Instructions
AK-CC 460
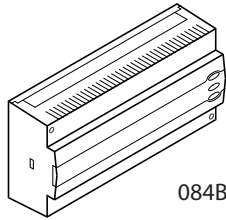
084R8052

RI8SE202

CE

Identification

084B8016

Dimensions

180

109

61.5
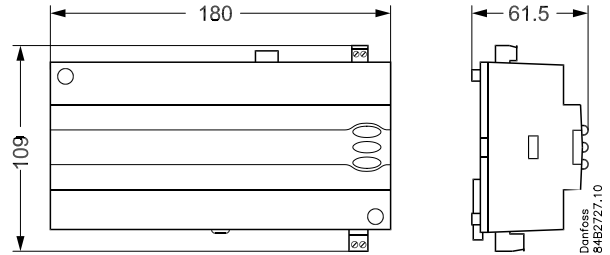
Danfoss
84B2727.10

Principle

Danfoss
84B3225.11

S_3

S_5

S_4

S_7

Danfoss
84B3224.10

S_6

S_3

S_4

S_5

1

Danfoss
84B3226.10

24 25	26 27		35 36	37 38	39 40		41 42	43 44		EKA Display	51 52 53	Ether RJ 45	54 55 56 57 58

S7   S3   S4   S5   S6   EKA Display   MODBUS

1	2	3	4	5	6		7	8	9		10	11	12	13	14	15	16	17	18	19	20	21		22	23

L
N
230Va.c.

1   2
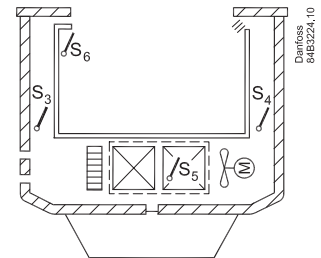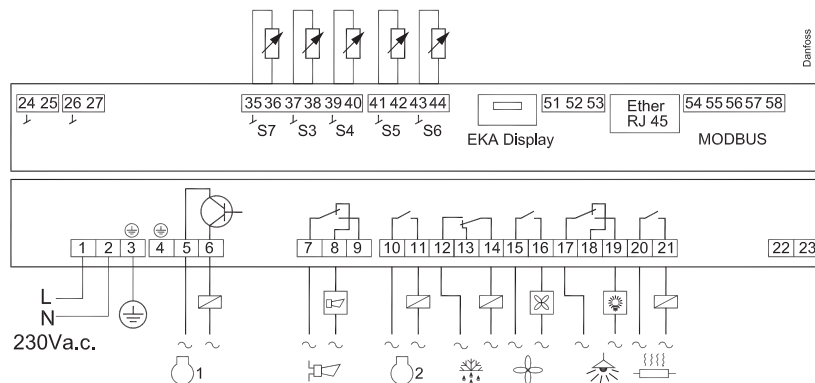
Connections
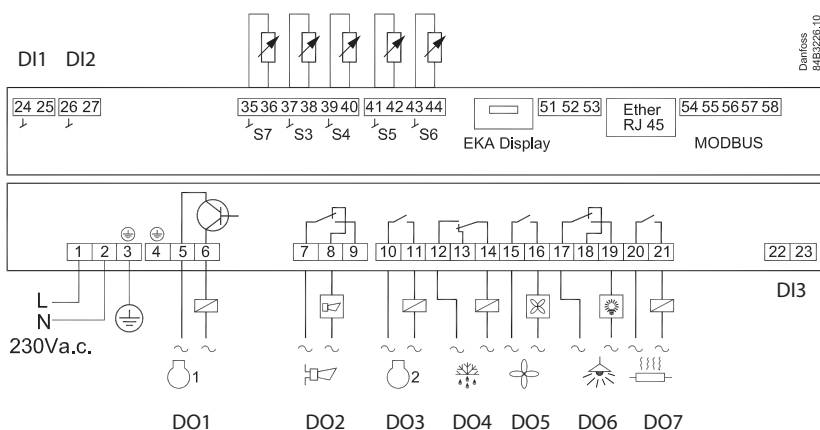
Solid state output	DO1 (for coil)	Max. 240 V a.c. , Min. 28 V a.c. Max. 0.5 A Leak < 1 mA Max. 1 pcs. coil
Relays		CE (250 V a.c.) IBExU approved
	DO3, DO4	4 (3) A
	DO2, DO5, DO6, DO7	4 (3) A

Overview of outputs and applications.

