

ENGINEERING
TOMORROW



Danfoss Industrial Refrigeration

Combinaari 13.11.2020 / Laura Pulkki



Aamun agendalla:

- LLS 4000
- EKE 400
- SFA 10 varoventtiili ja DSV10 vaihtventtiili
- Danfoss Flexline 65 bar
- GD Kaasuanturit ja hälytysjärjestelmät
- CoolSelector2 ja Danfoss sovellukset

ENGINEERING
TOMORROW

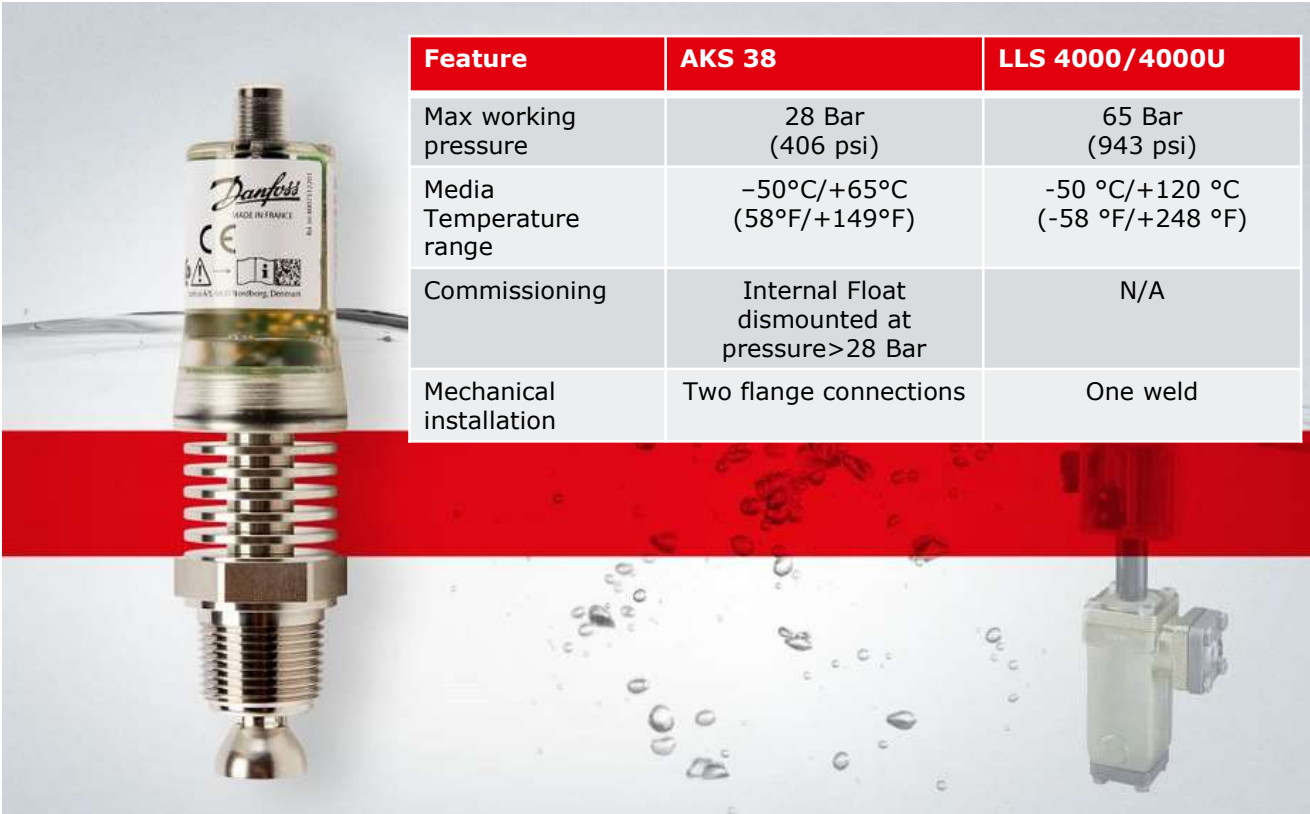


Danfoss LLS 4000/4000U

Electronic Liquid Level Switch



Switching from Danfoss AKS 38 float switch to Danfoss electronic LLS 4000/4000U liquid level switch



Feature	AKS 38	LLS 4000/4000U
Max working pressure	28 Bar (406 psi)	65 Bar (943 psi)
Media Temperature range	-50°C/+65°C (58°F/+149°F)	-50 °C/+120 °C (-58 °F/+248 °F)
Commissioning	Internal Float dismounted at pressure>28 Bar	N/A
Mechanical installation	Two flange connections	One weld

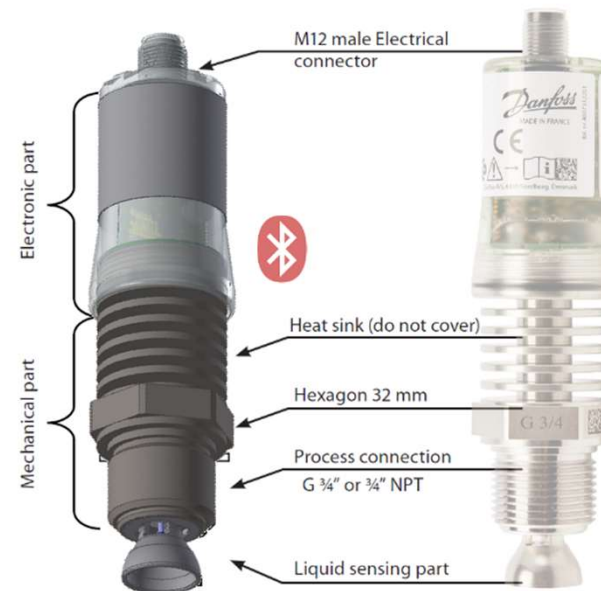
How does it look?

LLS 4000/4000U

Two main parts:

A **Mechanical** and an **electronic** part

- **Electrical connection** – power supply and relay contact
- **Heat sink** – dissipates unwanted heat from the electronics
- **Hexagon fastener** – to tighten the device into the fitting of the system
- **Process connection** – to connect the device into the system and seal it in place
- **Liquid sensing part** – in contact with the refrigerant, detects liquid state
- **Electronic circuit board** & protective casing, with Bluetooth



Refrigerants and temperature limitations

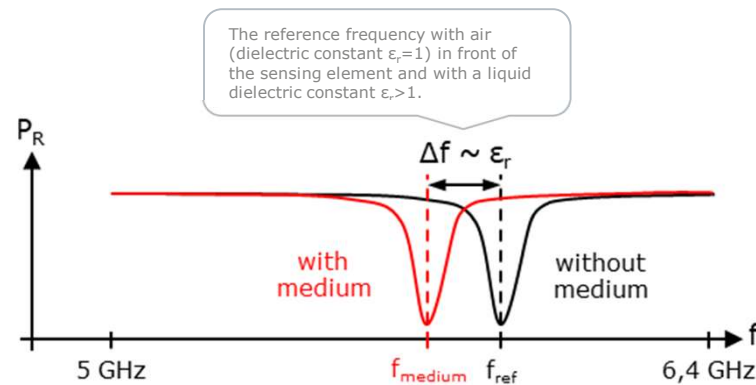
Refrigerant	Saturation temperature
R717/NH3 (Ammonia):	-50 °C to +105 °C
R22	-50 °C to +86 °C
R404A	-50 °C to +63 °C
R410A:	-50 °C to +61 °C
R134A:	-50 °C to +91 °C
R507A and R513A	Temperature range TBD. Data sheet will be updated once defined

Approx 10K
degrees
below
critical
temperature

- Other refrigerants may be validated based on general need
- Require individual validation test and can't be done on a project base

How does it work?

LLS 4000/4000U

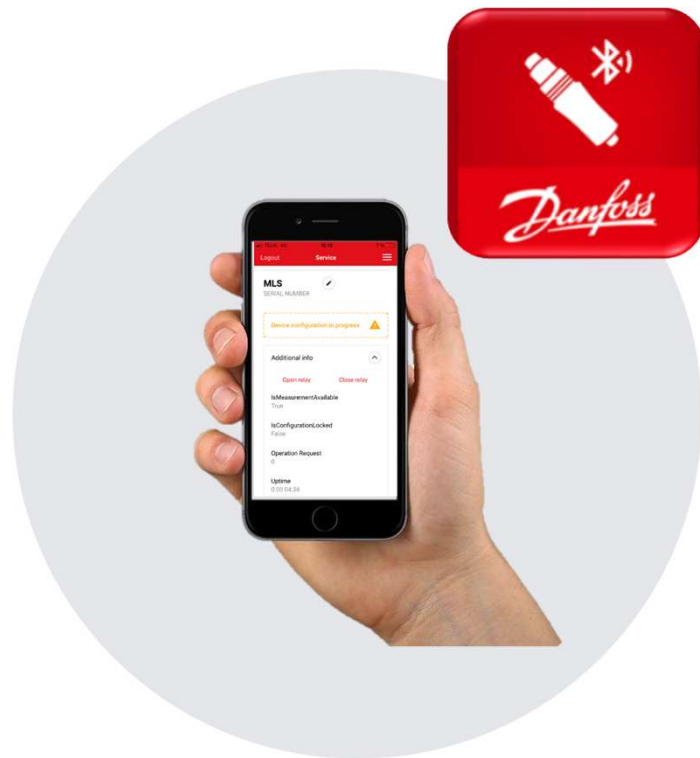


Measurement principle: Reflectometry

- The measurement principle is based on reflectometry with a 4.9 GHz to 6.2 GHz linear sweep (Microwave switch technology). A microwave at various frequencies is emitted out from the sensor.
- The reflected signal is characterized by a resonance frequency. The resonance frequency in air is taken as a reference (f_{ref}).
- When the sensing element is in contact with the liquid, the resonance frequency is shifting to a lower frequency. This is due to the change of the dielectric constant of the medium
- The point level switch monitors the resonance frequency and indicates whether the sensing element is surrounded by liquid or gas

How to configure, connect and control?

