

User Guide

Liquid level controller

EKE 347



The EKE 347 controller is used for regulation of the liquid level in:

- Pump reservoirs
- Separators
- Intermediate coolers
- Economisers
- Condensers
- Receivers

The controller is communicating with a transmitter that continuously measures the liquid level in the actual reservoir.

By comparing the measured value with the level setpoint entered by the customer, the controller dictates the valve to increase or decrease the liquid flow to or from the reservoir.

Features

- Liquid level control
- Alarm if the set alarm limits are exceeded
- Relay outputs for upper and lower level limits and for alarm level
- User friendly and easy setup Wizard for first time configuration
- PI control
- Low or High side control
- When AKV/A is selected, a MASTER/SLAVE system can run up to 3 AKV/A with distributed Opening Degree
- Manual control of output
- Limitation of Opening degree possible
- ON/OFF operation with hysteresis
- Programming menu with 3 access levels and separate passwords
- Connection to other EKE 347 controllers possible
- Wired remote display possible
- BUS communication:
 - CAN Bus (Danfoss internal only)
 - MODBUS RTU RS485 for communication with e.g. PLC

Signaltransmitter

With the guided micro wave rod AKS 4100/4100U it is possible to set the refrigerant level within a wide range.

EKE 347

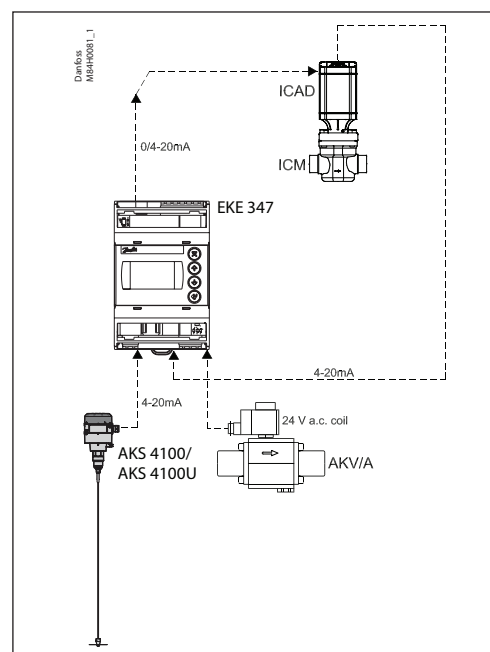
The controller receive a signal which enable it to control low or high side applications (see page 3).

EKE 347 does support 2 types of Danfoss expansion valves. (see below)
One analog input is available as feed back from ICM in order to indicate opening degree of the ICM.

Expansions valve

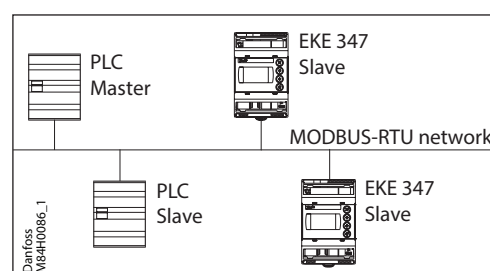
Two types of Danfoss expansion valves can be used

- **ICM**
ICM are direct operated motorized valves driven by digital stepper motor type ICAD
- **AKV/A**
AKVA or AKV are pulse-width modulating expansion valves.



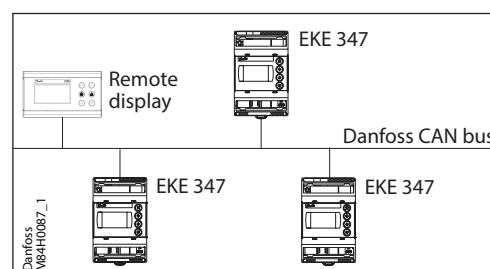
MODBUS communication

EKE 347 include as standard RS 485 based MODBUS-RTU bus communication interface to third party equipment like PLC. Via the MODBUS it is possible to read and write parameters to the EKE 347. Operation, monitoring and data collection can then be performed via PLC from a SCADA system.



Remote Display - option

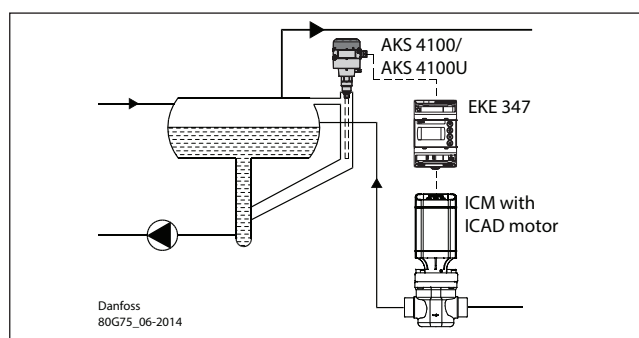
A remote display for panel mounting is available. From the remote display a full overview and access is possible to all individual EKE 347 controllers connected to the internal Danfoss CAN bus.



Application examples

Pump reservoir

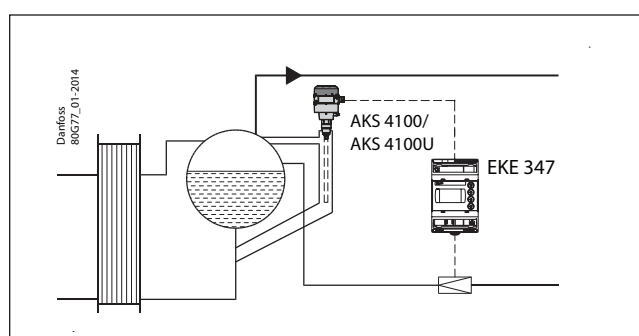
Modulating control of injection for a more stable liquid level and suction pressure.



System configuration ICAD
Regulating principle: Low
Level Signal setup: AKS 4100/U

Separator on flooded evaporator

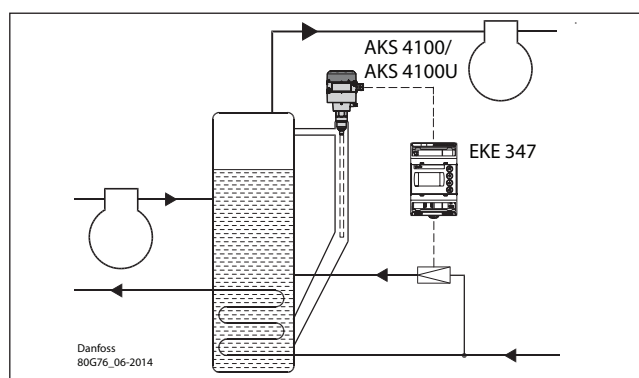
Modulating control and the valve's large capacity range ensure a stable level - even under conditions of quickly changing loads.



System configuration AKV/A
Regulating principle: Low
Level Signal setup: AKS 4100/U

Intermediate cooler

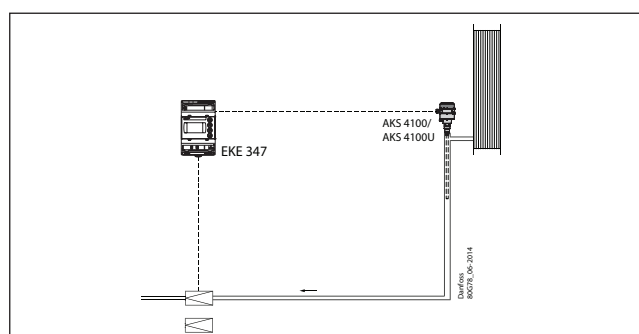
The level transmitter's wide measuring range enables it to monitor the liquid at all levels of the reservoir - and hence to use the signal for safety functions in connection with the max. permissible level



System configuration AKV/A
Regulating principle: Low
Level Signal setup: AKS 4100/U

Receiver / condenser

The control system's short reaction time makes it very suited for high-pressure float systems with small refrigerant charges.