Application	DO1	DO2	DO3	DO4	DO5	DO6	DO7	DI1	DI2	DI3	AI1	AI2	AI3	AI4	AI5	AI6
1	1		2					●	●	●		S7	S3	S4	S5	S6

See also electrical diagrams earlier in the instruction.

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

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

S7, S3, S4, S5, S6
Pt 1000 ohm
S7, brine sensor, placed in the cold inlet before the heat exchanger
S3, air sensor, placed in the warm air before the evaporator
S4, air sensor, placed in the cold air after the evaporator
    (the need for either S3 or S4 can be deselected in the configuration)
S5, defrost sensor, placed on the evaporator
S6, product sensor

EKA Display
If there is be external reading/operation of the controller, display type EKA 163B or EKA 164B can be connected.

RS485 (terminal 51, 52, 53)
For data communication, but only if a data communication module is inserted in the controller. The module can be a LON RS485, DANBUSS or a MODBUS.
Terminal 51 = screen
Terminal 52 = A (A+)
Terminal 53 = B (B-)
(For LON RS485 and gateway type AKA 245 the gateway must be version 6.20 or higher.)

RJ45
For data communication, but only if a TCP/IP module is inserted in the controller. (OEM)

MODBUS
For data communication.
Terminal 56 = screen
Terminal 57 = A+
Terminal 58 = B-
(Alternatively the terminals can be connected to an external display type EKA 163A or 164A, but then they cannot be used for data communication. Any data communication must then be carried out by one of the other methods.)

Supply voltage
230 V a.c., 50/60 Hz

DO1
Compressor 1
    Connection of relay. The coil must be a 230 V a.c. coil.

DO2
Alarm
    There is a connection between terminal 7 and 8 in alarm situations and when the controller is without power.

DO3
Compressor 2
    There is connection between terminal 10 and 11 when the compressor is on.

DO4
Defrost
    There is connection between terminal 12 and 14 when defrosting takes place.

DO5
Fan
    There is connection between terminal 15 and 16 when the fan is on.

DO6
Light relay
There is connection between terminal 17 and 18 when the light must be on.

DO7
Rail heat
There is connection between terminal 20 and 21 when the rail heat is on.

DI3
Digital input signal
Safety circuits compressor 1 and 2
The signal must have a voltage of 0 / 230 V a.c.

Data communication
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

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

Coordinated defrost via cable connections

max. 10
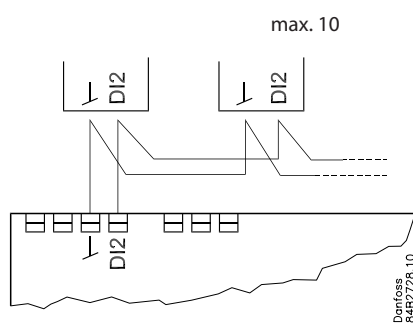
The following controllers can be connected up in this way:
EKC 204A, AK-CC 210, AK-CC 250, AK-CC 450, AK-CC 460, AK-CC 550,

Refrigeration is resumed when all controllers have "released" the signal for defrost.

Coordinated defrost via data communication
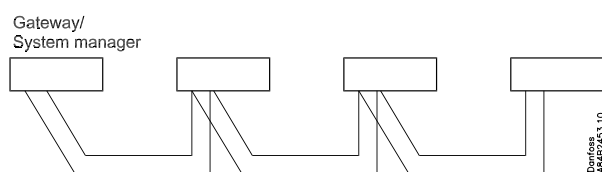
The setting of controllers to coordinate their defrosting takes place in the gateway/system manager.

Refrigeration is resumed when all controllers have "released" the signal for defrost.

Data communication

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MODBUS

MOD

Danfoss 84B2737.11

LON RS485/DANBUSS

RS

+LON RS485/DANBUSS

Danfoss 84B2738.10

IP

RJ45

+IP
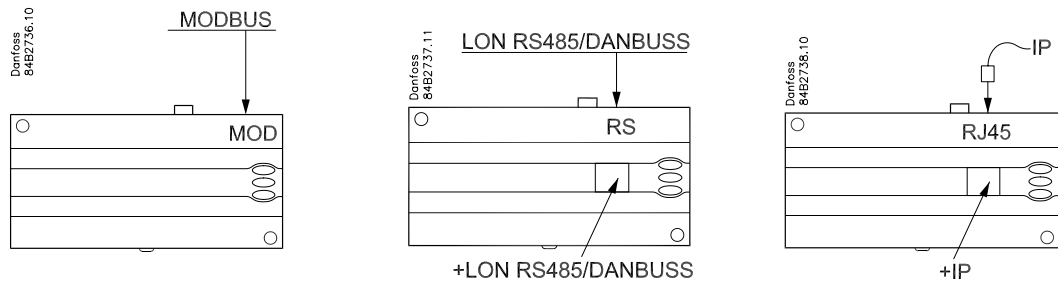
System manager / Gateway

AK-SM....