LLS 4000/4000U



LLS 4000/4000U App

- All configuration and readings from the LLS 4000/400U switch are performed through Bluetooth the Danfoss LLS 4000 app.
- **Easy set-up** with just a few parameters to be configured in the Danfoss LLS 4000 app:
 - Media type - Ammonia or HFC/HCFC. Factory default: Ammonia
 - Relay NO (normally open) or NC (normally closed). Factory default: Normally closed

Configuration – Switch State

LLS 4000/4000U

The Switch State, can be configured via the Danfoss LLS 4000 App:

- **LLS 4000/4000U SIL2 certificate unit** is locked to
 - Close at no Liquid (Normally Closed)*
- **LLS 4000/4000U Standard unit**
 - Not recommended in these applications because
 - A **High Level Alarm** may not be registered at a power failure
 - A **Low Level Alarm** may not be registered at a power failure

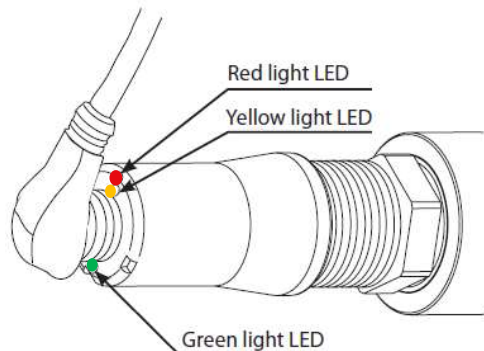
	Level	Open at no Liquid (Normally Open)*	Closed at no Liquid (Normally Closed)*
High Level sensor			
High Level sensor			
Low Level sensor			
Low Level sensor			
Voltage supply outside spec.	-		
LLS 4000/4000U fault**	-		

SIL2 fixed configuration

LED Light indicators – What they mean

LLS 4000/4000U

- Green LED – Voltage OK
- Yellow LED – Liquid detected
- Red LED – Fault state
- ☀ Green LED flashing – connecting to Smartphone



	Level	Voltage connected	Level detection		LLS Fault
		Green LED	Yellow LED	Red LED	
High Level sensor		●			
High Level sensor		●	●		
Low Level sensor		●	●		
Low Level sensor		●			
Voltage supply outside spec.	-				
LLS 4000/4000U fault**	-	●	● ***	●	

** For failure types please connect the device to the Bluetooth App, enter fault state mode, and read the failure type

*** Fault can be detected at any detected level, ie. two or all three lights on

Installation – Air pockets

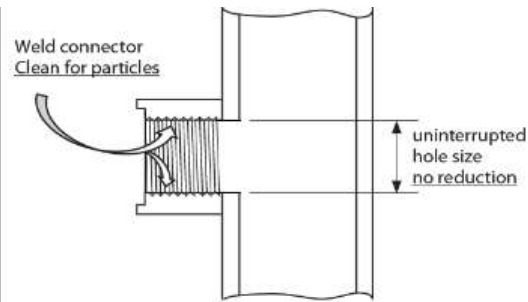
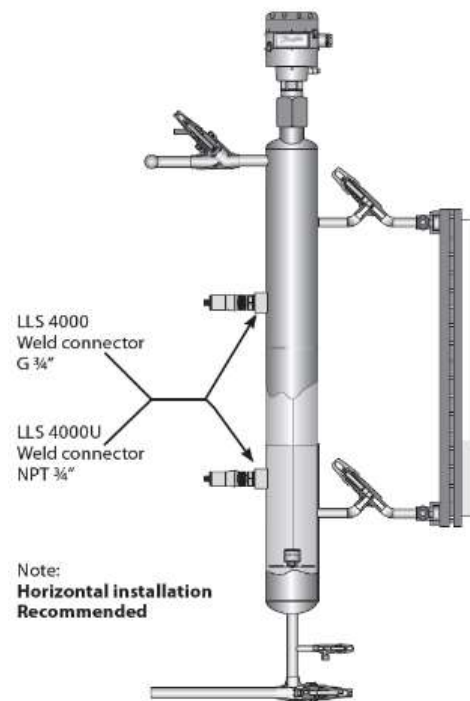
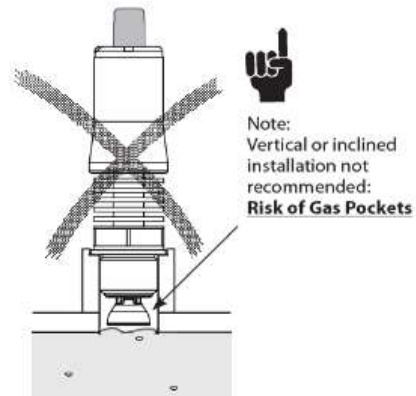


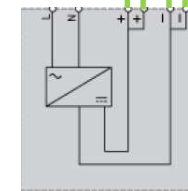
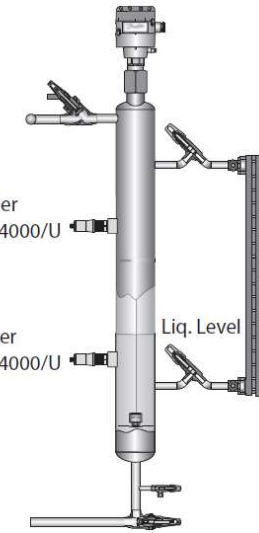
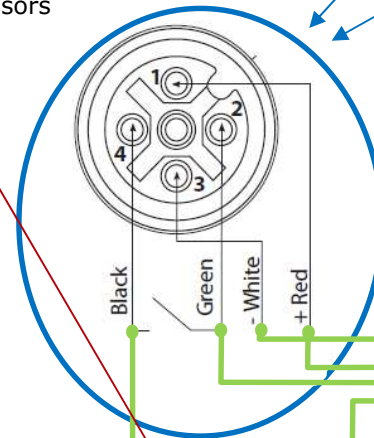
Fig. 4



High/Low level detection with LLS 4000/4000U

Switch control – One Power supply

- LLS 4000/4000U Solid state relay
 - Normally connected to an auxiliary relay, that transfers signal to a PLC.
 - At PLC the LLS 4000/4000U it can be used for e.g.
 - High Level alarm for protecting compressors
 - Low Level alarm for protecting pumps
 - Generic level alarms



Mechanical Installation



SIL Design - All LLS 4000 devices are safe!

LLS 4000/4000U

High functional safety:
Variants in **Standard SIL**
and **SIL2 Certified**
Design



LLS 4000 / 4000U - SIL feature	SIL2 certified	Standard SIL design
Hardware redundancy - micro processor - output relay	✓	✓
Internal reference detection system (test channel)	✓	✓
The signal is treated twice (Voting Principle)	✓	✓
Auto diagnostic of - Component fault - Corrupted signal - Mech disconnection	✓	✓
SIL 2 Certification	✓	-
NC/NO configuration	NC only	Configurable
Spare part needed	New device	Electronic part

- A **SIL 2 device** has between 100 and 1000 times lower probability for a failure, compared to "normally" designed electrical products with no SIL level.

Range overview - What to order?

LLS 4000/4000U

Complete LLS 4000/4000U Switch

Code No.	Description
084H6001	LLS 4000 G 3/4 in.
084H6002	LLS 4000 G 3/4 in. w/SIL2 certificate
084H6003	LLS 4000U NPT 3/4 in.
084H6004	LLS 4000U NPT 3/4 in. w/SIL2 certificate

Accessories

Code No.	Description
034G7073	M12 cable female angle x 2 meter
034G7074	M12 cable female angle x 8 meter
084H6012	Weld connection for G 3/4" in.

Spare Parts LLS 4000/4000U

Code No.	Description
084H6010***	LLS 4000 Electronic non-SIL2, incl. O-ring
084H6011	Inspection Kit, O-ring + Alu gasket (5 pcs)

*** LLS 4000 Electronic part SIL2 not available. Must be ordered as complete device due to SIL2 requirements

Two variants – identical except for the mechanical process connection: **G 3/4 in. or NPT 3/4 in.**



What does electronic liquid level switch mean?

