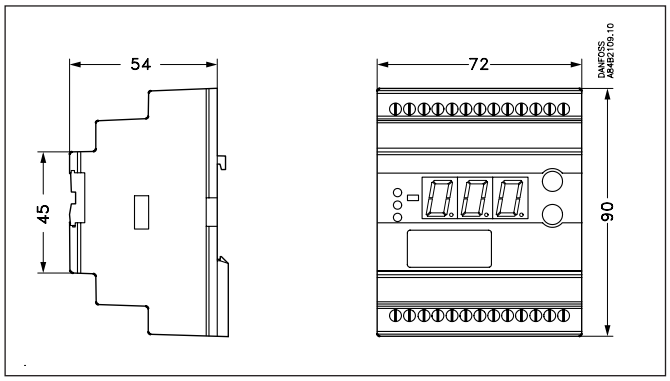
Functional description	Parameter	Min.	Max.	Factory setting
Standard display				
Shows current superheat level, valve opening degree or temperature. The view is defined in o17.	-		K	
Briefly press the lower button (1 s) to see the current opening degree of the expansion valve. The view is defined in o17.	-		%	
Reference				
Units (0: °C and bar; 1: °F and psig)	r05	0	1	0
Refrigeration start/stop	r12	Off	On	1
Control parameters				
P: amplification factor Kp	n04	0.5	20	3
I: integration time T	n05	30 s	600 s	120
Maximum superheat reference value	n09	2 K	30 K	10
Minimum superheat reference value	n10	1 K	12 K	4
MOP	n11	0.0 bar	20 bar	20
Superheat amplification factor Should be changed only by qualified specialists	n20	0.0	10.0	0,4
Minimum superheat reference value for loads below 10%	n22	1 K	15 K	2
Parameters n37 and n38 are set for valve type ETS 50 and should be changed only if another valve type is used.				
Number of steps from 0 to 100% opening degree (x10) (ETS 50: 263; ETS 100: 353)	n37	000 steps*	5000 steps *	263
Number of steps per second	n38	10 step/s	300 step/s	250
Integration time of inner loop (TnT0)	n44	10 s	120 s	30
Miscellaneous				
Controller address	o03*	1	60	
On/off switch (service pin message)	o04*	-	-	
Line voltage frequency	o12	50 Hz	60 Hz	50
Standard display view 1: superheat 2: valve opening degree 3: air temperature	o17	1	3	1
Manual output control: Off: manual control disabled 3: alarm relay activated (cut out) Parameter o45 is active if '3' is selected	o18	off	3	0
Pressure transmitter working range – minimum value	o20	-1 bar	60 bar	-1.0
Pressure transmitter working range – maximum value	o21	-1 bar	60 bar	12
Refrigerant: 1: R12, 2: R22, 3: R134a, 4: R502, 5: R717, 6: R13, 7: R13b1, 8: R23, 9: R500, 10: R503, 11: R114, 12: R142b, 13: user defined, 14: R32, 15: R227, 16: R401A, 17: R507, 18: R402A, 19: R404A, 20: R407C, 21: R407A, 22: R407B, 23: R410A, 24: R170, 25: R290, 26: R600, 27: R600a, 28: R744, 29: R1270	o30	0	29	0
Manual control of the valve opening degree. The function is available only if o18 is set.	o45	0%	100%	0
Control loop: 1: standard 2: double loop	o56	1	2	1

Service		
Read status of DI input	u10	on/off
S2 sensor temperature	u20	°C
Superheat	u21	K
Superheat reference value	u22	K
Read AKV valve opening degree	u24	%
Read evaporating pressure	u25	bar
Read evaporating temperature	u26	°C
S4 sensor temperature	u27	°C
Read pressure transmitter input signal	u29	mA

* This setting is only possible if a data communication module is fitted in the controller.

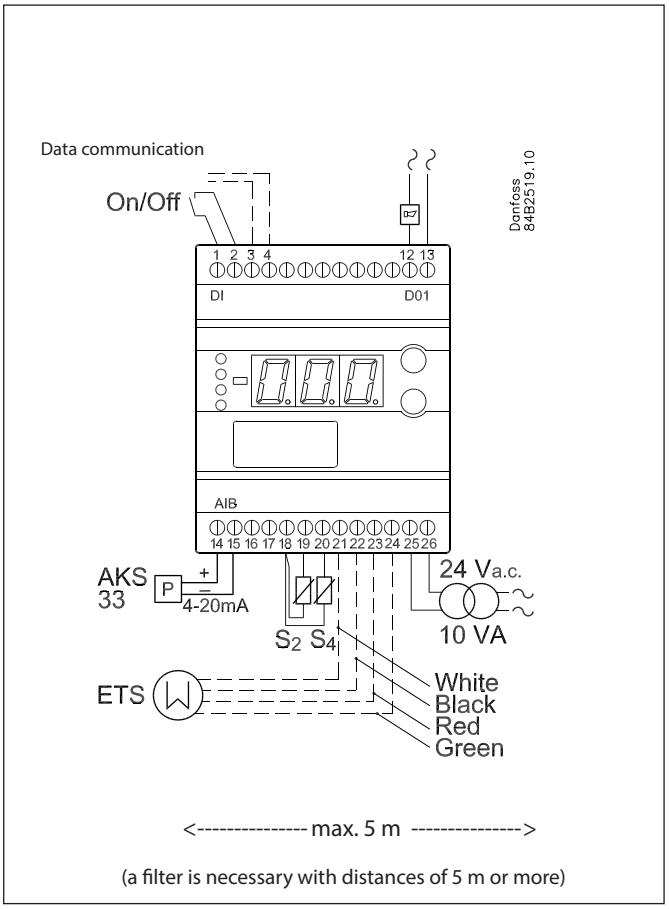
Technical data

Supply voltage	24 V a.c. ±15% 50/60 Hz, 10 VA (the supply voltage is galvanically isolated from the input and output signals)	
Power consumption	Controller ETS stepper motor	5 VA 1.3 VA
Input signals	Pressure transmitter	4–20 mA from AKS 33
	Digital input from external contact function	
Sensor input	2 Pt 1000 ohm	
Alarm relay	1 SPST	AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Stepper motor output	Pulsed 100 mA	
Data communication	A data communication module can be connected	
Ambient temperature	-10 to 55°C (operating) -40 to 70°C (transport)	
	20 to 80% RH, non condensing	
	No shock load or vibration	
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Approvals	Compliant with EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9 EMC tested in accordance with EN 61000-6-3 and EN 61000-6-2	



Ordering data

Type	Functional description	Code
EKC 312	Superheat controller	**084B7250**
EKA 175	Data communication module (accessories), (RS 485 module)	**084B8579**
EKA 174	Data communication module (accessories), (RS 485 module) with galvanic isolation	**084B7124**



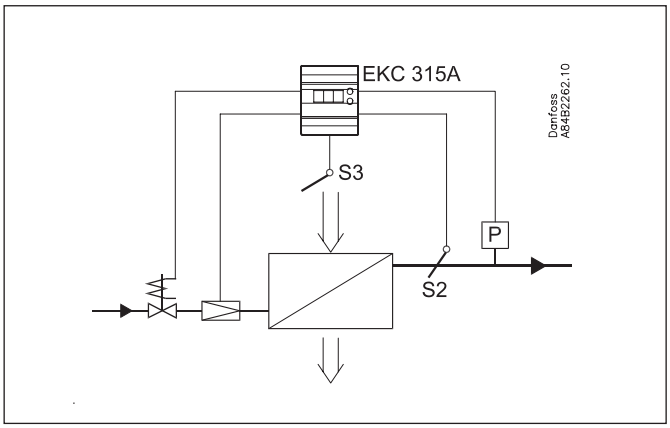
Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.

Additional information available:
Manual: DKRCC.PS.R1.A

EKC 315A

Application
This controller/valve combination can be used in applications that require precise control of superheating and temperature in connection with refrigeration.
For example:
- Cold storage plants (air coolers)
- Processing plants (water chillers)
- Air conditioning systems

Advantages
- Optimum evaporator charge, even with large variation in load and suction pressure
- Energy savings: adaptive regulation of refrigerant injection ensures optimum evaporator utilisation and thus high suction pressure
- Precise temperature control: the combination of adaptive evaporator control and temperature control ensures high media temperature accuracy
- Superheating is maintained at the lowest possible level, and at the same time the media temperature is controlled by the thermostat function



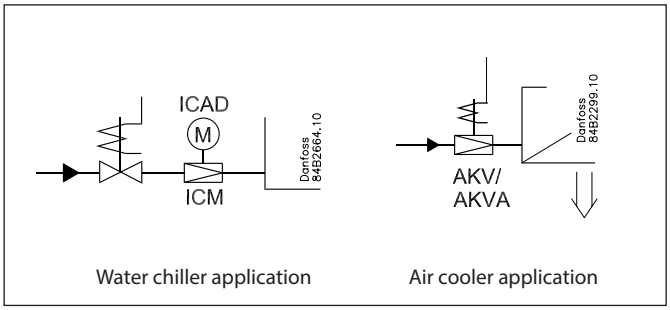
Functional description
- Superheat regulation
- Temperature control
- MOP function
- On/off input for starting and stopping regulation
- The superheat reference or temperature reference can be offset by an input signal
- Alarm if preset alarm limits are exceeded
- Relay output for solenoid valve
- PID control
- Output signal proportional to the displayed temperature

System description
Evaporator superheating is controlled by a pressure transmitter P and a temperature sensor S2.
Any of the following types of valves can be used:
- ICM
- AKV (AKVA)

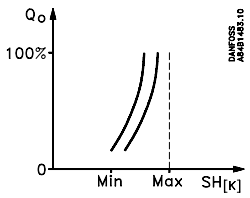
The ICM valve is an electronically operated valve with direct stepper motor drive, controlled by an ICAD actuator. It is used in combination with a solenoid valve in the liquid line.

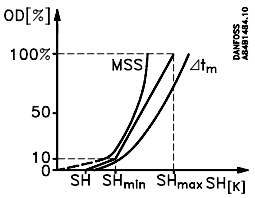
The AKV valve is a pulse-mode valve.
When the AKV valve is used, it also acts as solenoid valve.

Temperature is based on the signal from temperature sensor S3, which is located in the air flow ahead of the evaporator. Temperature control is provided by an on/off thermostat that enables or disables the flow in the liquid line.



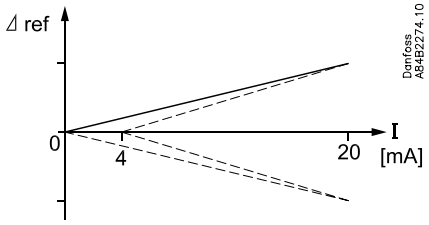
Superheat function
There are two selectable superheat options:
- adaptive superheat
- load-defined superheat



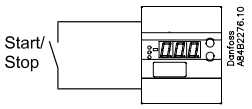


MOP
The MOP function limits the valve opening degree when the evaporating pressure is higher than the set MOP value.

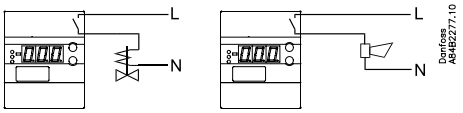
Override function
The temperature reference or superheat reference can be offset using an analog input signal. This can be a 0–20 mA signal or a 4–20 mA signal. The reference offset can be positive or negative.



External regulation start/stop
The controller can be started and stopped externally by a contact function connected to input terminals 1 and 2. Regulation is stopped when the contact is open. This must be done when the compressor is stopped. The controller then closes the solenoid valve to stop refrigerant flow to the evaporator.

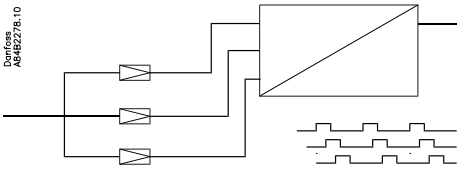


Relays
The relay for the solenoid valve is energised when cooling is required. The relay for the alarm function operates such that the contact is cut in when an alarm condition is present or the controller is de-energised.

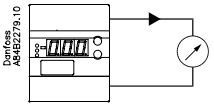


Modulated/pulsed expansion valve
The ICM valve is recommended for 1:1 systems (one evaporator, one compressor and one condenser) with small refrigerant charges.

If the AKV valve is used, up to three valves can be employed to distribute the capacity if slave modules are fitted. The controller offsets the opening times of the AKV valves so their pulse times are not simultaneous.
The EKE 347 controller can be used as a slave controller.



Analog output
The controller has an analog current output that can be set to 0–20 mA or 4–20 mA. The signal can track the superheat level, valve opening degree or air temperature.
If an ICM valve is used, the signal is used to control of valve via the ICAD actuator.



Menu overview

SW: 1.4x

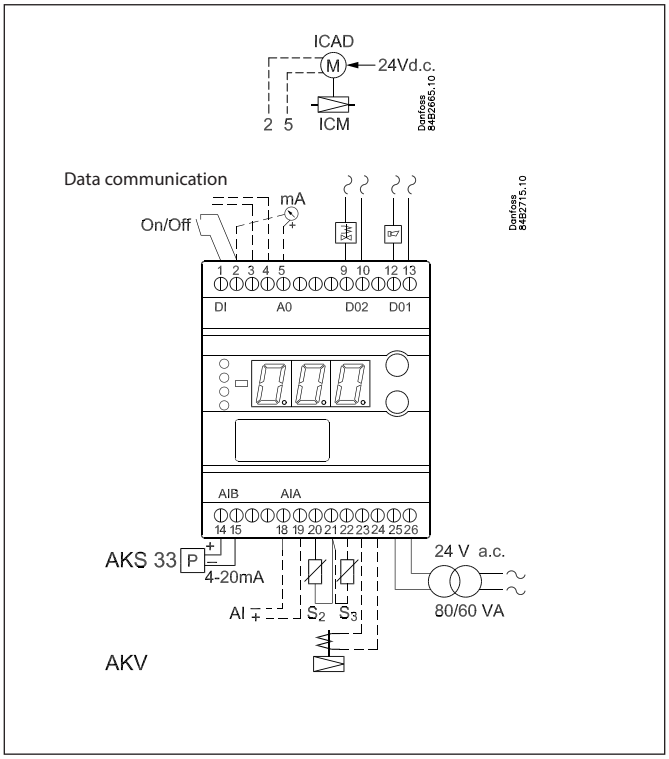
Functional description	Parameter	Min.	Max.	Factory setting
Standard display				
Shows current superheat level, valve opening degree or temperature. The view is defined in o17.	-		K	
Press the bottom briefly to display the temperature, superheat level, or temperature reference value. The view is defined by parameter o17.	-		%	
Reference				
Specify the required set point	-	-60°C	50°C	10
Differential	r01	0.1 K	20 K	2.0
Units (0: °C and bar; 1: °F and psig)	r05	0	1	0
External contribution to the reference	r06	-50 K	50 K	0
Correction of signal from S2	r09	-50.0 K	50.0 K	0.0
Correction of signal from S3	r10	-50.0 K	50.0 K	0.0
Refrigeration start/stop	r12	Off	On	1
Thermostat operation: (0: no thermostat function, 1: on/off thermostat)	r14	0	1	0
Alarm				
Upper excursion (above the temperature setting)	A01	3.0 K	20 K	5.0
Lower excursion (below the temperature setting)	A02	1 K	10 K	3.0
Alarm's time delay	A03	0 min	90 min	30
Control parameters				
P: amplification factor Kp	n04	0.5	20	3.0
I: integration time T	n05	30 s	600 s	120
D: differentiation time Td (0 = off)	n06	0 s	90 s	0
Maximum superheat reference value	n09	2 K	50 K	6
Minimum superheat reference value	n10	1 K	12 K	4
MOP (max = off)	n11	0.0 bar	60 bar	60
Period (only if an AKV/A valve is used)	n13	3 s	10 s	6
Stability factor for superheat control. Should be changed only by qualified specialists	n18	0	10	5
Gain attenuation near the reference value Should be changed only by qualified specialists	n19	0.2	1.0	0.3
Superheat amplification factor Should be changed only by qualified specialists	n20	0.0	10.0	0.4
Superheat control: 1: MSS, 2: LOADAP	n21	1	2	1
Minimum superheat reference value for loads below 10%	n22	1	15	2
Standby temperature when valve closed (TQ valve only) Should be changed only by qualified specialists	n26	0 K	20 K	0
Standby temperature when valve open (TQ valve only) Should be changed only by qualified specialists	n27	-15 K	70 K	20
Maximum opening degree Should be changed only by qualified specialists	n32	0	100	100
Minimum opening degree Should be changed only by qualified specialists	n33	0	100	0
Miscellaneous				
Controller address	o03*	0	119	-
On/off switch (service pin message)	o04*	-	-	-
Valve and output signal: 0: off 1: TQ; AO: 0–20 mA 2: TQ; AO: 4–20 mA 3: AKV; AO: 0–20 mA 4: AKV; AO: 4–20 mA 5: AKV; AO: EKC 347 slave 6: ICM; AO: 0–20 mA / ICM OD% 7: ICM; AO: 4–20 mA / ICM OD%	o09	0	7	0
Input signal on analog input AIA: 0: no signal 1: temperature setpoint (0–20 mA) 2: temperature setpoint (4–20 mA) 3: superheat reference offset (0–20 mA) 4: superheat reference offset (4–20 mA)	o10	0	4	0
Line voltage frequency	o12	50 Hz	60 Hz	0
Standard display view (the item shown in parenthesis is displayed if the bottom button is pressed briefly) 1: superheat (temperature) 2: valve opening degree (superheat) 3: air temperature (temperature reference)	o17	1	3	1
Manual output control: Off: manual control disabled 1: relay for solenoid valve: select 'On' 2: AKV/A output: select 'On' 3: alarm relay activated (cut out)	o18	off	3	Off
Pressure transmitter working range – minimum value	o20	-1 bar	60 bar	-1.0
Pressure transmitter working range – maximum value	o21	-1 bar	60 bar	12
(function o09 setting; only with AKV and TQ) Set the temperature value or opening degree for the minimum output signal (0 or 4 mA)	o27	-70°C	160°C	-35
(function o09 setting; only with AKV and TQ) Set the temperature value or opening degree for the maximum output signal (20 mA)	o28	-70°C	160°C	15
Refrigerant: 1: R12, 2: R22, 3: R134a, 4: R502, 5: R717, 6: R13, 7: R13b1, 8: R23, 9: R500, 10: R503, 11: R114, 12: R142b, 13: user defined, 14: R32, 15: R227, 16: R401A, 17: R507, 18: R402A, 19: R404A, 20: R407C, 21: R407A, 22: R407B, 23: R410A, 24: R170, 25: R290, 26: R600, 27: R600a, 28: R744, 29: R1270 30=R417A. 31=R422A. 32=R413A. 33=R422D. 34=R427A. 35=R438A	o30	0	35	0

Service		
TQ valve actuator temperature	u04	°C
Reference value for valve actuator temperature	u05	°C
Analog input AIA (18-19)	u06	mA
Analog output AO (2-5)	u08	mA
Read status of DI input	u10	on/off
Thermostat cut-in time	u18	Min.
S2 sensor temperature	u20	°C
Superheat	u21	K
Superheat reference value	u22	K
Read AKV valve opening degree	u24	%
Read evaporating pressure	u25	bar
Read evaporating temperature	u26	°C
S3 sensor temperature	u27	°C
Temperature reference	u28	°C
Read pressure transmitter input signal	u29	mA

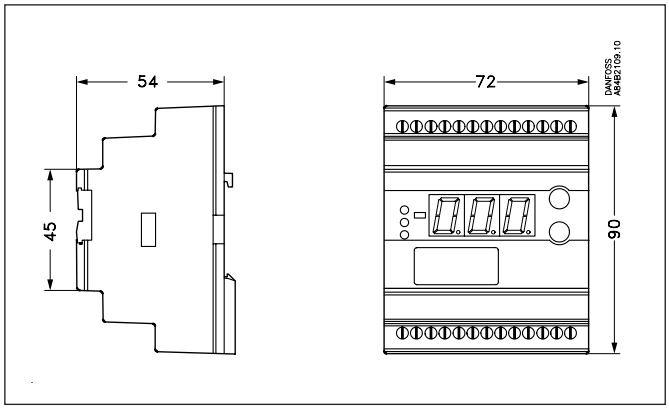
* This setting is only possible if a data communication module is fitted in the controller.

Technical data

Supply voltage	24 V AC ±15% 50/60 Hz, 80 VA (the supply voltage is galvanically isolated from the input and output signals)	
Power consumption	Controller AKV coil	5 VA 55 VA
Input signals	Current signal	4–20 mA or 0–20 mA
	Pressure transmitter	4–20 mA from AKS 33
	Digital input from external contact function	
Sensor input	2 Pt 1000 ohm	
Output signal	Current signal	4–20 mA or 0–20 mA
	Load	200 ohm max.
Relay outputs	1 SPST	AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Alarm relay	1 SPST	
ICAD	ICAD fitted to ICM	Current signal 4–20 mA or 0–20 mA
Data communication	A data communication module can be connected	
Ambient conditions	-10 to +55°C (operating) -40 to +70°C (transport)	
	20 to 80% RH, non condensing	
	No shock load or vibration	
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Terminals	max. 2.5 mm² stranded	
Approvals	Compliant with EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9 EMC tested in accordance with EN 61000-6-3 and EN 61000-4-(2-6,8,11)	



Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.



Ordering data

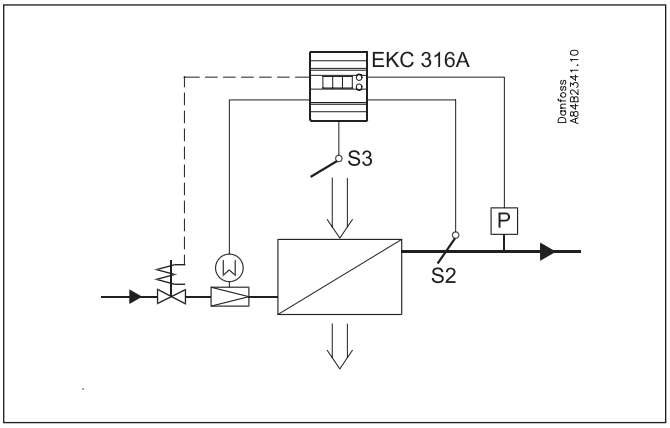
Type	Functional description	Code
EKC 315A	Superheat controller	**084B7086**
EKA 175	Data communication module (accessories), (RS 485 module)	**084B8579**
EKA 174	Data communication module (accessories), (RS 485 module) with galvanic isolation	**084B7124**

Additional information available:
Manual: DKRCI.PS.RP0.D

EKC 316A

Application
This controller/valve combination can be used in applications that require precise control of superheating and temperature in connection with refrigeration.
For example:
- Processing plants (water chillers)
- Cold storage plants (air coolers)
- Air conditioning systems

Advantages
- Optimum evaporator charge, even with large variation in load and suction pressure
- Energy savings: adaptive regulation of refrigerant injection ensures optimum evaporator utilisation and thus high suction pressure
- Superheating is maintained at the lowest possible level, and at the same time the media temperature is controlled by the thermostat function

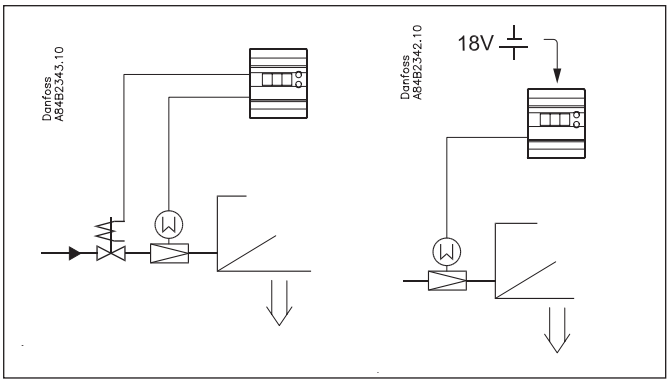


Functional description
- Superheat regulation
- Temperature control
- MOP function
- On/off input for starting and stopping regulation
- The superheat reference or temperature reference can be offset by an input signal
- Alarm if preset alarm limits are exceeded
- Relay output for solenoid valve
- PID control

System description
Evaporator superheating is controlled by a pressure transmitter P and a temperature sensor S2.
The expansion valve is equipped with a type ETS stepper motor.

If temperature control is required, it can be implemented using the signal from a temperature sensor S3 located in the air flow ahead of the evaporator. Temperature control is provided by an on/off thermostat that enables liquid flow when cooling is required (the ETS valve opens and the thermostat relay cuts in).