AKA 245 version 6.20$^+$ / AK-SM...

OEM

Display EKA 163 / 164

L < 15 m

Max. 15m

Danfoss 84B2734.10

L > 15 m

Danfoss 84B2739.11

Max. 1000m

DATA com.

RS MOD

+LON RS485/DANBUSS / MODBUS / IP

EKA 163A/164A

12V

A

B

Danfoss 84B2831.12

⊥	+		A+	B-
54	55	56	57	58

AK-CC 450/550 / AK-CC 460
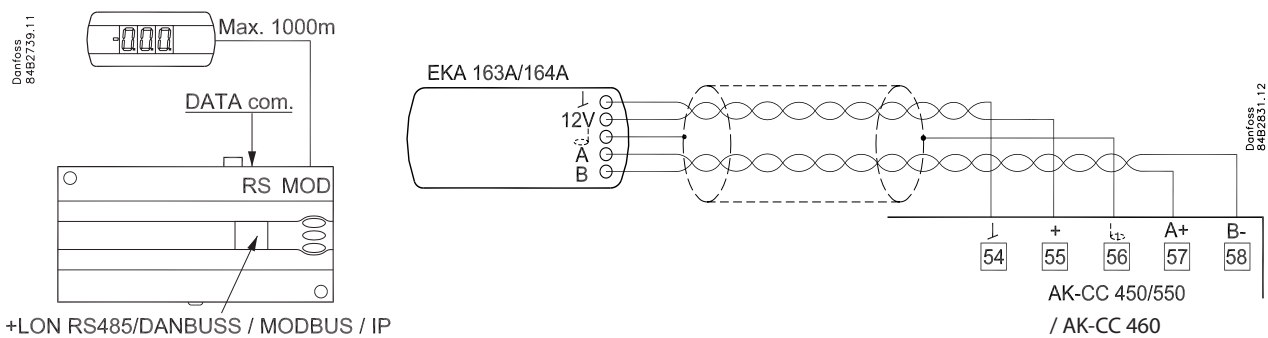
Operation

Controller/Display

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

Light-emitting diodes (LED) on front panel
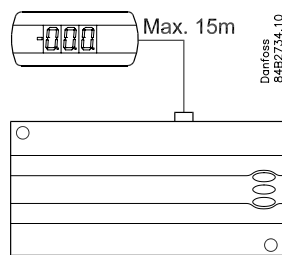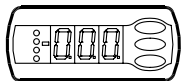
The LED's on the front panel will light up when the relevant relay is activated.

❄ = Refrigeration
❄ = Defrost
✤ = Fan running

The light-emitting diodes will flash when there is an alarm.
In this situation you can download the error code to the display and cancel/accept for the alarm by giving the top button a brief push.

The buttons

When you want to change a setting, the upper and the lower buttons will give you a higher or lower value depending on the button you are pushing. But before you change the value, you must have access to the menu. You obtain this by pushing the upper button for a couple of seconds - you will then enter the column with parameter codes. Find the parameter code you want to change and push the middle button until value for the parameter is shown. When you have changed the value, save the new value by once more pushing the middle button.

Examples

Set menu
1. Push the upper button until a parameter r01 is shown
2. Push the upper or the lower button and find that parameter you want to change
3. Push the middle button until the parameter value is shown
4. Push the upper or the lower button and select the new value
5. Push the middle button again to set the value.

Cutout alarm relay / receipt alarm/see alarm code
• A short press of the upper button
   If there are several alarm codes they are found in a rolling stack. Push the uppermost or lowermost button to scan the rolling stack.

Set temperature
1. Push the middle button until the temperature value is shown
2. Push the upper or the lower button and select the new value
3. Push the middle button again to conclude the setting.

Reading the temperature at defrost sensor (Or product sensor, if selected in o92.)
• A short press of the lower button

Manual start or stop of a defrost
• Push the lower button for four seconds.