LLS 4000/4000U



- Going from mechanically designed switch to electronic based switch – no moving parts
- Proven and precise technology to detect and sense liquid refrigerant
- Intuitive, App-based user interface for easy configuration and maintenance
- Enabling a new level of
 - Safety and reliability (SIL2 variant)
 - Accuracy
 - Ease of configuration and commissioning

Read more:

- [LLS 4000 Liquid level switch](#)
- [Cooling United Live LLS 4000 presentation](#)

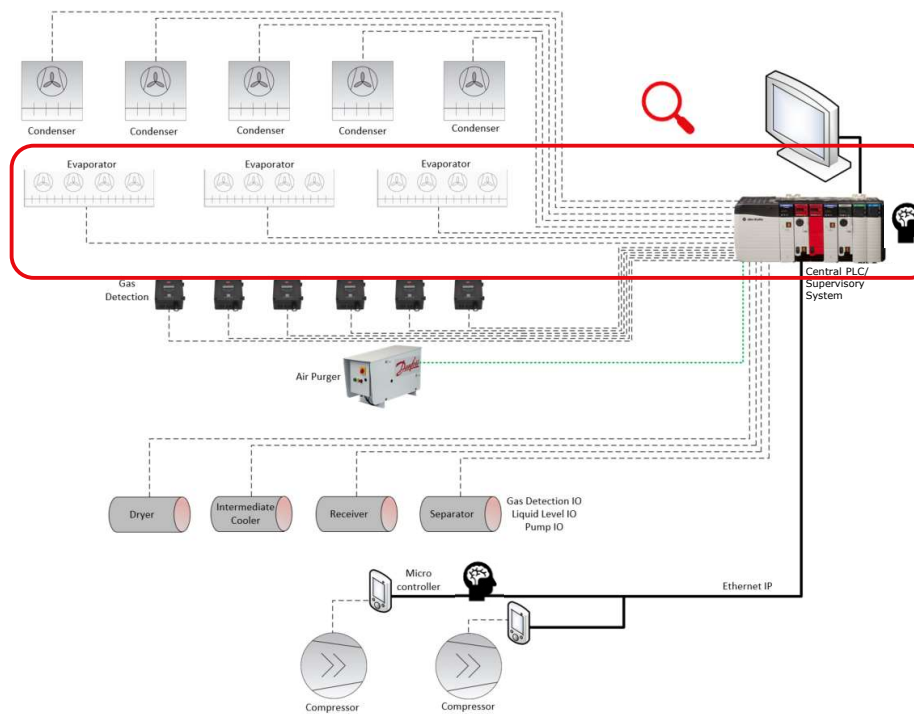
ENGINEERING
TOMORROW




Control system with Danfoss EKE 400



System without Danfoss EKE 400 - Centralized Logic and IO



- All evaporator control algorithms located in the Central PLC
- Expensive long wiring routes from controlled equipment to Central PLC
- Potential break-down of the Central PLC will affect all evaporator control
- Software (SW) update of evaporator PLC requires good PLC programming structure and expertise
- Expansion with more evaporators requires additional PLC programming and expensive long wiring routes

 Location of control logic

EKE 400

Designed specifically for the job

Any solution that does not take the specific needs and requirements of an industrial refrigeration application into consideration may compromise both efficiency and system reliability.

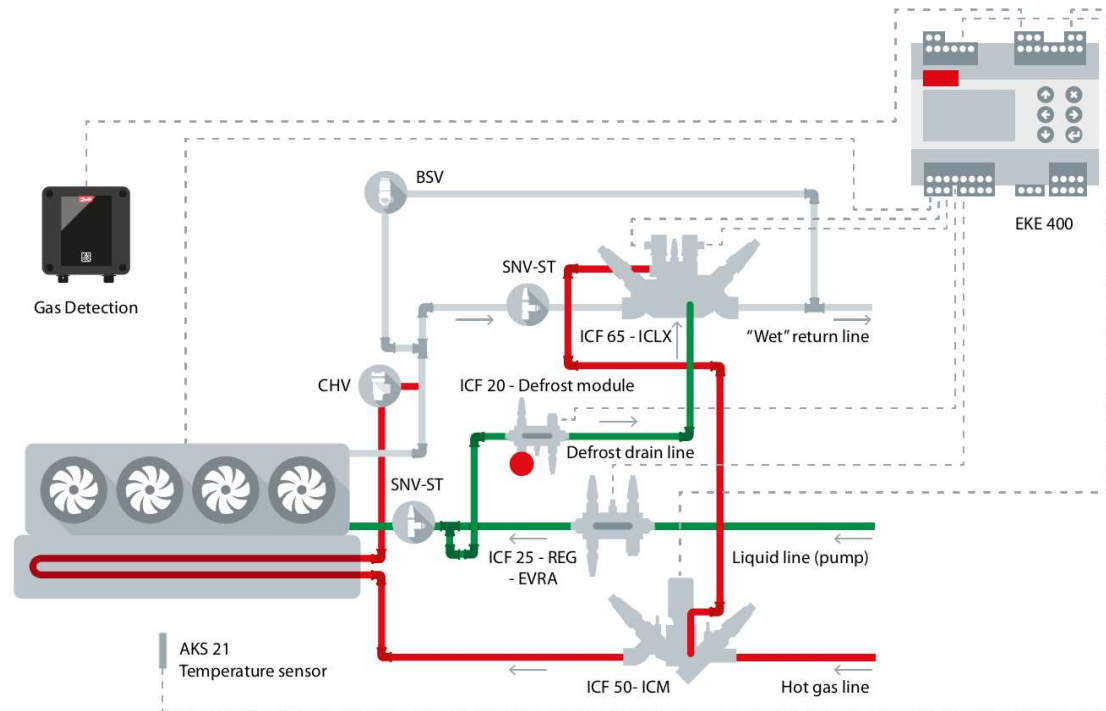
Being in control of your evaporator is key. Danfoss application knowledge and expertise in industrial refrigeration will help you to get there.



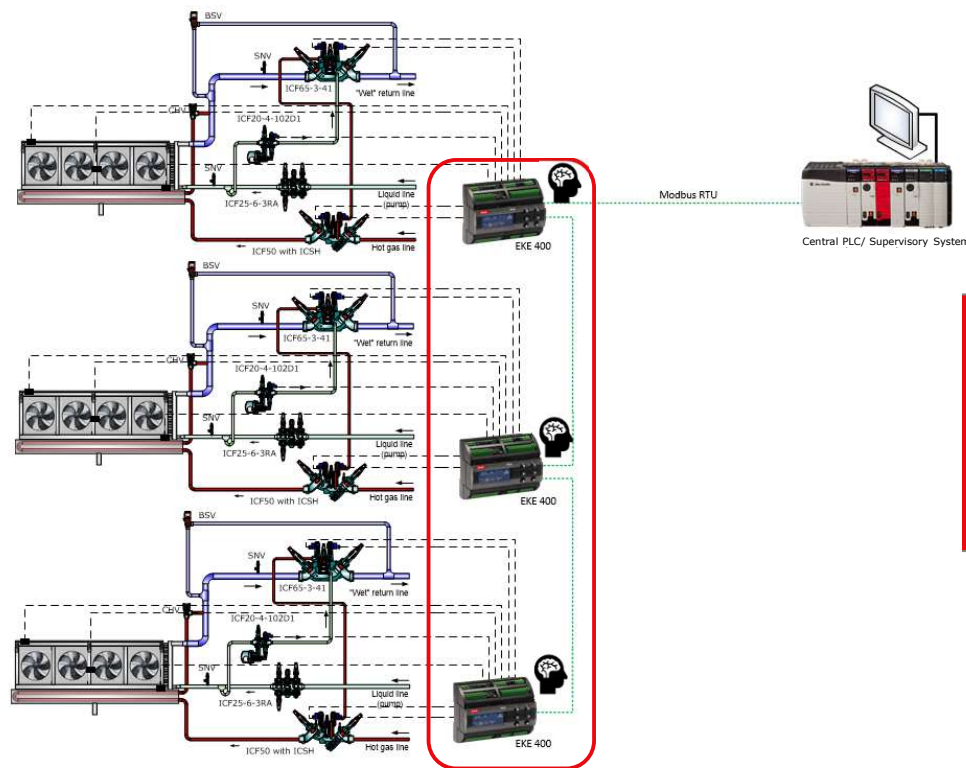
That's why we have engineered the EKE 400 - an application specific evaporator controller for industrial refrigeration which helps you save time and money, and puts you in control.



