ENGINEERING TOMORROW

Catalogue

Sensors for Industrial Refrigeration

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Liquid Level Sensor
Type AKS 4100/4100U

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Liquid Level Sensor
Type AKS 4100/4100U

AKS 4100/4100U - Cable Version

AKS 4100/4100U - Coaxial Version

The AKS 4100/4100U liquid level sensor is designed specifically to measure liquid levels in a wide range of refrigeration applications.

The AKS 4100/4100U liquid level sensor is based on a proven techhology called Time Domain Reflectometry (TDR) or Guided Micro Wave.

AKS 4100/4100U liquid level sensor can be used to measure the liquid level of many different refrigerants in vessels, accumulators, receivers, standpipes, etc.

The electrical output is a 2-wired, loop powered 4 – 20 mA output signal, which is proportional to the refrigerant liquid level.

AKS 4100/4100U in a cable version is suitable for HCFC, Non flammable HFC and R717 (Ammonia), and differing lengths from 800 mm(31.5 in) and up to 5000 mm (197 in).

The coaxial version of AKS 4100/4100U is designed for use with R744 (CO_2), HCFC, Non flammable HFC and R717 (Ammonia).

The AKS 4100/4100U coaxial version should always be used for marine applications for all refrigerant types.

The AKS 4100/4100U cable version should NOT be used for CO_2 or marine applications.

Dust, foam, vapour, agitated surfaces, boiling surfaces, changes in density or in the dielectric constant , εr, for the liquid have no influence on the AKS 4100/4100U performance.

Oil accumulated in the bottom of a standpipe will not disturb the liquid level signal and it is not necessary to remove AKS 4100/4100U for cleaning after oil has been drained out of the standpipe.

Features

- Approved and qualified by Danfoss for refrigeration applications
- One product covering several probe lengths (cable version)
- A single product for all commonly used refrigerants (cable version)
- Cable version requires less top-end clearance for installation and service
- Proven operation with all refrigerants in combination with oil
- No need to clean cable version when fully covered by oil
- The cable version is very compact and easy to handle, ship, install and use with different lengths and refrigerants
- Changes of the liquid dielectric constant (εr) do not affect operation
- 5000 mm (197 in) probe length with cable version
- 2-wire loop powered; no separate transformer needed

  Please Note:
  AKS 4100/4100U can be connected directly to Danfoss EKE 347 liquid level controller and thus be powered from EKE 347

  If used together with Danfoss EKC 347 liquid level controller, a 14 – 30 V DC supply is required.
- Multi language HMI. Level and setting readout in mm,cm,m (ft, in)

  Language HMI versions:
  - English (default), German, French, Spanish
  - English (default),Japanese, Chinese Russian

For further details regarding mechanical and electrical installation please refer to the product installation guides AN23828644199402 (CABLE version), AN23828644201102 (COAXIAL D14 version) and AN23828644203002 (COAXIAL D22 version).

Product concept

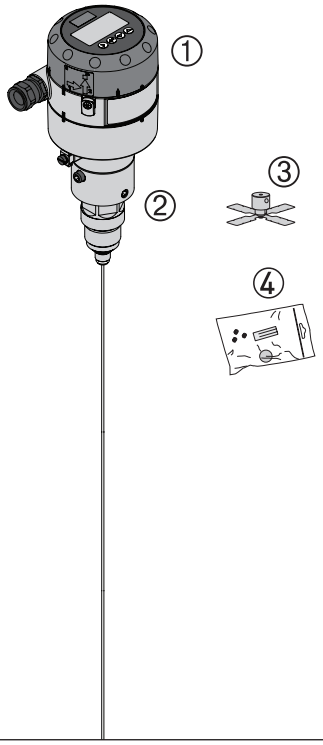
AKS 4100/4100U is available in two different versions:

- Cable version
- Coaxial version

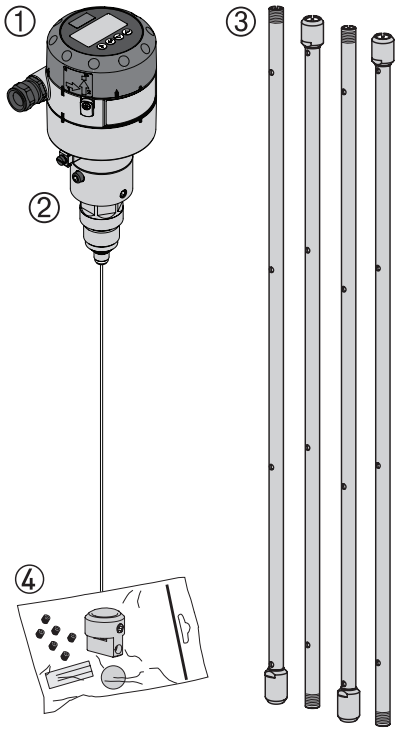
Both Cable and Coaxial versions are available with two different mechanical process connections:

- AKS 4100: G1 in. pipe thread. Aluminium gasket included
- AKS 4100U: ¾ in. NPT

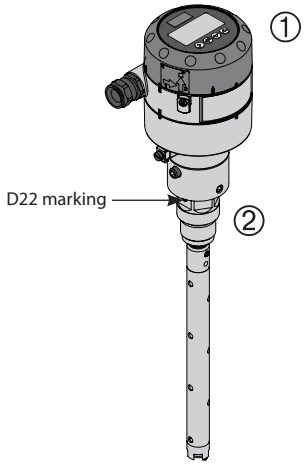
CABLE version:



COAXIAL D14 version:



COAXIAL D22 version:



Cable version

Cable version

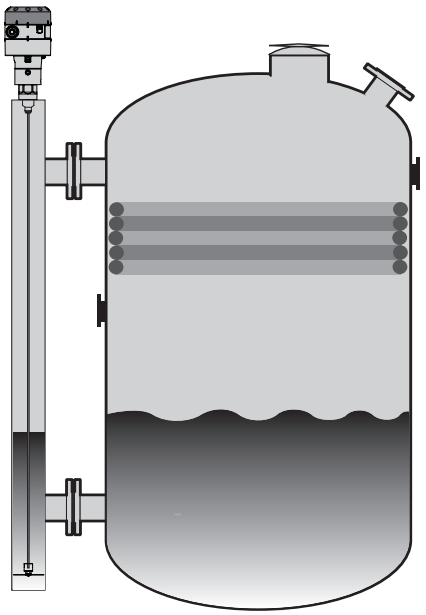
The cable version consists of:

① Signal converter, which can be supplied with or without HMI
② Mechanical process connection with 5 m / 197 in., Ø2 mm / 0.08 in. stainless cable
③ Counterweight
④ Accessory bag comprising:
3 mm set screws
Red cover to protect mechanical process connection ② prior to mounting signal converter.
Setting label.

With the cable version it is possible to adapt the AKS 4100/4100U to any possible length in the range of 800 mm / 31.5 in. to 5000 mm / 196.9 in.

Cable version can be used in R717 / NH_3, HCFC and HFC (εr, liquid > 5.6).

AKS 4100/4100U cable version must ALWAYS be installed in a standpipe.



Coaxial version

Coaxial D14 version (see page 6)
The Coaxial D14 version consists of:
① Signal Converter (with or without HMI)
② Mechanical process connection with 5 m / 197 in., Ø2 mm / 0.08 stainless wire
③ Tube(s) depending on required length
④ Accessory bag comprising:
- End Connector (incl. 3 mm / 0.12 in. set screws.)
- 3 mm / 0.12 in. set crews (1 set screw pr. tube)
- Red cover to protect mechanical process connection ②, before Signal Converter is mounted.
- Setting label.

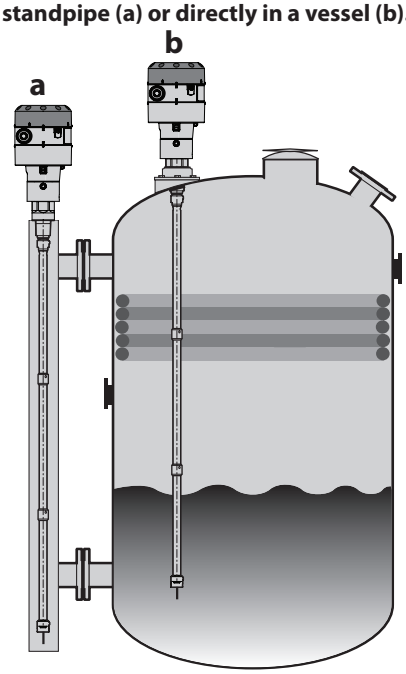
Coaxial D22 version (see page 6)
The Coaxial D22 version consists of:
① Signal Converter (with or without HMI)
② Mechanical process connection 280 mm / 11 in., . 8 mm / 0.3 in. inner rod.

The coaxial version is mandatory for use in:
- R744 / CO_2 (εr, liquid > 1.3).
- Marine applications

The Coaxial D14 version is allround for R744, R717, HCFC and Non flammable HFC.

The Coaxial D22 comes in 2 versions.
One is applicable for R717 only.
The other version is for R744, HCFC and HFC (see ordering section).

AKS 4100/4100U, Coaxial can be installed in a standpipe (a) or directly in a vessel (b).