For safety reasons, the liquid flow to the evaporator must be cut off if the controller experiences a power failure. The ETS valve is fitted with stepper motor, so it will remain open in this situation. There are two ways to deal with this situation:
- fit a solenoid valve in the liquid line
- install battery backup for the valve



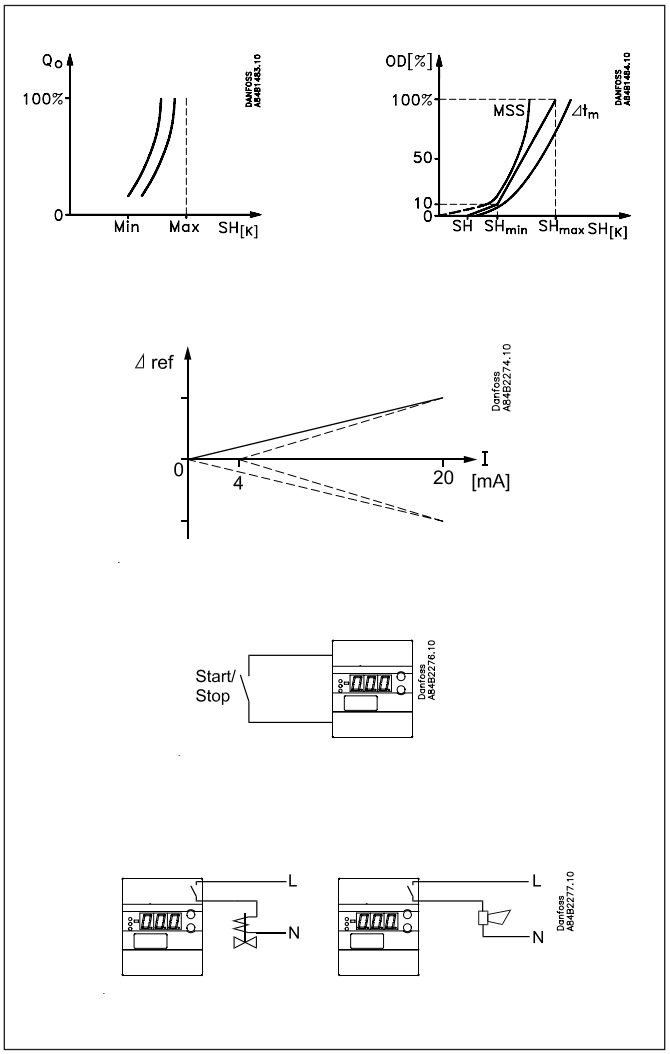
Superheat function
There are two selectable superheat options:
- adaptive superheat
- load-defined superheat

MOP
The MOP function limits the valve opening degree when the evaporating pressure is higher than the set MOP value.

Override function
The temperature reference or superheat reference can be offset using an analog input signal. This can be a 0–20 mA signal or a 4–20 mA signal. The reference offset can be positive or negative. This signal can be used to override the valve opening degree.

External regulation start/stop
The controller can be started and stopped externally by a contact function connected to input terminals 1 and 2. Regulation is stopped when the contact is open. This must be done when the compressor is stopped. The controller then closes the solenoid valve to stop refrigerant flow to the evaporator.

Relays
The relay for the solenoid valve is energised when cooling is required. The alarm relay operates such that the contact is cut in when an alarm condition is present and when the controller is de-energised.



Menu overview

SW: 1.2x

Functional description	Parameter	Min.	Max.	Factory setting
Standard display				
Shows current superheat level, valve opening degree or temperature. The view is defined in o17.	-		K	
Briefly press the lower button (1 s) to see the current opening degree of the expansion valve. The view is defined in o17.	-		%	
Reference				
Required thermostat set point	- *	-60°C	50°C	3.0
Differential	r01 *	0.1 K	20.0 K	2.0
Units (0: °C and bar; 1: °F and psig)	r05	0	1	0
External contribution to the reference	r06	-50 K	50 K	0..0
Correction of signal from S2	r09	-10.0 K	10.0 K	0.0
Correction of signal from S3	r10	-10.0 K	10.0 K	0.0
Refrigeration start/stop	r12	Off	On	On
Thermostat operation: (0: no thermostat function, 1: on/off thermostat)	r14	0	1	0
Alarm				
Upper excursion (above the temperature setting)	A01 *	3 K	20 K	5
Lower excursion (below the temperature setting)	A02 *	1 K	10 K	3
Alarm's time delay	A03 *	0 min	90 min	30
Battery monitoring	A34	Off	On	Off
Control parameters				
P: amplification factor Kp	n04	0.5	20	3.0
I: integration time T	n05	30 s	600 s	120
D: differentiation time Td (0 = off)	n06	0 s	90 s	0
Maximum superheat reference value	n09	2 K	30 K	10
Minimum superheat reference value	n10	1 K	12 K	4
MOP (max = off)	n11	0.0 bar	20 bar	20
Signal reliability during start-up. Safety interval. Should be changed only by qualified specialists	n15	0 s	90 s	0
Signal reliability during start-up – initial opening degree. Should be changed only by qualified specialists	n17	0	100	0
Stability factor for superheat control. Should be changed only by qualified specialists	n18	0	10	5
Gain attenuation near the reference value Should be changed only by qualified specialists	n19	0.2	1.0	0.3
Superheat amplification factor Should be changed only by qualified specialists	n20	0.0	10.0	0.4
Superheat control: 1: MSS, 2: LOADAP	n21	1	2	1
Minimum superheat reference value for loads below 10%	n22	1 K	15 K	2
Maximum opening degree Should be changed only by qualified specialists	n32	0%	100%	100
The n37 to n42 parameters are configured for a type ETS 50 valve and should be changed only if a different type of valve is used.				
Number of steps from 0 to 100% opening degree (x10) ETS 50: 263) ETS 100: 353)	n37	000 steps**	5000 steps **	263
Number of steps per second	n38	10 step/s	300 step/s	250
Compensation for spindle play at valve closed position	n39	0 steps	100 steps	50
Compensation for spindle play in the control range	n40	0 steps	100 steps	100
Valve state in case of power interruption: 1: NC, 2: NO (special application)	n41	1	2	1
Compensation for spindle play at the closed position is applied: 1: when the valve opens; 2: when the valve closes	n42	1	2 steps	1
Attenuation factor for inner loop	n43	0,1	1	0.4
Integration time of inner loop (TnT0)	n44	10 s	120 s	30
Safety margin for lower temperature difference for inner loop	n45	1 K	20 K	3.0
Miscellaneous				
Controller address	o03***	0	119	0
On/off switch (service pin message)	o04***	-	-	-
Input signal on analog input AIA: 0: no signal 1: temperature setpoint (0–20 mA) 2: temperature setpoint (4–20 mA) 3: superheat reference offset (0–20 mA) 4: superheat reference offset (4–20 mA) 5: Forced control of maximum valve opening degree (0–20 mA) 6: Forced control of maximum valve opening degree (4–20 mA)	o10	0	6	0
Line voltage frequency	o12	50 Hz	60 Hz	50
Standard display view 1: superheat 2: valve opening degree 3: air temperature	o17	1	3	1
Manual output control: Off: manual control disabled 1: relay for solenoid valve: select 'On' 2: relay for solenoid valve: select 'Off' 3: alarm relay activated (cut out) 4: forced control of valve opening degree (0–20 mA) 5: forced control of valve opening degree (4–20 mA) Parameter o45 is active if setting 1, 2 or 3 is selected	o18	off	5	0
Pressure transmitter working range – minimum value	o20	-1 bar	60 bar	-1.0
Pressure transmitter working range – maximum value	o21	-1 bar	60 bar	12.0
Refrigerant: 1: R12, 2: R22, 3: R134a, 4: R502, 5: R717, 6: R13, 7: R13b1, 8: R23, 9: R500, 10: R503, 11: R114, 12: R142b, 13: user defined, 14: R32, 15: R227, 16: R401A, 17: R507, 18: R402A, 19: R404A, 20: R407C, 21: R407A, 22: R407B, 23: R410A, 24: R170, 25: R290, 26: R600, 27: R600a, 28: R744, 29: R1270	o30	0	29	0
Manual control of the valve opening degree. The function is available only if o18 is set.	o45	0%	100%	0
Control mode: 1: standard 2: with inner loop (T0) 3: with inner loop (S media temperature minus T0)	o56	1	3	1
Service				
Analog input AIA (16-17)	u06			mA
Read status of DI input	u10			on/off
Thermostat cut-in time	u18			Min.
S2 sensor temperature	u20			°C
Superheat	u21			K
Superheat reference value	u22			K
Read AKV valve opening degree	u24			%
Read evaporating pressure	u25			bar
Read evaporating temperature	u26			°C
S3 sensor temperature	u27			°C
Temperature reference	u28			°C
Read pressure transmitter input signal	u29			mA

* Used only when thermostat function is selected (r14 = 1)

** The controller display is limited to three digits, but the setting is a four-digit value Only the three most significant digits are shown. For example, a setting of 2500 is displayed as 250.

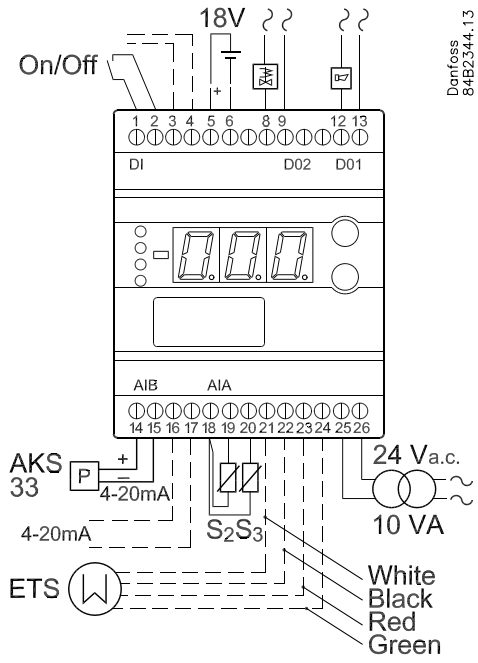
*** This setting is only possible if a data communication module is fitted in the controller.

The configuration settings can be accessed only when regulation is stopped.

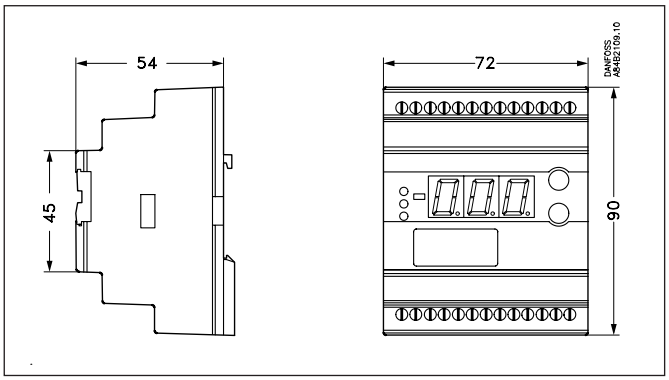
Technical data

Supply voltage	24 V a.c. ±15% 50/60 Hz, 10 VA (the supply voltage is galvanically isolated from the input and output signals)	
Power consumption	Controller ETS stepper motor	5 VA 1.3 VA
Input signals	Current signal	4–20 mA or 0–20 mA
	Pressure transmitter	4–20 mA from AKS 33
	Digital input from external contact function	
Sensor input	2 Pt 1000 ohm	
Thermostat relay	1 SPST	AC-1: 4 A (resistive) AC-15: 3 A (inductive)
Alarm relay	1 SPST	
Stepper motor output	Pulsed 100 mA	
Data communication	A data communication module can be connected	
Ambient conditions	-10 to +55°C (operating) -40 to +70°C (transport)	
	20 to 80% RH, non condensing	
	No shock load or vibration	
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Approvals	Compliant with EU Low Voltage Directive and EMC requirements for CE marking LVD tested in accordance with EN 60730-1 and EN 60730-2-9 EMC tested in accordance with EN 61000-6-3 and EN 61000-4-(2-6,8,11)	

Battery specification if battery backup is used: 18 V d.c., 100 mAh (min.)



Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.



Ordering data

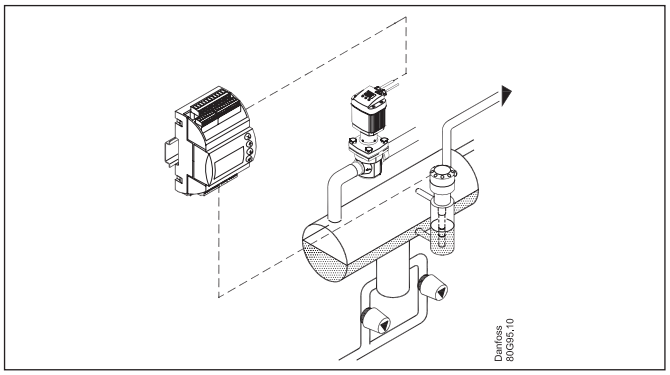
Type	Functional description	Code
EKC 316A	Superheat controller	**084B7088**
EKA 175	Data communication module (accessories), (RS 485 module)	**084B8579**
EKA 174	Data communication module (accessories), (RS 485 module) with galvanic isolation	**084B7124**

Additional information available:
Manual: RS8CX

EKE 347

Application

This controller is used to regulate the refrigerant level in:
- Pump reservoirs
- Separators
- Intermediate coolers
- Economisers
- Condensers
- Receivers



System description

A signal transmitter constantly measures the refrigerant liquid level in the container. The controller receives the signal and regulates the valve to control the refrigerant level according to liquid level setpoint.

Signal transmitter

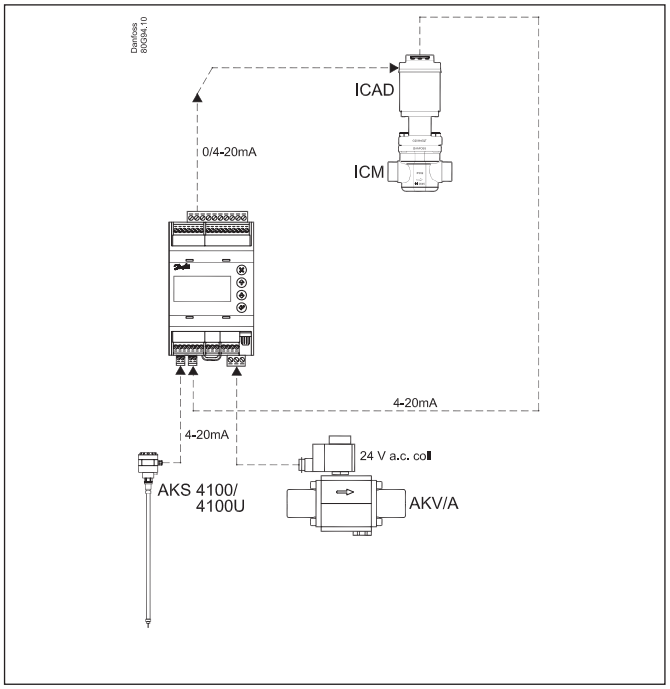
The desired refrigerant liquid level can be set within a wide range using a capacitive rod sensor.

EKE 347

The controller receives a signal and uses it to control low-side or high-side applications. The setpoint can be offset by an analog input signal (voltage or current), thus enabling remote setpoint adjustment.

The EKE 347 supports two types of Danfoss expansion valves (see below).

One analog input is available for a feedback signal from the ICM valve that indicates the opening degree of the valve.



Expansion valve

Two types of Danfoss expansion valves can be used: ICM and AKV/AKVA.

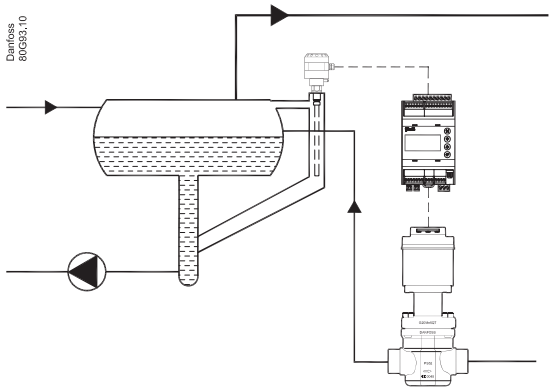
ICM is a direct-operated motorised valve driven by an ICAD digital stepper motor.

AKV and AKVA are pulse-width modulated expansion valves.

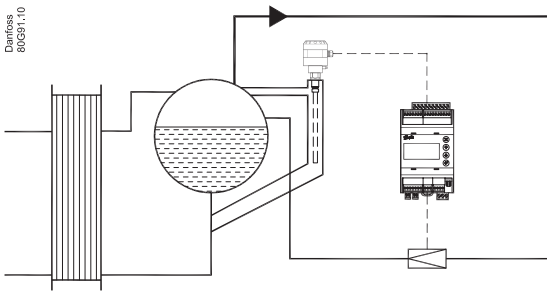
Functional description

- Liquid level control
- Alarm if preset alarm limits are exceeded
- Relay outputs for upper and lower level limits and alarm level
- Reference offset dependent on an analog input signal
- PI control
- Low-side or high-side control
- If an AKV or AKVA valve is used, a master/slave system can operate up to three valves with various opening degrees.
- Manual output control
- Opening degree limitation possible
- On/off operation with hysteresis

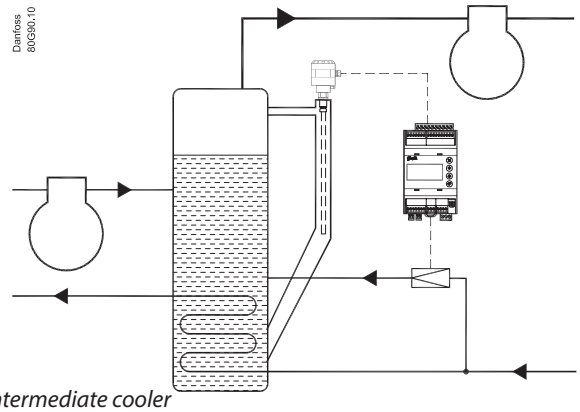
Application examples



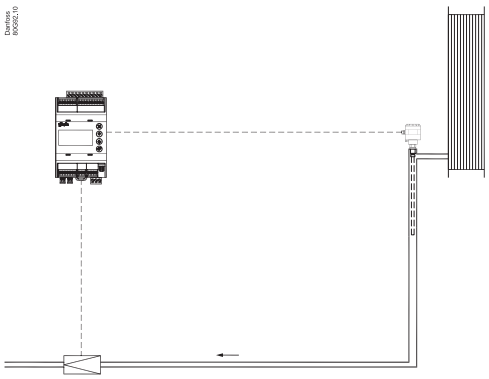
Pump reservoir
Modulated injection control increases the stability of the liquid level and suction pressure.



Separator on flooded evaporator
The combination of modulated control and large capacity range of the valve ensures a stable level, even under quickly changing load conditions.



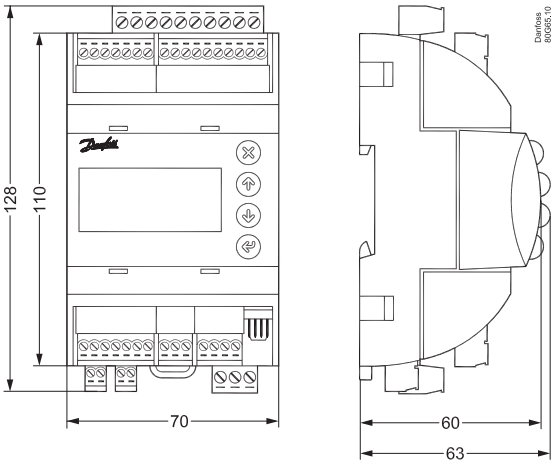
Intermediate cooler
The wide measuring range of the level transmitter enables it to detect the liquid level of the reservoir over the full level range, which means the signal can also be used for safety monitoring of the maximum allowable level.



Receiver/condenser
The short response time of the control system makes it highly suitable for high-pressure float systems with small refrigerant charges.

Ordering

Type	Function	Code no.
EKE 347	Liquid level controller	**080G5000**



Additional information available:
Manual: DKRCI.PD.RP0.A

Programmable controllers

MCX

Application
This is almost up to you. As long as the hardware input/output feature meet the requirements of your application

Advantage
Open programmable standard.
Can receive client-specific software.
Danfoss has programmes that can be configured for the most current client-specific regulation.

Regulations
Together with our clients, we have developed a line of controllers that are designed for specific applications.
These contain no superficial features or settings that might confuse the end user. Instead, they are fitted with what is needed, and no more.

We have a great deal of experience with the following applications. You can see more in the manuals displayed.

- *Chiller*
- *Roof top*
- *Air handler HVAC*
- *FanCoil*
- *Light control*
- *Residential heat pump*
- *Waterloop*
- *Close control*

Software
The development of an application includes:
- C-editor
- Graphic user interface editor
- Graphic logic editor
- MCX compiler and debugger
- MCX PC simulator
- Modbus PC communication interface

Approvals

Building management system
The MCX product range offers a wide range of communication options based on open standards:
- Integration with Building Management System via MODBUS directly
- System integration with other protocols, e.g. LONWORKS and BACnet
- Web pages for internet or intranet access
- Remote access via modem or MODBUS over TCP/IP
- Data logging.

Examples displays

Type	MCX06C	MCX06D	MCX061V	MCX08M	MCX15B	MCX20B
Analog inputs						
NTC 0/1V, 0/5V *	2	2		4	4	6
NTC, Pt1000, 0/1V, 0/5V, 0/10V, ON/OFF, 0/20mA, 4/20mA *	2	2	3	4	6	10
NTC, 0/1V, 0/5V, 0/10V, ON/OFF, 0/20mA, 4/20mA *			2			
Superheat S1: 0/1V, 0/5V, 0/10V, ON/OFF, 0/20mA, 4/20mA *			1			
Superheat S2: PT1000, 0/1V, 0/5V, 0/10V, ON/OFF *			1			
Digital inputs						
24 V optoisolated					18	22
++230 V a.c. optoisolated					4	4
Voltage free contact	6	8	8	8		
Max number					18	22
Analog outputs						
0/10 V d.c.			2			
0/10 V d.c. optoisolated				2	4	6
0/10 V d.c. PWM, PPM *	1	2	1			
PWM, PPM cutting phase	1	1		2	2	
Digital outputs						
SPST relay 5 A	6	5	6			
SPST relay 8 A				2	9	13
SPDT relay 8 A		1		4	4	4
SPST relay 16 A				2		2
SPDT relay 16 A					2	1
SSR 24 V a.c. / 230 V a.c. (optional)		1		2	4	4
Stepper motor			1			
Max number		6	6	8	15	20
Power supply						
20/60 V d.c. - 24 V a.c.	•	•	°	°	°	°
110-230 V a.c. – 50/60 Hz			°	°	°	°
Isolated power supply	•	•	•	•	•	•
Others						
Connection for programming key	•	•	•	•	•	•
Connection for remote display and keyboard	•	•	•	•	•	•
Buzzer		•	•	•	•	•
CANbus	•	•	•	•	•	•
RTC clock	°	°	•	•	•	•
Modbus RS485 serial interface (optional)	1 not isolated	1	2	1	2	2
Ethernet/ Web server			°			
Memory card slot			•			
Dimensions	33x75mm	4DIN	8DIN	8DIN	16DIN	16DIN
Mounting	Panel	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail

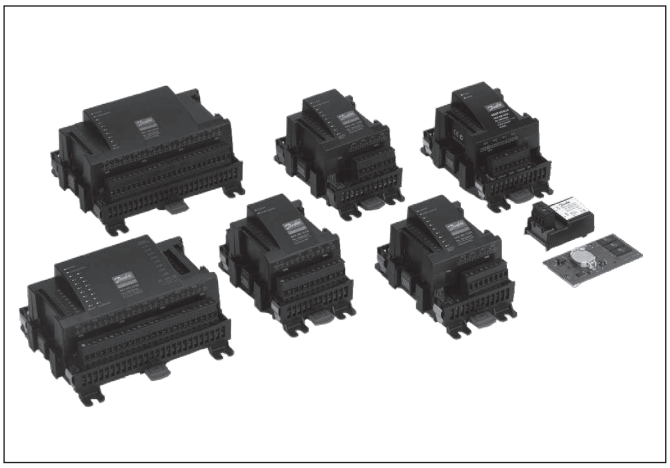
*) selectable via software
• Available for all models
° Available for some models

Additional information available:
Brochure: DKRCE.PB.RH0.A
Chiller - Manual: DKRCC.ES.RI0.A
Roof top - Manual: DKRCC.PS.RI0.G
Air handler - Manual: DKRCC.PS.RI.A

I/O modules for AK series

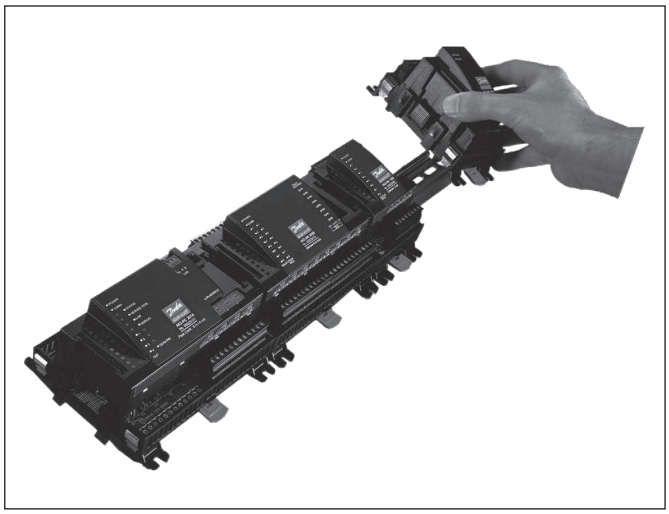
Introduction

Any member of the controller family can be expanded if the system is enlarged. The controller is designed for refrigeration control systems, but not for any specific application. It can be adapted to a particular application by loading the appropriate software and choosing specific connections.
The same modules can be used for any desired control task, and the configuration can be modified as necessary. These modular building blocks can be used to construct a wide variety of control systems. The refrigeration engineer or installer must configure the system according to the actual needs, and these instructions will help you answer find the right answers to your questions so you can define the control system and make the right connections. Controller programming and setup is described elsewhere.