Improving job site efficiency




Evaporator **with** Danfoss EKE 400 - Modbus RTU (RS485) to PLC solution



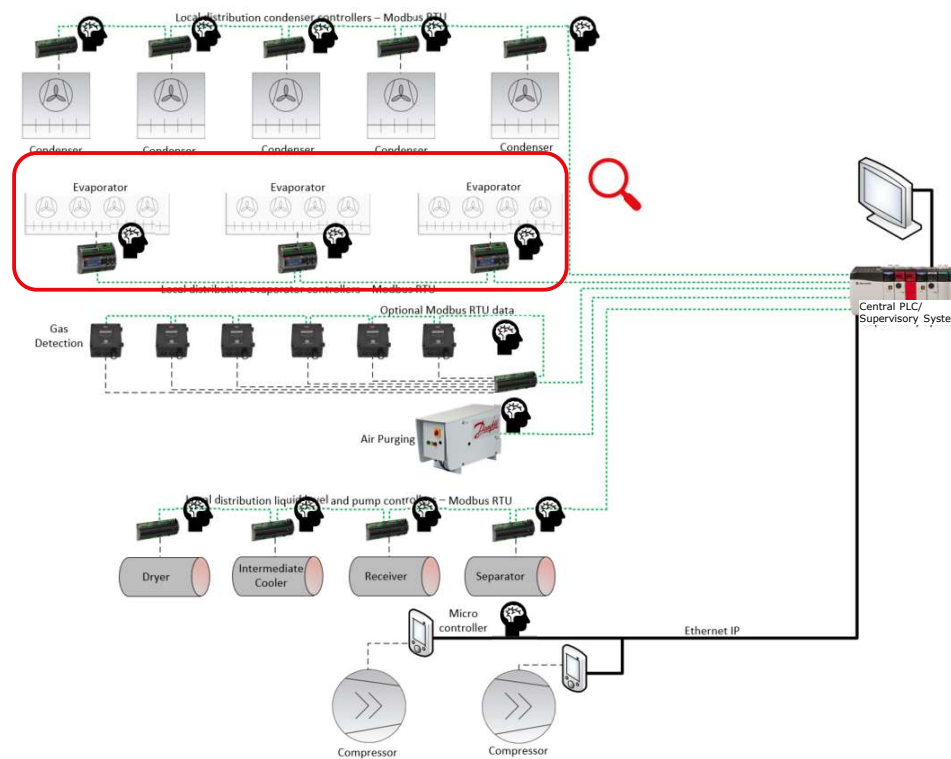
**Easy configuration of
each evaporator – no
PLC skills needed**

**Fewer technicians
needed for initial setup**


**Simple error detection
and location**

 Location of control logic

System **with** Danfoss EKE 400 - Modbus RTU (RS485) to PLC solution



- One EKE 400 controller per evaporator
- Potential break-down of the PLC will NOT affect the evaporators
- Standardized solution, quick setup of key parameters, no need for PLC programming in the field
- Expansion with more evaporators just requires adding 1 EKE 400 per evaporator and address (up to 125 EKE 400 controllers can be connected to one sub-network)

 Location of control logic

Evaporator Controller EKE 400 for industrial and heavy commercial refrigeration



Designed for industrial and heavy commercial refrigeration systems

- Significantly reduces control installation time and costs
- Managing the complete operation in cooling and defrost mode for optimal operation and defrost sequence
- One dedicated controller per evaporator
- Cost-efficient installation and easy setup
- Predefined process sequence for reliable operation and defrost
- Complies with IIAR recommendations for hot gas defrosting

Read more:

- [EKE 400 evaporator controller](#)
- [Cooling United Live EKE 400 presentation](#)

One Product from small to large systems

Setup method

There are two ways in which the EKE 400 controller can be set up:

- **Via Wizard**
 - The wizard leads you through a series of selected parameters which are commonly required to be configured at every start-up.
 - Some parameters are not included in the Wizard and may still need to be configured, i.e. to be done from the complete Parameter list.
- **Via Parameter list**
 - Configuration via the complete parameter list

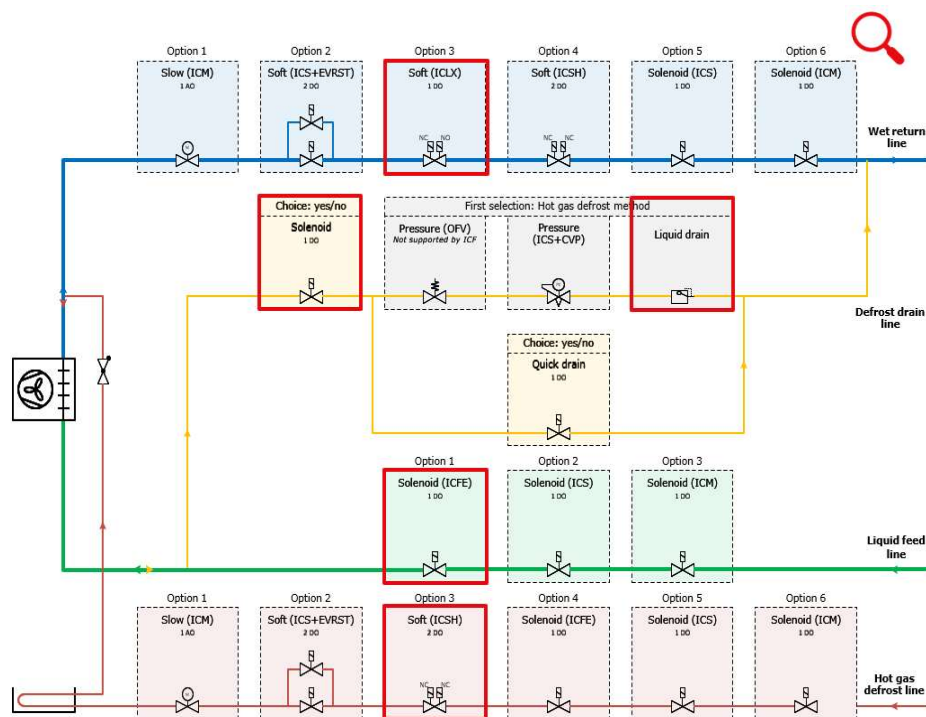
EKE 400 Wizard												
Label ID	Parameter name	Description and selection options	Min.	Max.	Factory setting							
P01	Display unit	Display unit 0 MET: Metric units - Celsius (°C) and Kelvin (°K) 1 IMP: Imperial units - Fahrenheit (°F) and Rankine (°R)	0	1	0=MET							
R01	Evap. ctrl mode	Evaporator control mode: -1 None 0 Flood, evap. On/OFF	-1	0	0=Flood, evap. On/OFF							
D1A	Defrost method	Select the defrost method 0 No defrost: No defrost function 1 Hot gas Defrost done by Hot gas 2 Electrical or water	0	1	1=Hot gas							
R02	Liq. feed line valve	Select type of valves in Liquid feed line 1 Solenoid (ICE): ON/OFF Solenoid ICE 20 Valve station 2 Solenoid (ICS): ON/OFF Solenoid ICS with EVM pilot 3 Solenoid (ICM): Motorized ICM, as slow opening/closing ON/OFF valve. Occupy 1 DO	1	3	1=Solenoid (ICE)							
D3A	Wet return line val.	Select type of valves in Wet return line 0 No Valve 1 Soft (ICS+EVRS): Dual position individual solenoid valves. Occupy 2 DO 2 Soft (ICSH): Dual position solenoid valve. Occupy 2 DO 3 Soft (ICLX): 2-step gas powered solenoid valve. Occupy 1 DO 4 Solenoid (ICS): ON/OFF Solenoid ICS with EVM pilot 5 Solenoid (ICM): Motorized ICM, as slow opening/closing ON/OFF valve. Occupy 1 DO 6 Slow (ICM): Motorized ICM, as slow opening/closing modulating valve. Occupy 1 AO	0	1	Soft (ICLX)							
D2A	Hot gas line valve	Select type of valves in Hot gas line 0 No Valve 1 Soft (ICS+EVRS): Dual position individual solenoid valves. Occupy 2 DO 2 Soft (ICSH): Dual position solenoid valve. Occupy 2 DO 3 Soft (ICLX): 2-step gas powered solenoid valve. Occupy 1 DO 4 Solenoid (ICS): ON/OFF Solenoid ICS with EVM pilot 5 Solenoid (ICM): Motorized ICM, as slow opening/closing ON/OFF valve. Occupy 1 DO 6 Slow (ICM): Motorized ICM, as slow opening/closing modulating valve. Occupy 1 AO	0	1	Soft (ICLX)							
D1B	HG Drain valve	Select type of valves in Hot gas line 0 No Valve 1 Soft (ICS+EVRS): Dual position individual solenoid valves. Occupy 2 DO 2 Soft (ICSH): Dual position solenoid valve. Occupy 2 DO 3 Soft (ICLX): 2-step gas powered solenoid valve. Occupy 1 DO 4 Solenoid (ICS): ON/OFF Solenoid ICS with EVM pilot 5 Solenoid (ICM): Motorized ICM, as slow opening/closing ON/OFF valve. Occupy 1 DO 6 Slow (ICM): Motorized ICM, as slow opening/closing modulating valve. Occupy 1 AO	0	1	Soft (ICLX)							