The coaxial version is available in the following probe lengths:

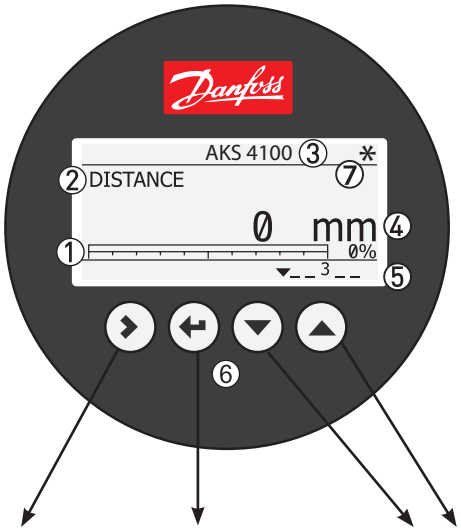
Danfoss type	Tube diameter		Type selection in HMI	Thread
AKS 4100, 280 mm	22 mm	0.87 in.	D22	G1 in. pipe thread
AKS 4100, 500 mm	14 mm	0. 55 in.	D14	G1 in. pipe thread
AKS 4100, 800 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100, 1000 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100, 1200 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100, 1500 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100, 1700 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100, 2200 mm	14 mm	0.55 in.	D14	G1 in. pipe thread
AKS 4100U, 11.0 in.	22 mm	0.87 in.	D22	¾ in. NPT
AKS 4100U, 19.2 in.	14 mm	0.55 in.	D14	¾ in. NPT
AKS 4100U, 30 in.	14 mm	0.55 in.	D14	¾ in. NPT
AKS 4100U, 45 in.	14 mm	0.55 in.	D14	¾ in. NPT
AKS 4100U, 55 in.	14 mm	0.55 in.	D14	¾ in. NPT
AKS 4100U, 65 in.	14 mm	0.55 in.	D14	¾ in. NPT
AKS 4100U, 85 in.	14 mm	0.55 in.	D14	¾ in. NPT

Optional HMI

The optional HMI Service / Display unit is used for commissioning and quick on-site setup and is easily mounted on the AKS 4100/4100U.

The service unit supports mulitple languages in both SI and US units.

Supported standard languages:
English (default), German, French, Spanish, Japanese, Chinese and Russian.



① 4 – 20 mA output displayed as bar graph and in percentage [%]

② Measurement name (in this example, DISTANCE)

③ Device tag name

④ Measurement reading and unit

⑤ Device status (markers)
Marker 1, 2 and 3 (Error)
Hardware problem; the Signal Converter hardware is defective. Contact Danfoss.

Marker 4 and 5 (Notification)
Depending on the level, the marker is ON or OFF. Used for Danfoss service information only.

⑥ Keypad buttons

⑦ Flashing star indicating unit in operation.

Enter menu system
Enter QUICK SETUP

Unit change at distance / level readout:
m, cm, mm, in, ft

Change between:
Distance*
Level**
Output (%)***
Output (mA)****

* DISTANCE is a display option.
If the display is set to "DISTANCE" the displayed value will be the distance from the Reference point to the top surface of the liquid refrigerant (see pages 10 and 11).

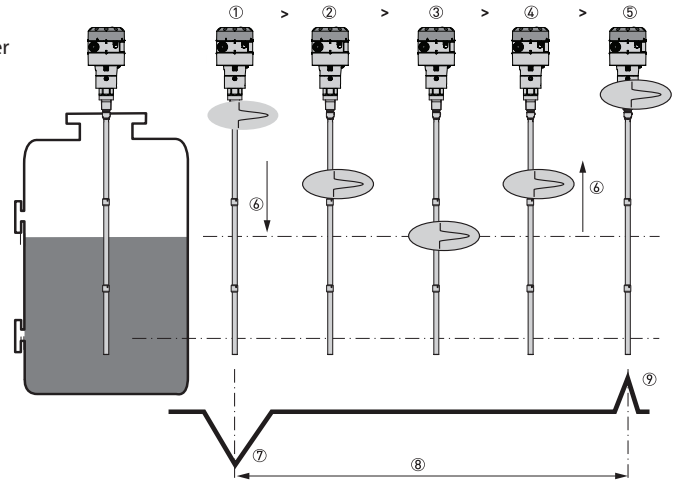
** LEVEL is display option.
If the display is set to "LEVEL" then the value displayed will be:
PROBE LENGTH (entered in QUICK SETUP) – DISTANCE (see pages 10 and 11)

***OUTPUT (%) is display option.
Will represent the level of refrigerant,in percent, scaled (entered in QUICK SETUP) according to: SCALE 4 mA (0%), SCALE 20 mA (100%) (see pages 10 and 11).