Get a good start

With the following procedure you can start regulation very quickly:

1 Open parameter r12 and start the regulation

2 Go through the survey of factory settings. Make any necessary changes in the respective parameters.

3 For network. Set the address in o03

4 Send address to system unit:
   • MODBUS: Activate scan function in system unit
   • If another data communication card is used in the controller:
      - LON RS485: Activate the function o04

Menu survey

Parameter		EL-diagram page 1	Min.-value	Max.-value	Factory setting	Actual setting
Function	Code	1				
Normal operation						
Temperature (setpoint)	- - -	1	-50°C	50°C	2	
Thermostat						
Differential	r01	1	0.1 K	20 K	2	
Max. limitation of setpoint setting	r02	1	-49°C	50°C	50	
Min. limitation of setpoint setting	r03	1	-50°C	49°C	-50	
Adjustment of temperature indication	r04	1	-10	10	0	
Temperature unit (°C/°F)	r05	1	0/°C	1/F	0/°C	
Correction of the signal from S4	r09	1	-10 K	10 K	0	
Correction of the signal from S3	r10	1	-10 K	10 K	0	
Manual service, stop regulation, start regulation (-1, 0, 1)	r12	1	-1	1	0	
Displacement of reference during night operation	r13	1	-50 K	50 K	0	
Thermostat function (Read out) ON/OFF	r14	1 =On/Off	—	—	—	
Definition and weighting, if applicable, of thermostat sensors - S4% (100%=S4, 0%=S3)	r15	1	0 %	100 %	100	
Time between melt periods	r16	1	0 hrs	10 hrs	1	
Duration of melt periods	r17	1	0 min.	30 min.	5	
Temperature setting for thermostat band 2 . As differential r01 is used	r21	1	-50°C	50°C	2	
Correction of the signal from S6	r59	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	
S4 min. limit, Frost protection. Cooling is stopped.	r98	1	-50°C	20°C	-50°C	
Alarms						
Delay for temperature alarm	A03	1	0 min.	240 min.	30	
Delay for door alarm	A04	1	0 min.	240 min.	60	
Delay for temperature alarm after defrost	A12	1	0 min.	240 min.	90	
High alarm limit for thermostat 1	A13	1	-50°C	50°C	8	
Low alarm limit for thermostat 1	A14	1	-50°C	50°C	-30	
High alarm limit for thermostat 2	A20	1	-50°C	50°C	8	
Low alarm limit for thermostat 2	A21	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 1	A22	1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 1	A23	1	-50°C	50°C	-30	
High alarm limit for sensor S6 at thermostat 2	A24	1	-50°C	50°C	8	
Low alarm limit for sensor S6 at thermostat 2	A25	1	-50°C	50°C	-30	
S6 alarm time delay With setting = 240 the S6 alarm will be omitted	A26	1	0 min.	240 min.	240	
Alarm time delay or signal on the DI1 input	A27	1	0 min.	240 min.	30	
Alarm time delay or signal on the DI2 input	A28	1	0 min.	240 min.	30	
Signal for alarm thermostat. S4% (100%=S4, 0%=S3)	A36	1	0 %	100 %	100	
Delay for S6 (product sensor alarm) after defrost	A52	1	0 min.	240 min.	90	
Alarm limit for max. S7 brine temperature	A76	1	-50°C	50°C	8°C	
Differential for S7 brine alarm	A77	1	0.1 K	10 K	3.0 K	
Compressor						
Min. ON-time	c01	1	0 min.	30 min.	0	
Min. OFF-time	c02	1	0 min.	30 min.	0	
Time delay for cutin of comp.2	c05	1	0 sec	999 sec	5	
Compressor 1 on time when sensor fault (compressor 2 = off)	c86	1	0 min	240 min	15	
Compressor 1 off time when sensor fault	c87	1	0 min	240 min	15	
Defrost						
Defrost method: 0=none, 1= EL	d01	1	0/No	1/EL	1/EL	
Defrost stop temperature	d02	1	0°C	50°C	6	
Interval between defrost starts	d03	1	0 hrs/Off	240 hrs	8	
Max. defrost duration	d04	1	0 min.	360 min.	45	
Displacement of time on cutin of defrost at start-up	d05	1	0 min.	240 min.	0	