Parameter list												
Observe that many of the individual parameters listed below, will only be visible, if other parameters have been set. Hereby irrelevant parameters are filtered out, during setup of EKE 400.												
Label ID	Parameter name	Description and selection options	Min.	Max.	Factory Setting	Unit	Locked by Main switch	Deci. mode	Read by Main switch	Pass word level to change	Modbus address	Modbus function
Start / stop												
M01	Main switch	Release the controller for operation or force EKE 400 out of operation OFF: the controller is forced out of operation. Observe if "M02, Ext. Main switch" is ON, this DI will also when OFF, forced the controller out of operation. ON: the controller released for operation. Observe if "M02, Ext. Main switch" is ON, this DI must also be ON to release the controller for operation.	0=OFF	1=ON	0=OFF		0	No	Pass word level 1,2,3	2	3001	RW
M02	Ext. Main switch	Status of the external main switch (DI)	0=OFF	1=ON	-		0	Yes	Pass word level 1,2,3	Can never be changed	3002	RO
Evaporator control												
R01	Evap. ctrl mode	Evaporator control mode: -1 None 0 Flood, evap. On/OFF	-1	0	0=Flood, evap. On/OFF		0	Yes	Pass word level 1,2,3	3	3020	RW
R02	Liq. feed line valve	Select type of valves in Liquid feed line. 1 Solenoid (ICE): ON/OFF Solenoid ICE 20 Valve station. 2 Solenoid (ICS): ON/OFF Solenoid ICS with EVM pilot 3 Solenoid (ICM): Motorized ICM, as slow opening/closing ON/OFF valve. Occupy 1 DO	1	3	1=Solenoid (ICE)		0	Yes	Pass word level 1,2,3	3	3021	RW
R05	Cool On/Off by DI	Cooling demand from external equipment (e.g. PLC) to EKE 400, via DI	0=No	1=Yes	0=No		0	Yes	Pass word level 1,2,3	3	3024	RW
R06	Forced closing	Forced stop cooling via MODBUS (e.g. PLC) or local from EKE 400 If a PLC controls cooling ON/OFF, "Forced closing" can be used to stop cooling. OFF: Function disabled	0=OFF	1=ON	0=OFF		0	No	Pass word level 1,2,3	2	3025	RW

One Product from small to large systems

Wizard for easy setup

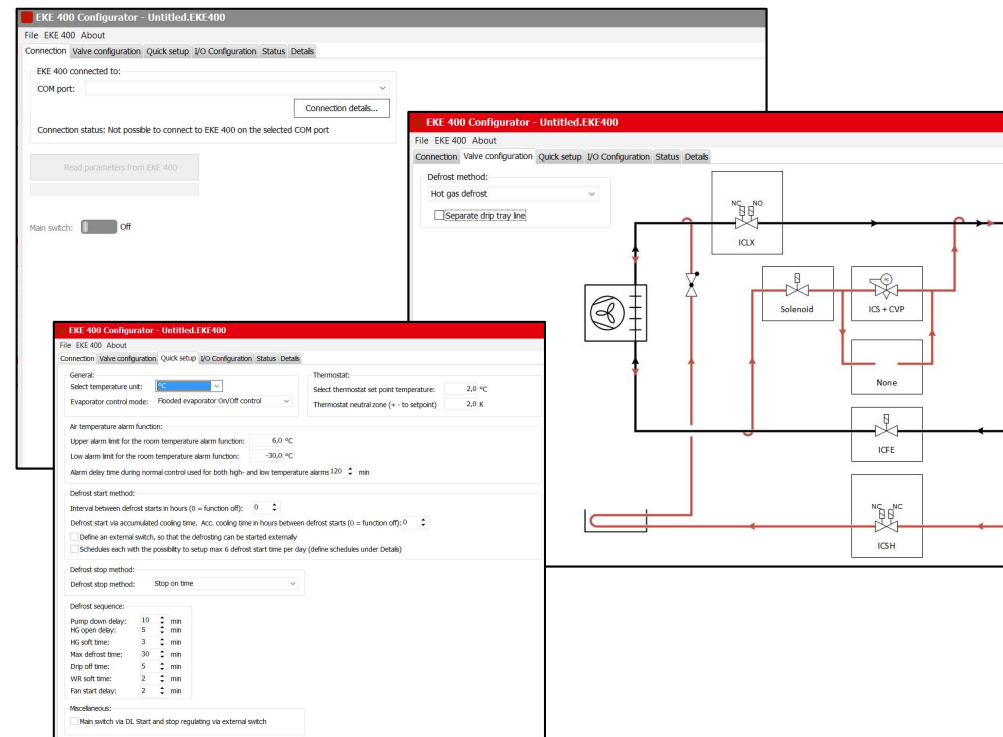
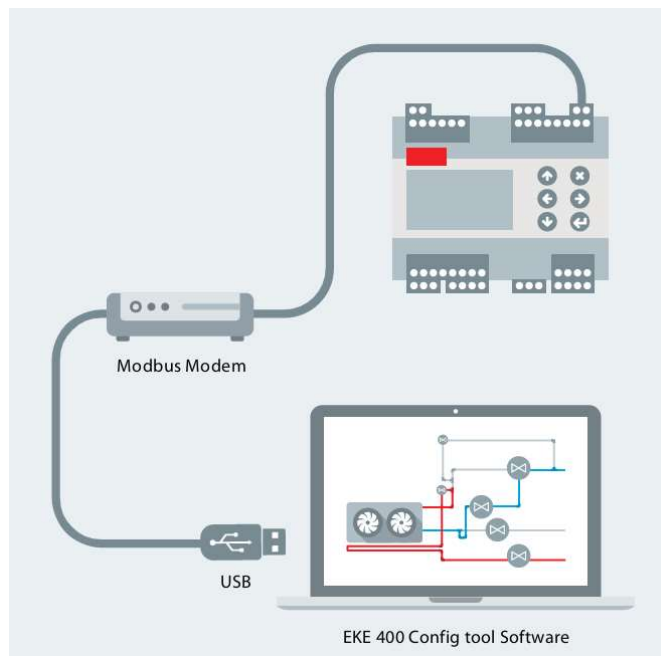
- save commissioning time with EKE 400

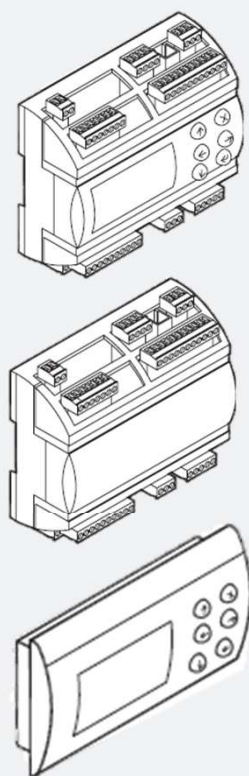


- Showing relevant valves only for each line
- Using industrial refrigeration specific terminology
- Optimized for best performance with Danfoss industrial refrigeration valves
- Also works with non-Danfoss valves

CoolConfig

Save and share your settings with one click





EKE 400 Product range

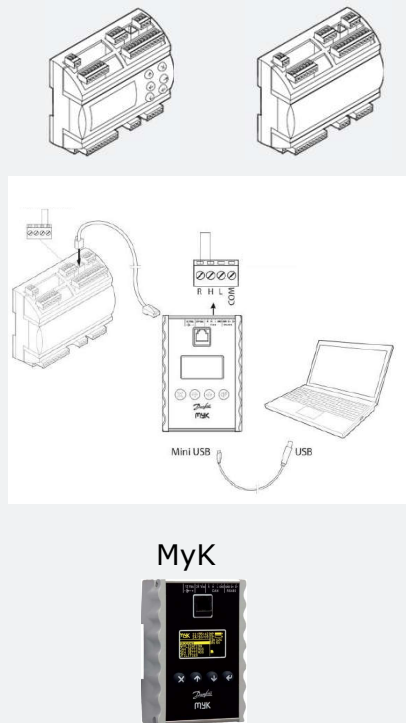
EKE 400 is available in four variants

EKE 400 models



Sales code	Description
080G5003	EKE 400 with HMI 85 – 265 V AC, 50/60 Hz
080G5004	EKE 400 with HMI 20 – 60 V DC and 24 V AC \pm 15% 50/60 Hz
080G5005	EKE 400 without HMI 85 – 265 V AC, 50/60 Hz
080G5006	EKE 400 without HMI 20 – 60 V DC and 24 V AC \pm 15% 50/60 Hz
080G0294	EKE 400 Remote HMI, type MMIGRS2 IP 64 ~ NEMA 3R (panel version) IP 40 (wall version)
080G0075	1.5 m (5 ft) cable for Remote HMI, type MMIGRS2
080G0076	3.0 m (10 ft) cable for Remote HMI, type MMIGRS2

- A remote HMI is available for front panel mounting
- One remote HMI can operate multiple EKE 400s
- Can be connected to all EKE 400 variants

EKE 400 Tools & accessories



Danfoss tools supporting EKE 400

Sales code	Description
Free download	AK-PT 50 PC tool for: <ul style="list-style-type: none"> • Configuration of EKE 400 parameters on-line and off-line • Replication of parameters to multiple EKE 400 evaporator controllers • Download of EKE 400 field controller parameters to PC file for project documentation
080G0073	MyK - MMIMYK <ul style="list-style-type: none"> • PC/MCX Interface to EKE 400 • Data Logging possible <div>   </div>



Application specific evaporator controller

EKE 400 Versions

Future version upgrades to include additional applications and functionalities:

EKE 400
V1.0

Applications:

- Flooded evaporators

Controls and manages:

- **Cooling mode**
 - Room temperature control
- **Defrost**
 - Time-based defrost
 - Accumulated cooling time
 - Hot gas defrost by pressure
 - Hot gas defrost by liquid drain
 - Electrical defrost
 - Water or brine defrost

EKE 400
V1.1

Applications:

- Flooded evaporators
- DX evaporators w/wo. hot gas defrost including CO2*

Controls and manages:

- **Cooling mode**
 - Room temperature control
 - Media temperature control
 - Pressure control
 - DX Direct Expansion control
- **Defrost**
 - Time-based defrost
 - Accumulated cooling time
 - Hot gas defrost by pressure
 - Hot gas defrost by liquid drain
 - Electrical defrost
 - Water or brine defrost

* DX-application available January 2020

Yleisökysymys: Voiko EKC-400 säätimen yhdistää AK-SM 800:aan?