**** OUTPUT I (mA) is display option.
Will represent the level of refrigerant, in 4-20 milliampere, scaled (entered in QUICK SETUP) according to: SCALE 4 mA (4 mA), SCALE 20 mA (20 mA) (see pages 10 and 11).

Measuring principle (Cable and Coaxial)

1. The electromagnetic (EM) pulse is transmitted by the signal converter
2. The pulse goes down the probe at the speed of light in air, V1
3. The pulse is reflected
4. The pulse goes up the probe at speed, V1
5. The converter receives the pulse and records the signal
6. The EM pulse moves at speed, V1
7. Transmitted EM pulse
8. Half of this time is equivalent to the distance from the reference point of the device (the flange facing) to the surface of the product
9. Received EM pulse



The AKS 4100/4100U electronic converter emits low-intensity, high frequency electromagnetic pulses with a width of approximately 1 nanosecond, which travel at the speed of light along the probe (wire or coaxial cable) down to the liquid surface.

The pulses are reflected by the liquid surface, guided back along the probe, and received and analysed by the AKS 4100/4100U electronic converter and then converted into a liquid level reading. This method is called time domain reflectometry (TDR) or guided microwave.

The dielectric constant, εr, of the liquid is a key parameter and has a direct impact on the degree of reflection of the high frequency electromagnetic pulses. Liquids with high εr values, such as ammonia, produce strong reflections, while liquids with low εr values, such as CO_2, produce weak reflections.

As long as the εr value of the liquid refrigerant is higher than 1.2, AKS 4100/4100U can detect the liquid level and level measurement accuracy is not affected.

If the temperature condition in the standpipe / vessel is known, a constant (dielectric constant of the refrigerant gas) can be entered (parameter 2.5.3 GAS EPS.R), in order to obtain improved Top and Bottom Dead Zone values.

Refer to pages 7 to 8 for Measuring range of AKS 4100/4100U - CABLE version and COAXIAL version.

For details of gas constant values for different temperatures and refrigerants plus the procedure for entering these via the HMI, refer to pages 16 to 17.

Main technical data

(see a complete list of all technical data on page 11)

Supply Voltage
14 – 30 V DC. Min/Max. Value for an output of 22 mA at the terminal.

Ambient temperature supply voltage limitations:
-40 – 80 °C / -40 – 176 °F : 16 – 30 V DC
-20 – 80 °C / -4 – 176 °F : 14 – 30 V DC

Load
RL [Ω] ≤ ((Uext -14 V) / 20 mA).
– Default (Error output set to 3.6 mA)
RL [Ω] ≤ ((Uext -14 V) / 22 mA).
– (Error output set to 22 mA)

Cable gland
AKS 4100 PG 13, M20×1.5 ;
(cable diameter: 6 – 8 mm / 0.24 – 0.31in.
AKS 4100U ½ in. NPT

Refrigerant temperature
-60 – 100 °C / -76 – 212 °F

Ambient temperature
-40 – 80 °C / -40 – 176 °F
For HMI : -20 – 60 °C / -4 – 140 °F

Process pressure
-1 – 100 barg / -14.5 – 1450 psig

Terminals (spring loaded)
0.5 – 1.5 mm^2 (~20-15 AWG)

Enclosure:
IP 66/67 (~NEMA type 4X)

Mechanical connection
Cable version / Coaxial version:
AKS 4100: G1 in. pipe thread.
Aluminium gasket included
AKS 4100U: ¾ in. NPT

Refrigerants [1)]
The listed refrigerants are qualified and approved by Danfoss
R717 / NH_3 -40 – 50 °C / -40 – 122 °F
R744 / CO_2 -50 – 15 °C / -58 – 59 °F

HCFC: R22 -50 – 48 °C / -58 – 118 °F
HFC: R404A -50 – 15 °C / -58 – 59 °F
R410A -50 – 15 °C / -58 – 59 °F
R134A -40 – 50 °C / -40 – 122 °F

The listed refrigerants may be used in the complete temperature range of AKS 4100/4100U, however, the accuracy may be affected if the above listed temperature range is exceeded.

Other refrigerants within the groups of HCFC and HFC can be detected and measured if the following conditions are fulfilled:

Reference conditions
Dielectric constant
Cable version can be used in R717 / NH_3, HCFC and HFC (εr, liquid > 5.6).

The coaxial version is mandatory for use in:
- R744 / CO_2 (εr, liquid > 1.3).
- Marine applications.

The coaxial version can also be used in the refrigerants:
R717 / NH_3, HCFC and HFC.