System configuration AKV/A
Regulating principle: High
Level Signal setup: AKS 4100/U

Control Panel



The user interface of the control panel consists of a multiline display and 4 individual push buttons: Enter button, Scroll up button, Scroll down button and Back button.

The figure shows the Home display image, which give the actual overview. This is the starting point for entering into menus, and you will revert to this image by pushing  1 – 3 times (depending on actual position).

Display



The display itself show the state of **Liquid level**, **Controller Mode** (controller On/Off), **Valve opening degree**, **Lower level alarm** (off = no alarm present) and **Upper level alarm** (off = no alarm present).

Additional to the external connected alarm audio/video sources, a Bell symbol will flash in the upper right corner in case of an alarm.

To see more details on system performance and setting of parameters, 2 different main menu levels can be reached by operation of the push buttons.

From Home image the **Status menu** can be reached by **1 push** on Enter.

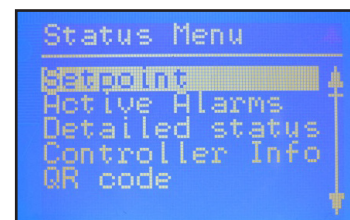
From Home image the **Setup & service menu** can be reached by **1 push and hold** on Enter. For entrance a Log In is required by the password given during Commissioning.

Menus

Status menu

To enter Status menu from Home image:
Push  once.

The Status menu is an open menu accessible for all. Therefore only 1 parameter can be changed from here. A selection of other parameters can be seen from the status menu.



Status menu (Open menu)

	Options
Setpoint	
Liquid level setpoint	0 - 100%
Active alarms	
Example of alarm content. The list will be empty in normal operation as no alarm is active.	
Level signal out of range	hours minutes
Standby mode	hours minutes
Detailed status	
Controller state	Stop, Manual, Auto, Slave, IO
Actual level	0.0 - 100%
Actual reference	0.0 - 100%
Actual OD	0.0 - 100%
Digital input status	On / Off
Actual level signal current	mA
Oscillation amplitude	0.0 - 100%
Oscillation period	sec
Controller Info	
Type	
Name (Controller name)	
SW (Software version)	
Bios (Bios version)	
Adr (Controller address)	
SN (Serial Number)	
PV (Product version)	
Site (Production site)	
QR code	
Code	

	Read & Write
	Read only

Setup & service menu (Requires log-in password assigned in Commissioning menu)

To enter Setup and service menu from Home image:
Push and hold .

Maneuvering in the Status menu and the Setup and service menu's are done by use of the 4 push buttons shown on page 4.

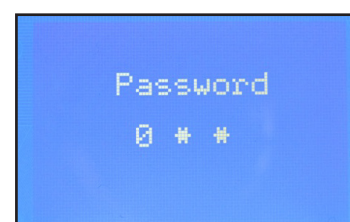
The Setup & service menu is divided into 3 access levels, where personnel have individual authority.

Most advanced level is **Commissioning**, where you have access to change all allowable parameters, including password issuing and re-run of Setup wizard.

Service level is for service personnel and has fewer rights than commissioning.

The lowest level is for **Daily** use, and allows only a few changes.

The table on the next page shows authority given to the Commissioning level.



Setup & service menu - COMMISSIONING

Parameter	Options	Default values
Reference	Main switch	On, Off
	Liquid level setpoint	0 - 100%
	Operation mode	Master, IO, Slave
Alarm setup	Lower level limit	0 - 100%
	Upper level limit	0 - 100%
	Level alarm mode	Time, Hysteresis
	Lower delay	0 - 999 sec
	Upper delay	0 - 999 sec
	Lower level hysteresis	0-20 %
	Upper level hysteresis	0-20 %
	Function common alarm	Not follow; Follow up; Follow low; Follow all
	Oscillation detect band	0 - 100%
	Oscillation detect timeout	2 - 30 min
	Force pump OFF in stop mode	Yes / No
	IO Lower level limit	0 - 100%
	IO Upper level limit	0 - 100%
	IO Lower level hysteresis	0-20 %
	IO Upper level hysteresis	0-20 %
	IO Lower delay	0 - 999 sec
	IO Upper delay	0 - 999 sec
	IO Level limit	0 - 100%
	IO Level delay	0 - 999 sec
	IO Level hysteresis	0-20 %
	IO Level action	Falling,Rising
Control	Control Method	On/Off ,P, PI
	Regulating principle	Low, High
	P-band	5 - 200%
	Integration time Tn	60 - 600 sec
	Neutral zone	0 - 25%
	Difference	0,5-25%
	Period time for AKV/AKVA	3-15 sec
	Minimum OD	0 - 99%
Display	Maximum OD	1 - 100%
	Language	EN,CN,PT,RU,SP,FR,IT, GER, ARAB
	Output indication	level, OD
	Login timeout	1 - 120 min
	Backlight timeout	0 - 120 min
	Password daily	3 -digit, 0 - 999
	Password service	3 -digit, 0 - 999
IO config	Password commission	3 -digit, 0 - 999
	System configuration	ICAD+NC, ICAD, AKV/A+NC, AKV/A, NC only
	Level signal setup	AKS 4100, AKS 41, Current, Voltage
	Voltage at low liquid level	0-10V
	Voltage at high liquid level	0-10V
	Current at low liquid level	0-20 mA
	Current at high liquid level	0-20 mA
	Valve position setup	Not used, Current, Voltage
	Voltage at closed valve position	0-10V
	Voltage at open valve position	0-10V
	Current at closed valve position	0-20 mA
	Current at open valve position	0-20 mA
	Common alarm setup	D04, High alarm, D03, Disp only
	Multiple valve setup	Not used, 2 same cap, 2 dif cap, 3 same cap, 3 dif cap
	Multiple valve pattern	Parallel,Sequence
	Valve A capacity	0-100 %
	Valve B capacity	0-100 %
	Valve C capacity	0-100 %
	ICAD takeover OD	0-100%
	IO module setup	Used, Not used
Communication	CAN ID	1 - 127
	CAN baudrate	20k, 50k, 125k, 250k, 500k, 1M
	Modbus ID	0 - 120
	Modbus baudrate	0, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400
	Modbus mode	8N1, 8E1, 8N2
	Modbus mapping	Operation, Setup
	Valve B CAN ID	1 - 127
	Valve C CAN ID	1 - 127
	IO Mod. CAN ID	1 - 127

To be continued.....