Application

Controller for refrigeration control systems. See the descriptions of various control applications, such as:
- Capacity regulation of compressor and condenser groups
- Evaporator control of refrigeration and freezer appliances
- Network control



Advantages
- The controller can grow with your system
- The software can be configured for single or multiple control loops
- A variety of control systems can be implemented using the same component
- Easy expansion in case of altered system requirements
- Flexible concept:
  - Controller family with common form factor
  - A single basic design supports a wide variety of applications
  - Modules can be selected to suit actual I/O needs
  - The same modules can be used for different control tasks

Basic description
- The controller module can handle the needs of relatively small, simple systems.
- Extension modules
  Extension modules can be added to the controller for use in more complex systems or when additional I/O capacity is needed. A connector on the side of each module provides the supply voltage and supports data communication between the modules.
- Upper part
  The upper part of the controller module holds the intelligence. It defines the operation of the control system and serves as a network node for communication with other controllers in a larger network.
- Connections
  There are various types of inputs and outputs. Some inputs receive signals from sensors or switches, while others may receive a voltage signal. The outputs can be relay signals or other types of signals. The various input and output types are shown in the accompanying table.
- Connection options
  The control system design (configuration) determines the need for various inputs and outputs selected from the described types. These inputs and outputs must be assigned to the controller module or an extension module. Here it must be borne in mind that signal types cannot be mixed (for example, an analog input signal cannot be connected to a digital input).
- Programming inputs and outputs
  The controller needs to know where the individual input and output signals are connected. This is handled by the subsequent parameter configuration process, when each input and output is defined in the following terms:
  - the module that is used
  - the connection point (terminals or connector)
  - the type of device connected (e.g. pressure transmitter, type x, pressure range y)

UL: E166834

Module overview

Use the information in the controller manuals to define and select a suitable controller in this family.

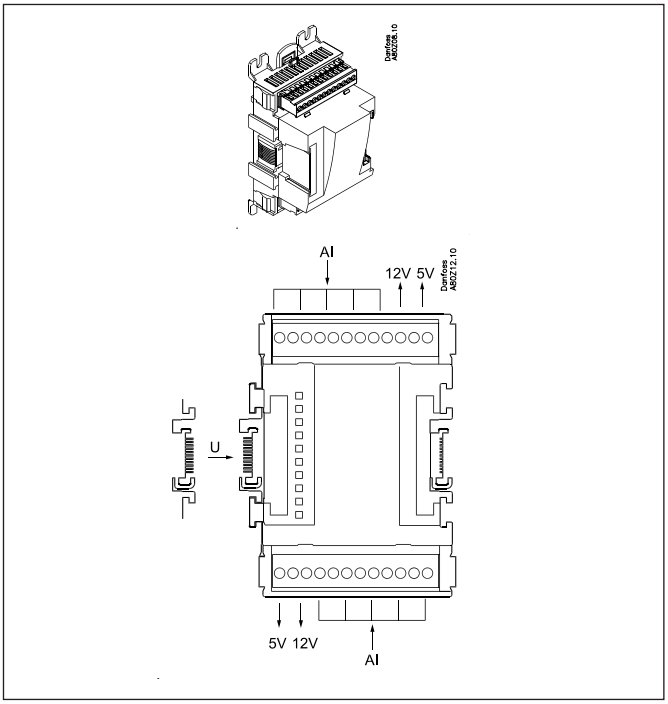
The data in the following table is intend for general information and reordering.

Type	Analog inputs	On/off outputs		On/off supply voltage (DI signal)		Analog outputs	Stepper outputs	Module with switches	Code
	For sensors, pressure transmitters, etc.	Relay (SPDT)	Solid state	Low voltage (80 V max.)	High voltage (260 V max.)	0–10 V d.c.	For valves with step control	For overriding relay outputs	With screw terminals
Controller	11	4	4	-	-	-	-	-	-
The controller module supports the I/O connections listed in the previous line. If additional connections are necessary, one of the modules listed below should be used.									
Extension modules									
AK-XM 101A	8								**080Z0007**
AK-XM 102A				8					**080Z0008**
AK-XM 102B					8				**080Z0013**
AK-XM 103A	4					4			**080Z0032**
AK-XM 107A pulse module									**080Z0020**
AK-XM 204A		8							**080Z0011**
AK-XM 204B		8						x	**080Z0018**
AK-XM 205A	8	8							**080Z0010**
AK-XM 205B	8	8						x	**080Z0017**
AK-XM 208C	8						4		**080Z0023**
AK-OB 110						2			**080Z0251**

Miscellaneous

Type	Functional description	Application	Code
AK-ST 500	Operating software for AK controllers	AK operation	**080Z0161**
-	Cable between PC and AK controller	AK Com port (length 3 m)	**080Z0262**
-	Cable between null modem cable and AK controller	AK RS 232 (length 1 m)	**080Z0261**
-	Cable between PC and controller	AK-USB	**084Z0264**
AK-OB 101A	Real time clock with battery backup	For installation in an AK controller	**080Z0252**
AK-PS 075	Power supply 18 VA	Can be mounted to the left of the controller	**080Z0053**
AK-PS 150	Power supply 36 VA	Can be mounted to the left of the controller	**080Z0054**
AK-PS 250	Power supply 60 VA	Can be mounted to the left of the controller	**080Z0055**
AK-CM 101A	Communication module for AK-SC 355 and AK-SC 255	Lon TP 78 data communication (not available in Europe)	**080Z0061**
AK-CM 101C		Lon RS 485 data communication	**080Z0063**
AK-CM 102	Communication module for AK-PC 781 etc.	Data communication for external extension modules	**080Z0064**

Extension module
AK-XM 101A



Functional description
This module has eight analog inputs for sensors, pressure transmitters, voltage signals and contact signals.

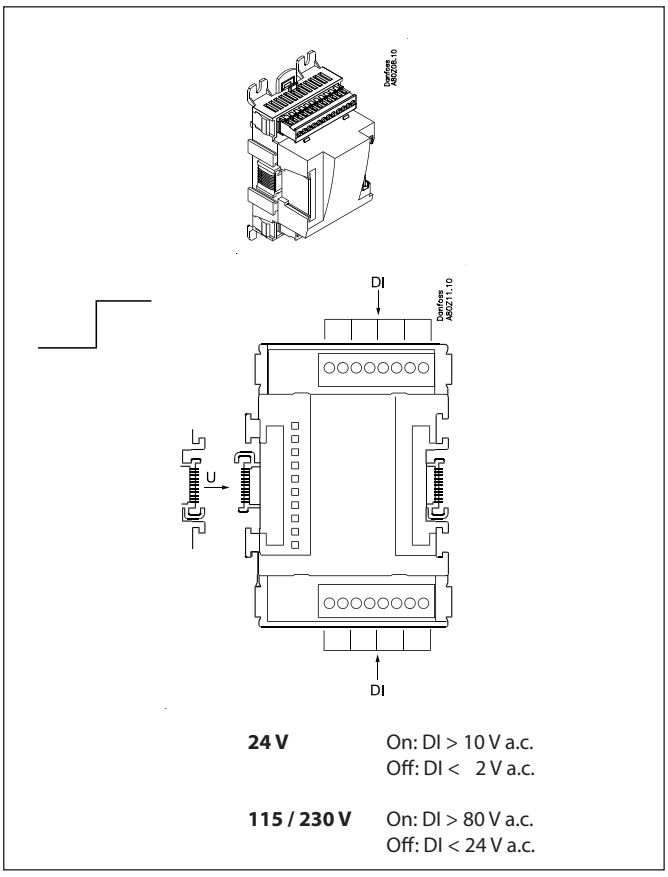
A pressure transmitter supply voltage can be taken from the 5 V output or the 12 V output.

Ordering data

Type	Function	Code No.
AK-XM 101A	Extension module for sensors, pressure transmitters, contact signals	**080Z0007**

Additional information available:
See controller manual.

Extension module
AK-XM 102A/B



Functional description
This module has eight inputs for on/off voltage signals.

LEDs
• Status of the individual inputs (voltage present when lit)

Ordering data

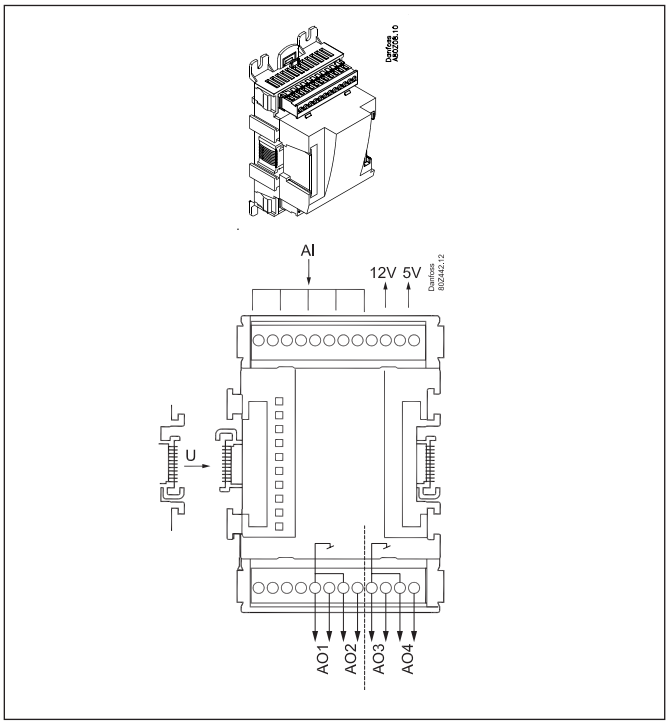
Type	Function	Code No.
AK-XM 102A	Extension module for on/off voltage signals Low voltage (24 V)	**080Z0008**
AK-XM 102B	Extension module for on/off voltage signals High voltage (230 V)	**080Z0013**

Additional information available:
See controller manual.

Extension module
AK-XM 103A

Functional description
This module has:
four analog inputs for sensors, pressure transmitters, voltage signals and contact signals
four voltage outputs (0–10 V)

A pressure transmitter supply voltage can be taken from the 5 V output or the 12 V output.



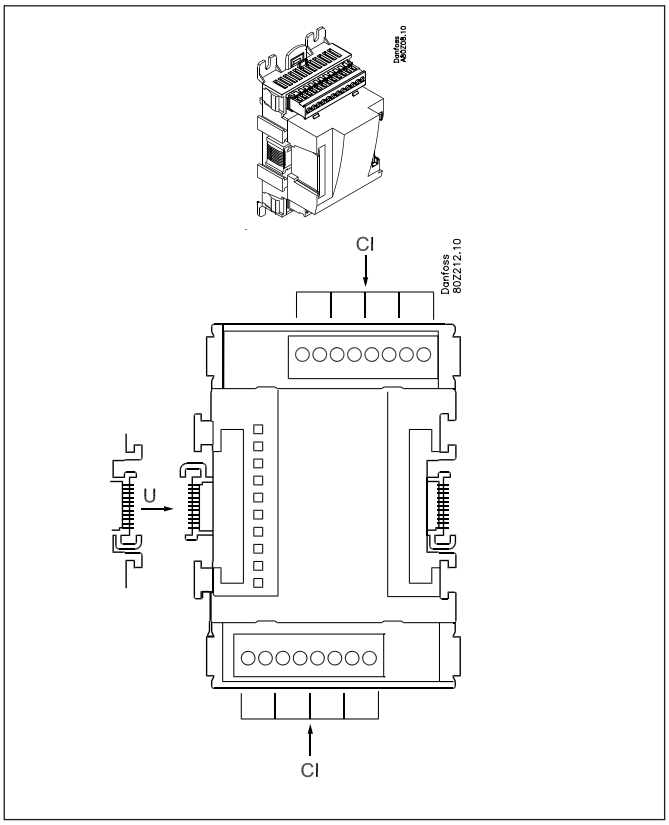
Ordering data

Type	Function	Code No.
AK-XM 103A	Extension module for sensors, pressure transmitters, contact signal, analog outputs	**080Z0032**

Additional information available:
See controller manual.
Technical brochure: RD8BS

Extension module
AK-XM 107A

Functional description
This module has eight digital inputs for detecting pulses or on/off signals from a switch function.
Pulses are detected in accordance with the DIN 43864/S01 interface specification.



Ordering data

Type	Function	Code No.
AK-XM 107A	Extension module for pulse measuring	**080Z0020**

Extension module
AK-XM 204A/B

Functional description
This module has eight relay outputs.

The AK-XM 204B has eight changeover switches at the front that can be use to override the relay functions and
force the relay output to Off or On.
Operation is governed by the controller in the Auto position.

LEDs
Status of outputs DO1 to DO8

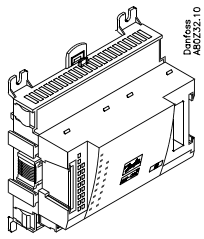
The AK-XM 204B also LEDs that indicate whether the relays are being overridden.
LED on: override active
LED off: no override

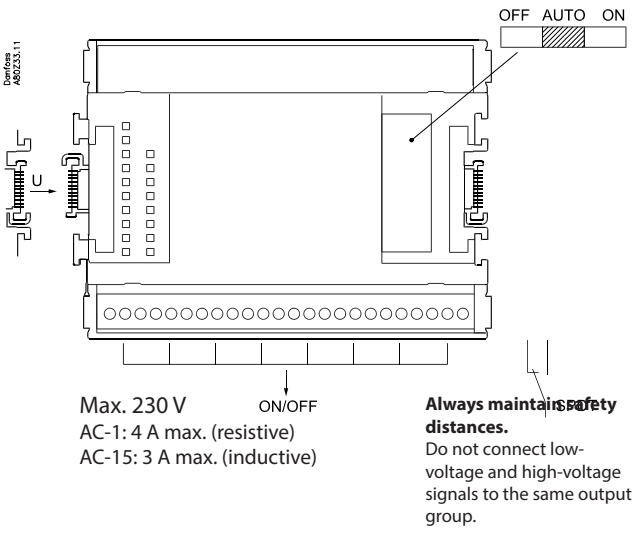
Fuses
Fuses for the individual outputs are located behind the upper front panel.

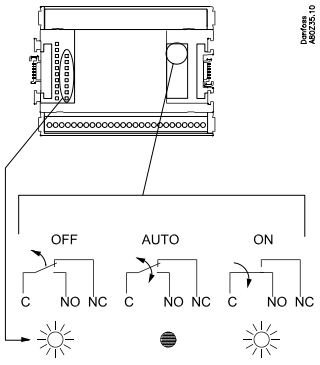
Ordering data

Type	Function	Code No.
AK-XM 204A	Extension module for on/off relay outputs	**080Z0011**
AK-XM 204B	Extension module for on/off relay outputs with overriding function	**080Z0018**

Additional information available:
See controller manual.







Extension module
AK-XM 205A/B

Functional description
This module has:
eight analog inputs for sensors, pressure transmitters, voltage signals and contact signals
eight relay outputs

The AK-XM 205B has eight changeover switches at the front that can be use to override the relay functions and
force the relay output to Off or On.
Operation is governed by the controller in the Auto position.

LEDs
Status of outputs DO1 to DO8

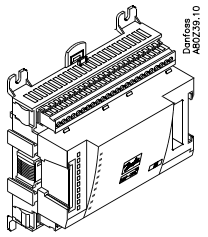
The AK-XM 205B also LEDs that indicate whether the relays are being overridden.
LED on: override active
LED off: no override

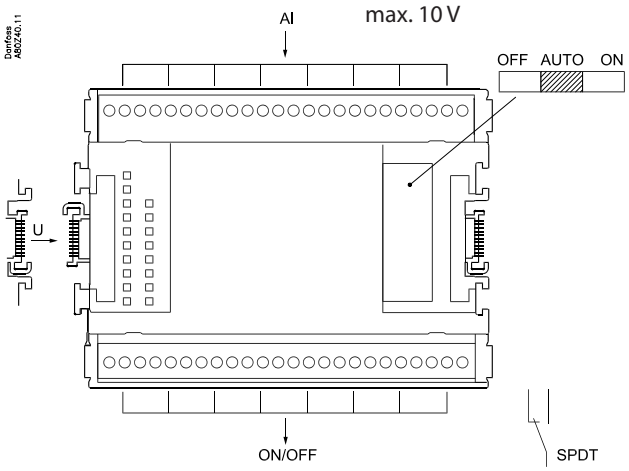
Fuses
Fuses for the individual outputs are located behind the upper front panel.

Ordering data

Type	Function	Code No.
AK-XM 205A	Extension module for sensors, pressure transmitters and on/ off outputs	**080Z0010**
AK-XM 205B	Extension module for sensors, pressure transmitters and on/ off output with overriding function	**080Z0017**

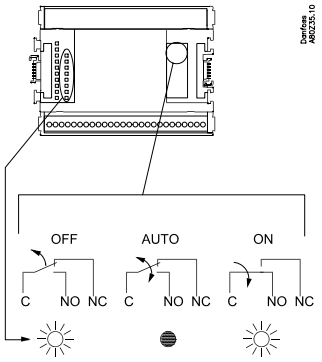
Additional information available:
See controller manual.





Max. 230 V
AC-1: 4 A max. (resistive)
AC-15: 3 A max. (inductive)

Always maintain safety distances.
Low and high voltage must not be connected to the same output group



Extension module
AK-XM 208C

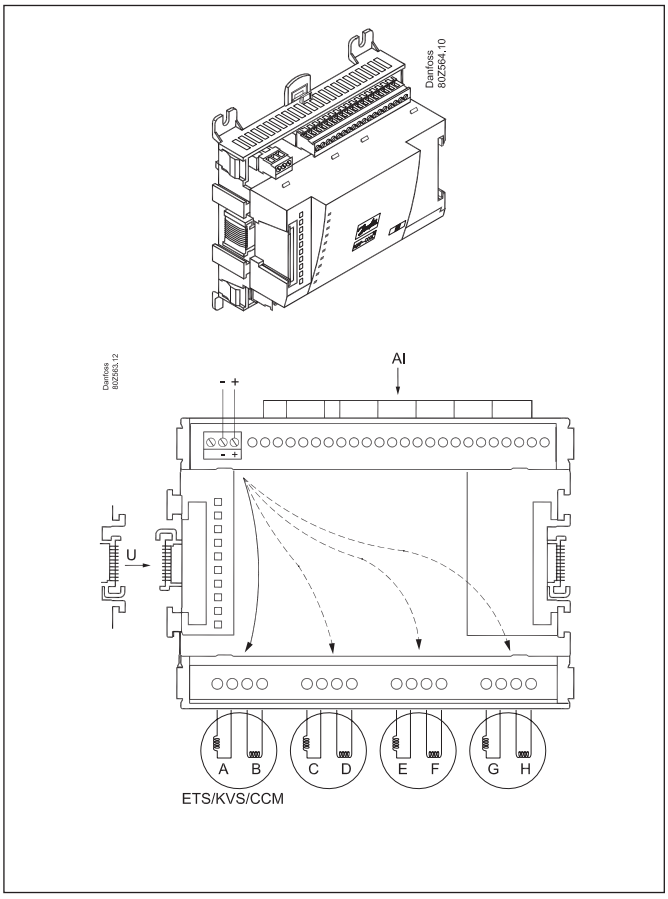
Functional description
This module has:
eight analog inputs for sensors, pressure transmitters, voltage signals and contact signals
four outputs for stepper motor valve e.g. ETS, KVS, CCM or CCMT.

Power supply
A separate power supply for the stepper motor valve must be connected.

Ordering data

Type	Function	Code No.
AK-XM 208C	Stepper output module	**080Z0023**

Additional information available:
See controller manual.



Extension module
AK-OB 110

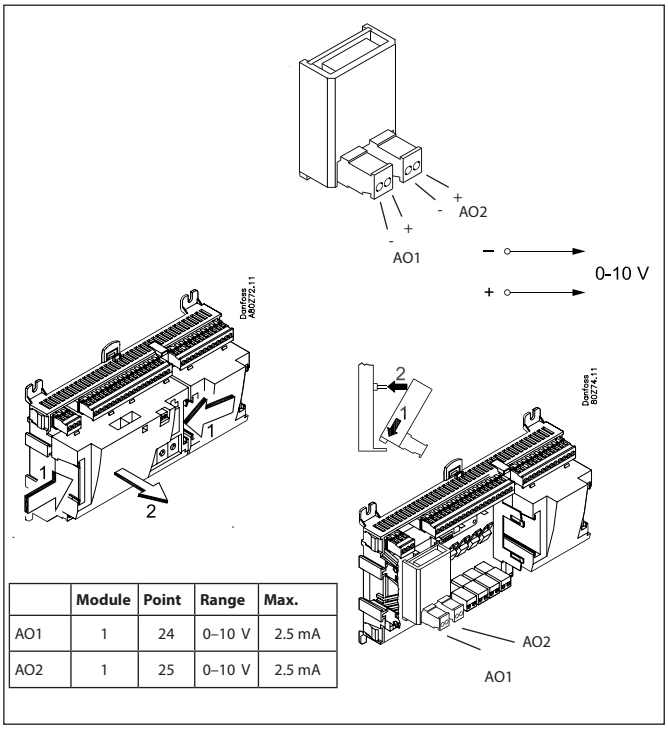
Functional description
This module has two analog voltage outputs (0–10 V).

Mounting
The module is fitted on the PCB of the controller module.

Ordering data

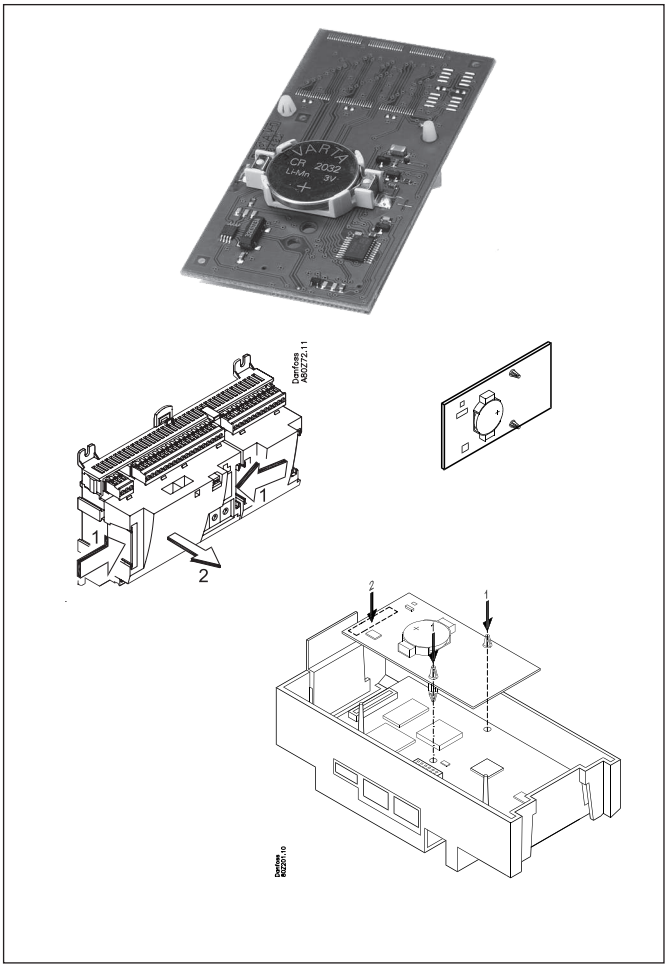
Type	Function	Code No.
AK-OB 110	Analog output module	**080Z0251**

Additional information available:
See controller manual.