[1)] AKS 4100 Coaxial 280mm and AKS 4100U Coaxial 11 in are only released for R717/NH_3

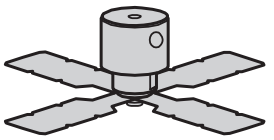
Measuring range of AKS 4100/4100U - CABLE version

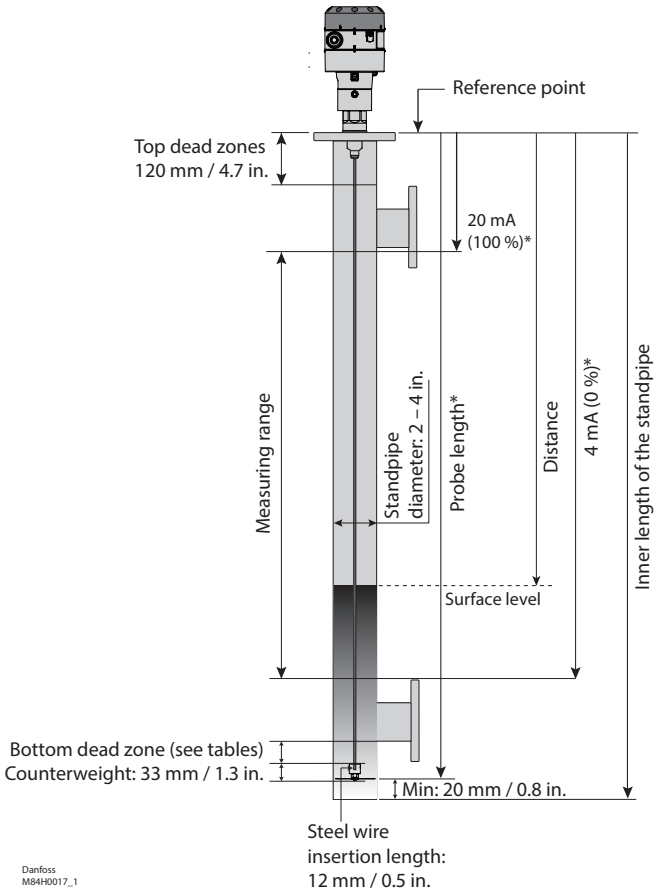
Bottom deadzone values based on the factory setting of dielectric constant

Refrigerant	Probe length range		Bottom dead zone	
	[mm]	[in.]	[mm]	[in.]
Ammonia, HFC, HCFC	800	31.5	115	4.2
	801 – 999	31.5 – 39	120	4.7
	1000 – 1999	39 – 79	150	5.9
	2000 – 2999	79 – 118	180	7.1
	3000 – 3999	118 – 157	210	8.3
	4000 – 5000	157 – 197	240	9.4

Improved Bottom dead zone values after the adjustment of dielectric constant

Refrigerant	Probe length range		Bottom dead zone	
	[mm]	[in.]	[mm]	[in.]
Ammonia, HFC, HCFC	800 – 5000	31.5 – 197	90	3.5





* Values to be entered into HMI Quick Setup menu and recorded on the setting label.
Stick the setting label onto the Signal Converter either inside or outside.

Measuring range of AKS 4100/4100U - COAXIAL D14 version

Please note: It is mandatory to input dielectric constant for CO_2 applications.

AKS 4100

Dielectric Constant εr always set during Quick Setup

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
CO_2	500	19.7	170	6.7
	800	31.5		
	1000	39.4		
	1200	47.2		
	1500	59.1		
	1700	66.9		
	2200	86.6		

Factory setting

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
Ammonia	500	19.7	95	3.7
	800	31.5	104	4.1
	1000	39.4	110	4.3
	1200	47.2	116	4.6
	1500	59.1	125	4.9
	1700	66.9	131	5.2
	2200	86.6	146	5.8

Improved Bottom dead zone values after the adjustment of dielectric constant

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
Ammonia	500	19.7	80	3.2
	800	31.5		
	1000	39.4		
	1200	47.2		
	1500	59.1		
	1700	66.9		
	2200	86.6		

Factory setting

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
HCFC,HFC	500	19.7	115	4.5
	800	31.5	124	4.9
	1000	39.4	130	5.1
	1200	47.2	136	5.4
	1500	59.1	145	5.7
	1700	66.9	151	5.9
	2200	86.6	166	6.5

Improved Bottom dead zone values after the adjustment of dielectric constant

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
HCFC,HFC	500	19.7	100	3.9
	800	31.5		
	1000	39.4		
	1200	47.2		
	1500	59.1		
	1700	66.9		
	2200	86.6		

AKS 4100U

Dielectric Constant εr always set during Quick Setup

Refrigerant	Probe Length [in.]	Bottom Dead Zone [in.]	Bottom Dead Zone [mm]
CO_2	19.2	6.7	170
	30		
	45		
	55		
	65		
	85		