Setup & service menu - COMMISSIONING (Continued)

Parameter	Options	Default values
Service	Controller state	-
	Actual level	-
	Actual reference	-
	Actual OD	-
	Actual valve position	-
	Digital input status	-
	Actual level signal voltage	-
	Actual level signal current	-
	Actual position signal voltage	-
	Actual position signal current	-
	Actual OD A	-
	Actual OD B	-
	Actual OD C	-
	Manual Mode	On, Off
	Manual OD	0 - 100%
	Manual low alarm	Off-On
	Manual high alarm	Off-On
	Manual common alarm	Off-On
	Apply defaults	None, Factory
Setup wizard	Setup wizard	Re-run Setup wizard
		-
I/O check	Main switch EKE act:	Off
	AKS 4100 EKE act:	-
	ICAD EKE act:	-
	Nor. Close (NC) EKE act:	-
	Upper lvl (alarm) EKE act:	-
	Lower lvl (alarm) EKE act:	-
Controller name	Controller name	Type in controller name

	Read & Write
	Read only

Alarm and error codes:

When detecting an alarm from external sources or the flashing bell in the display, the alarm description can be found as a text message in the Status menu under Active alarms.

Both alarms and errors will be shown here.

If more alarms/errors occur simultaneously, they will be shown as subsequent text lines.

Alarms:

Upper level
Lower level
Standby mode
Valve B CAN ID conflict
Valve C CAN ID conflict
IO module CAN ID conflict
IO module communication
Communication to master lost
Min/max OD conflict
Common alarm HW conflict
Control method conflict
Multiple valve setup conflict
Valve C alarm
Valve B alarm
Oscillation in level signal
Valve position
Multiple valve capacity
Valve C communication
Valve B communication

Errors:

Internal error
Level signal out of range
Valve position signal out of range
Sensor supply overload
AKS 4100 error
Too much current AI3
Too much current AI4
DO4 overload

Ordering

Type		Description	Code No.
EKE 347		Liquid level controller	080G5000
MMIGRS2		Remote display, Panel, S	080G0294
-		Wire for display unit, L = 1.5 m, 1 pcs.	080G0075
-		Wire for display unit, L = 3 m, 1 pcs.	080G0076
-		EKE / EKC accessory for panel mounting	027F0309

Data

Supply voltage	24 V a.c. +/-20% 50/60 Hz or 24 V d.c. +/-20% (the supply voltage is galvanically separated from the input and output signals. Input/output are not individual galvanic isolated)	
Power consumption	Controller	15 VA / 10W
	20 W coil for AKV or AKVA	55 VA
Input signal * Ri = 0(4)-20mA: 33 ohm 0(2)-10 V: 100 kohm	Level signal *	4-20 mA or 0-10 V
	ICM valve feedback signal *	From ICAD 0/4-20 mA
	Contact function start/stop of regulation	
Relay output	3 pcs. SPDT (Lower level alarm, Upper level alarm, Common alarm / NC Solenoid)	Normally Open: 3 A GP*, 2.2 FLA / 13.2 LRA, 1/6 hp, PD 220 VA, 250 V a.c. 100 k 3 FLA / 18 LRA, 1/10 hp, PD 150 VA, 125 V a.c. 100 k Normally Closed: 3 A GP*, 250 V a.c. 100 k (*GP = General purpose). Max 240 V a.c. or 24 V a.c./d.c. can be used, but same voltage type must be used on DO3 and DO2
Current output	0-20 mA or 4-20 mA Max. load: 500 ohm	
Valve connection	ICM - via current output AKV/A- via 24 a.c. Pulse-Width Modulating output	
Data communication	MODBUS RTU: Communication to system controller, MODBUS on RS485: galvanic isolation (500 V d.c.) CAN: Communication to other EKE controllers	
Supported Modbus Commands	Supported commands with max of 50 ms re- sponse time	03 (0x03) Read Holding Registers 04 (0x04) Read Input Registers 06 (0x06) Write Single Register
	Supported commands without defined max re- sponse time	08 (0x08) Diagnostics 16 (0x10) Write Multiple Registers (up to 20 registers) 43 (0x2b) Read Device Identification
Environments	-20 - 55°C, during operation	
	-30 - 80°C, during storage	
	90% Rh, not condensed	
	No shock influence / vibrations	
Enclosure	IP 20 /IP 40 for the front mounted into a panel	
Weight	193 g	
Mounting	DIN rail	
Display	Graphical LCD display	
Terminals	plugs 1.5 or 2.5 mm ² multicore	
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with. LVD-tested acc. to EN 60730-1 and EN 60730-2-9 EMC-tested acc. to EN61000-6-3 and EN 61000-6-2 UL file E31024	



Connection

Necessary connections

Terminals:

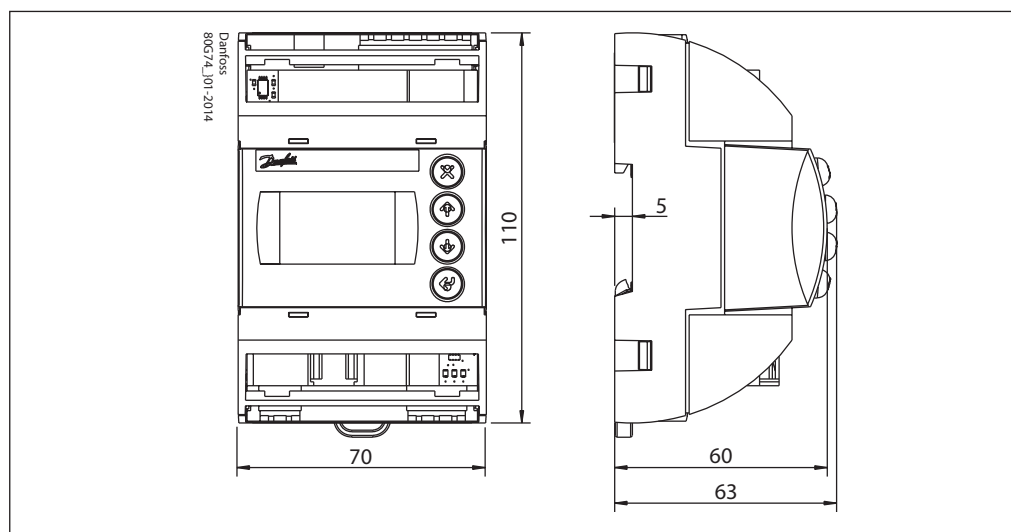
28-29	Supply voltage 24 V a.c. or d.c.	23-24	Expansion valve type: ICM with ICAD
1-7	Signal from level transmitter type AKS 4100/4100U or	13-14	Switch function for start/stop of controller. If a switch is not connected, terminals 13 and 14 must be short-circuited.
7-10	Signal from level transmitter type AKS 41		
36-37	Expansion valve type AKV or AKVA or		See the figures on the next pages.