- Kyllä voi:

The screenshot displays the Danfoss Engineering Tomorrow software interface. The top navigation bar includes tabs for File, Simulator, Dashboard, Alarms, System View, Detail, Schedules, Info, History, and Configuration. The left sidebar shows a tree structure under 'Refrigeration' with 'Controllers A' expanded, showing 'Circuit AA1'. The main panel has tabs for Overview, Alarm, History Log, Status/Settings, and Schedules. The 'Status/Settings' tab is active, showing the following details:

Status	Offline
Alarm	OK
Address	0
Setpoint	2.0 °C
Current Value	0.00 °C
Model	EKE-400-0150

Below this, there are tabs for Status, Settings, and Manual Operation. The 'Status' tab is selected, showing a summary table:

Summary	Status
* I01 Act. Alarm statu	0
* I02 Active alarms	0
* I03 Cleared alarms	0
* SIA Control states	#0

ENGINEERING
TOMORROW



Danfoss SFA 10 safety valve & DSV 10 change- over valve



The safe choice for industrial low charge ammonia, CO2 and H(C)FC applications



SFA 10 safety valve

- System flexibility – wider capacity range
- Easy selection with Coolselector2®
- Weld nipples ease installation
- Nonstick grease available for easy de-installing

DSV 10 change over valve

- Position indicator – less risk of errors during service
- Easy selection with Coolselector2®
- Easy installation – reducer for perfect positioning
- Blind plug available – for system pressure testing

The lower capacity line extension provides more options to optimized system design

Read more:

- [Website](#)
- [Documents](#)



Danfoss **SFA 10** Safety valve – Technical data

Specification		Comment
Refrigerants	R717, R744, H(C)FC	Size not relevant for HC, HFO
Effective discharge area	30,9 mm ²	30% of SFA 15 60% of SFA 15-50
Pressure rating	65 bar	
Temperature range	-50 °C ... +100 °C	Some conditions at low and high static temperature shall be observed
Connections	Inlet 1/2" G Outlet 3/4" G (ND 15 weld nipple)	H2-2020: NPT version
Certificates	G-treads available with Danfoss or TÜV Set pressure and 3.1 certificate	H2-2020: NPT will be available with Danfoss Certificate only
Set pressures (10-65 bar)	Available in 1 bar step for G thread version	NPT in 13,16,17,18,20,21,22,24,25, 28,32,35,38,40,50,52,60,65 bar
Reseating	Max. -10% below set pressure (Meet ISO 4126 + AD2000)	Leak test after API 527
Improvements	Improved cone/seat design Shorter sealing wire Easier Service and maintenance	Compared to SFA 15



SFA 10

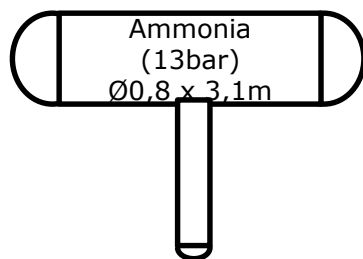
Capacity – EN 378

Main specification

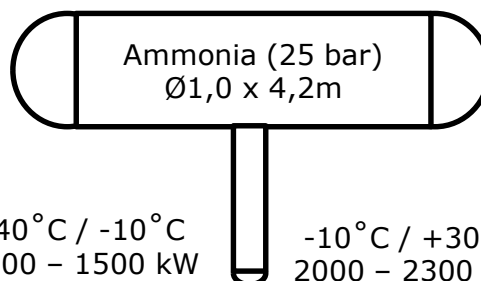
- Back pressure dependent
- 30% capacity of SFA 15
- Set Pressure up to 65 bar
- Applicable for R717, R744
- Temp range -50°C / +100°C

Refrigerant	Temp. [°C]	Set Pressure [barg]	SFA 10 Capacity [kg/h]
R717	-40 / -10	13	293
R717	-40 / -10	25	553
R717	-10 / +30	25	553
R744	-40 / -10	52	2323

Corresponding cooling capacity with Pump Separator (EN 378)

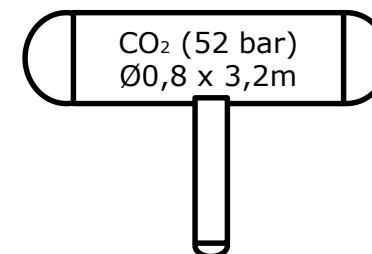


-40°C / -10°C
700 – 900 kW



-40°C / -10°C
1300 – 1500 kW

-10°C / +30°C
2000 – 2300 kW



-40°C / -10°C
1000 – 1200 kW

All design to be verified in Coolselector2

Coolselector2 calculation

Excessive pressure caused by Heat sources

Coolselector2 - Untitled.csprj

File Options Tools Help About Debug Selections Report Bill of Materials

Safety relief valve 1 x + New

Calculations according to: EN 13136:2013+A1:2018 Help

☒ External relief (to ambient) Refrigerant: R717 (Ammonia) Back pressure, absolute: 1,000 bar

☐ Internal relief

Copy Rename Delete

✓ Compressor 1

☐ Outlet losses

Operating conditions:
Safety relief valve and changeover valve:
Setpoint pressure, gauge: 15,00 bar
☐ Inlet temperature: 69,3 °C
Select valves:
SFA 10 + DSV 10 (15-20)

Results:

Relieving pressure, absolute:	17,50 bar
Required capacity:	0,0146 kg/s
Selected valve capacity:	0,09403 kg/s
Adjusted valve capacity:	0,07523 kg/s
Inlet pressure loss:	0,204 bar 1,2 %
Outlet pressure loss:	0 bar 0,0 %
Result:	OK

☐ Inlet losses

☒ Suction volume flow at +10°C, saturated: 0,003 m³/s
☐ Compressor size

Valve Size
DSV Size
Upstream ΔP
Downstream ΔP

Capacity, blow down and pressure setting

Functional Design and Product Lifetime

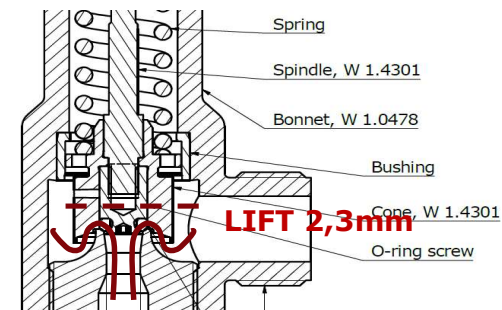
The right capacity and opening characteristics of SFA 10 are dependent on the right spring being used. Across the pressure range, different spring are used to deliver the right capacity and operating characteristics.

Using the wrong spring for a pressure setting might result in:

- Reduced lift, leading to lack of valve capacity and increased system pressure
- Increased blowdown, leading to extraordinary loss of charge

Valve	Flow diam [mm]	Flow Area [mm ²]	Kdr	Aeff [mm ²]
SFA 10	6,8	36	0,85	31
SFA 15	13	133	0,73	97
SFA 15-50	13	133	0,39	52

$A_{eff} = A_o \times K_{dr}$ -> Valve Capacity





Danfoss **DSV 10** Safety valve – Technical data

	Specification	Comment
Refrigerants	R717, R744, H(C)FC	Size not relevant for HC, HFO
Pressure rating	65 bar	
Temperature range	-50°C ... +100°C	
Connections	G3/4" inlet thread Outlet reducer similar to DSV 1	DSV Inlet / SFA outlet welding nipple included
Kv / Cv value	Kv 5,5 m3/hr Cv 6,4 Usgal/min	
Improvements	Position indicator Blind plug for system pressure testing Non stick thread solution (de-installing)	Compared to DSV 1





Danfoss **SFA 10 /DSV 10/ spare parts & accessories** – Code numbers

Code numbers

Code Number	Description	Comment
148F42(10-65)	SFA 10 T 2(10-65)	Danfoss certificate
148F43(10-65)	SFA 10 T 3(10-65)	TÜV certificate
148F3054	DSV 10 G	Change over valve
Code number >27 bar are under sales release and available after week 47		

Accessories

Code Number	Description
148F3063	DSV 10 Plug + gasket for testing (2 pcs)
148F3064	DSV/SFA/SFV Non-stick grease
148F3067	Nipples + Gaskets set for DSV 10/SFA 10 (20T/ND15)

Spareparts

Code Number	Description
148F3068	SFA 10 Inspection kit
148F3069	SFA 10 Repair kit, ≤27 bar



ENGINEERING
TOMORROW



The Danfoss GD Kaasuanturit



Pre-calibrated digital gas detectors

Complete range of fixed gas detectors



- **Designed for industrial and heavy commercial refrigeration systems**
- Digital, factory configured, and pre-calibrated gas detectors for plug-and-play installation
- Flexible connection - analog or RS485 open Modbus communications
- Automatic self-diagnostics for correct communication and operation
- Calibration with gas, no potentiometers or multimeters required