Factory setting

Refrigerant	Probe Length [in.]	Bottom Dead Zone [in.]	Bottom Dead Zone [mm]
Ammonia	19.2	3.73	95
	30	4.05	103
	45	4.50	114
	55	4.80	122
	65	5.10	130
	85	5.70	145

Improved Bottom dead zone values after the adjustment of dielectric constant

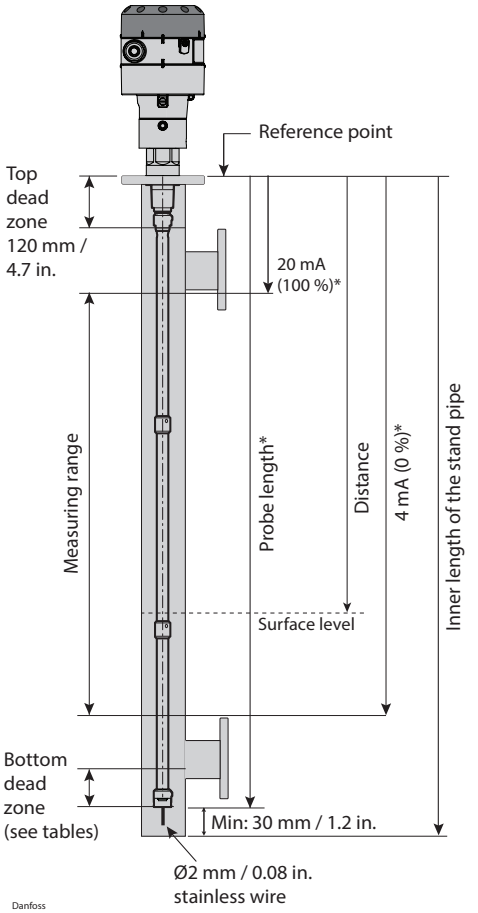
Refrigerant	Probe Length [in.]	Bottom Dead Zone [in.]	Bottom Dead Zone [mm]
Ammonia	19.2	3.1	80
	30		
	45		
	55		
	65		
	85		

Factory setting

Refrigerant	Probe Length [in.]	Bottom Dead Zone [in.]	Bottom Dead Zone [mm]
HCFC,HFC	19.2	4.52	115
	30	4.84	123
	45	5.29	134
	55	5.59	142
	65	5.89	150
	85	6.49	165

Improved Bottom dead zone values after the adjustment of dielectric constant

Refrigerant	Probe Length [in.]	Bottom Dead Zone [in.]	Bottom Dead Zone [mm]
HCFC,HFC	19.2	3.94	100
	30		
	45		
	55		
	65		
	85		



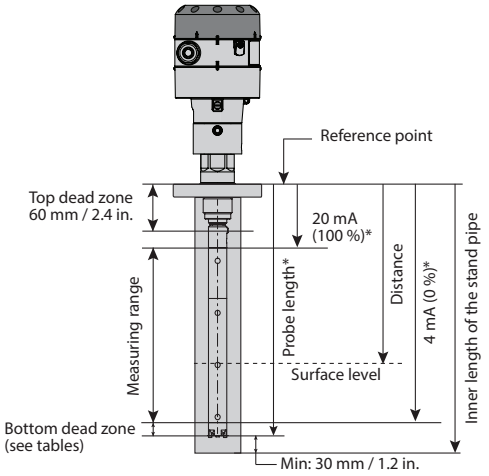
* Values to be entered into HMI Quick Setup menu and recorded on the setting label.
Stick the setting label onto the Signal Converter either inside or outside.

Measuring range of AKS 4100/4100U - COAXIAL D22 version

Factory setting

Refrigerant	Probe Length [mm]	Probe Length [in.]	Bottom Dead Zone [mm]	Bottom Dead Zone [in.]
R717 Ammonia	280	11.0	48	1.9
R744 CO_2			60	2.4
R134a			50	2
R404A				
R410A				
R22				

* Values to be entered into HMI Quick Setup menu and recorded on the setting label.
Stick the setting label onto the Signal Converter either inside or outside.



Ordering AKS 4100/4100U

*** When ordering without HMI please observe:**

Each AKS 4100/AKS 4100 must always be programmed via the HMI display unit.

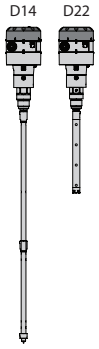
The HMI display unit can be ordered separately:

- **084H4540 / 084H4590**
  AKS 4100/4100U HMI display unit with rear cover and mounting bracket.
  The mounting bracket is very useful when the AKS 4100/4100U have to be programmed.
  The same AKS 4100/4100U HMI display unit can be used to programme more AKS 4100/4100U and both Cable and Coaxial versions.
- **084H4548 / 084H4598**
  AKS 4100/4100U HMI display unit (usually spare part).