Application dependent connections

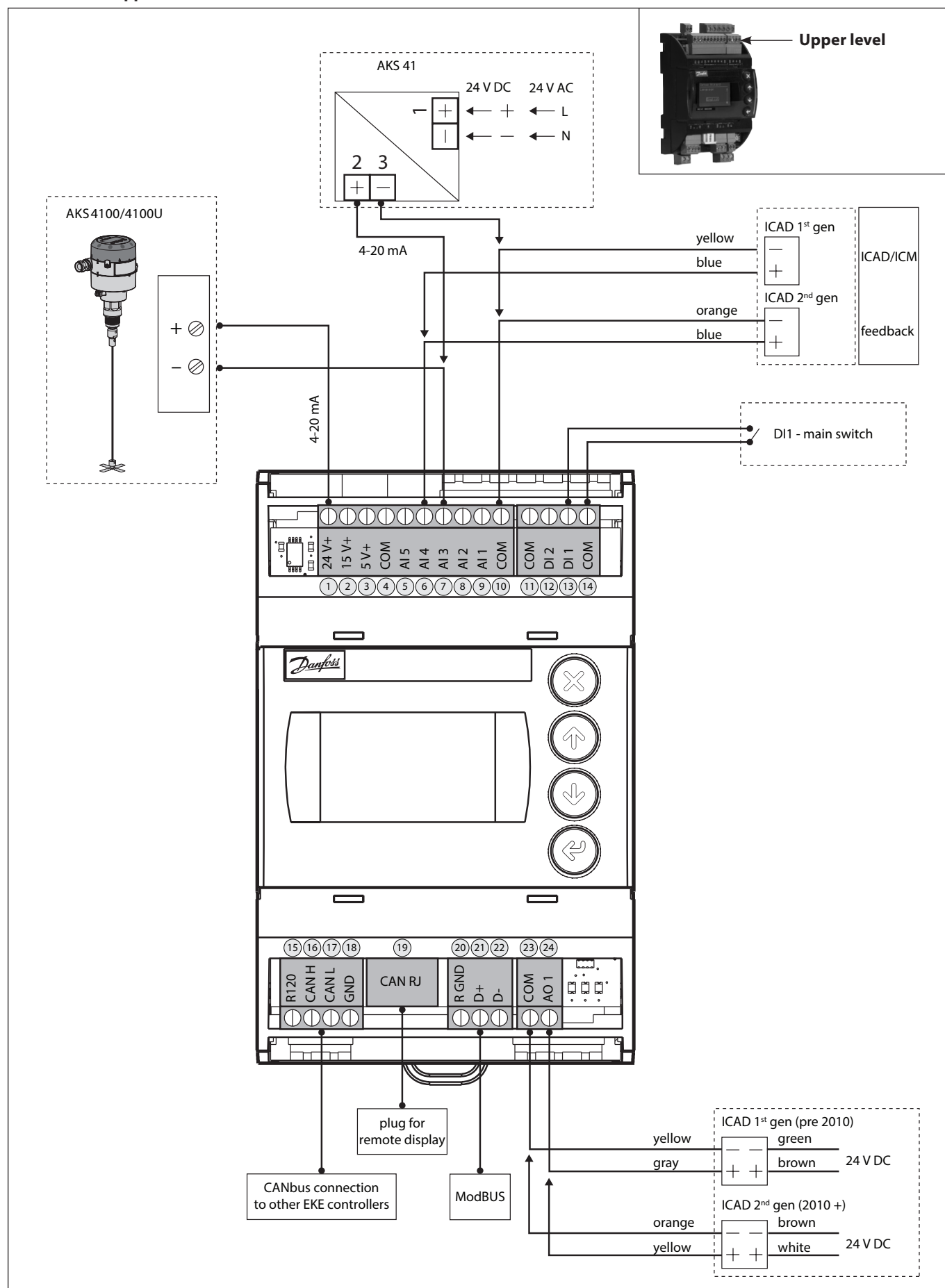
Terminals:

33-35	Relay for common alarm. Installer can choose between Normally Open (33-34) or Normally Closed (34-35) circuits. The relay will switch according to the programmed setting.	30-32	Relay for upper level limit. Installer can choose between Normally Open (30-31) or Normally Closed (31-32) circuits. The relay will switch when the set value is passed.
25-27	Relay for low level limit. Installer can choose between Normally Open (26-27) or Normally Closed (25-26) circuits. The relay will switch when the set value is passed.	6-10	ICM valve feedback signal from ICAD 0/4-20 mA