	Module	Point	Range	Max.
AO1	1	24	0–10 V	2.5 mA
AO2	1	25	0–10 V	2.5 mA

Extension module
AK-OB 101A



Functional description
This module is a clock module with battery backup.

It can be used in controllers that are not linked to other controllers by a data communication module. The module is used in this situation if the controller needs a battery-backed clock for:
- clock functions;
- fixed day/night switching times;
- fixed defrost times;
- protection against loss of alarm log in the event of power failure
- protection against loss of temperature log in the event of power failure

Mounting
The module is fitted on the PCB inside the upper part of the controller.

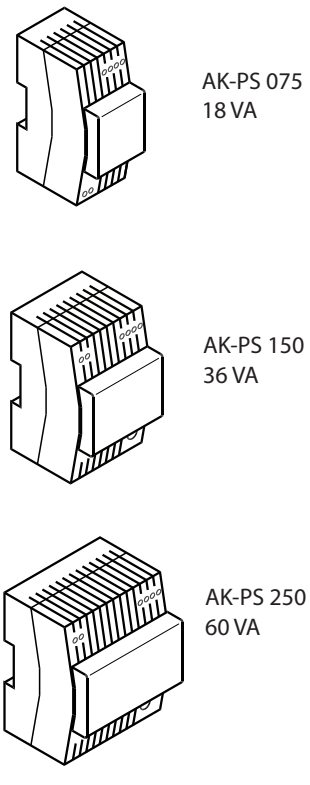
Battery life
The battery lifetime is several years, even if power failures occur frequently.
An alarm is generated when the battery needs to be replaced.
The battery still has several months of useful life when the alarm is first generated.

Ordering data

Type	Function	Code No.
AK-OB 101A	Real-time clock with battery backup.	**080Z0252**

Extension module
AK-PS 075 / 150 / 250

Power supply



Functional description
24 V d.c. power supply for controller

Supply voltage
115 or 230 V a.c. (operating range 100–240 V a.c.)

Mounting
DIN rail

Cannot be used with controllers that require an a.c. supply voltage

Ordering data

Type	Function	Code No.
AK-PS 075	Power supply, d.c., 18 VA	**080Z0053**
AK-PS 150	Power supply, d.c., 36 VA	**080Z0054**
AK-PS 250	Power supply, d.c., 60 VA	**080Z0055**

Additional information available:
See controller manual.

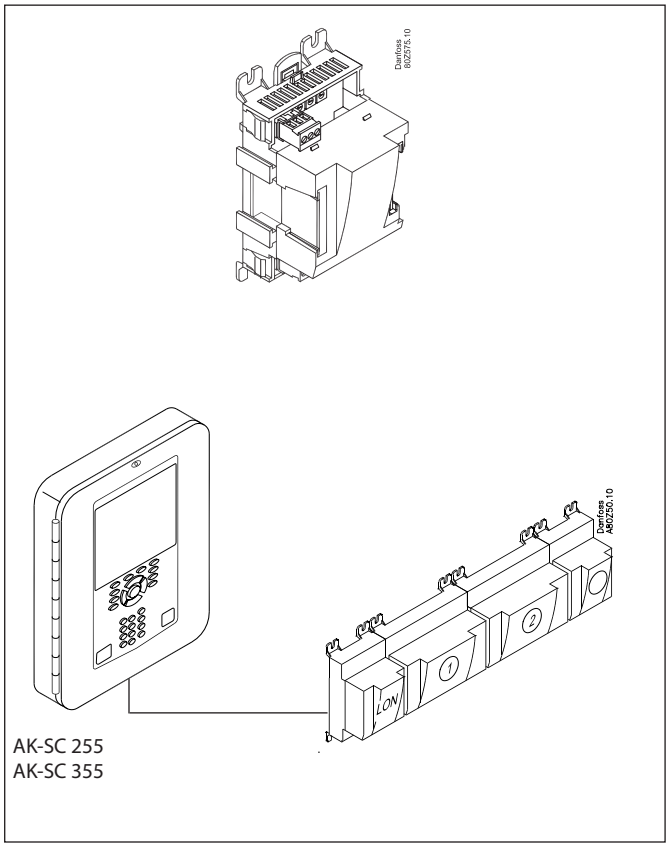
Communication module
AK-CM 101C

Function
The module is a communication module, meaning the row of extension modules can be placed in distance from the system unit.
The module communicates with the system unit via data communication and forwards information to the connected extension modules

Connection
Both the communication module and the system unit are fitted with LON RS 485 communication. Several AK-CM 101C modules can be connected to the same communication device.

Supply voltage
24 volt a.c. or d.c. should be connected to the communication module.
The terminals must **not** be earthed.
The power consumption is determined by the power consumption of the total number of modules.

Address
The Address of the communication module can be set from 1 to 99.

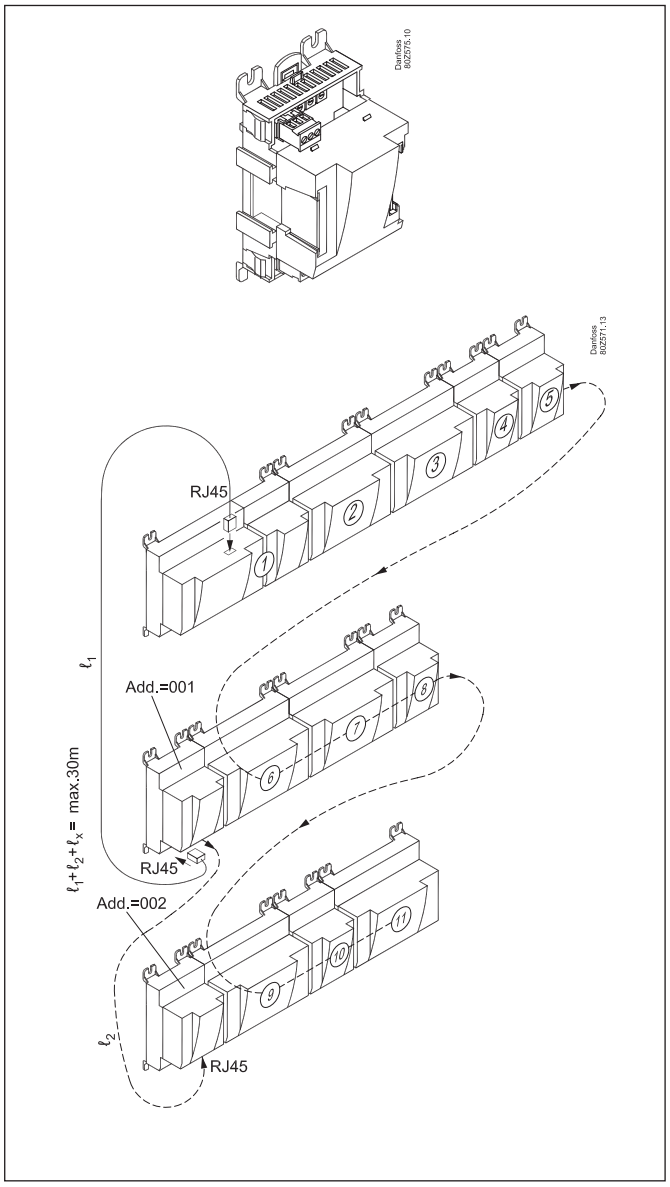


AK-SC 255
AK-SC 355

Ordering

Type	Function	Code no.
AK-CM 101C	Communication module	**080Z0063**

Communication module
AK-CM 102



Function
The module is a new communication module, meaning the row of extension modules can be interrupted.
The module communicates with the regulator via data communication and forwards information between the controller and the connected extension modules

Connection
Communication module and controller fitted with RJ 45 plug connectors.
Nothing else should be connected to this data communication; a maximum of 5 I/O communication modules can be connected to one controller.
The communication module can be used only with controllers of the type AK-PC 781, AK-PC 783, AK-LM 340, AK-LM 350.

Positioning
Max. 30 m from the controller
(Total length of communication cables = 30 m)

Supply voltage
24 volt a.c. or d.c. should be connected to the communication module. The 24 V can be sourced from the same supply that supplies the controller. (The supply for the communication module is galvanically separated from the connected extension modules).
The terminals must not be earthed.
The power consumption is determined by the power consumption of the total number of modules.

Ordering

Type	Function	Code no.
AK-CM 102	Communication module	**080Z0064**

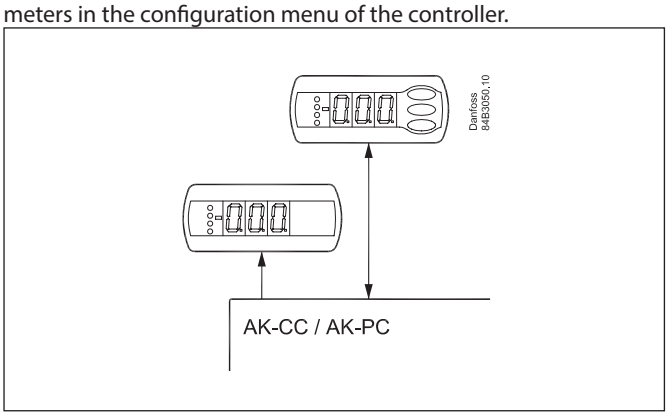
Display

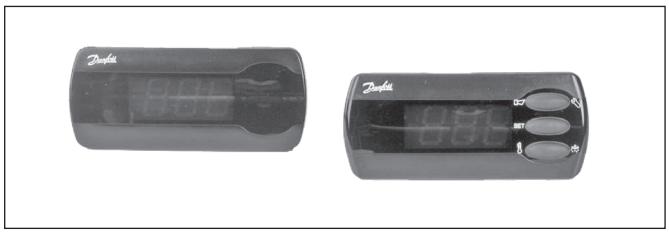
EKA 163 / 164

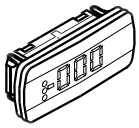
Application
These displays can be used with certain controllers in the AK and EKC series, such as AK-CC and AK-PC.

The EKA 163 do not has control buttons. It can be mounted on a refrigeration appliance so that customers can see the temperature of the refrigerated items.

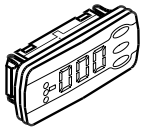
The EKA 164 has control buttons, so it can be used to set parameters in the configuration menu of the controller.







Display module for measured value

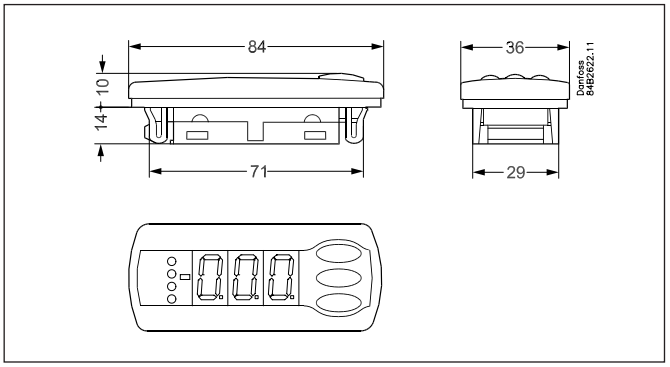


Display module for measured data with control buttons for configuring controller parameters

Technical data

Supply voltage	12 V ±15% (from controller)	
Display operation	Display accuracy in measuring range: 0.1°C EKA163, LED, 3 digits EKA 164, LED, digits, control buttons	
Electrical connection	EKA 163A EKA 164A	Screw terminals
	EKA 163B EKA 164B	Connector
Data communication	A version	RS 485* and TTL
	B version	TTL
Ambient conditions	-10 to 55°C (operating) -40 to 70°C (transport)	
	20 to 80% RH, non condensing	
	No shock load or vibration	
Enclosure	Rear:	IP 20
	From front:	IP 65

* Data communication must be installed in accordance with the requirements specified in technical brochure RC8AC.



Ordering data
There are 2 types: type A and type B.
Type A has a more versatile data communication interface that supports both RS 485 and TTL.
Type A can be used in place of type B,
but a type B module cannot be used when the controller requires a type A interface.

See also the ordering data of the controller that will provide the signals to the display. It includes the recommended display type.

Type	Description		Code
EKA 163A	Display unit	Screw terminals	**084B8562**
EKA 163B		With connector	**084B8574**
EKA 164A	Display unit with operation buttons	Screw terminals	**084B8563**
EKA 164B		With connector	**084B8575**
	Cable for display unit (2 m with plug)	Qty 1	**084B7298**
		Qty 24	**084B7179**
	Cable for display unit (6 m with plug)	Qty 1	**084B7299**
		Qty 24	**084B7097**
	Cable for display unit (3 m with plug)	Qty 24	**084B7099**
	Cable for display unit (9 m with plug)	Qty 24	**084B7630**

Display console

This console can be used with an EKA 163 or EKA 164 display module.

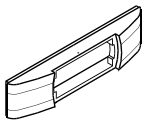
The console can be used on refrigeration appliances where the display cannot be recessed in the front panel.

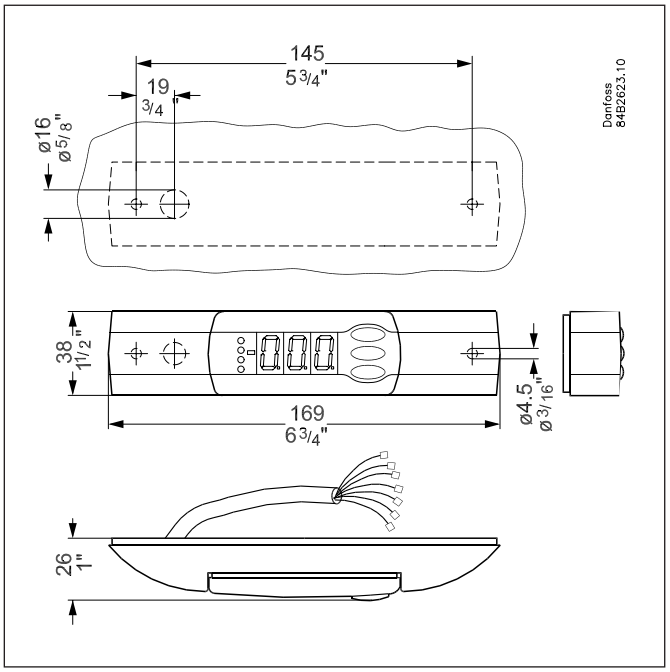
The console is secured with two screws, and the display cable is routed to the rear.

Technical data

Mounting	On plate with two screws (screws included)
Enclosure	IP 65

Ordering data

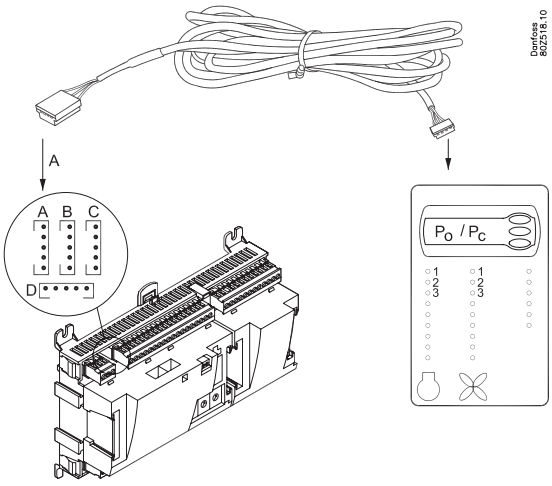
Description	Application	Code
Mounting kit	With EKA 163 or EKA 164	**084B8584**
		



EKA 166

This display can be used with AK-PC 710 and AK-PC 781 compressor controllers.
It shows P0 or Pc and the control loop status relative to the neutral zone.
The LEDs on the panel correspond to the connected compressors and condensers.

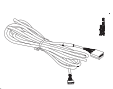
There are LEDs for the following functions:
- Compressors
- Fans
- Speed control
- Digital input
- Optimisation
- Alarm



Technical data

Power supply	From controller
Display operation	Display accuracy in measuring range: 0.1°C LED, three digits, control buttons
Electrical connection	Plug
Ambient conditions	-10 to +50°C (operating) -40 to +70°C (transport)
	20 to 80% RH, non condensing
	No shock load or vibration
Mounting	Front panel
Enclosure	IP 65

Ordering data

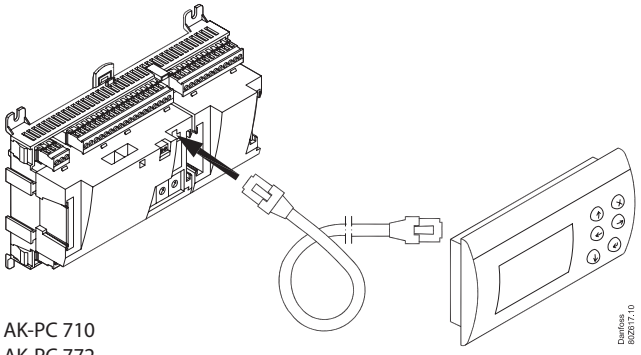
Description		Type	Code no.
Display unit with control buttons and LEDs		EKA 166	**084B8578**
Cable to display unit (2 m with plug)	Qty 1		**084B7298**
	Qty 24		**084B7179**
Cable to display unit (6 m with plug)	Qty 1		**084B7299**
	Qty 24		**084B7097**
Cable to display unit (3 m with plug)	Qty 24		**084B7099**
Cable to display unit (9 m with plug)	Qty 24		**084B7630**

Additional information available:
AK-PC 710-Manual: RS8FT
AK-PC 781-Manual: RS8GG

AK-MMI / MMIGRS2

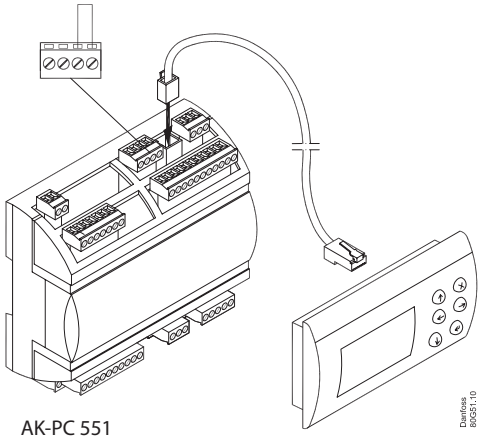
Application
The display can be used together with selected compressor control in the AK-PC series.
The displayet will show status on the compressor control and on the condenser control.
Via the operation panel it is possible to setup the controller.
The extent depends on the controller type.

Advantage
Graphic LCD display, 128 x 64 points resolution
Connection via RJ11 plug
Dimension: 88 x 150 mm
Front panel



AK-PC 710
AK-PC 772
AK-PC 781 until medio 2015: AK-MMI
from medio 2015: MMIGRS2
AK-PC 783

AK-MMI



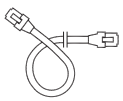
AK-PC 551
AK-PC 651

MMIGRS2

Technical data

Type	AK-MMI	MMIGRS2
Power supply	External 12-30 V d.c. or 24 V a.c. +/- 15%	From controller at the same cable as display signal
Ambient conditions	-10 - 55°C, during operation -40 - 70°C, during transport	
	20 - 80% RH, non condensing	
	No shock load or vibration	
Mounting	Front panel	
Enclosure	IP 64	

Ordering data

Description		Type	Code no.
Remote display, panel mounting		AK-MMI	**080G0311**
Remote display, panel mounting		MMIGRS2	**080G0294**
Cabel to display unit (1.5 m with plug)	Qty. 1		**080G0075**
Cabel to display unit (3 m with plug)	Qty. 1		**080G0076**

Additional information available:
AK-MMI - Technical brochure: DKRCC.PD.RJ0.N
MMIGRS2 - Technical brochure: DKRCC.PD.RJ0.L

Pt 1000 ohm / 0°C

AKS 11, AKS 12, AKS 21, AK-HS 1000

Application
These sensors are recommended for accurate temperature measurement in applications such as superheating, food safety logs, and other important temperature measurement applications.

Functional description
The sensor unit consists of a platinum element the resistance value of which changes proportionally with the temperature.
Pt 1000 ohm sensor (1000 ohm at 0°C).
The sensors are adjusted and meet the tolerance requirements of EN 60751 Class B.

Type	Description	Temperature range °C	Sensor/ sensor body	Connection/ cable	Enclosure	Time constant [s]	Cable length m	Qty	Code
AKS 11 *)	Surface and duct sensor for control and monitoring	-50 to +100	Top: PPO (Noryl) Bottom: stainless steel	PVC cable, 2 x 0.2 mm²	IP 67	3 [1] 10 [2] 35 [3]	3.5 m	1	**084N0003**
							3.5 m + AMP	110	**084N0050**
							5.5 m	1	**084N0005**
							5.5 m + AMP	70	**084N0051**
							8.5 m	1	**084N0008**
							8.5 m + AMP	50	**084N0052**
AKS 12	Air temperature sensor for monitoring	-40 to 100	18/8 stainless steel	PVC cable 2 x 0.22 mm²	IP 67	15 [2]	1.5 m	1	**084N0036**
								30	**084N0035**
							3.5 m	30	**084N0039**
							5.5 m	30	**084N0038**
							5.5 m + AMP	30	**084N0037**
AKS 21A **)	Surface sensor with clip	-70 to +180	18/8 stainless steel	Fire-resistant silicone rubber cable, 2 x 0.2 mm²	IP 67	6 [1] 14 [2] 35 [3]	2.5 m	1	**084N2007**
							5.0 m	1	**084N2008**
	Surface sensor with shielded cable and clip	-70 to +180					2.0 m	1	**084N2024**
AKS 21M	Multipurpose sensor	-70 to +180					2.5 m	1	**084N2003**
AKS 21W	Immersion sensor with cable and sensor pocket, welded version	-70 to +180	Immersion sensor, 18/8 stainless steel tube	Fire-resistant silicone rubber cable, 2 x 0.2 mm²	IP 56	18 [1]	2.5 m	1	**084N2017**
			Weld nipple: 18/8 stainless steel						
			Thread nipple: free cutting steel						
AK-HS 1000	Product sensor for HACCP logging	-30 to +50	ABS and PC	PVC cable 2 x 0.25 mm²	IP 54	180-900 [3]	5.5 m	1	**084N1007**

*) Recommended for measuring superheat
**) Recommended for hot gas systems

[1]) Agitated liquid.
[2]) Clamped to pipe.
[3]) Air 4 m/s.

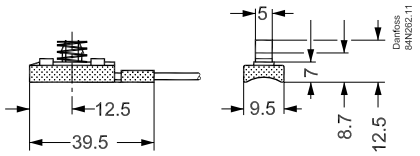
AKS 11, AKS 12, AKS 21, AK-HS 1000

°C	ohm	°C	ohm
0	1000.0		1000.0
1	1003.9	–1	996.1
2	1007.8	–2	992.2
3	1011.7	–3	988.3
4	1015.6	–4	984.4
5	1019.5	–5	980.4
6	1023.4	–6	976.5
7	1027.3	–7	972.6
8	1031.2	–8	968.7
9	1035.1	–9	964.8
10	1039.0	–10	960.9
11	1042.9	–11	956.9
12	1046.8	–12	953.0
13	1050.7	–13	949.1
14	1054.6	–14	945.2
15	1058.5	–15	941.2
16	1062.4	–16	937.3
17	1066.3	–17	933.4
18	1070.2	–18	929.5
19	1074.0	–19	925.5
20	1077.9	–20	921.6
21	1081.8	–21	917.7
22	1085.7	–22	913.7
23	1089.6	–23	909.8
24	1093.5	–24	905.9
25	1097.3	–25	901.9
26	1101.2	–26	898.0
27	1105.1	–27	894.0
28	1109.0	–28	890.1
29	1112.8	–29	886.2
30	1116.7	–30	882.2
31	1120.6	–31	878.3
32	1124.5	–32	874.3
33	1128.3	–33	870.4
34	1132.2	–34	866.4
35	1136.1	–35	862.5
36	1139.9	–36	858.5
37	1143.8	–37	854.6
38	1147.7	–38	850.6
39	1151.5	–39	846.7
40	1155.4	–40	842.7
41	1159.3	–41	838.8
42	1163.1	–42	835.0
43	1167.0	–43	830.8
44	1170.8	–44	826.9
45	1174.7	–45	822.9
46	1178.5	–46	818.9
47	1182.4	–47	815.0
48	1186.3	–48	811.0
49	1190.1	–49	807.0
50	1194.0	–50	803.1

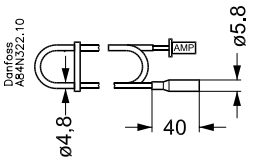
approx. 3.9 ohm/K

The tolerance of a Pt 1000 sensor is less than ±(0.3 + 0.005 T).
This translates into a temperature error of less than 0.5 degree for refrigeration control.