Continued		code	1	Min.	Max.	Fac.	Actual
Drip off time		d06	1	0 min.	60 min.	0	
Delay for fan start after defrost		d07	1	0 min.	60 min.	0	
Fan start temperature		d08	1	-50 °C	0 °C	-5	
Fan cutin during defrost 0: stopped 1 & 2: Running		d09	1	0	2	1	
Defrost sensor: 0 =Stop on time, 1=S5, 2=S4, 3=S5 and S6		d10	1	0	3	0	
Pump down delay		d16	1	0 min.	60 min.	0	
Max. aggregate refrigeration time between two defrosts		d18	1	0 hrs	48 hrs	0/OFF	
Rail heat during defrost 0: off 1: on 2: Pulsing		d27	1	0	2	2	
Max. duration of -d- in display		d40	1	5 min.	240 min.	30 min.	
Fan							
Fan stop temperature (S5)		F04	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	0	2	0	
Period time for fan pulsation (on-time + off-time)		F06	1	1 min.	30 min.	5	
On-time in % of period time		F07	1	0 %	100 %	100	
Real time clock							
Six start times for defrost. Setting of hours. 0=OFF		t01 - t06	1	0 hrs	23 hrs	0	
Six start times for defrost. Setting of minutes. 0=OFF		t11 - t16	1	0 min.	59 min.	0	
Clock - Setting of hours		t07	1	0 hrs	23 hrs	0	
Clock - Setting of minute		t08	1	0 min.	59 min.	0	
Clock - Setting of date		t45	1	1 day	31 day	1	
Clock - Setting of month		t46	1	1 mon.	12 mon.	1	
Clock - Setting of year		t47	1	0 year	99 year	0	
Miscellaneous							
Delay of output signals after start-up		o01	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). 12=night cover. 15=appliance shutdown		o02	1	0	15	0	
Network address (0= off)		o03	1	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 **must** be set prior to o04 (used at LON 485 only)		o04	1	0/Off	1/On	0/Off	
Access code 1 (all settings)		o05	1	0	100	0	
Software Version		o08	1				
Max hold time after coordinated defrost		o16	1	0 min.	360 min.	20	
Select signal for display view. S4% (100%=S4, 0%=S3)		o17	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). 12=night cover, 13=coordinated defrost. 15=appliance shutdown		o37	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	4	1	
Activation of light relay (only if o38=2) On=light		o39	1	0/Off	1/On	0/Off	
Rail heat On time during day operations		o41	1	0 %	100 %	100	
Rail heat On time during night operations		o42	1	0 %	100 %	100	
Rail heat period time (On time + Off time)		o43	1	6 min.	60 min.	10	
Case cleaning. 0=no case cleaning. 1=Fans only. 2=All output Off.	***	o46	1	0	2	0	
Selection of EL diagram. See overview page 1	*	o61	1	1	1	1	
Access code 2 (partial access)	***	o64	1	0	100	0	
Replace the controllers factory settings with the present settings		o67	1	0/Off	1/On	0/Off	

Continued		code	1	Min.	Max.	Fac.	Actual
Rail heat control 0=not used, 1=pulse control with timer function (o41 and o42), 2=pulse control with dew point function		o85	1	0	2	0	
Dew point value where the rail heat is minimum		o86	1	-10°C	50°C	8	
Dew point value where the rail heat is 100% on		o87	1	-9°C	50°C	17	
Lowest permitted rail heat effect in %		o88	1	0 %	100 %	30	
Time delay from "open door" refrigeration is started		o89	1	0 min.	240 min.	30	
Definition of readings on lower button: 1=defrost stop sensor, 2=S6 sensor		o92	1	1	2	1	
Display of temperature 1= u56 Air temperature 2= u36 product temperature		o97	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	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 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	0	63	47	
Stop time for fan while night blind rolls down		P65	1	0 min.	5 min.	0 min.	
Service							
Temperature measured with S5 sensor		u09	1				
Status on DI1 input. on/1=closed		u10	1				
Actual defrost time (minutes)		u11	1				
Temperature measured with S3 sensor		u12	1				
Status on night operation (on or off) 1=on		u13	1				
Temperature measured with S4 sensor		u16	1				
Thermostat temperature		u17	1				
Run time of thermostat (cooling time) in minutes		u18	1				
Temperature measured with S6 sensor (product temperature)		u36	1				
Status on DI2 output. on/1=closed		u37	1				
Display air temperature. Weighted S3 + S4 (o17)		u56	1				
Measured temperature for alarm thermostat. Weighted S3 + S4 (A36)		u57	1				
Status on relay for compressor 1	**	u58	1				
Status on relay for fan	**	u59	1				
Status on relay for defrost	**	u60	1				
Status on relay for rail heat	**	u61	1				
Status on relay for alarm	**	u62	1				
Status on relay for light	**	u63	1				
Status on relay for compressor 2	**	u67	1				
Readout of the actual rail heat effect		u85	1				
1: Thermostat 1 operating, 2: Thermostat 2 operating		u86	1				
Status on high voltage input DI3		u87	1				
Readout of thermostats actual cut in value		u90	1				
Readout of thermostats actual cut out value		u91	1				
Readout of brine temperature S7		u98	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.