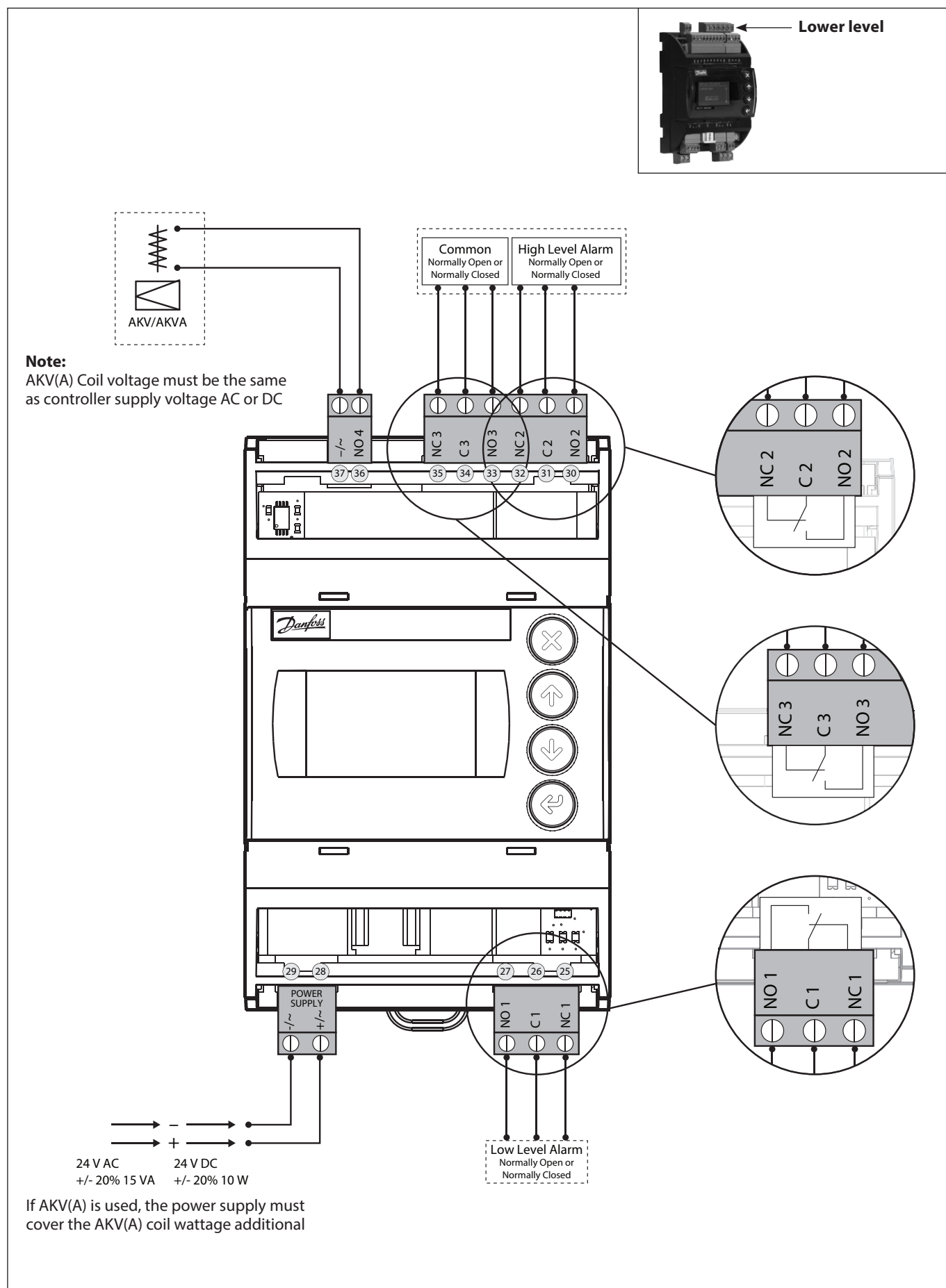
Dimensions



Connections - Upper level

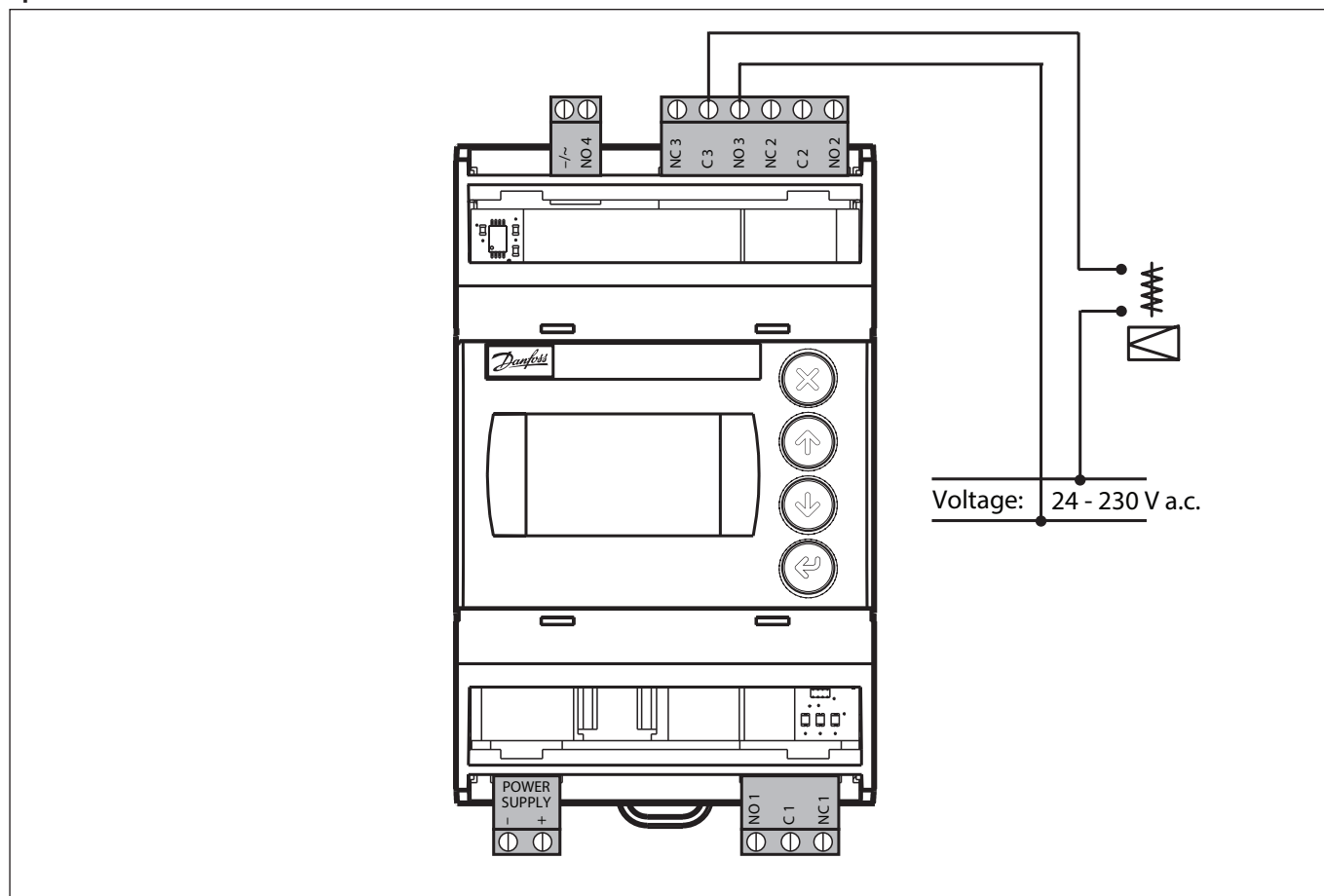


Connections - Lower level

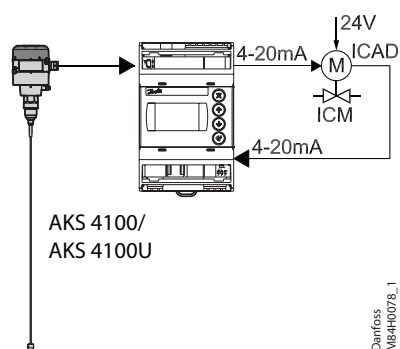
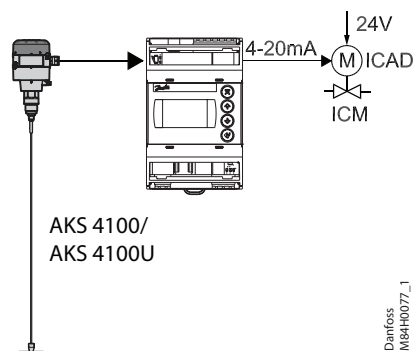
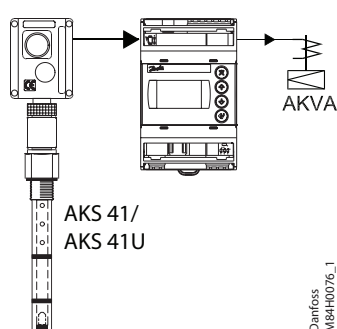
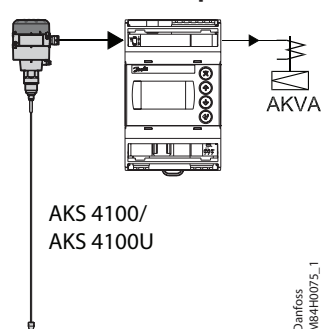


EKE 347 - ON/OFF Application.

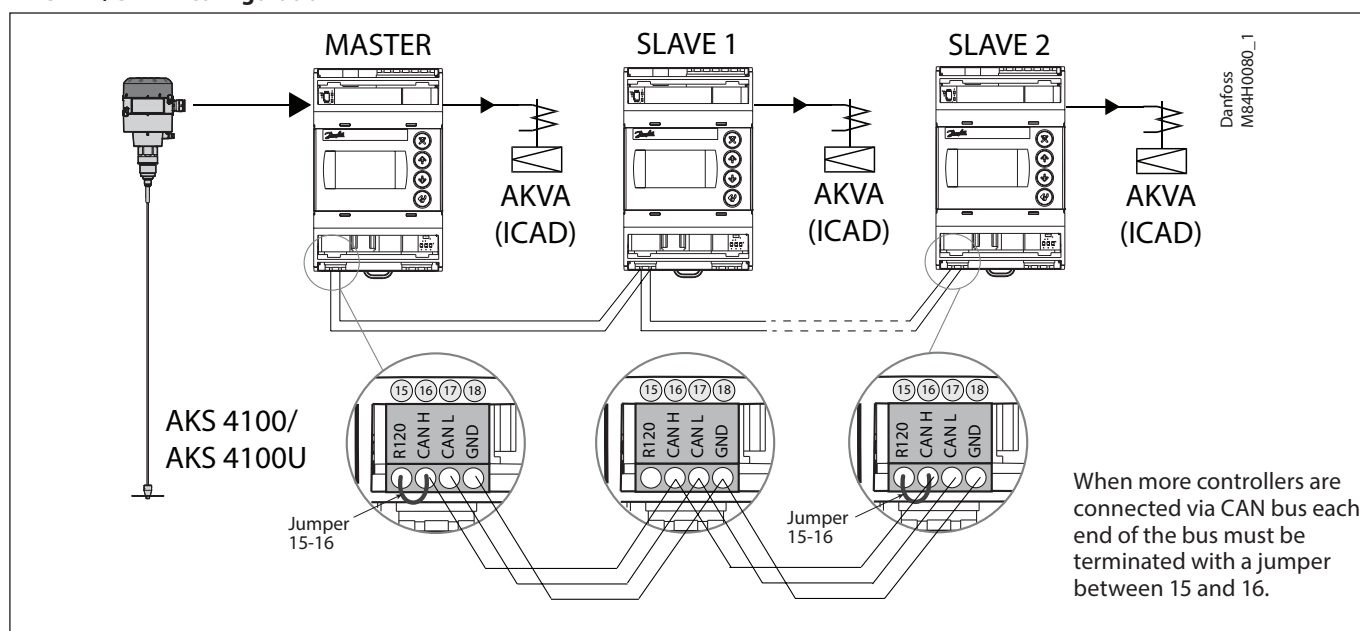
Open/Close solenoid valve with coil 24 V - 230V