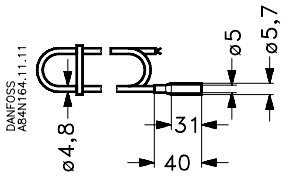
AKS 11



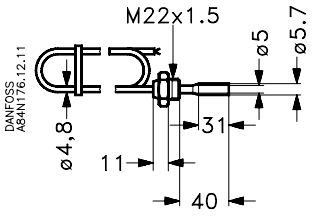
AKS 12



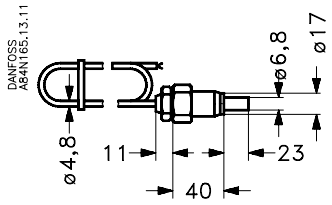
AKS 21A,
AKS 21M



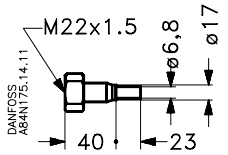
AKS 21W



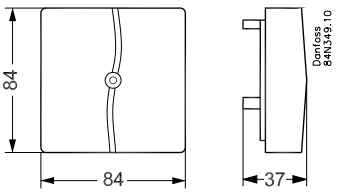
AKS 21W
welded version



Pocket in welded version
for AKS 21W



Product sensor
for HACCP
AK-HS 1000



Sensors with AMP plug:
connector type AMP ital mod 2, housing 280 358,
crimp contacts type 280 708-2

PTC 1000 ohm

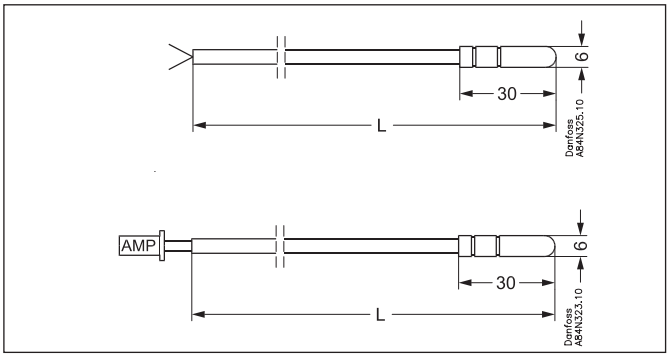
EKS 111

Application
This sensor is used primarily with EKC 202, AK-CC 210 and EKC 302 controllers in situations where the error due to the sensor tolerance can be tolerated or corrected.

Functional description
The sensor is based on a PTC element with a resistance of 990 ohms at 25°C.

Technical data

Nominal resistance		990 ohms at 25°C
Temperature range		-55 to 100°C
Cable material		PVC
Sensor tube		AISI 304 stainless steel
Time constant	Water	30 seconds
Enclosure		IP 67
AMP plug		AMP ital mod 2, housing 280 358 crimp contact 280 708-2



R (Typ.) Ohm	Temp. °C	Error K	Temp. °F
1679	100	+/-3.5	212
1575	90		194
1475	80		176
1378	70		158
1286	60		140
1196	50		122
1111	40		104
1029	30		86
990	25	+/-1.3	77
951	20		68
877	10		50
807	0		32
740	-10		14
677	-20		-4
617	-30		-22
562	-40		-40
510	-50		-58
485	-55	+/-3.0	-67

The sensor has a relatively large resistance tolerance. Consequently, it cannot be used to measure values used for food safety logs or superheat control.

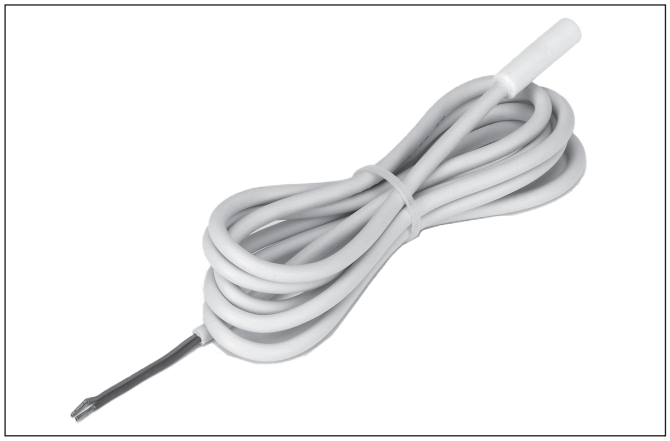
Ordering

Type	Sensor		Cable	Number	Code no.
EKS 111	PTC	990 ohm / 25°C	1.5 m	1	**084N1178**
				150	**084N1161**
			3.5 m	1	**084N1179**
				150	**084N1163**
			6 m	1	**084N1180**
				80	**084N1173**
			8.5 m	60	**084N1168**
			1.5 m with AMP plug	1	**084N1181**
				150	**084N1174**
			3.5 m with AMP plug	1	**084N1182**
				150	**084N1170**
			6 m with AMP plug	1	**084N1177**
				80	**084N1171**

Not suitable for measuring superheat or food safety log data

NTC 5000 ohm / 25°C

EKS 211

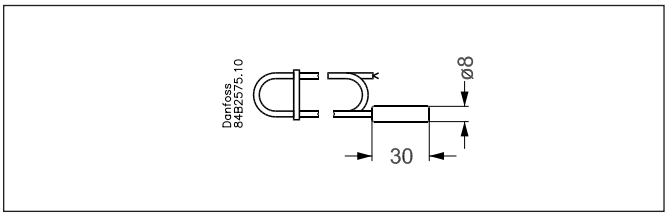


Application
This sensor is used primarily with ERC 211-214 controllers in situations where its tolerance is acceptable.

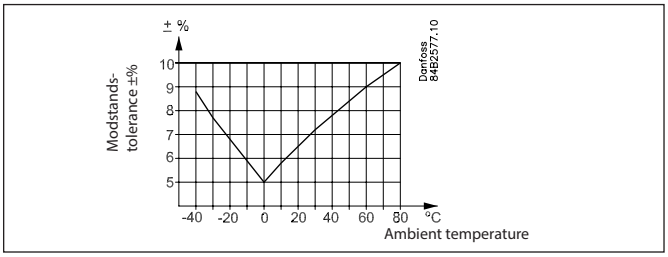
Functional description
NTC sensor for temperature measurements in the following areas:
- Refrigeration
- Air conditioning
- Heating

Technical data

Nominal resistance		5000 ohms at 25°C
Temperature range		-40 to 80°C
Cable material		PVC, 2 x 0.22 mm²
Sensor housing		PBT (thermoplastic polyester)
Time constant	Water	25 seconds
	Air	80 seconds
Enclosure		IP 67



Tolerance



R_nom ohm	Temperature °C	Temperature °F
631.0	80	176
743.2	75	167
878.9	70	158
1044	65	149
1247	60	140
1495	55	131
1803	50	122
2186	45	113
2665	40	104
3266	35	95
4029	30	86
5000	25	77
6246	20	68
7855	15	59
9951	10	50
12696	5	41
16330	0	32
21166	-5	23
27681	-10	14
36503	-15	5
48614	-20	-4
65333	-25	-13
88766	-30	-22
121795	-35	-31
169157	-40	-40

The sensor has a relatively large resistance tolerance. Consequently, it cannot be used to measure values for food safety logs.

Ordering data
Industry pack

Type	Sensor element		Connection	Cable	Quantity	Code
EKS 211	NTC	5000 ohm / 25°C	-	1.5 m	300	**084B4403**
				3.5 m	150	**084B4404**
				6 m	50	**084N3211**

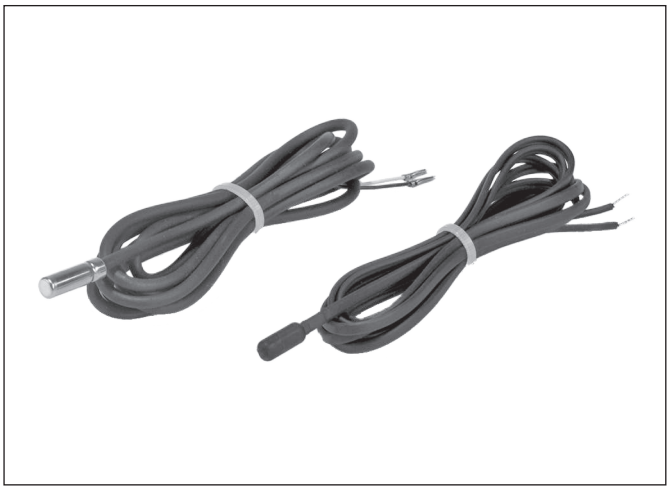
Single pack

Type	Sensor element		Connection	Cable	Quantity	Code
EKS 211	NTC	5000 ohm / 25°C	-	1.5 m	1	**084N1220**
				3.5 m	1	**084N1221**

Not suitable for food safety log data

NTC 10 kohm / 25°C

EKS 221



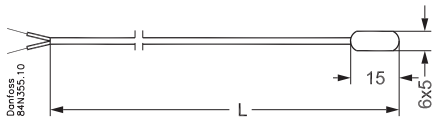
Application
NTC sensor for temperature measurements in the following areas:
- Refrigeration
- Air conditioning
- Heating

The sensor characteristic is adapted to:
- OPTYMA room controllers
- MCX unit controllers

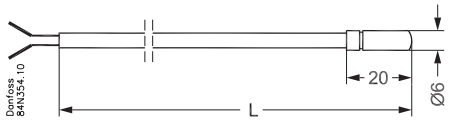
Functional description
The sensor is based on a NTC element with a resistance of 10000 ohms at 25°C.

Technical data

Sensor sheath	Thermoplastic rubber	Steel AISI 304
Temperature range	-50 to 120°C	-50 to 110°C
Cable material	Thermoplastic rubber, flat, 2 x 0.25 mm²	Thermoplastic rubber, round, 2 x 0.25 mm²
Wire ends	Tin plated	Nipples
Time constant, water 2 m/s	10 seconds	10 seconds
IP Class	IP 67	IP 68
Nominal resistance	10,000 ohms at 25°C	
Tolerance	±1%	
Beta value	3435 at 25/85 °C	
Tolerance of beta value	±1%	



Sensor sheathed in thermoplastic rubber



Sensor sheathed in AISI 304 steel

R_nom Ohm	Temp. °C	Temp. °F
595	120	248
757	110	230
972	100	212
1265	90	194
1667	80	176
2228	70	158
3020	60	140
4160	50	122
5827	40	104
8313	30	86
10000	25	77
12091	20	68
17958	10	50
27278	0	32
42450	-10	14
67801	-20	-4
111364	-30	-22
188500	-40	-40

Ordering data

Type	Sensor element	Sensor sheath	Cable length	Quantity	Code no.
EKS 221	NTC 10000 ohm / 25°C	Thermoplastic rubber	3.5 m	1	**084N3210**
			8.5 m	50	**084N3208**
				1	**084N3209**
		Steel AISI 304	1.,5 m	150	**084N3200**

AKS 32, AKS 33, AKS 32R, AKS 2050

Introduction

AKS 32 and AKS 33 are pressure transmitters that measure a pressure and convert the measured value to a standard signal:
- 1 → 5 V d.c. for AKS 32
- 4 → 20 mA for AKS 33

AKS 32R and AKS 2050 are ratiometric pressure transmitters that convert the measured pressure to a linear output signal. The minimum value of the output signal is 10% of the actual supply voltage. The maximum value is 90% of the actual supply voltage.

With a supply voltage of 5 V, this yields a linear output signal with a value of:
- 0.5 V at the minimum pressure of the pressure transmitter;
- 4.5 V at the maximum pressure of the pressure transmitter.

Application
- A/C systems
- Refrigeration systems
- Process control
- Laboratories

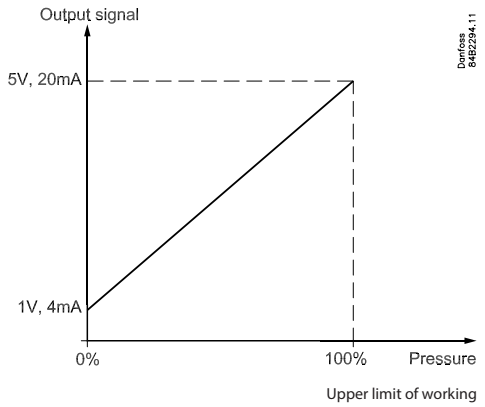
Advantages

Advanced sensor technology enables high pressure control accuracy, which essential for precise and energy-efficient capacity regulation in refrigeration systems.

- Temperature compensation for low-pressure and high-pressure pressure transmitters specifically designed for refrigeration systems:
  Low pressure: −30 → +40°C (≤16 bar)
  High pressure: 0 → +80°C (>16 bar)
- Compatible with all refrigerants, including ammonia, for reduced parts inventory and greater application flexibility.
- Effective moister protection allows the sensors to be used in very harsh environments, such as a suction line surrounded by ice.
- Robust construction provides protection against mechanical factors as shock, vibration, and pressure surges. AKS sensors can be fitted directly on the system components.
- No adjustment is necessary. Thanks to the advanced sensor technology and sealed gauge construction, the accuracy of the factory calibration is maintained regardless of changes in ambient temperature and atmospheric pressure. This is essential for reliable control of evaporating pressure in air conditioning and refrigeration systems.
- Built-in voltage regulator
- EMC protection compliant with the EU EMC Directive (CE marking)
- UL approved

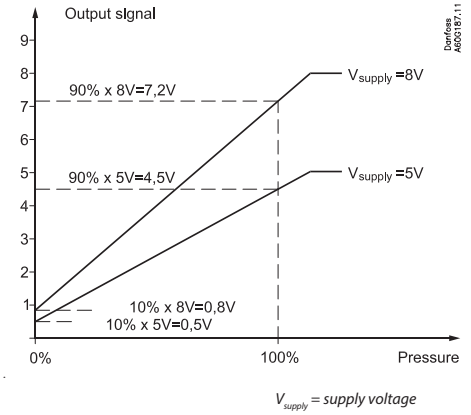
Output signal

AKS 32, AKS 33



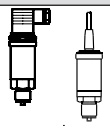
AKS 32R, AKS 2050

The plot shows the relationship between the AKS 32R (or AKS 2050) output signal from , the supply voltage and the pressure.

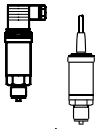


Ordering data

AKS 32, version 1 → 5 V

	Operating range [bar]	Allowable working pressure PB [bar]	Compensated temperature range [°C]	Code no. EN 175301-803 plug Pg 9 1/4 NPT [1]	G 3/8 A [2]	1/4 flare [3]
	-1 to 6	33	-30 to +40	**060G2000**	**060G2004**	**060G2068**
	-1 to 12	33	-30 to +40	**060G2001**	**060G2005**	**060G2069**
	-1 to 20	40	0 to +80	**060G2002**	**060G2006**	**060G2070**
	-1 to 34	55	0 to +80	**060G2003**	**060G2007**	**060G2071**
	-1 to 50	100	0 to +80			**060G2155**

AKS 33, version 4 → 20 mA

	Operating range [bar]	Allowable working pressure PB [bar]	Compensated temperature range [°C]	Code no. EN 175301-803 plug Pg 9 1/4 NPT [1]	G 3/8 A [2]	1/4 flare [3]	Cable 1/4 NPT [1]	G 3/8 A [2]	1/4 flare [3]
	-1 to 5	33	-30 to +40	**060G2112**	**060G2108**	**060G2047**			
	-1 to 6	33	-30 to +40	**060G2100**	**060G2104**	**060G2048**		**060G2120**	
	-1 to 9	33	-30 to +40	**060G2113**	**060G2111**	**060G2044**			**060G2062**
	-1 to 12	33	-30 to +40	**060G2101**	**060G2105**	**060G2049**	**060G2117**		
	-1 to 20	40	0 to +80	**060G2102**	**060G2106**	**060G2050**	**060G2118**		
	-1 to 34	55	0 to +80	**060G2103**	**060G2107**	**060G2051**	**060G2119**		**060G2065**
	0 to 16	40	0 to +80	**060G2114**	**060G2109**				
	0 to 25	40	0 to +80	**060G2115**	**060G2110**	**060G2045**		**060G2127**	**060G2067**

AKS 32R, AKS 2050

	Type	Operating range bar	Allowable working pressure PB [bar]	Compensated temperature range [°C]	Code no. 1/4 NPT 1)	G 3/8 A 2)	1/4 flare 3)	3/8 solder	1/4 female flare 4)
	AKS 32R	-1 to 12	33	-30 to +40	**060G1037**	**060G1038**	**060G1036**	**060G3551**	**060G6323**
		-1 to 34	55	0 to +80			**060G0090**	**060G3552**	**060G6341**
	AKS 2050	-1 to 59	100	-30 to +40	**060G6342**	**060G5750**		**060G6408**	
		-1 to 99	150	-30 to +40	**060G6343**	**060G5751**			
		-1 to 159	250	0 to +80	**060G6344**	**060G5752**			
	Mating plug with 5 m cable (rated IP 67 when fitted to pressure transmitter)				**060G1034**				
	Plug Pg 9				**060G0008**				

1) 1/4-18 NPT.
2) Thread ISO 228/1 - G 3/8 A (BSP).
3) 7/16-20 UNF.
4) With depressor pin for Schraeder valve. 7/16-20 UNF.

Compact pressure transmitter for CO_2

Advantage:
- Designed for CO_2 plants
- Compact design
- High accuracy

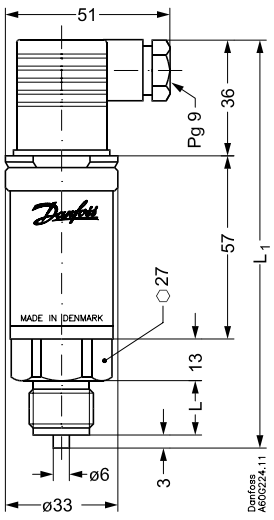
Additional information available:
Technical brochure: IC.PD.P21.I

MBS 8250	Operating range bar	Allowable working pressure PB [bar]	Compensated temperature range [°C]	Signal	Code no. 1/4 NPT 1)
	-1 to 159	250	-20 to +100	Ratiometric	**064G1131**
				4 - 20 mA	**064G1132**
	Round Packard Metri-Pack. Connection plug with 10 m cable				**064G0910**

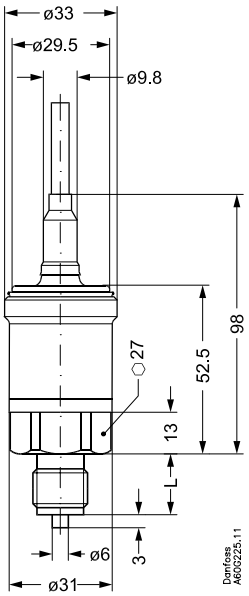
Dimensions and weights

AKS 32, AKS 33

Version with EN 175301-803 plug Pg 9



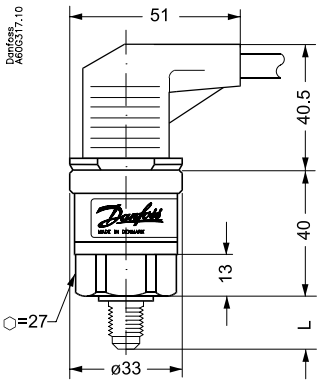
Cable version

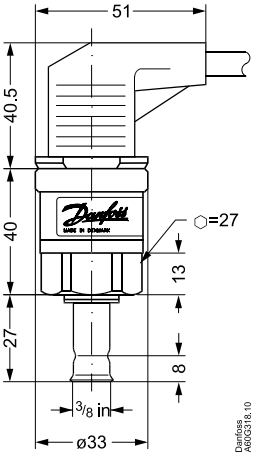


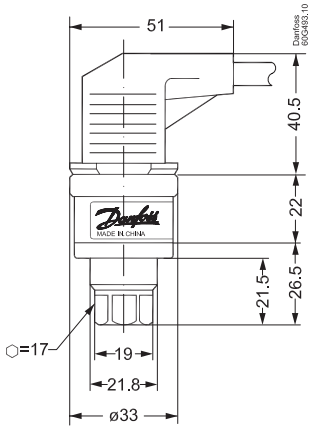
Pressure connection	¼-18 NPT	G ⅜ A ISO 228/1	¼ in. flare 7/16-20 UNF
L_1 [mm]	122	127	122.5
L [mm]	16	18	16.5

Weight approx. 0.3 kg

AKS 32R, AKS 2050







Pressure connection	¼-18 NPT	G ⅜ A ISO 228/1	¼ in. flare 7/16-20 UNF	⅜ Solder
L [mm]	16	21	16.5	30

Weight approx. 0.15 kg

Additional information available:

AKS 32 and AKS 33
Technical brochure: IC.PD.P21.Z

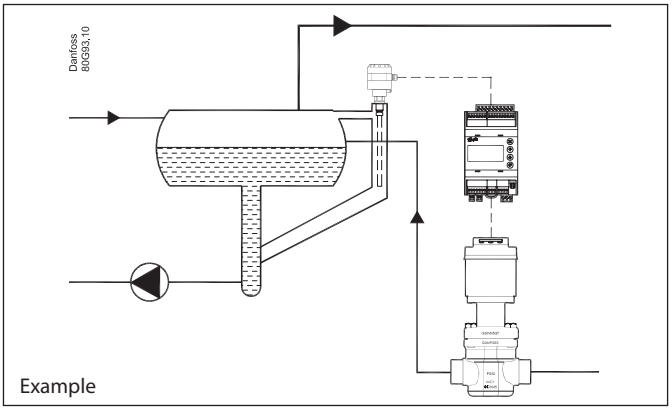
AKS 32R and AKS 2050
Technical brochure: IC.PD.P20.W

MBS 8250
Technical brochure: IC.PD.P21.I

AKS 4100/4100U

Introduction
AKS 4100/4100U is a liquid level transmitter used to measure the amount of liquid in a refrigerant receiver.
The measurement is based on "Time Domain Reflectometry" (TDR) / "Guided Micro Wave" technology.

Application
- Used with EKE 347 controller or EKC 347 controller
- Supports the following refrigerants:
  - R 717
  - R 744
  - R 22
  - R 404A
  - R 410A
  - R 134a



Example

See also EKE 347.

Additional information
Technical brochure: DKRCI.PD.SC0.C

Gas detector

DGS

Application
The DGS unit can detect a wide range of commonly used refrigerants, including carbon dioxide, halogenated hydrocarbons and hydrocarbons.

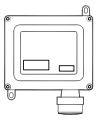
Advantages
- Alarm levels can be set locally.
- The gas sensor can be connected to a AK System unit.