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 upper and lower button depressed at the same time as you reconnect the supply voltage

Factory settings are indicated for standard units. Other code numbers have customized settings.

Fault message		
In an error situation the LED's on the front will flash and the alarm relay will be activated. If you push the top button in this situation you can see the alarm report in the display. There are two kinds of error reports - it can either be an alarm occurring during the daily operation, or there may be a defect in the installation. A-alarms will not become visible until the set time delay has expired. E-alarms, on the other hand, will become visible the moment the error occurs. (An A alarm will not be visible as long as there is an active E alarm). Here are the messages that may appear:		

Code / Alarm text via data communication	Description	Alarm relay groups (P41)
A1/--- High t.alarm	High temperature alarm	1
A2/--- Low t. alarm	Low temperature alarm	2
A4/--- Door alarm	Door alarm	8
A5/--- Max hold time	The "o16" function is activated during a coordinated defrost	16
A13/--- High temp S6	Temperature alarm. High S6	1
A14/--- Low temp S6	Temperature alarm. Low S6	2
A15/--- DI1 alarm	DI1 alarm	8
A16/--- DI2 alarm	DI2 alarm	8
A45/--- Standby mode	Standby position (stopped refrigeration via r12 or DI input)	-
A59/--- Case clean	Case cleaning. Signal from DI input	-
A97/--- Comp. Safety	Compressor safety. Signal from DI3 input	8
AA3/---High brine temp.	High brine temperature alarm	8
E1/--- Ctrl. error	Faults in the controller	32
E6/--- RTC error	Check clock	32
E25/--- S3 error	Error on S3 sensor	4
E26/--- S4 error	Error on S4 sensor	4
E27/--- S5 error	Error on S5 sensor	4
E28/--- S6 error	Error on S6 sensor	4
E50/--- S7 error	Error on S7 sensor	4
---/--- Max Def.Time	Defrost stopped based on time instead of, as wanted, on temperature	16

Data communication

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

Settings from System manager AK-SM	Settings from AKM (AKM destination)	Send via Network
High	1	X
Middle	2	X
Low	3	X
Log only		
Disabled		

Operating status		**(Measurement)**
The controller goes through some regulating situations where it is just waiting for the next point of the regulation. To make these "why is nothing happening" situations visible, you can see an operating status on the display. Push briefly (1s) the upper button. If there is a status code, it will be shown on the display. The individual status codes have the following meanings:		Ctrl. state: (Shown in all menu displays)
Normal regulation	S0	0
Waiting for end of the coordinated defrost	S1	1
When the compressor is operating it must run for at least x minutes.	S2	2
When the compressor is stopped, it must remain stopped for at least x minutes.	S3	3
The evaporator drips off and waits for the time to run out	S4	4
Refrigeration stopped by main switch. Either with r12 or a DI-input	S10	10
Refrigeration stopped by thermostat	S11	11
Defrost sequence. Defrost in progress	S14	14
Defrost sequence. Fan delay — water attaches to the evaporator	S15	15
Refrigeration stopped due to open ON input or stopped regulation	S16	16
Door is open. DI input is open	S17	17
Melt function in progress. Refrigeration is interrupted	S18	18
Modulating thermostat control	S19	19
Emergency cooling due to sensor error *)	S20	20
Manual control of outputs	S25	25
Case cleaning	S29	29
Delay on outputs during start-up	S32	32
Case shut down	S45	45
Other displays:		
The defrost temperature cannot be displayed. There is stop based on time	non	
Defrost in progress / First cooling after defrost	-d-	
Password required. Set password	PS	
Regulation is stopped via main switch	OFF	

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

ADAP-KOOL®