Connection examples



MASTER / SLAVE configuration



Multivalve

If the system capacity requires more than one control valve; up to three valves can be controlled simultaneously in a Master/Slave configuration, where the master and each slave controls one valve respectively.

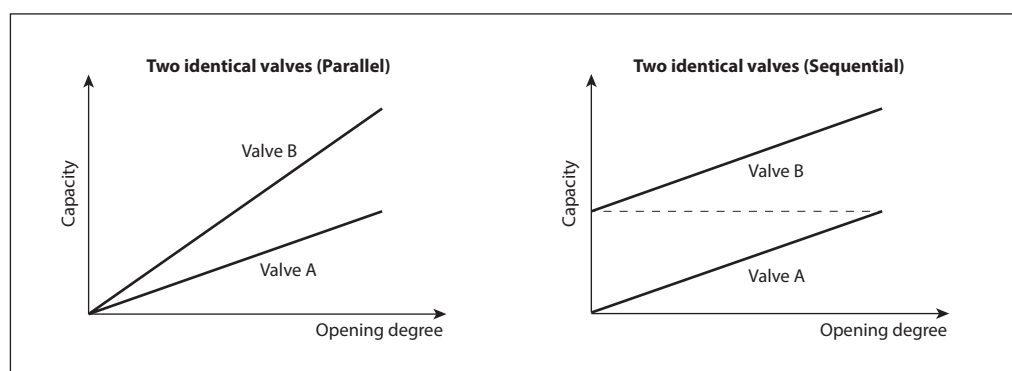
The configuration is programmed in the master EKE 347 IO config menu - Multiple valve setup - with one of these options:

- 2 valves with same capacity
- 2 valves with different capacity
- 3 valves with same capacity
- 3 valves with different capacity

Additionally the master must be programmed in IO config menu - Multiple valve pattern - for either:

- **Valves in parallel**
(valves regulate simultaneously)
 - or
 - **Valves sequential**
(mainly one valve regulating at any time)
- See principle below.

The slave EKE's only need identification of Slave and valve CAN ID (communication menu).



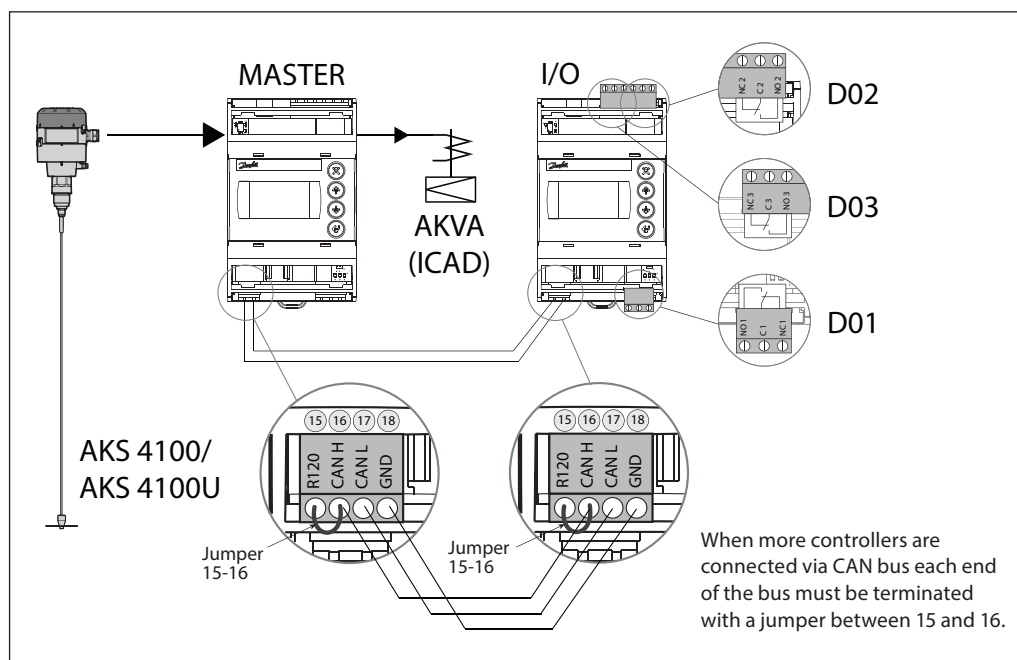
The default display of the master EKE will show the standard information together with a symbol of multiple valves and the actual total opening degree (see below).



The default display of the slave EKE will show the actual liquid level (as the master), symbol of multiple valves, actual total opening degree and the opening degree of the individual valves involved (see below).