Technical data

Power suply	12/24 V a.c./d.c. ±20%
Power consumption	Semi-conductor (SC):153 mA Infra red: (IR) 136 mA
Power monitoring	Green LED
Visual Alarm	Red LED
Audible alarm	Enabled / disabled
Fault state	0 - 0.5 V (1-5 V), 0 - 1 V(2-10 V), 0 - 2 mA (4-20 mA)
Analogue outputs	0-5 V, 1-5 V, 0-10 V, 2-10 V, 4-20 mA
Relay output	SPDT, max. 1 A / 24 V d.c.
Alarm delay. Optional	0, 1, 5 or 10 minutes

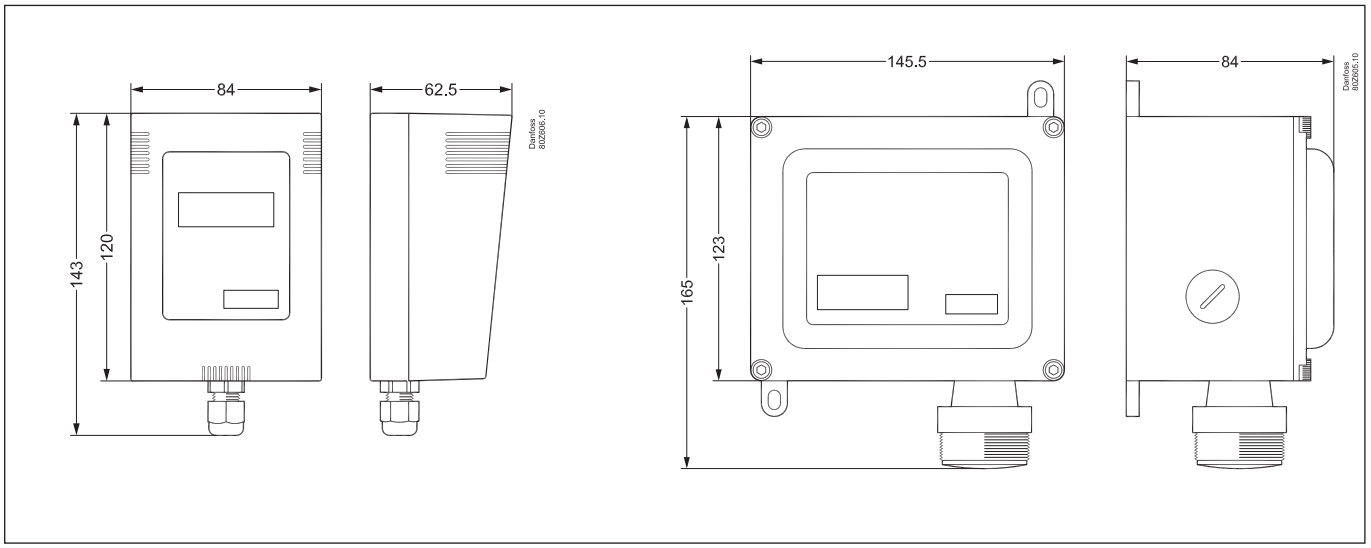
Sensor information		**Semi-Conductor with filter (multigas) SC** Halocarbons	**Semi-Conductor (multigas) SC** Hydrocarbons	**Infrared IR** CO_2
Typical measurement range		0 - 1000 ppm	0 - 1000 ppm	0 - 10000 ppm 0 - 20000 ppm 0 - 50000 ppm
Factory setting (Relay activate at)		50% of the range		
Ambient	IP41	-20°C to +50°C (-4°F to 122°F)		
	IP66	-40°C to +50°C (-40°F to 122°F)		
		0 to 95 % Humidity Range (RH), non-condensing		
Life time for sensor	Typical	5 years		
Alarm Threshold	T50	76 seconds, filtrered	50 seconds, filtrered	50 seconds
	T90	215 seconds, filtrered	90 seconds, filtrered	120 seconds
Recovery time		600 seconds	200 seconds	235 seconds
Linearity		Linear over calibrated range		
Calibration		Annual test and calibration according to standards. See also guide line for calibration		
		Calibrated to a specific gas	Calibrated to a specific gas	

Ordering data

Type		Enclosure	Calibrated for	Function	Code no.
DGS		IP 41, -20°C to +50°C	R404A, R507	Gas detector	080Z2098
			R134a	Gas detector	080Z2092
			R407A	Gas detector	080Z2093
			R407F	Gas detector	080Z2076
			R410A	Gas detector	080Z2088
			R22	Gas detector	080Z2090
			R744 (CO_2)	Gas detector	080Z2095
				Gas detector, Fail safe	080Z2294
		IP 66, -40°C to +50°C	R404A, R507	Gas detector	080Z2099
			R134a	Gas detector	080Z2089
			R407A	Gas detector	080Z2094
			R407F	Gas detector	080Z2077
			R410A	Gas detector	080Z2087
			R22	Gas detector	080Z2091
			R744 (CO_2)	Gas detector	080Z2096
				Gas detector, Remote 3 m	080Z2097
				Gas detector, Fail safe	080Z2293
				Gas detector, Fail safe, Remote	080Z2292

DGS is also available for alternative refrigerants gases on request.
Please contact your local Danfoss sales office for details.

Dimensions



Additional information available:
Technical brochure: USCO.EN.S00.A

Energy meter

Application
Energy meter that can send a signal to the system unit.
The modbus signal can be used on a Danfoss ADAP-KOOL® system.

Function
Energy meter that can record the consumption of 1, 2 or 3 phases, with voltages from 120 V to 600 V and a current from 5 to 6,000 A.

Ordering
080Z2146

The system unit AK-SM 820, 850 and 880 can also receive signals from an energy meter type:
Garlo Garvazzi EM24.
Veris Industries H8035

Indoor moisture and temperature sensor

Application
Moisture and temperature sensor that can send signals to a system unit.
For wall mounting in an office environment of 0-50°C. Non-condensing

Function
Temperature sensor: Pt 1000 Ω
Measurement range for moisture sensor: 0-100% Rh
Output signal: 0-5 V or 0-10 V (jumper configurable)
Supply: 12-24 V DC or 24 V AC ±10%, 50/60 Hz.

Ordering
080Z2171

Indoor light sensor

Application
Light and temperature sensor that can send signals to a system unit.
For indoor ceiling mounting.

Function
Light range: 0-400 foot candles (0-4305 lux)
Output signal: 0-5 V DC
Supply: 12 V AC or 12 V DC

Ordering
080Z2177

Outdoor light and temperature sensor

Application
Light and temperature sensor that can send signals to a system unit.
For outdoor wall mounting

Function
Temperature sensor: Pt 1,000 Ω
Light range: 0-750 foot candles (0-8073 lux)
Output signal: 0-5 V DC
Supply: 12 V DC

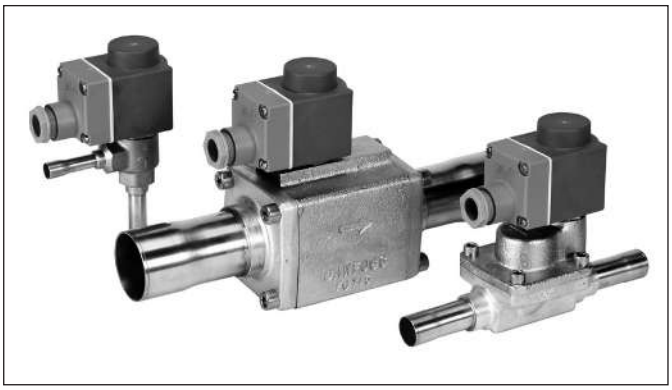
Ordering
080Z2172

Expansion valves

The principal features of the most commonly used products are described briefly here.
Additional information is available in the relevant technical brochures.

In particular, additional information is necessary selection of the right valve capacity.

AKV 10, AKV 15, AKV 20



Application
The AKV valves are electrically operated expansion valves designed for refrigerating systems.
They can be used with HCFC, HFC and R744 refrigerants. It cannot be used with flammable hydrocarbons.
The AKV valves are usually operated by a controller from the Danfoss range of ADAP-KOOL® controllers.

Advantages
- No adjustment necessary
- Wide control range
- Replaceable orifice assembly
- Combined expansion valve and solenoid valve

Functional description
Individual components are available for AKV valves, as follows:
- Valve only
- Coil only with terminal box or cable
- Spare parts: upper part, orifice and filter

The individual capacity is indicated by a number forming part of the type designation. This number represents orifice size of the associated valve. For example, an AKV 10 valve with orifice size 3 is designated AKV 10-3.
The orifice assembly is replaceable.

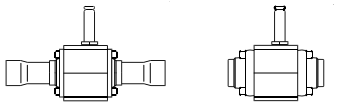
Approvals
DEMKO (Denmark)
SETI (Finland)
SEV (Switzerland)
UL listed (separate code numbers)
CSA certified (separate code numbers) nr.)

Technical data

Valve type	AKV 10	AKV 15	AKV 20
Coil voltage tolerance	+10/–15%		
Enclosure rating per IEC 529	Max. IP 67		
Operating principle	PWM (pulse width modulation)		
Recommend period	6 seconds		
Capacity (R22)	1 to 16 kW	25 to 100 kW	100 to 630 kW
Control range (capacity range)	10–100%		
Connected device	Solder	Solder	Solder or weld
Evaporating temperature	– 50 to 60°C	– 50 to 60°C	– 40 to 60°C
Ambient temperature	– 50 to 50 °C	– 40 to 50 °C	– 40 to 50 °C
Valve seat leakage	< 0.02% of Kv value		
MOPD	18 bar	22 bar	18 bar
Filter, replaceable	Internal 100 µm	External 100 µm	External 100 µm
Max. working pressure	AKV 10-1....6: Ps = 52 bar AKV 10-7: Ps = 42 bar	AKV 15-1,2,3: Ps = 42 bar AKV 15-4: Ps = 28 bar	Ps = 28 bar

Rated capacity and ordering data

Valve type	Rated capacity in kW [1]				K_v value	Connection			
						Solder ODF			
	R22	R 134a	R 404A R 507	R 407C	m3/h	Inlet × outlet in.	**Code**	Inlet × outlet in.	**Code**
AKV 10-1	1.0	0.9	0.8	1.1	0.010	$^3/_8 \times ^1/_2$	**068F1161**	10 × 12	**068F1162**
AKV 10-2	1.6	1.4	1.3	1.7	0.017	$^3/_8 \times ^1/_2$	**068F1164**	10 × 12	**068F1165**
AKV 10-3	2.6	2.1	2.0	2.5	0.025	$^3/_8 \times ^1/_2$	**068F1167**	10 × 12	**068F1168**
AKV 10-4	4.1	3.4	3.1	4.0	0.046	$^3/_8 \times ^1/_2$	**068F1170**	10 × 12	**068F1171**
AKV 10-5	6.4	5.3	4.9	6.4	0.064	$^3/_8 \times ^1/_2$	**068F1173**	10 × 12	**068F1174**
AKV 10-6	10.2	8.5	7.8	10.1	0.114	$^3/_8 \times ^1/_2$	**068F1176**	10 × 12	**068F1177**
AKV 10-7	16.3	13.5	12.5	17.0	0.209	$^1/_2 \times ^5/_8$	**068F1179**	12 × 16	**068F1180**
AKV 15-1	25.5	21.2	19.6	25.2	0.25	$^3/_4 \times ^3/_4$	**068F5000**	18 × 18	**068F5001**
AKV 15-2	40.8	33.8	31.4	40.4	0.40	$^3/_4 \times ^3/_4$	**068F5005**	18 × 18	**068F5006**
AKV 15-3	64.3	53.3	49.4	63.7	0.63	$^7/_8 \times ^7/_8$	**068F5010**	22 × 22	**068F5010**
AKV 15-4	102	84.6	78.3	101	1.0	$1^1/_8 \times 1^1/_8$	**068F5015**	28 × 28	**068F5016**



Valve type	Rated capacity in kW [1]				K_v value	Connections					
						Solder ODF				Weld	
	R22	R 134a	R 404A R 507	R 407C	m^3/h	Inlet × outlet in.	**Code**	Inlet × outlet mm	**Code**	Inlet × outlet in.	**Code**
AKV 20-1	102	84.6	78.3	101	1.0	$1^3/_8 \times 1^3/_8$	**042H2020**	35 × 35	**042H2020**	$1^1/_4 \times 1^1/_4$	**042H2021**
AKV 20-2	163	135	125	170	1.6	$1^3/_8 \times 1^3/_8$	**042H2022**	35 × 35	**042H2022**	$1^1/_4 \times 1^1/_4$	**042H2023**
AKV 20-3	255	212	196	252	2.5	$1^5/_8 \times 1^5/_8$	**042H2024**	42 × 42	**042H2025**	$1^1/_4 \times 1^1/_4$	**042H2026**
AKV 20-4	408	338	314	404	4.0	$2^1/_8 \times 2^1/_8$	**042H2027**	54 × 54	**042H2027**	$1^1/_2 \times 1^1/_2$	**042H2028**
AKV 20-5	643	533	494	637	6.3	$2^1/_8 \times 2^1/_8$	**042H2029**	54 × 54	**042H2029**	2 × 2	**042H2030**

1 The rated capacity is based on:
Condensing temperature t_c = 32°C
Liquid temperature t_l = 28°C
Evaporating temperature t_e = 5°C

Dimensioning

To obtain an expansion valve that will function correctly under various load conditions, the aspects listed below must be considered for valve dimensioning.
They must be evaluated in the order listed.

1. Evaporator capacity
2. Pressure drop across the valve
3. Correction for subcooling
4. Correction for evaporating temperature
5. Determination of valve size
6. Correct liquid line dimensioning

Additional information available:
Technical brochure: DKRCC.PD.VA1.A

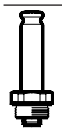
Spare parts

AKV 10

Orifice

Orifice no.	Code no.	Contents
0	**068F5283**	4 pc. orifice 4 pc. gasket
1		
2		
3		
4	**068F5284**	3 pc. orifice 3 pc. gasket
5		
6		
7	**068F5285**	2 pc. orifice 2 pc. gasket
8		

Filter: **Code no. 068F0540**
Contents: 10 filters
10 aluminium gaskets



Upper part: **Code no. 068F0541**
Contents: 1 armature assembly
1 armature tube
1 aluminium gasket

AKV 15

Piston

Type	Code no.	Contents
AKV 15-1	**068F5265**	1 piston assembly 1 gasket 1 O-ring 2 labels
AKV 15-2	**068F5266**	
AKV 15-3	**068F5267**	
AKV 15-4	**068F5268**	

Gasket set: **Code no. 068F5264**
Contents: 30 O-rings
10 copper gaskets
10 gaskets

Filter: **Code no. 068F0540**
Contents: 10 filters
10 aluminium gaskets

Upper part: **Code no. 068F5045**
Contents: 1 armature assembly
1 armature tube
1 aluminium gasket

AKV 20

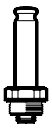
Piston

Type	Code no.	Contents
AKV 20-0.6	**042H2039**	1 pc. piston assembly 3 O-rings
AKV 20-1	**042H2040**	
AKV 20-2	**042H2041**	
AKV 20-3	**042H2042**	
AKV 20-4	**042H2043**	
AKV 20-5	**042H2044**	

Orifice set

Type	Code no.	Contents
AKV 20-0.6	**068F5270**	Main orifice, dia. 8 mm Pilot orifice, dia. 1.8 mm 2 aluminium gaskets O-ring
AKV 20-1		
AKV 20-2		
AKV 20-3		
AKV 20-4	**068F5271**	Main orifice, dia. 14 mm Pilot orifice, dia. 2.4 mm 2 aluminium gaskets O-ring
AKV 20-5		

Gasket set: **Code no. 032F2327**
Contents: Complete gasket set
for new-model and old-model
valves



Upper part: **Code no. 068F5045**
Contents: 1 armature assembly
1 armature tube
1 aluminium gasket

AKVH 10

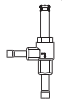
AKVH are a serie electrically operated expansion valves designed for refrigeration plants using CO_2 (R 744).
The series is similar in design to the rest of the AKV range, but has been developed for the higher pressure.

Approvals

PED (97/23/EF A3.P3)

CE The Low Voltage Directive 73/23/EC with amendments EN 60730-2-8

Rated capacity and Ordering



Valve type	Rated capacity kW		k_v -value	Connections	
				Solder ODF	
	Refrig.	Freezing	m^3/t	**3/8 × 1/2 inch**	**10 × 12 mm**
AKVH 10-0	0.4	0.8	0.003	**068F4078**	**068F4088**
AKVH 10-1	1.1	2.2	0.010	**068F4079**	**068F4089**
AKVH 10-2	1.7	3.5	0.017	**068F4080**	**068F4090**
AKVH 10-3	2.6	5.4	0.025	**068F4081**	**068F4091**
AKVH 10-4	4.3	8.7	0.046	**068F4082**	**068F4092**
AKVH 10-5	6.7	13.6	0.064	**068F4083**	**068F4093**
AKVH 10-6	10.7	21.7	0.114	**068F4084**	**068F4094**

Coils with coil control (EEC)

Voltage	**Power**	**Code no.**
230 V a.c.	4 W	**018F6783**

Technical data

Valve type	**AKVH 10**
Tolerance of coil voltage	+10/-15 %
Enclosure acc. to IEC 529	Maks. IP 67
Working principle	PWM (pulse-width modulation)
Recommended period of time	6 seconds
Capacity (R 744)	Refrigeration: 0,4 kW to 11 kW Freezing: 0,8 kW to 22 kW
Regulation range (Capacity range)	10 to 100 %
Connection	Solder
Evaporating temperature	-60 to 60° C
Ambient temperature	-50 to 50° C
Leak of valve seat	<0,02 % af k_v-value
MOPD	35 bar
Filter, replaceable	Internal 100 µm
Max working pressure	PS = 90 barg *)

*) 90 barg under stand still conditions, but under normal operating conditions, there must be liquid to the inlet of the valve.

Spare parts

AKVH 10

Orifice

Orifice no..	**Code no.**	Contents
0	**068F5283**	4 Orifices 4 gaskets
1		
2		
3		
4	**068F5284**	3 Orifices 3 gaskets
5		
6		
7	**068F5285**	2 Orifices 2 gaskets
8		

Filter: **Code no.**
Contents: **068F0540**
10 filters
10 gaskets.

Upper part: **Code no.**
Contents: **068F0541**
1 armature assembly
1 armature tube
1 gasket

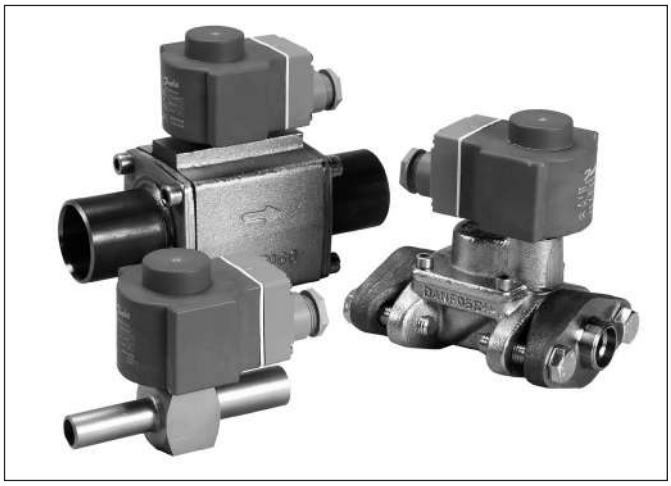
Additional information available:
Technical brochure: DKRCC.PD.VA1.D

AKVA 10 AKVA 15, AKVA 20

The AKVA valves are electrically operated expansion valves designed for ammonia refrigeration systems. They are usually operated by a controller from the Danfoss line of ADAP-KOOL® controllers.

AKVA valves are available as individual components as follows:
- Valve only
- Coil only with terminal box or cable
- Spare parts: upper part, orifice and filter

The individual capacity is indicated by a number forming part of the type designation. This number represents orifice size of the associated valve.
For example, an AKVA 10 valve with a size 3 orifice is designated AKVA 10-3.
The orifice assembly is replaceable.



Features
- For ammonia (R 717), R744, HCFC, and HFC
- It cannot be used with flammable hydrocarbons.
- No adjustment necessary
- Wide control range
- Replaceable orifice assembly
- Can be used as a combined expansion and solenoid valve in some applications
- Wide range of coils for d.c. and a.c. operation

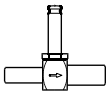
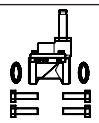
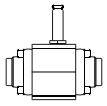
Approvals
DEMKO (Denmark)
SETI (Finland)
SEV (Switzerland)
UL listed for US and Canadian standards (separate code numbers)

AKVA 20 is CE certified in accordance with Pressure Directive 97/23

Technical data

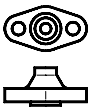
Valve type	AKVA 10	AKVA 15	AKVA 20
Coil voltage tolerance	+10/–15%		
Enclosure rating (IEC 529)	Max. IP 67		
Operating principle	PWM (pulse width modulation)		
Recommend period	6 seconds		
Capacity (R717)	4 to 100 kW	125 to 500 kW	500 to 3150 kW
Control range (capacity range)	10–100%		
Connection	Weld		
Media temperature	– 50 to 60°C	– 40 to 60°C	– 40 to 60°C
Ambient temperature	– 50 to 50 °C	– 40 to 50 °C	– 40 to 50 °C
Valve seat leakage	< 0.02% of Kv value		
MOPD	18 bar	22 bar	18 bar
Filter, replaceable	Internal 100 µm, replaceable	External 100 mm	External 100 mm
Allowable operating pressure	Ps = 42 bar gauge	Ps = 42 bar gauge	Ps = 42 bar gauge

Rated capacity and ordering data

Symbol	Valve type	Nominal capacity [1] kW	Nominal capacity [1] metric tons	Kv value m^3/h	Connected device inlet x outlet in.	Code	Connected device inlet x outlet in.	Code
	AKVA 10-1	4	1.1	0.010	$^3/_8 \times ^1/_2$	**068F3261**	$^1/_2 \times ^3/_4$	**068F3281**
	AKVA 10-2	6.3	1.8	0.015	$^3/_8 \times ^1/_2$	**068F3262**	$^1/_2 \times ^3/_4$	**068F3282**
	AKVA 10-3	10	2.8	0.022	$^3/_8 \times ^1/_2$	**068F3263**	$^1/_2 \times ^3/_4$	**068F3283**
	AKVA 10-4	16	4.5	0.038	$^3/_8 \times ^1/_2$	**068F3264**	$^1/_2 \times ^3/_4$	**068F3284**
	AKVA 10-5	25	7.1	0.055	$^3/_8 \times ^1/_2$	**068F3265**	$^1/_2 \times ^3/_4$	**068F3285**
	AKVA 10-6	40	11.4	0.103	$^3/_8 \times ^1/_2$	**068F3266**	$^1/_2 \times ^3/_4$	**068F3286**
	AKVA 10-7	63	17.9	0.162			$^1/_2 \times ^3/_4$	**068F3267**
	AKVA 10-8	100	28.4	0.251			$^1/_2 \times ^3/_4$	**068F3268**
	AKVA 15-1	125	35	0.25	Flange	**068F5020**[2]		
	AKVA 15-2	200	60	0.40	Flange	**068F5023**[2]		
	AKVA 15-3	300	90	0.63	Flange	**068F5026**[2]		
	AKVA15-4	500	140	1.0	Flange	**068F5029**[2]		
	AKVA 20-1	500	140	1.0	$1\ ^1/_4 \times 1\ ^1/_4$	**042H2101**		
	AKVA 20-2	800	240	1.6	$1\ ^1/_4 \times 1\ ^1/_4$	**042H2102**		
	AKVA 20-3	1250	350	2.5	$1\ ^1/_4 \times 1\ ^1/_4$	**042H2103**		
	AKVA 20-4	2000	600	4.0	$1\ ^1/_2 \times 1\ ^1/_2$	**042H2104**		
	AKVA 20-5	3150	900	6.3	2 x 2	**042H2105**		

1 The rated capacity is based on:
Condensing temperature $t_c = 32°C$
Liquid temperature $t_l = 28°C$
Evaporating temperature $t_e = 5°C$
2 Including screws and gaskets, but not flanges

Flange set for AKVA 15

Symbol	Valve type	Connected device in.	**Code**
	AKVA 15-1 to 15-4	$^3/_4$	**027N1220**
		1	**027N1225**

Filter
For installations using ammonia and similar industrial systems, a filter must be fitted ahead of an AKVA 15 or AKVA 20 valve.
The AKVA 10 valve has a built-in filter, so an external filter is not necessary.

Recommended filters for AKVA 15/20 = FIA.
Additional information:
Technical brochure DKRCI.PD.FN1.A

Dimensioning
To obtain an expansion valve that will function correctly under various load conditions, the aspects listed below must be considered for valve dimensioning.
They must be evaluated in the order listed.