Cable *version - AKS 4100/4100U*

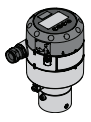
Description	Code number with HMI English (default) German French Spanish	Code number with HMI English (default) Japanese Chinese Russian	Code number without HMI
AKS 4100 with 5 m / 197 in., Ø2 mm / Ø0.08 in. stainless cable and counterweight	**084H4501**	**084H4550**	**084H4500**
AKS 4100U with 5 m / 197 in., Ø2 mm / Ø0.08 in. stainless cable and counterweight	**084H4521**	**084H4571**	**084H4520**

Coaxial *version - AKS 4100/4100U (available in predefined lengths, with or without HMI)*



Description	Probe length mm	Probe length in.	Code number with HMI English (default) German French Spanish	Code number with HMI English (default) Japanese Chinese Russian	Code number Without HMI*
AKS 4100 - Coaxial D14	500		**084H4510**	**084H4560**	**084H4503**
AKS 4100 - Coaxial D14	800		**084H4511**	**084H4561**	**084H4504**
AKS 4100 - Coaxial D14	1000		**084H4512**	**084H4562**	**084H4505**
AKS 4100 - Coaxial D14	1200		**084H4513**	**084H4563**	**084H4506**
AKS 4100 - Coaxial D14	1500		**084H4514**	**084H4564**	**084H4507**
AKS 4100 - Coaxial D14	1700		**084H4515**	**084H4565**	**084H4508**
AKS 4100 - Coaxial D14	2200		**084H4516**	**084H4566**	**084H4509**
AKS 4100 - Coaxial D22 for R717	280		**084H4517**	**084H4567**	**084H4518**
AKS 4100 - Coaxial D22 for R744, HCFC, HFC	280		**084H4572**	**084H4573**	**084H4574**
AKS 4100U - Coaxial D14		19.2	**084H4530**	**084H4580**	**084H4524**
AKS 4100U - Coaxial D14		30	**084H4531**	**084H4581**	**084H4525**
AKS 4100U - Coaxial D14		45	**084H4532**	**084H4582**	**084H4526**
AKS 4100U - Coaxial D14		55	**084H4533**	**084H4583**	**084H4527**
AKS 4100U - Coaxial D14		65	**084H4534**	**084H4584**	**084H4528**
AKS 4100U - Coaxial D14		85	**084H4535**	**084H4585**	**084H4529**
AKS 4100U - Coaxial D22 for R717		11	**084H4536**	**084H4586**	**084H4537**
AKS 4100U - Coaxial D22 for R744, HCFC, HFC		11	**084H4575**	**084H4576**	**084H4577**

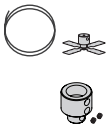
Accessories



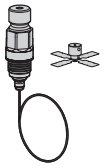
Description	Code number with HMI English (default) German French Spanish	Code number with HMI English (default) Japanese Chinese Russian
AKS 4100/4100U HMI Service/Display unit with rear cover and mounting bracket	**084H4540**	**084H4590**
AKS 4100/4100U HMI Display	**084H4548**	**084H4598**
AKS 4100/4100U Signal Converter + Metaglass **with** HMI, excluding cable gland	**084H4555**	**084H4556**
AKS 4100/4100U converter connecting cable (5 pcs.)	**084H4557**	

Ordering AKS 4100/4100U
Continued

Service kits



Description	Content	Code number
Cable and counterweight for **AKS 4100/4100U** - CABLE version	Cable - 5 m / 197 in., Ø2 mm / Ø0.08 in.	**084H4542**
	Crimp	
	Counterweight	
End connector incl screws for **AKS 4100/4100U** - COAXIAL D14 version	End connector (incl. 3 mm / 0.12 in. set screws)	**084H4549**



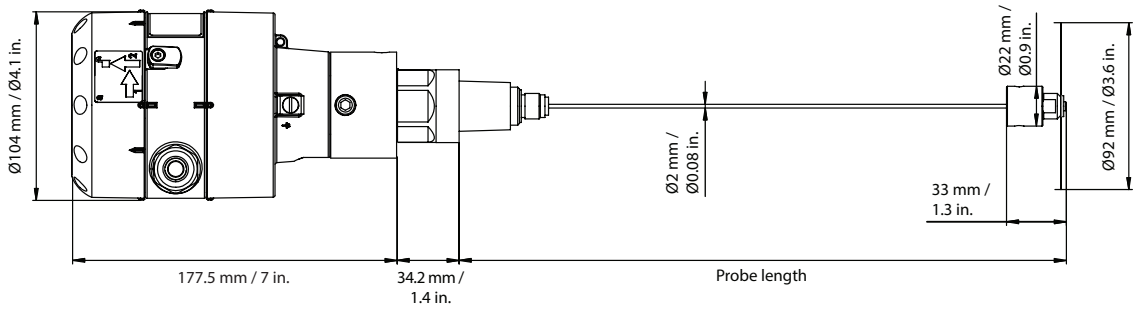
Process connection, counterweight and 5 m / 197 in., Ø2 mm / Ø0.08 in. cable for **AKS 4100** - CABLE and COAXIAL D14 version	1 in. process connection	**084H4545**
	Counterweight	
Process connection, counterweight and 5 m / 197 in., Ø2 mm / Ø0.08 in. cable for **AKS 4100U** - CABLE and COAXIAL D14 version	¾ in. NPT process connection	**084H4546**
	Counterweight	