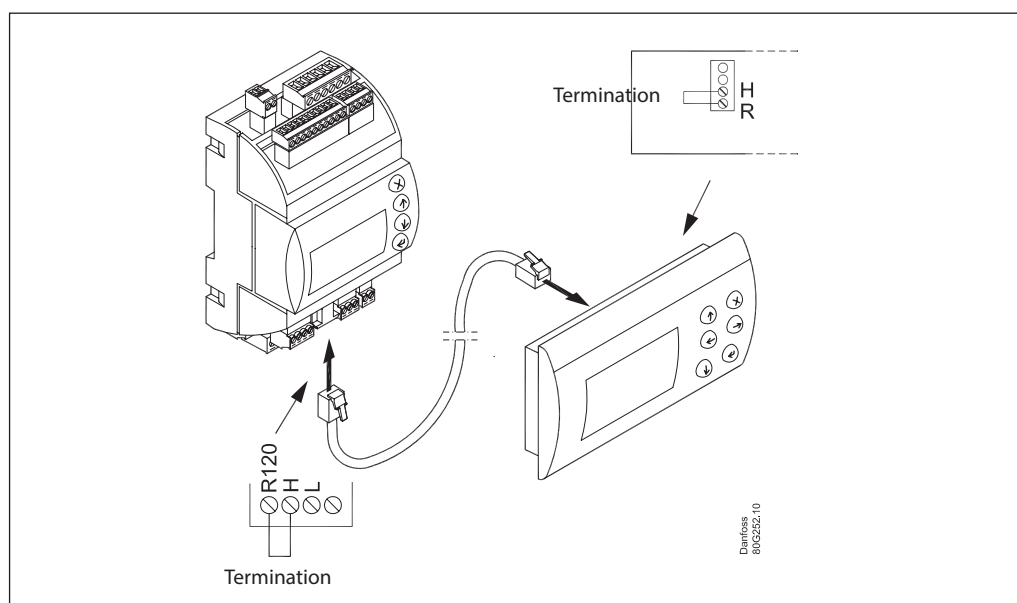
I/O configuration



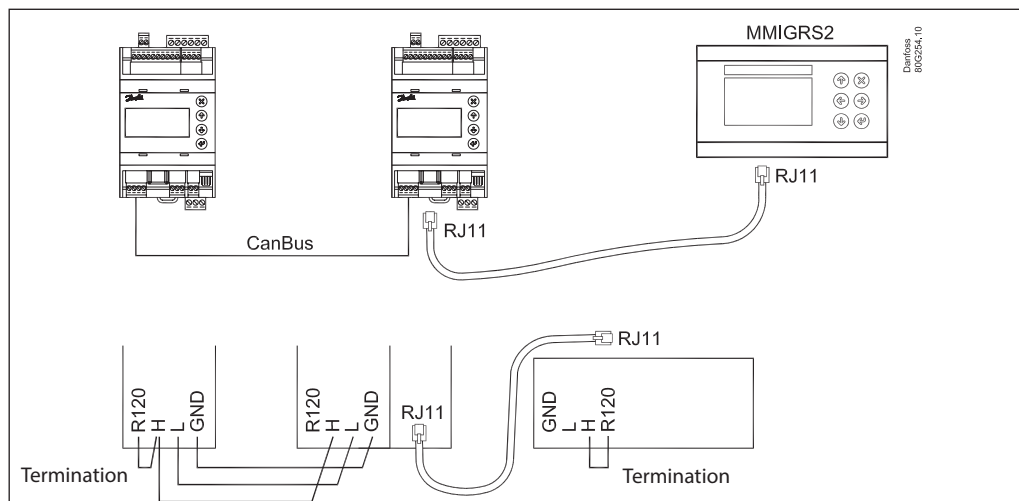
Remote display

The daily operation can be set up directly on the controller or via an external display device.

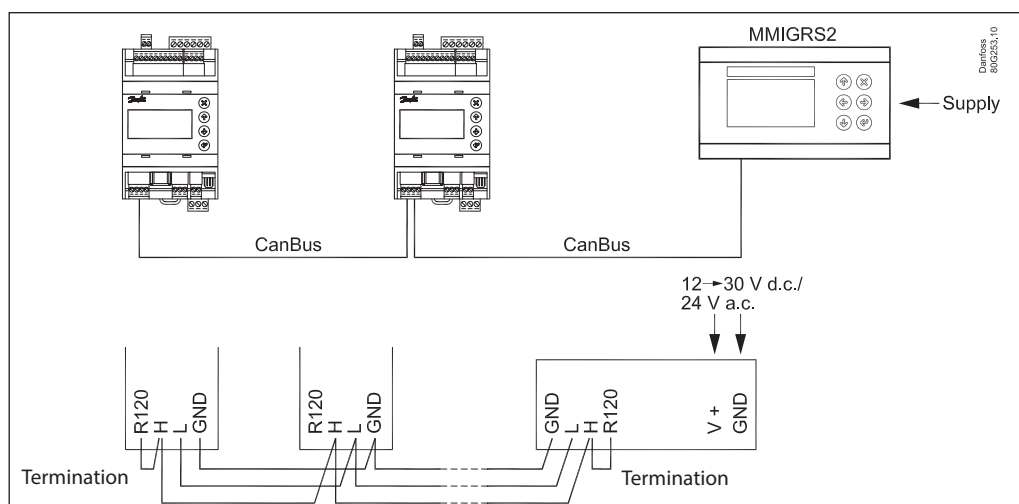
Example 1



Example 2



Example 3



ERR31

Alarm on the external display - MMIGRS2

If the communication to the display is not carried out correctly, it will send an "ERR31" error notification. This may be caused by the displayed terminations not being installed, or that there have been interruptions in data communication during the time when the display retrieves the basic information from the controller. Once the terminations have been inspected, you should then check the software version of the external display. This is done by holding down the Enter key and the X key for 5 seconds, until the Bios menu appears. Next, press the X key and read off the software version in the bottom right corner. The software version must be 1.13 or newer.

Once the display's software version has been checked, check the display's settings as follows:

1. Hold the Enter key and the X key down for 5 seconds, until the Bios menu appears.
2. Select the "MCX selection" menu
 - Select the "Clear UI" line and press Enter
 - Select the "Autodetect" line and press Enter
3. Press the X key to return to the Bios menu
4. Select the "COM selection" menu
 - Select the "CAN" line and press Enter
5. Press the X key to return to the Bios menu
6. Select the "Start up mode" menu
 - Select the "Remote application" line and press Enter
7. Press the X key to return to the Bios menu
8. Select the "CAN" menu
 - Select the "Baudrate" line and then select the "Autobaud" setting and press Enter
 - Select the "Node ID" line and set the value to 126 and press Enter
9. Press the X key to return to the Bios menu
10. Select the "Application" menu and press Enter.

The display will once again retrieve data from the controller. This process will take about 5 minutes.