1. Evaporator capacity
2. Pressure drop across the valve
3. Correction for subcooling
4. Correction for evaporating temperature
5. Determination of valve size
6. Correct liquid line dimensioning

Additional information is available:
Technical brochure: DKRCC.PD.VA1.B

Spare parts

AKVA 10

Orifice

Type	Code	Contents
AKVA 10-1	**068F0526**	1 orifice 1 aluminium gasket 1 coil cap
AKVA 10-2	**068F0527**	
AKVA 10-3	**068F0528**	
AKVA 10-4	**068F0529**	
AKVA 10-5	**068F0530**	
AKVA 10-6	**068F0531**	
AKVA 10-7	**068F0532**	
AKVA 10-8	**068F0533**	

Filter

Code	Contents
068F0540	10 filters 10 aluminium gaskets

Upper part

Code	Contents
068F5045	1 armature 1 armature tube Qty 1 aluminium gasket

AKVA 15

Piston

Type	Code	Contents
AKVA 15-1	**068F5265**	1 piston assembly 1 gasket Qty 1 O-ring 2 labels
AKVA 15-2	**068F5266**	
AKVA 15-3	**068F5267**	
AKVA 15-4	**068F5268**	

Gasket set	**068F5264**	Complete gasket set

Orifice set

Code	Contents
068F5261	Main orifice Pilot orifice aluminium gaskets O-rings Gaskets

Upper part

Code	Contents
068F5045	1 armature 1 armature tube Qty 1 aluminium gasket

Filter

Code	Contents
068F0540	10 filters 10 aluminium gaskets

AKVA 20

Piston

Type	Code	Contents
AKVA 20-0.6	**042H2039**	1 piston assembly 3 ea. O-rings
AKVA 20-1	**042H2040**	
AKVA 20-2	**042H2041**	
AKVA 20-3	**042H2042**	
AKVA 20-4	**042H2043**	
AKVA 20-5	**042H2044**	

Orifice set

Type	Code	Contents
AKVA 20-0.6	**068F5270**	Main orifice, dia. 8 mm Pilot orifice, dia. 1.8 mm 2 aluminium gaskets O-ring
AKVA 20-1		
AKVA 20-2		
AKVA 20-3		
AKVA 20-4	**068F5271**	Main orifice, dia. 14 mm Pilot orifice, dia. 2.4 mm 2 aluminium gaskets O-ring
AKVA 20-5		

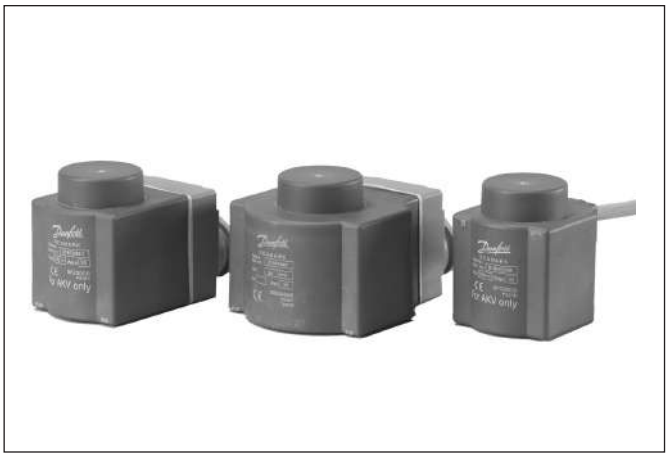
Gasket set	**032F2327**	Complete gasket set for new and old valve versions

Upper part

Code	Contents
068F5045	1 armature 1 armature tube Qty 1 aluminium gasket

Coils for expansion valves

These coils are used with type AKV, AKVH and AKVA expansion valves.



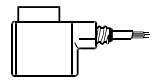
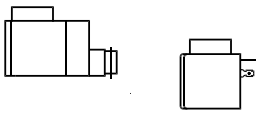
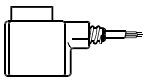
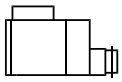
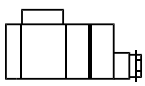
Technical data

3-conductor cable
The external thread of the threaded cable entry is suitable for flexible steel conduit or equivalent cable protection.

Terminal box
Leads are connected to terminal screws in the terminal box.
The box is fitted with a PG 13.5 cable gland for 6 → 14 mm cable.
Max. conductor cross section.: 2.5 mm^2.

Enclosure
IP 67

Coils for AKV and AKVA valves

Voltage	Type	Cable/terminal box/DIN plug	Power consumption	Code no.
230 V d.c.		With 2.5 m cable	18 W *)	**018F6288**
		With 4 m cable		**018F6278**
		With 8 m cable		**018F6279**
		With terminal box	18 W *)	**018F6781**
		Without terminal box		**018F6991**
230 V a.c.		With 1 m cable	10 W, 50 Hz (AKV 10, 1-6) (AKV 15)	**018F6251**
		With terminal box		**018F7351**
		Coil and terminal box with coil control (EEC)	4 W (recommended for AKVH)	**018F6783**
24 V a.c.		With terminal box	12 W, 50 Hz. **)	**018F6807**
			12 W, 60 Hz **)	**018F6815**
			20 W, 50 Hz	**018F6901**
			20 W, 60 Hz	**018F6902**

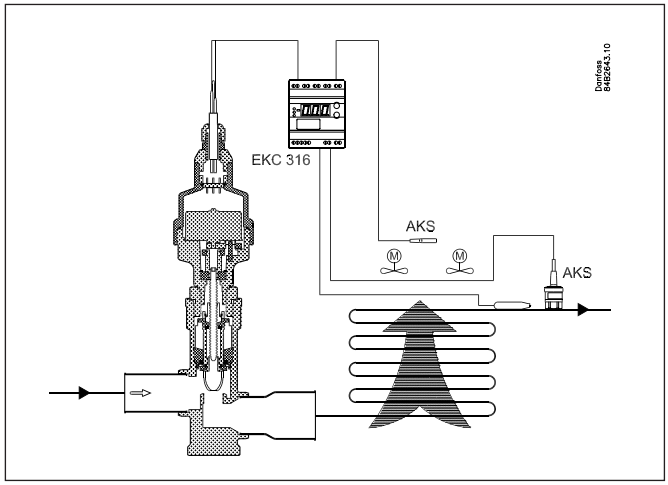
*) Not for AKVH 10 orifice 6 or higher at high MOPD (35 bar).
**) Not for orifice 6 or higher. Not for high MOPD (35 bar).

ETS

Application
ETS is a series of electrically operated expansion valves for precise liquid injection in evaporators for air conditioning and refrigeration applications. It cannot be used with flammable hydrocarbons.

Functional description
The valve piston and linear positioning mechanism is fully balanced, providing bidirectional flow capability and tight solenoid shut-off in both flow directions.

Advantages
- Precise positioning for optimal control of liquid injection.
- The ETS 12½, 25, 50 and 100 are designed for HFC and HCFC operation, including R410A, and rated for working pressures up to 45.5 bar (660 psig).
- The ETS 50 and 100 have bimetallic connections for fluxless brazing, which makes processing easier and increases productivity.
- The ETS 50 to 400 are available with a built-in sight glass.
- The ETS 250 and 400 are designed for HFC and HCFC operating and rated for working pressures up to 34 bar (493 psig).
- Balanced design enables bidirectional flow operation and tight solenoid tight shut-off in both flow directions at a MOPD of 33 bar (478.6 psig).
- The AST-g service driver is available for manual operation and servicing. For additional information, see document RI4JY.
- Special valves for CO2 are available.



Technical data

Parameter	ETS 12½ / ETS 25	ETS 50 / ETS 100	ETS 250/ ETS 400
Compatibility	HFC, HCFC	HFC, HCFC	HFC, HCFC
P.E.D	Yes	Yes	Yes
Max. opening difference pres. MOPD	33 bar (478 psi)	33 bar (478 psi)	33 bar (478 psi)
Max. opening difference press. (MOPD) in opposite flow direction	33 bar (478 psi)	33 bar (478 psi)	10 bar (145 psi)
Max. working pressure (PS/MWP)	45.5 bar (660 psi)	45.5 bar (660 psi)	34 bar (493 psi)
Refrigerant temperature range	–40°C to 65°C (–40°F to 149°F)	–40°C to 65°C (–40°F to 149°F)	–40°C to 65°C (–40°F to 149°F)
Ambient temperature	–40°C to 60°C (–40°F to 140°F)	–40°C to 60°C (–40°F to 140°F)	–40°C to 60°C (–40°F to 140°F)
Total stroke	13 mm (0.5 in.)	13 mm / 16 mm (0.5 in. / 0.6 in.)	17.2 mm (0.68 in.)
Motor enclosure	IP 67	IP 67	IP 67

Electrical data

Parameter	ETS 12½-400
Stepper motor type	Bipolar, permanent magnet
Stepping mode	2 phase, full step
Winding resistance (1 phase)	52 Ω ±10%
Winding inductance (1 phase)	85 mH
Holding current	Depends on application. Full current allowed (100% duty cycle)
Step angle	7.5° (motor), 0.9° (lead screw), Gear ratio 8.5:1 (38/13)^2:1
Rated voltage	(Constant-voltage drive) 12 V DC -4%/+15%, 150 step/s
Phase current	(Switch-mode drive) 100 mA RMS -4/+15%
Maximum total power	Voltage drive: 5.5 W, current drive: 1.3 W (UL NEC Class 2)
Step rate	150 step/s (constant-voltage drive) 0–300 step/s; 300 recommended (switch-mode current drive)
Total steps	ETS 12½, 25, 50: 2625 (+160/-0) ETS 100: 3530 (+160/-0) ETS 250 and 400: 3810 (+160/-0)
Full travel time	ETS 12½, 25, 50: 17 s (voltage current) / 8.5 s (current drive) ETS 100: 23 s (voltage current) / 11.5 s (current drive) ETS 250 and 400: 25.4 s (voltage current) / 12.7 s (current drive)
Lifting height	ETS 12½, 25, 50: 13 mm (0.5 in.) ETS 100: 16 mm (0.6 in.) ETS 250-400: 17.2 mm (0.7 in.)
Reference position	Overdrive against full closed position
Electrical connection	M12 Connector

Stepper motor switching sequence:

STEP		Coil I		Coil II	
		Red	Green	White	Black
↓ OPENING ↓	1	+	-	+	-
	2	+	-	-	+
	3	-	+	-	+
↑ CLOSING ↑	4	-	+	+	-
	1	+	-	+	-

Ordering data

Type	Connection		Code no.	
	ODF × ODF [in]	ODF × ODF [mm]	Straight way	Angle way
ETS 12½	½ × ½		**034G4209**	**034G4213**
		12 × 12	**034G4208**	**034G4212**
	5/8 × 5/8	16 × 16	**034G4210**	**034G4214**
	7/8 × 7/8	22 × 22	**034G4211**	**034G4215**
ETS 25	½ × ½		**034G4201**	**034G4205**
		12 × 12	**034G4200**	**034G4204**
	5/8 × 5/8	16 × 16	**034G4202**	**034G4206**
	7/8 × 7/8	22 × 22	**034G4203**	**034G4207**
ETS 50	7/8 × 7/8	22 × 22	**034G1708**	
	7/8 × 1 1/8	22 × 28	**034G1705**	
	1 1/8 × 1 1/8	28 × 28	**034G1706**	
	1 1/8 × 1 3/8	28 × 35	**034G1704**	
ETS 100	1 1/8 × 1 1/8	28 × 28	**034G0507**	
	1 1/8 × 1 3/8	28 × 35	**034G0501**	
	1 3/8 × 1 3/8	35 × 35	**034G0508**	
	1 5/8 × 1 5/8		**034G0505**	
ETS 250	1 1/8 × 1 1/8	28 × 28	**034G2600**	
	1 3/8 × 1 3/8	35 × 35	**034G2601**	
	1 5/8 × 1 5/8		**034G2602**	
		42 × 42	**034G2611**	
ETS 400	1 5/8 × 1 5/8		**034G3500**	
	2 1/8 × 2 1/8	54 × 54	**034G3501**	

ETS 50-400 are delivered with sight glass

ETS for CO_2 application (MWP 45.5 bar / 660 psig).
Exspansion valve / gas bypass valve.
For capacities, please contact Danfoss.

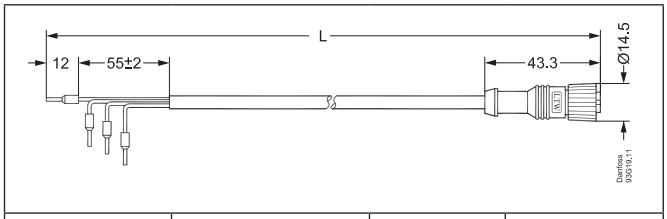
Type	Connection	Code no.
	ODF × ODF [in.]	Straight way
ETS 12.5	7/8 x 7/8	**034G4220**
ETS 25	7/8 x 7/8	**034G4219**
ETS 50	1 1/8 x 1 1/8	**034G1714**
ETS 100	1 1/8 x 1 1/8	**034G0515**

Capacity

Type	Rated capacity[1]									
	R410A		R407C		R22		R134a		R404A	
	kW	TR	kW	TR	kW	TR	kW	TR	kW	TR
ETS 12½	70	20	63	18	57	16	45	13	43	12
ETS 25	144	41	129	37	117	34	93	27	88	25
ETS 50	262.3	75.7	240.5	69.1	215	62	170	48.9	161.4	46.3
ETS 100	488.4	140.9	447.8	128.7	400.4	115.4	316.5	91.2	300.5	86.6
ETS 250	-	-	1212	349	1106	319	874	252	828	239
ETS 400	-	-	1933	556	1764	509	1394	402	1320	381

[1] The rated capacity is based on:
Evaporating temperature te: 5°C (40°F)
Liquid temperature tl: 28°C (82°F)
Condensing temperature tc: 32°C (90°F)
Full stroke opening.

Cable with M12 plug



Material	Temperature range	Cable length	Code
Plug: PVC Insulation: PVC	–50 / +80°C	2 m	**034G2201**
		8 m	**034G2200**
Plug: CPE Insulation: CPE	–40 / +80°C	2 m	**034G2202**
		3 m	**034G2203**
		5 m	**034G2205**

Additional information available:
Technical brochure: DKRCC.PD.VD1.C

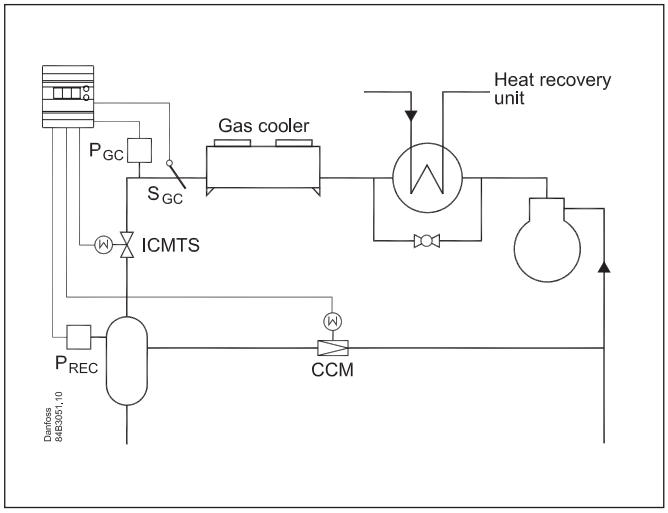
Less capacity:
See ETS 6. (must be controlled by controller type EKD)
Technical brochure: DKRCC.PD.VD1.D

CCM

Application
The CCM is an electrically operated valve designed specifically for operation in CO_2 systems. The valve is capable of functioning both as an expansion valve, and as a gas bypass valve with back-pressure regulation in subcritical applications.

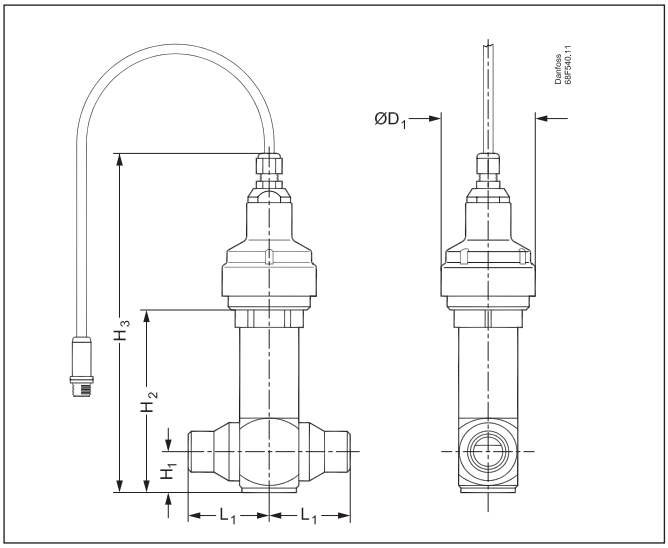
Function
The CCM can be used in a variety of applications within CO_2 refrigeration systems. Typically it is used as a gas bypass valve in a transcritical CO_2 booster system or as an expansion valve.

Advantage
- Up to 90 bar (1305 psi) working pressure to accomodate CO_2 system pressures during standstill conditions.
- Precise positioning for optimal control of intermediate pressures in transcritical CO_2 systems or liquid injection in heat exchangers.
- Possibility of bi-flow operation
- MOPD up to 50 bar (725 psi)
- Combined stainless steel butt weld/solder connections for installation in copper piped systems (K65 alloy or standard) as well as steel piped systems.
- Standard M12 connector for simple and flexible connection to the motor driver.
- For manual operation and service of the CCM an AST-g service driver is available. For further information please contact Danfoss (Commercial Refrigeration and Air Conditioning Controls).



Technical data

Parameter	**CCM**
Compatibility	R744
MOPD	50 bar (725 psi)
Max. working pressure (PS/MWP)	90 bar (1305 psi)
Refrigerant temperature range	–40°C to 60°C (–40°F to 140°F)
Ambient temperature	–40°C to 60°C (–40°F to 140°F)
Total stroke	13 mm / 16 mm (0.5 in. / 0.6 in.)
Motor enclosure	IP 67



Type	H_1		H_2		H_3		L_1		$ØD_1$		Weight	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	kg	lb.
CCM	26.2	1.0	120.0	4.7	225.0	8.9	53.0	2.1	62.0	2.4	1.8	4.0

Electrical data

Parameter	CCM
Stepper motor type	Bi-polar - permanent magnet
Step mode	2 phase full step
Phase resistance	52Ω ±10%
Phase inductance	85 mH
Holding current	Depends on application. Full current allowed (100% duty cycle)
Step angle	7.5° (motor), 0.9° (lead screw), Gearing ration 8.5:1. $(38/13)^2$:1
Nominal voltage	(Constant voltage drive) 12 V dc -4% +15%, 150 steps/sec.
Phase current	(Using chopper drive) 100 mA RMS -4% +15%,
Max. total power	Voltage / current drive: 5.5 / 1.3 W (UL: NEC class 2)
Step rate	150 steps/sec. (constant voltage drive) 0-300 steps/sec. 300 recommended (chopper current drive)
Total steps	CCM 10, 20, 30 2625 [+160 / -0] steps CCM 40 3530 [+160 / -0] steps
Full travel time	CCM 10, 20, 30 17 / 8.5 sec. (voltage / current) CCM 40 23 / 11.5 sec. (voltage / current)
Lifting height	CCM 10, 20, 30 13 mm (0.5 in.) CCM 40 16 mm (0.6 in.)
Reference position	Overdriving against the full close position
Electrical connection	4 wire 0.5 mm^2 (0.02 in^2), 0.3 m (1 ft) long cable

Coupling sequence, step motor:

STEP		Coil I		Coil II	
		Red	Green	White	Black
↓ OPENING ↓	1	+	-	+	-
	2	+	-	-	+
	3	-	+	-	+
↑ CLOSING ↑	4	-	+	+	-
	1	+	-	+	-

Ordering

Valve incl. actuator

Type	Connections (Combi)		Code nos
	Weld[1)] [in]	Solder ODF x ODF [in]	
CCM 10	1/2 x 1/2	5/8 x 5/8	**027H7188**
CCM 20	3/4 x 3/4	7/8 x 7/8	**027H7187**
CCM 30	1 x 1	1 1/8 x 1 1/8	**027H7186**
CCM 40	1 x 1	1 1/8 x 1 1/8	**027H7185**

[1)] OD according to EN 10220

Spare parts

Actuator CCM CO_2 valve	**027H7184**
Wire with M12 plug, 8 m	**034G2323**
AST-G driver manual box for operating the valve	**034G0013**

Additional information available:
Technical brochure: DKRCI.PD.VK1.A

CCMT
For high pressure

Application

The CCMT is designed to regulate the flow of transcritical gas or subcritical liquid from the gascooler in transcritical CO_2 systems. The CCMT can also be used for other control functions in CO_2 systems or other high pressure systems. It cannot be used with flammable hydrocarbons.

Advantages

- Variant of the CCM valve
- Designed for high pressure CO_2 systems with applications for a maximum working pressure of 140 bar (2030 psig).

Technical data

Temperature range:

- Media: -40 to 60°C (-40 to 140°F)

Pressure:

- Max. working pressure Ps: 140 bar g (2030 psig)
- Max. MOPD: 90 bar (1305 psi)

Additional information available:
Technical brochure:: : DKRCC.PD.VK1.B

Ordering

Valve with actuator

Type	Connection		kv-value	Code no.
	Weld [in]	Solder ODF x ODF [in]	m3/h	
CCMT 2	1/2 x 1/2	5/8 x 5/8	0.17	**027H7200**
CCMT 4			0.45	**027H7201**
CCMT 8			0.8	**027H7202**

ICM
Motor valve

Application
ICM valves are intended to be used to control expansion processes in liquid lines with or without phase shift, or to control the pressure or temperature in dry and wet liquid lines as well in hot gas lines.

Functional description
ICM motor valves belong to the ICV (industrial control valve) family. They consist of three main components: the valve body, the combined top cover / operating module, and the actuator.

ICM valves are directly operated motorised valves driven by an ICAD actuator (industrial control actuator with display).

ICM valves are designed to have balanced opening and closing forces, so only three sizes of ICAD actuators are necessary for the complete range of ICM valves, from DN 20 to DN 105. The ICM motorised valve and ICAD actuator assembly forms a very compact unit.

The following table shows the possible combinations of ICM motorised valve and ICAD actuator:

Actuator	ICAD 600	ICAD 900/1200	ICAD 1200
Valve size	ICM 20	ICM 40	ICM 100
	ICM 25	ICM 50	ICM 125
	ICM 32	ICM 65	ICM 150

ICAD 600 / ICAD 900 / ICAD 1200
ICAD actuators can be controlled using the following signals:
- 0–20 mA
- 4–20 mA (default)
- 0–10 V
- 2–10 V

An ICAD actuator can also operate an ICM valve in on/off mode controlled by a digital input.

The ICM valve can be operated manually using the ICAD actuator or the ICM multifunction tool.

Fail-safe supply options
Several options are available for fail-safe operation in case of power failure, assuming an ICAD UPS or similar device used.
The ICM can be configured to operate as follows during a power failure:
- close ICM;
- open ICM;
- maintain the position at the time of power failure;
- go to a specified ICM valve opening degree.

Advantages
- Designed for industrial refrigeration applications with a maximum working pressure of 52 bar/754 psig.
- ICM 20-65: Can be used with all common refrigerants, including R717, R744 (CO_2), and non-corrosive gases or liquids.
- ICM 100-150: Can be used with R 717. For other refrigerants, please contact Danfoss
- Directly coupled connections
- Connection types include butt weld, socket weld, solder, and threaded
- Low temperature steel body.
- Low weight and compact design.
- V-port regulating cone ensures optimum control accuracy, especially with partial load
- Cavitation-resistant valve seat.
- Modular concept:
  - Each valve body is available with several connection types and sizes
  - Valve overhaul is performed by replacing the operating module.
  - ICM motor valves can be converted to ICS servo valves
- Manual opening possible using ICAD or multifunction tool
- The PTFE seat provides excellent valve tightness.
- Magnetic coupling with true hermetic enclosure

Design

Connections
A very wide range of connection types are available with ICM valves:
D: butt weld, EN 10220
A: butt weld, ANSI (B 36.10)
J: butt weld, JIS (B S 602)
SOC: socket weld, ANSI (B 16.11)
SD: solder connection, EN 1254-1
SA: solder connection, ANSI (B 16.22)
FPT: female pipe thread (ANSI/ASME B 1.20.1)

Approvals
ICV valves are designed to fulfil global refrigeration requirements. Contact Danfoss for specific approval information.

ICM valves are approved in accordance with European standards specified in the Pressure Equipment Directive and are CE marked. See the installation instructions for additional information and restrictions.

Valve body and top cover material
Low temperature steel

ICM valves			
Nominal bore	DN ≤ 25 (1 in.)	DN 32-65 mm ($1^1/_4$ - $2^1/_2$ in.)	DN 80-125 mm (3- 5 in.)
Classified for	Fluid group I I		
Category	Article 3, paragraph 3	II	III

Technical data

Refrigerants
Suitable for use with all common refrigerants, including R717, R744 (CO_2), and non-corrosive gases and liquids.
Not recommended for use with flammable hydrocarbons.

Temperature range
Media: –60/+120°C (–76/+248°F).

Pressure
The valve is designed for a
maximum working pressure of 52 bar g (754 psig).

Surface protection
ICM 20-150:
External surfaces are zinc chromated to provide good corrosion protection.

Maximum opening pressure differential (MOPD)
– ICM 20-32: 52 bar (750 psi)
– ICM 40: 40 bar (580 psi)
– ICM 50: 30 bar (435 psi)
– ICM 65: 20 bar (290 psi)
– ICM 100: 20 bar (290 psi)
– ICM 125: 20 bar (290 psi)
– ICM 150: 20 bar (290 psi)

Additional information available:
Technical brochure: DKRCI.PD.HT0.B

ICMTS
Motor valve for high pressure

Application
The ICMTS valve is designed to control the flow of transcritical gas or subcritical liquid from the gas cooler in transcritical CO_2 systems. The ICMTS valve can also be used for other control functions in CO_2 systems or other high pressure systems. It cannot be used with flammable hydrocarbons.