Read more:










- [Gas Detection for Industrial Refrigeration](#)

Video:

- [Recalibrate the way you look at gas detection](#)

Danfoss **GD** gas detection portfolio

GD Complete Units overview – Key features

	Basic		Premium						Heavy Duty
									
Name	Basic	Basic+	Premium	Premium+	Premium Flex	Premium Duplex	Premium Remote	Premium Uptime	Heavy Duty
Features			3 Relays						2 Relays
		Buzzer and light function		Buzzer and light function				Buzzer and light function	
					LCD display	LCD display	LCD display	LCD display	LCD display
						2 different sensors	Remote sensor (5 meters)	UPS	Explosion proof (ATEX/IEC)
Protection	IP 65								
Communication	Analog (4-20 mA) and RS 485 Modbus communication								
Power supply	24 V AC/DC		24 V DC						90-240 V AC / 24 V DC
Ammonia	X	X	X	X	X	X	X	X	X
CO2					X				
Fluorinated	X	X	X	X	X				
Hydrocarbons			X	X	X				



Danfoss **GD Gas Detection portfolio**

GD Complete Units overview - Part numbers

Type	Refrigerants	Sensor	PPM range	Alarm	Basic	Basic+	Premium	Premium+	Premium Flex	Premium Duplex	Premium Remote	Premium Uptime	Heavy Duty
GDA	Ammonia	EC 100	0-100	25/35	148H6000	148H6001	148H6002	148H6003	148H6006	148H6004	148H6005	148H6007	
		EC 300	0-300	25/150	148H6008	148H6009	148H6010	148H6011	148H6013	148H6012			
		EC1000	0-1000	500/900	148H6014	148H6015	148H6016	148H6017	148H6020	148H6018	148H6019	148H6021	148H6022
		SC1000	0-1000	500/900	148H6023	148H6024	148H6025	148H6026	148H6027	148H6037			
		EC 5000	0-5000	1000/4500				148H6028			148H6029	148H6030 (w/rem 5 m)	148H6031
		SC 10000	0-10000	5000/9000			148H6032	148H6033			148H6034		148H6035
		P LEL	0-100% LEL	21% (30000 PPM)				148H6036	148H6038				148H6039
GDC	CO2	IR 20000	0-20000	5000/9000					148H6040				
		IR 50000	0-50000	10000/18000					148H6041				
GDHC	HCFC R123a	SC2000	0-2000	500/900			148H6042	148H6043	148H6044				
GDHF	HFC R404A, R507	SC2000	0-2000	500/900	148H6045	148H6046	148H6047	148H6048	148H6049				
	HFC R134A	SC2000	0-2000	500/900			148H6050	148H6051	148H6052				
GDH	R290	P 5000	0-5000	800/2500			148H6053	148H6054	148H6055				



Meet the Danfoss **gas detection portfolio**

GD Accessories

GD Controller and system accesories



Controller Solution



Controller unit



Wire breaking warning module



Controller Expansion module



Gateway

Service and calibration accesories



Service tool



PC tool



Magnetic Pen



Calibration adapter Heavy duty/ remote



Calibration adapters Basic/premium

Other accesories



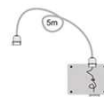
Buzzer and light replacement



Duct adapter



Seal cap
(remove before commissioning)



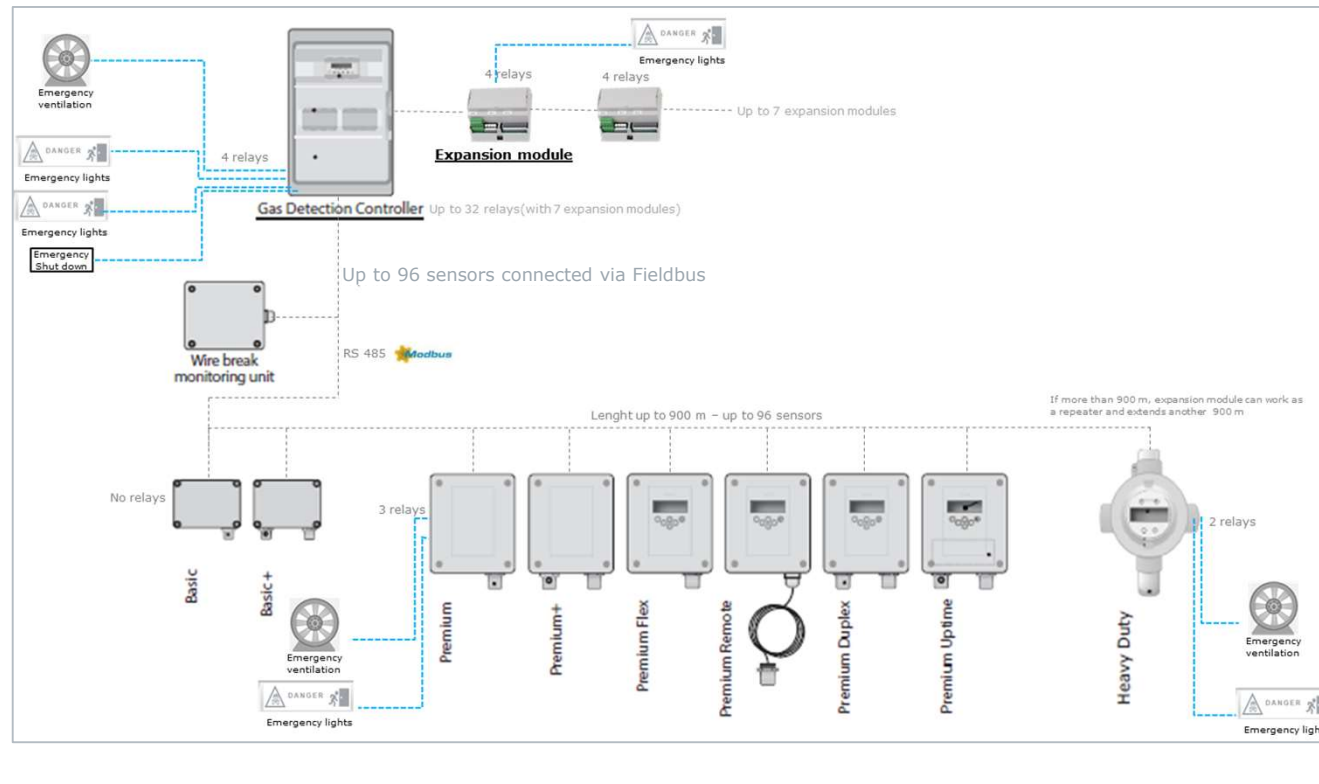
Remote kit



Splash guard
(do not remove)



Danfoss gas detection – System Overview





Gas detecting sensor technologies

GD Sensors

Characteristics

Offering the most common types of sensors used for detection of refrigerants:

- **Electrochemical sensors (EC)**
- **Semi-conductor sensors (SC)**
- **Pellistor (P) sensors** (also named catalytic bead sensor)
- **Infra-red (IR) sensors**

Easily exchangeable, plug and play sensors

Hermetically sealed, pre-calibrated and certified from the factory
Temperature compensated (IR, P, IR)

Selection guideline of sensor types given refrigerant

Refrigerant	Sensor type
CO ₂	IR – Infra-red sensors
Fluorinated (synthetic) refrigerants	SC – Semiconductor sensors
R290	P – Pellistor sensor
Ammonia	Three different type of sensors: EC, SC, P. Selection should be based on the criteria below:




Selection criteria - sensor types for Ammonia detection

Sensor	PPM range	Cross-sensitivity	Temperature range	Expected life time
EC	<5000 ppm	Low	-30 to 50 °C (-22 to 122 °F)	2 years
SC	1000 ppm-10,000 ppm	High	-10 to 50 °C (14 to 122 °F)	5 years
P	>10,000 ppm	Low	-25 to 60 °C (-13 to 140 °F)	3 years

GD Sensors

Danfoss GD sensor range overview

All sensor heads on the gas detector units can be replaced by factory calibrated sensor replacements with a plug & play procedure. Either to fulfil calibration requirements or at the end of life of the sensor.