Modbus parameters

Software version: 1.62.xx

Label	Parameter name	Min value	Max value	Default	Unit	Deci-mals	Modbus PNU	Locked by main switch	EEPROM	Enumeration
r12	Main switch	0	1	0		0	3001	NO	YES	0 = Off 1 = On
R01	Liquid level setpoint	0	100	50	%	1	3002	NO	YES	
N07	Operation Mode	0	2	0		0	3003	YES	YES	0 = Master 1 = Slave 2 = IO
a02	Lower level limit	0	100	15	%	0	3004	NO	YES	
a01	Upper level limit	0	100	85	%	0	3005	NO	YES	
a07	Level alarm mode	0	1	0		0	3006	NO	YES	0 = Time 1 = Hysteresis
a04	Lower delay	0	999	10	s	0	3007	NO	YES	
a03	Upper delay	0	999	50	s	0	3008	NO	YES	
a06	Lower level hysteresis	0	20	3	%	1	3009	NO	YES	
a05	Upper level hysteresis	0	20	5	%	1	3010	NO	YES	
a08	Function common alarm	0	3	0		0	3011	NO	YES	0 = Not follow 1 = Follow up 2 = Follow low 3 = Follow all
a12	Oscillation detect band	0	100	100	%	0	3012	NO	YES	
a13	Oscillation detect timeout	2	30	20	min	0	3013	NO	YES	
a25	Force pump OFF in stopped mode	0	1	0		0	3117	NO	YES	0 = Off 1 = On
a14	IO Lower level limit	0	100	5	%	0	3101	NO	YES	
a15	IO Upper level limit	0	100	95	%	0	3102	NO	YES	
a16	IO Lower level hysteresis	0	20	3	%	1	3103	NO	YES	
a17	IO Upper level hysteresis	0	20	3	%	1	3104	NO	YES	
a18	IO Lower delay	0	999	10	s	0	3105	NO	YES	
a19	IO Upper delay	0	999	50	s	0	3106	NO	YES	
a20	IO Level limit	0	100	50	%	0	3107	NO	YES	
a21	IO Level delay	0	999	10	s	0	3108	NO	YES	
a22	IO Level hysteresis	0	20	3		1	3109	NO	YES	
a23	IO Level action	0	1	0		0	3110	NO	YES	0 = Falling 1 = Rising
N03	Control Method	0	2	2		0	3014	NO	YES	0 = On/off 1 = P-ctrl 2 = PI-ctrl
n35	Regulating principle	0	1	0		0	3015	NO	YES	0 = Low 1 = High
n04	P-band	5	200	30	%	1	3016	NO	YES	
n05	Integration time Tn	60	600	400	s	0	3017	NO	YES	
n34	Neutral zone	0	25	2	%	1	3018	NO	YES	
N06	Difference	0,5	25	2	%	1	3019	NO	YES	
n13	Period time for AKV/AKVA	3	15	6	s	1	3020	NO	YES	
n33	Minimum OD	0		0	%	0	3021	NO	YES	
n32	Maximum OD	1	100	100	%	0	3022	NO	YES	
o11	Language	0	0	0		0	3023	YES	YES	0 = \$ActiveLanguageList
o17	Output indication	0	1	0		0	3024	NO	YES	0 = Level 1 = OD
K04	Login timeout	1	120	10	min	0	3025	NO	YES	
K06	Backlight timeout	0	120	2	min	0	3026	NO	YES	
o05	Password daily	0	999	100		0	3027	NO	YES	
K02	Password service	0	999	200		0	3028	NO	YES	
K03	Password commission	0	999	300		0	3029	NO	YES	
K05	Contrast	0	100	40	%	0	3030	NO	YES	
K01	Brightness	0	100	80	%	0	3031	NO	YES	
I09	System configuration	0	4	0		0	3032	YES	YES	0 = ICAD+NC 1 = ICAD 2 = AKV/A+NC 3 = AKV/A 4 = NC only
o31	Level signal setup	0	3	0		0	3033	YES	YES	0 = AKS4100 1 = AKS41 2 = Current 3 = Voltage
o32	Voltage at low liquid level	0		0	V	1	3034	NO	YES	
o33	Voltage at high liquid level		10	10	V	1	3035	NO	YES	
I06	Current at low liquid level	0		4	mA	1	3036	NO	YES	
I07	Current at high liquid level		20	20	mA	1	3037	NO	YES	
o34	Valve position setup	0	2	0		0	3038	YES	YES	0 = Not used 1 = Current 2 = Voltage
I02	Voltage at closed valve position	0		0	V	1	3039	NO	YES	
I03	Voltage at open valve position		10	10	V	1	3040	NO	YES	
I04	Current at closed valve position	0		4	mA	1	3041	NO	YES	
I05	Current at open valve position		20	20	mA	1	3042	NO	YES	
I18	Common alarm setup	0	3	1		0	3043	YES	YES	0 = DO4 1 = High Alarm 2 = DO3 3 = Disp only
I08	Multiple valve setup	0	4	0		0	3044	YES	YES	0 = Not used 1 = 2 same cap 2 = 2 dif cap 3 = 3 same cap 4 = 3 dif cap
I13	Multiple valve pattern	0	1	0		0	3045	NO	YES	0 = Parallel 1 = Sequence
I10	Valve A capacity	0	100	50	%	0	3046	YES	YES	

I11	Valve B capacity	0	100	50	%	0	3047	YES	YES	
I12	Valve C capacity	0	100	33	%	0	3048	YES	YES	
I17	ICAD takeover OD	0	100	80	%	0	3052	NO	YES	
I19	IO module setup	0	1	0		0	3091	YES	YES	0 = Not used 1 = Used
G01	CAN ID	1	127	1		0	4032	NO	NO	
G02	Can baudrate	0	5	4		0	4033	NO	NO	0 = 20k 1 = 50k 2 = 125k 3 = 250k 4 = 500k 5 = 1M
G06	Modbus ID	0	120	1		0	3055	NO	YES	
G05	Modbus baudrate	0	8	6		0	3056	NO	YES	0 = 0 1 = 1200 2 = 2400 3 = 4800 4 = 9600 5 = 14400 6 = 19200 7 = 28800 8 = 38400
G08	Modbus mode	0	2	1		0	3057	NO	YES	0 = 8N1 1 = 8E1 2 = 8N2
G07	Modbus mapping	0	1	0		0	3058	NO	YES	0 = Operation 1 = Setup
G09	Valve B CAN ID	1	127	2		0	3088	YES	YES	
G10	Valve C CAN ID	1	127	3		0	3089	YES	YES	
G11	IO Mod. CAN ID	1	127	4		0	3090	YES	YES	
B01	Controller state	0	6	0		0	4001	YES	NO	0 = Powerup 1 = Stop 2 = Auto 3 = Manual 4 = Slave 5 = IO 6 = Safe
u01	Actual level	0	100	0	%	1	4002	NO	NO	
u02	Actual reference	0	100	0	%	1	4003	YES	NO	
u24	Actual OD	0	100	0	%	1	4004	NO	NO	
u33	Actual valve position	0	100	0	%	1	4005	NO	NO	
u10	Digital input status	0	1	0		0	4006	NO	NO	0 = Off 1 = On
u31	Actual level signal voltage	0	100	0	V	1	4007	NO	NO	
u30	Actual level signal current	0	24	0	mA	1	4008	NO	NO	
B02	Actual position signal voltage	0	100	0	V	1	4009	NO	NO	
u32	Actual position signal current	0	100	0	mA	1	4010	NO	NO	
B03	Actual OD A	0	100	0	%	1	4011	NO	NO	
B04	Actual OD B	0	100	0	%	1	4012	NO	NO	
B05	Actual OD C	0	100	0	%	1	4013	NO	NO	
o18	Manual Mode	0	1	0		0	4014	NO	NO	0 = Off 1 = On
o45	Manual OD	0	100	50	%	1	3059	NO	NO	
B08	Manual low alarm	0	1	0		0	3060	NO	NO	0 = Off 1 = On
B06	Manual high alarm	0	1	0		0	3061	NO	NO	0 = Off 1 = On
B07	Manual common alarm	0	1	0		0	3062	NO	NO	0 = Off 1 = On
B09	Apply defaults	0	1	0		0	3063	YES	NO	0 = None 1 = Factory
B11	Oscillation amplitude	0	100	0	%	1	4028	YES	NO	
B10	Oscillation period	0	3600	0	s	0	4029	YES	NO	

Label	Alarm name	Modbus PNU	Bit number
A1	Upper level	1901	8
A2	Lower level	1901	9
A92	Oscillation in level signal	1901	10
A96	Valve position	1901	14
A97	Multiple valve capacity	1901	15
E1	Internal error	1901	0
E21	Level signal out of range	1901	1
E22	Valve position signal out of range	1901	2
E96	AKS 4100 error	1901	3
A45	Standby mode	1901	4
A99	Valve B communication	1901	5
A98	Valve C communication	1901	6
A85	Communication to master lost	1901	7
A91	Valve B alarm	1902	8

A90	Valve C alarm	1902	9
A88	Control method conflict	1902	10
A87	Common alarm HW conflict	1902	11
A86	Min/max OD conflict	1902	12
E95	Sensor supply overload	1902	13
E99	DO4 overload	1902	14
E97	Too much current AI3	1902	15
E98	Too much current AI4	1902	0
A89	Multiple valve setup conflict	1902	1
A80	Valve B CAN ID conflict	1902	2
A81	Valve C CAN ID conflict	1902	3
A82	IO module CAN ID conflict	1902	4
A83	IO module communication	1902	5