Advantages
- Variant of the ICM valve
- Designed for high pressure CO_2 systems with a maximum working pressure of 140 bar (2030 psig)

Actuator
ICAD 600A-TS

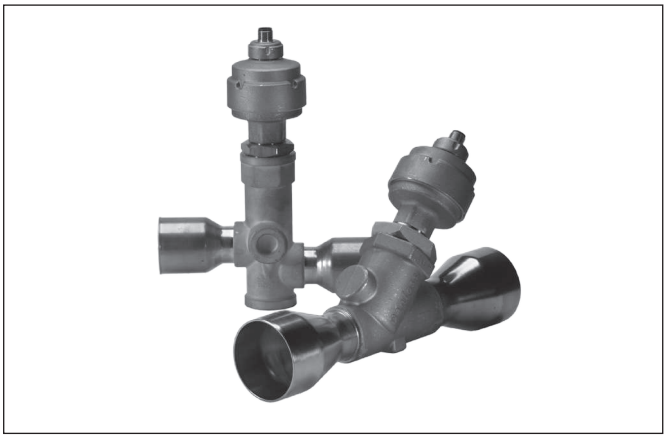
Technical data
Temperature range:
- Media: -60 to 120°C (-76 to 248°F)

Pressure
- Maximum working pressure Ps: 140 bar gauge (2030 psig)
- Maximum MOPD: 90 bar (1305 psi)

Additional information available:
Technical brochure: DKRCI.PD.HY0.B

Evaporation pressure valve

KVS

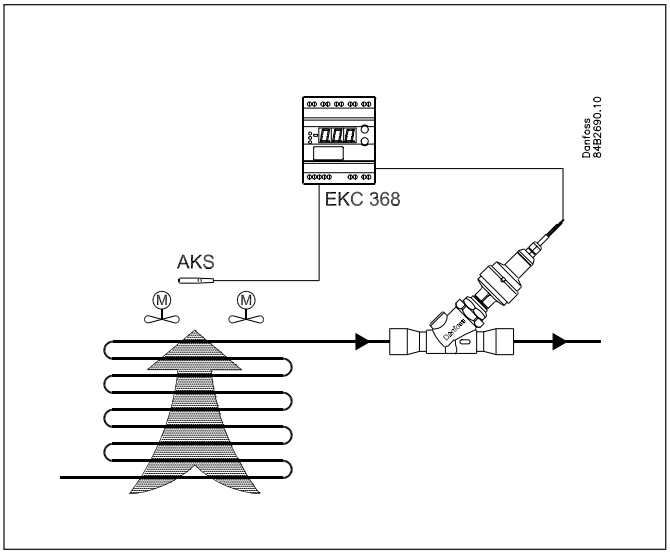


Application
KVS is a series of electrically operated modulating suction control valves for air conditioning and refrigeration applications.
It cannot be used with flammable hydrocarbons.

Functional description
Accurate temperature or pressure control is obtained by modulating the refrigerant flow in the evaporator, using a current or voltage driver.

With an EKC 368 controller (current driver) and an AKS sensor located in the media to be controlled, an accuracy better than ±0.5 K can be obtained.

The balanced design enables bidirectional flow operation and solenoid shut-off in both flow directions at an MOPD of 33 bar (478 psi).



Advantages
- Balanced port design
- High resolution for precise control
- Tight solenoid shut-off
- Low power consumption
- Corrosion resistant design inside and outside

Technical data

Parameter	KVS 15	KVS 42
Compatibility	HFC, HCFC	HFC, HCFC
CE marking	-	Yes
MOPD	33 bar (478 psi)	33 bar (478 psi)
Maximum working pressure	45.5 bar (660 psig)	34 bar (493 psig)
Refrigerant temperature range	–40 to +65°C (–40 to +149°F)	–40 to +65°C (–40 to +149°F)
Ambient temperature	–40 to +60°C (–40 to +140°F)	–40 to +60°C (–40 to +140°F)
Total stroke	13 mm (0.5 in.)	17.2 mm (0.68 in.)
Motor enclosure	IP 67	IP 67

Electrical data

Parameter	KVS 15, 42
Stepper motor type	Bipolar, permanent magnet
Stepping mode	2 phase, full step
Winding resistance (1 phase)	52 Ω ±10%
Winding inductance (1 phase)	85 mH
Holding current	Depends on application. Full current allowed (100% duty cycle)
Step angle	7.5° (motor), 0.9° (lead screw), Gear ratio 8.5:1 (38/13)^2:1
Rated voltage	(Constant-voltage drive) 12 V d.c. -4%/+15%, 150 step/s
Phase current	(Switch-mode drive) 100 mA RMS -4/+15%
Maximum total power	Voltage drive: 5.5 W, current drive: 1.3 W (UL NEC Class 2)
Step rate	150 step/s (constant-voltage drive) 0–300 step/s; 300 recommended (switch-mode current drive)
Total steps	KVS 15: 2625 (+160 / -0) KVS 42 : 3810 (+160 / -0)
Full travel time	KVS 15: 17 / 8.5 s (voltage or current drive) KVS 42 : 25.4 / 12.7 s (voltage or current drive)
Lifting height	KVS 15: 13 mm (0.5 in.) KVS 42 = 17.2 mm (0.68 in.)
Reference position	Overdrive against full closed position
Electrical connection	M12 plug

Stepper motor switching sequence:

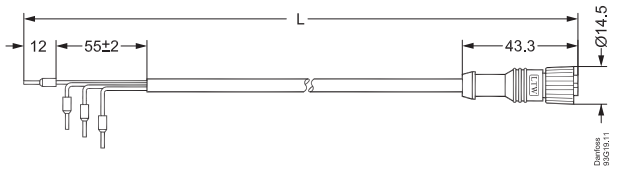
STEP		Coil I		Coil II	
		Red	Green	White	Black
↓ OPENING ↓	1	+	-	+	-
	2	+	-	-	+
↑ CLOSING ↑	3	-	+	-	+
	4	-	+	+	-
	1	+	-	+	-

Ordering data

Type	Rated capacity[1]						KVS valve + AST actuator		
	R22		R134a		R404A/R507		Connected device		Code single pack
	kW	TR	kW	TR	kW	TR	mm	in.	
KVS 15	5.15	1.31	3.78	0.94	4.58	1.07	16	5.8	**034G4252**
							22	7.8	**034G4253**
KVS 42	40.4	11.4	29.3	8.3	35.3	10,0	22	7/8	**034G2858**
							28	1 1/8	**034G2850**
							35	1 3/8	**034G2851**
								1 5/8	**034G2852**

[1] The rated capacity is the valve capacity under the following conditions:
evaporating temperature te = –10°C (14°F)
condensing temperature tc = +25°C (77°F)
pressure drop across valve Δp = 0.2 bar (2.9 psig)

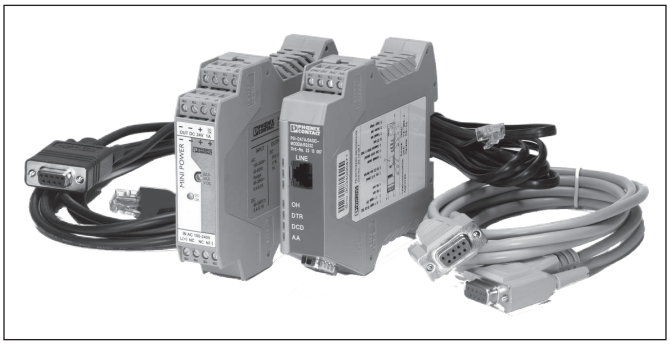
Cable with M12 plug



Material	Temperature range	Cable length	Code
Plug: PVC Insulation: PVC	–50 / +80°C	2 m	**034G2201**
		8 m	**034G2200**
Plug: CPE Insulation: EPR	–40 / +80°C	2 m	**034G2202**

Additional information available:
Technical brochure: DKRCC.PD.VD1.C

AKA 231
Modem



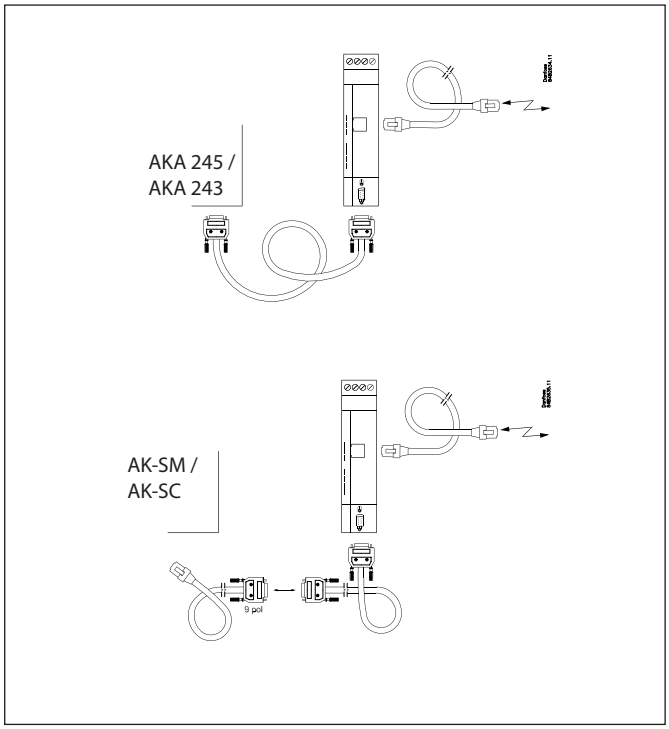
Application
The AKA 231 is a modem for use with an ADAP-KOOL® refrigeration system controller. It can transmit data between the ADAP-KOOL® system unit in the refrigeration system and the communication port of an external ADAP-KOOL® product. Data is transmitted via the telephone network.

Advantages
The PSI-DATA/BASIC-Modem/RS232 V.24 modem is designed for use in an industrial environment with harsh EMI conditions.

Technical data

Power supply	For power supply	100 - 240 V AC 50/60 Hz (Supplies modem with 24 V d.c.) At 115 V: 750 mA At 230 V: 450 mA
Connection	To system unit	9-pol D-SUB
	To telephone network	RJ12 6 pos.
Data format	Serial asynchronous UART/NRZ, 7/8 data, ½ stop, 1 parity, 10/11 bits character length	
Serial transmission speed	Automatic adjustment to: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps	
CE compliance	In accordance with EMC directive 89/336/EEC	
Approvals	TBR21 TIA-968-A CS-03 for Europe, USA and Canada	
Ambient temperature	0 - 55°C	
Assembly	DIN rail	
Measurements (H x W x D)	99 mm x 22.5 mm x 114.5 mm	
Weight	Modem	165 g
	Power supply	290 g
Internal earth	Linked to DIN bar via the housing	

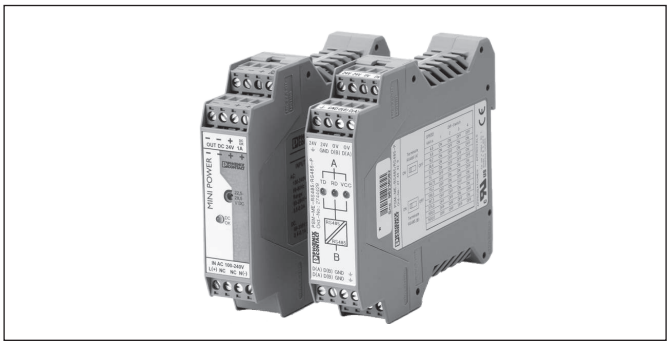
Cabling



Ordering data

Type	Description	Code
AKA 231	Modem (PSI-DATA/BASIC-MODEM/RS232) including power supply including cable to AKA 243 or AKA 245 including cable to AK unit including cable to telephone network	**084B2242**
Modem adapter for AK-SC 255 to AKA 231		**084Z2100**

AKA 222/223
Repeater

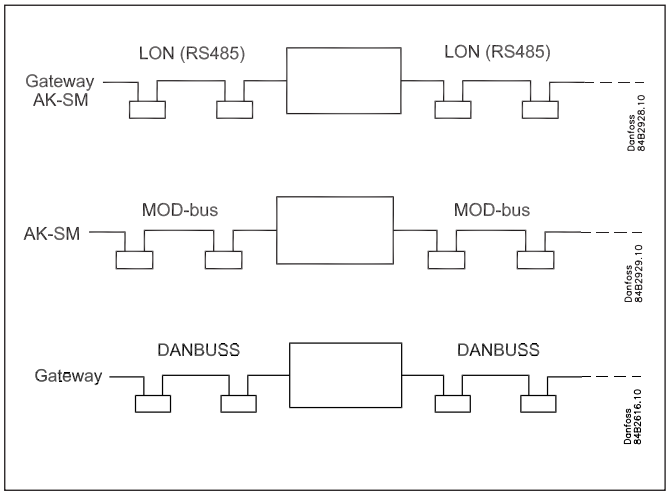


Application
This module is a repeater for use with ADAP-KOOL® control systems. It can amplify and regenerate the signals on the data communication cable between a refrigeration system controller and the system unit.
This module can be used with the following communication interfaces:
• DANBUSS
• Lon RS 485
• Modbus

Functional description
The repeater regenerates the bus signals in situations with long connecting cables and many connected controllers.

Technical data

Power supply	Input voltage	100–240 V AC 50/60 Hz (supplies 24 V DC 90 mA to repeater)
Connections	Screw terminals	
Baud rate	Lon (RS 485)	78.1 (factory setting)
	DANBUSS	4800 (factory setting)
	MOD-bus	19.2 (must be set)
CE compliance	In accordance with EMC Directive 89/336/EEC	
Ambient temperature	0 to 55°C	
Mounting	DIN rail	
Dimensions (H x W x D)	99 x 22.5 x 114.5 mm	
Weight	Repeater	200 g
	Power supply	290 g

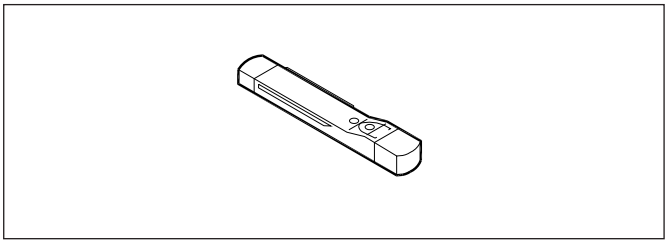


Ordering data

Type	Description	Code
AKA 222	Bus repeater DANBUSS and MOD-bus (power supply included)	**084B2240**
AKA 223	Bus repeater Lon (RS 485) (power supply included)	**084B2241**

Note:
Data bus or network cables and repeaters must be installed according to the requirements specified in the following document:
Data Communication between ADAP-KOOL® Refrigeration Controls Document number: RC8AC

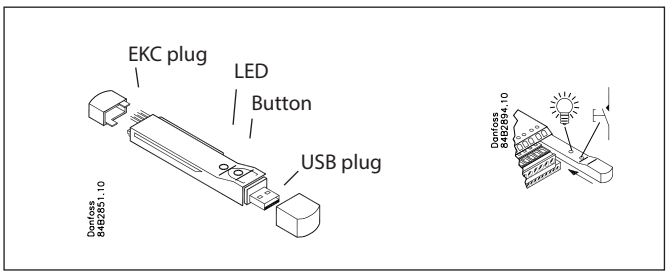
EKA 183A
Programming key

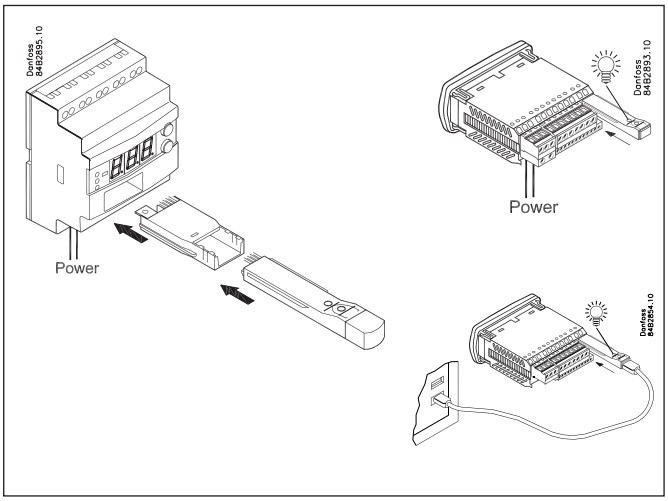


Application
The EKA 183A programming key is used to copy settings to an EKC and ERC controller.

It can also be used to copy settings from one controller to another controller of the same type (same order number and software version).
The programming key can hold only one file for each order number, but it has room for many order numbers.

It can be used with the following modules:
EKC 102, EKC 202, EKC 204, AK-CC 210
EKC 3xx (except EKC 301), EKC 4xx, EKC 5xx, AK-CC 450, AK-CC 550.
ERC 211, ERC 213, ERC 214.
A suitable adapter is necessary for use with the ERC 21x, EKC 3xx, EKC 4xx, EKC 5xx, AK-CC 450, and AK-CC 550 modules.





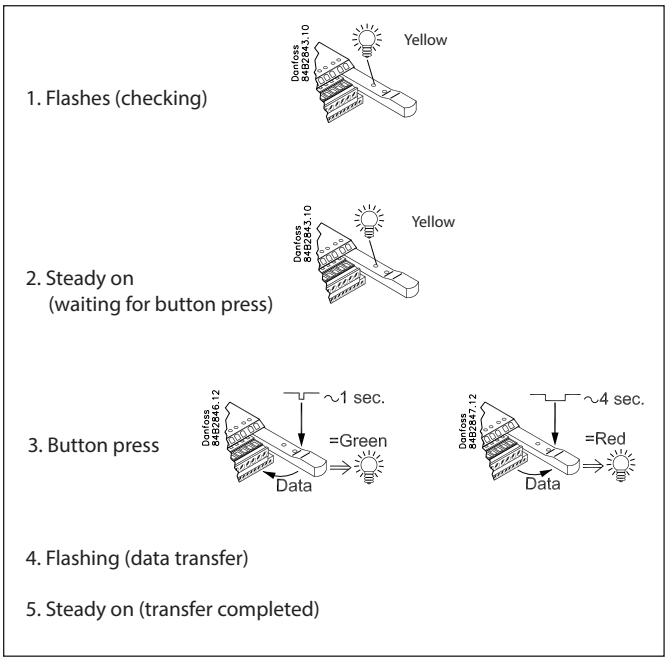
Advantages
- OEM tool for controller configuration
- Service tool for configuring controllers quickly
- Power for the programming key and the necessary components of the controller can be provided by a USB cable, eliminating the need a source of 230-V power with panel-mounted controllers.

Functional description

Basic operation
The EKA 183A is plugged in to the controller. The controller is connected to the AC mains.
Data can be copied from the programming key to the controller or vice versa by pressing the button.

Pre-programming
The EKA 183A is plugged into a USB port on the PC. The current file is transferred. The settings are configured using Microsoft Excel.

Fast data transfer
For OEM use, the programming key can be configured to start data transfer as soon as the key is plugged in to the controller.



Ordering data

Type	Description	Code no.
EKA 183A	Programming key	**084B8582**
EKA 183A	Programming key + adapter for ERC 21x	**080G9740**

Further information!
Technical brochure DKRCC.PD.R1.06.--

Appendix

AK series order data

This list is intended to serve as a convenient overview for customers who are familiar with our AKC product series.

Type	Description	Language	Code	Recommended for new installations
AKC 114	Refrigeration appliance controllers for one evaporator	GB, DE, FR	084B6027	AK-CC 550
AKC 114	Refrigeration appliance controllers for one evaporator	GB, DK, ES	084B6028	AK-CC 550
AKC 115	Refrigeration appliance controllers for two evaporators	GB, DE, FR	084B6042	AK-CC 550, 2 ea.*
AKC 115	Refrigeration appliance controllers for two evaporators	GB, DK, ES	084B6046	AK-CC 550, 2 ea.*
AKC 116	Refrigeration appliance controllers for three evaporators	GB, DE, FR	084B6043	AK-CC 550, 3 ea.*
AKC 116	Refrigeration appliance controllers for three evaporators	GB, DK, ES	084B6047	AK-CC 550, 3 ea.*
AKC 114D	Refrigeration appliance controllers for one evaporator	GB, DE, FR	084B6029	AK-CC 550
AKC 115D	Refrigeration appliance controllers for two evaporators	GB, DE, FR	084B6044	AK-CC 550, 2 ea.*
AKC 115D	Refrigeration appliance controllers for two evaporators	GB, DK, ES	084B6048	AK-CC 550, 2 ea.*
AKC 116D	Refrigeration appliance controllers for three evaporators	GB, DE, FR	084B6045	AK-CC 550, 3 ea.*
AKC 116D	Refrigeration appliance controllers for three evaporators	GB, DK, ES	084B6049	AK-CC 550, 3 ea.*
AKC 114A	Refrigeration appliance controllers for one evaporator	GB, DE, FR	084B6171	AK-CC 550
AKC 114A	Refrigeration appliance controllers for one evaporator	GB, DK, ES	084B6172	AK-CC 550
AKC 115A	Refrigeration appliance controllers for two evaporators	GB, DE, FR	084B6173	AK-CC 550, 2 ea.*
AKC 115A	Refrigeration appliance controllers for two evaporators	GB, DK, ES	084B6174	AK-CC 550, 2 ea.*
AKC 116A	Refrigeration appliance controllers for three evaporators	GB, DE, FR	084B6175	AK-CC 550, 3 ea.*
AKC 116A	Refrigeration appliance controllers for three evaporators	GB, DK, ES	084B6176	AK-CC 550, 3 ea.*
AKC 114F	Refrigeration appliance controllers for one evaporator	GB, DE, FR	084B6178	AK-CC 550
AKC 115F	Refrigeration appliance controllers for two evaporators	GB, DE, FR	084B6179	AK-CC 550, 2 ea.*
AKC 121A	Refrigeration appliance controllers for two evaporators	GB, DE, FR, DK, ES, SE	084B2051	AK-CC 450, 2 ea.*
AKC 121B	Cold room controllers for two evaporators	GB, DE, FR, DK, ES, SE	084B2904	AK-CC 450, 2 ea.*
AKC 72A	Cold room controllers for one evaporator, without bus interface	GB, DE, FR	084B1202	AK-CC 550
AKC 72A	Cold room controllers for one evaporator, without bus interface	ES, IT, PT	084B1208	AK-CC 550
AKC 72A	Cold room controls for one evaporator, with bus interface	GB, DE, FR	084B1203	AK-CC 550
AKC 72A	Cold room controls for one evaporator, with bus interface	ES, IT, PT	084B1209	AK-CC 550
AKC 72A	Cold room controls for one evaporator, with bus interface	GB, PL, NL	084B1211	AK-CC 550
	AKC 72A base for wall mounting		084B1241	-
	AKC 72A based for front panel or DIN rail mounting		084B1240	-
AKC 151R	Cold room controller for one flooded evaporator	GB	084B6195	
AKC 24W2	Water chiller controller	GB	084B2027	
AKC 24W3	Water chiller controller, extended	GB	084B2043	
AKC 25H7	Capacity controller for brine cooler units	GB, DE, FR	084B2022	
AKC 25H7	Capacity controller for brine cooler units	GB, DK, SE	084B2023	

* Or 1 AK-CC 750 with P0 measuring capability

Type	Description	Language	Code	Recommended for new installations
AKC 25H1	Compressor control	GB, DE, FR	084B2017	AK-PC 551
AKC 25H1	Compressor control	GB, ES, DK	084B2018	AK-PC 551
AKC 25H3	Compressor controller, dual	GB, DE, FR, ES, DK	084B2039	AK-PC 551, 2 ea.
AKC 25H5	Compressor controller, extended	GB, DE, FR	084B2020	AK-PC 651
AKC 25H5	Compressor controller, extended	GB, ES, DK	084B2021	AK-PC 651
AKC 22H	Alarm module		084B2050	-
AKL 111A	Monitoring and alarm units	GB, DE, FR, DK, ES, IT, SE	084B6039	AK-LM 330
AKL 25	Monitoring and alarm units, extended	GB	084B2012	AK-LM 330
AKA 14	Display		084B6040	-
AKA 15	Display		084B6130	-
	3 m cable for AKA 15 (qty 24)		084B6145	-
AKA 243A	Gateway, DANBUSS & LON (FTT10)		084B2265	AKA 245
Bridge	Lon FTT to Lon RS 485 (bidirectional)		084B2255	-
	Cable, PC gateway, 9-way to 25-way		084B2096	-
EKA 182A	Copying key EKC–EKC		084B8567	EKA 183A

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