Danfoss part number	Danfoss description	Refrigerant	Sensor type	Sensor – ppm range	Sensors
148H6200	Sensor Ammonia EC 100	Ammonia	Electrochemical	0-100	
148H6201	Sensor Ammonia EC 300	Ammonia	Electrochemical	0- 300	
148H6202	Sensor Ammonia EC 1000	Ammonia	Electrochemical	0-1000	
148H6203	Sensor Ammonia SC 1000	Ammonia	Semiconductor	0-1000	
148H6204	Sensor Ammonia EC 5000	Ammonia	Electrochemical	0-5000	
148H6205	Sensor Ammonia SC 10000	Ammonia	Semiconductor	0-10.000	
148H6206	Sensor Ammonia P LEL	Ammonia	Pellistor	0-100% LEL	
148H6207	Sensor CO2 IR 20000	CO2	Infrared	0-20.000	
148H6208	Sensor CO2 IR 50000	CO2	Infrared	0-50.000	
148H6209	Sensor HCFC R123 SC 2000	R123	Semiconductor	0-2000	
148H6210	Sensor HFC R404A, R507 SC 2000	R404A, R507	Semiconductor	0-2000	
148H6211	Sensor HFC R134A SC 2000	R134A	Semiconductor	0-2000	
148H6212	Sensor HC R290 / Propane P 5000	R290	Pellistor	0-5000	
148H6213	Remote Sensor Ammonia EC 100	Ammonia	Electrochemical	0-100	
148H6214	Remote Sensor Ammonia EC 1000	Ammonia	Electrochemical	0-1000	
148H6215	Remote Sensor Ammonia EC 5000	Ammonia	Electrochemical	0-5000	
148H6216	Remote Sensor Ammonia SC 10000	Ammonia	Semiconductor	0-10.000	
148H6217	Heavy Duty Sensor Ammonia EC 1000	Ammonia	Electrochemical	0-1000	
148H6218	Heavy Duty Sensor Ammonia EC 5000	Ammonia	Electrochemical	0-5000	
148H6219	Heavy Duty Sensor Ammonia SC 10000	Ammonia	Semiconductor	0-10.000	
148H6220	Heavy Duty Sensor Ammonia P LEL	Ammonia	Pellistor	0-100% LEL	



ENGINEERING
TOMORROW



Danfoss Flexline™



ICV Flexline™
- Control valve



ICF Flexline™
- Complete valve stations



SVL Flexline™
- Line components

The Flexline™ platform

Intelligent and cost-efficient solution



ICF Flexline™
Complete Valve Station



ICV Flexline™
Control Valve



SVL Flexline™
Line Components

- Modular solutions that fit almost any application
- Solutions approved for high pressure, up to 52 bar (754 psi) and for natural refrigerants
- Direct-weld design ensures perfect fit and no leakage
- High energy efficiency
- Compact design
- Plug and play installation

The Flexline™ platform **SVL Line Components**



- One common housing allows easy and timesaving switch between the functions
- Selection, system design and mounting are simple and trouble free
- Allows for fast and easy service with shared spare parts and modular design
- Also available in stainless steel for demanding environments
- Suitable for subcritical CO₂ and heat pump systems

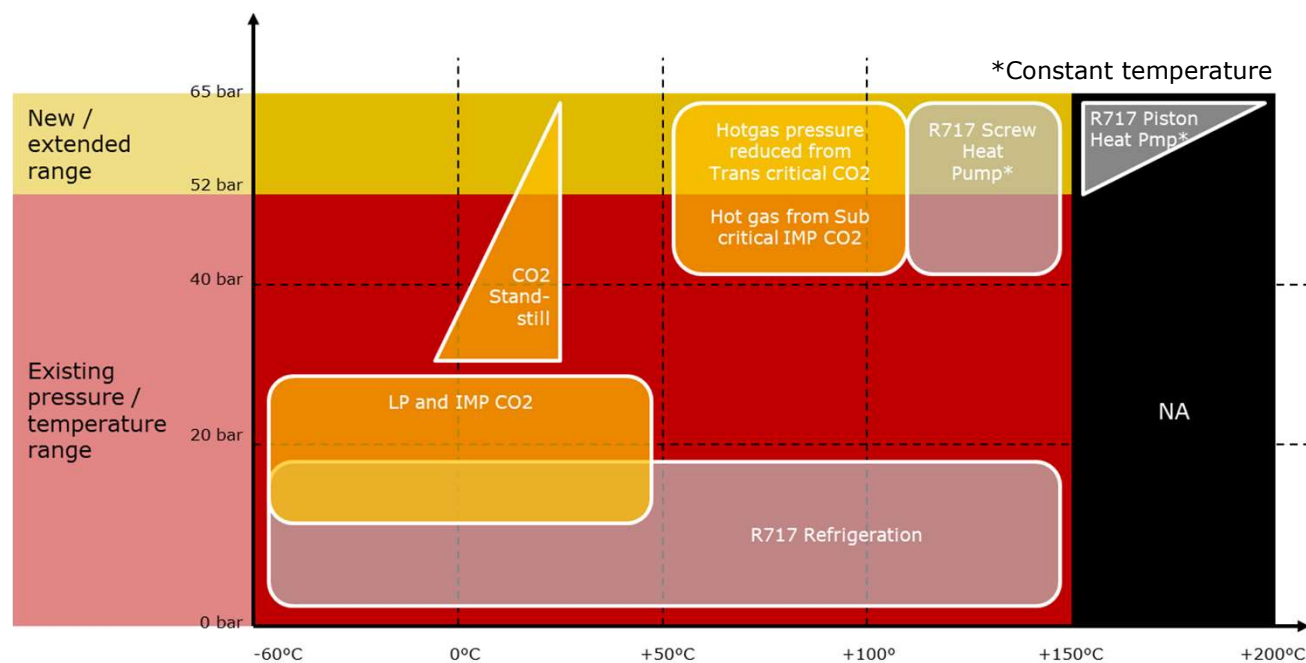
Documentation:

- [Spare parts](#)

The Flexline™ platform

SVL Line Components

- Temperature range: -60 to +150°C
- Working pressure: **up to 65 bar** (943 psi)



The Flexline™ platform

SVL 65 bar parts program

- **RAL 1032 color** to differentiate on site
- 65 bar re-embossed on 52 bar housing
- 42CrMo5 Bolts (52bar with stainless steel bolts)



Reinforced piston ring

Special O-rings
depending on refrigerant

Size (DN)		O-ring kit for	
mm	in.	R717 Heat pump	R1270 Propylene
10	3/8	148B6084	148B6085
15	1/2	148B6070	148B6077
20	3/4		
25	1	148B6071	148B6078
32	1 1/4		
40	1 1/2		

* Replacement kits for R717 Ammonia Heat Pump is applicable for continuous operating temperature between +100°C to 150°C (212°F to 302°F)

SVL product overview		Carbon Steel	Stainless Steel
	Min. Temp	-60°C -76°F	-60°C -76°F
	Max. Temp	+150°C +302°F	+150°C +302°F
52 bar 754 psi	Complete valves	YES	YES (40bar@+150°C)
	Parts program	YES	NO
65 bar 943 psi	Complete valves	NO (SVA 150-200)	NO
	Parts program	YES	NO

ENGINEERING
TOMORROW



CoolSelector2, Danfoss sovellukset ja muuta

Extended Danfoss Offering

Industrial Refrigeration

Support Tools for Professionals - 1

We offer a wide selection of **support tools** which make working with Danfoss Industrial components easy and enjoyable

Coolselector®2

Easy selection & calculation software

Ref Tools App

The Danfoss IR app is now known as Spare Parts Finder and it is available as part of our Ref Tools app

3D CAD drawings

To make designing of industrial refrigeration plants easier

IR application tool

An interactive PowerPoint slideshow that takes you through all details of a two stage ammonia plant

ICF Flexline™ interactive tool

See our valve stations in a digital format. Spin them and view them from all sides.

Industrial Refrigeration

Support Tools for Professionals - 2

We offer a wide selection of **support tools** which make working with Danfoss Industrial components easy and enjoyable

A complete guide

A compiled catalogue of Industrial Refrigeration

Application Handbook - Ammonia & CO₂ Applications

How to select control methods for different refrigeration systems

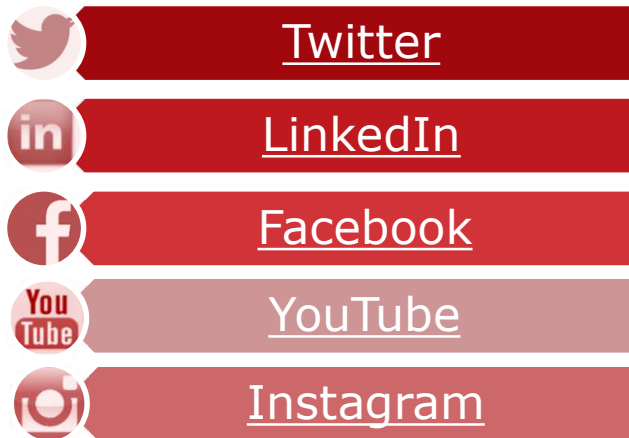
Overview video

An overview video on Danfoss & Danfoss Industrial Refrigeration products

Sign up for our newsletter

Stay on top of the latest news within the Danfoss business units and the markets we serve

Danfoss Industrial Refrigeration **Social media and training**

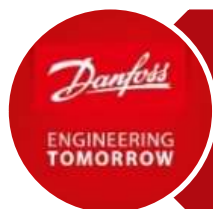


Through Danfoss Learning, you can access free industrial refrigeration training programs:

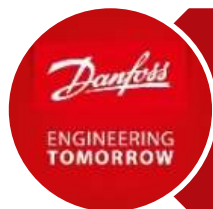


Danfoss Industrial Refrigeration

Contact information - Finland



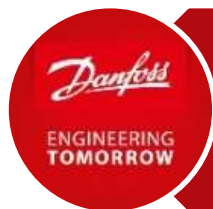
[IR home page](#)



Laura Pulkki

puh. 040 185 1776

s-posti: laura.pulkki@danfoss.com



Asiakaspalvelu ja Tekninen Tuki

puh. 0753 251 100

s-posti: asiakaspalvelu.fi@danfoss.com



ENGINEERING
TOMORROW