Other spare parts

Description	Code number
AKS 4100/4100U Coaxial tube. Tube length : 680 mm / 26.8 in.	**084H4543**
AKS 4100/4100U blank top cover for signal converter	**084H4544**
AKS 4100/4100U Aluminium gaskets (10 pcs.) for 1in. process connection	**084H4547**
AKS 4100 1. in. welding connection	**027F1010**
Process connection **AKS 4100** - Coaxial D22 - G1 in. - 280 mm	**084H4551**
Process connection **AKS 4100U** - Coaxial D22 - ¾ in. NPT – 11 in.	**084H4552**

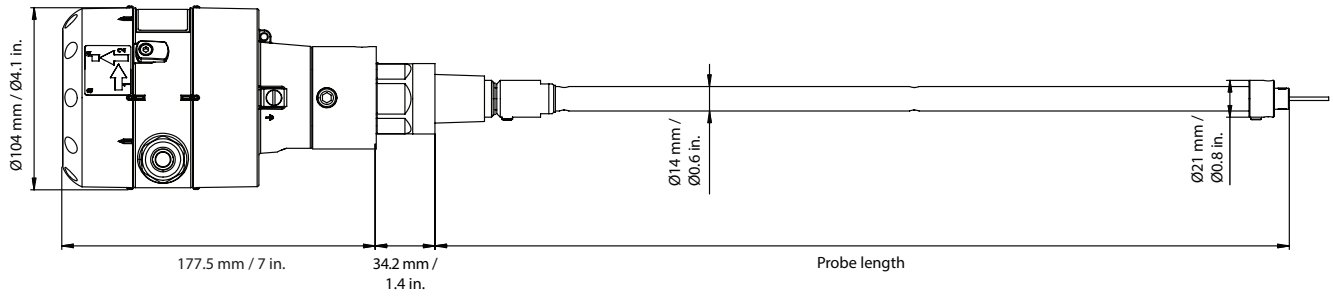
Dimensions and weights

CABLE version



Weight: approx. 2.0 kg / 4.4 lbs

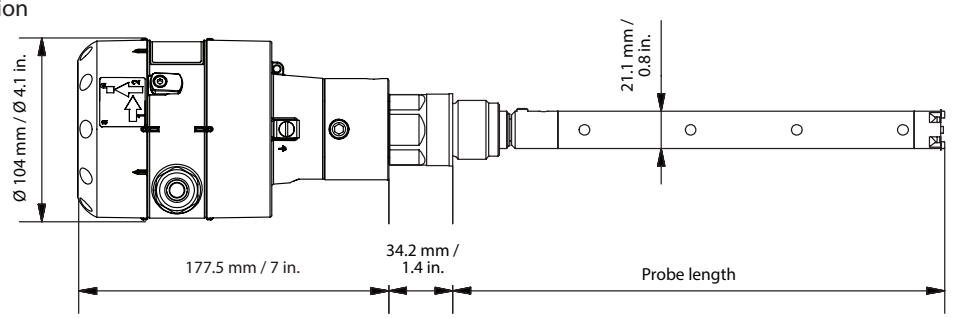
COAXIAL D14 version



Weight: approx. 3.5 kg / 7.7 lbs

Dimensions and weights (continued)

COAXIAL D22 version



Weight: 2.1 kg / 4.6 lbs

Technical data

Measuring system

Measuring principle	2-wire loop-powered level transmitter; Time Domain Reflectometry (TDR)
Application range	Level measurement of liquid refrigerants. Approved refrigerants: Halogen Free / Environmently friendly: R717 / NH_3, R744 / CO_2 HCFC and non flammable HFC.
Primary measured value	Time between the emitted and received signal
Secondary measured value	Distance or level

Design

Options	**Probe types** *Cable* Mechanical process connection with 5 m / 197 in., Ø2 mm / 0.08 in. stainless cable: Mechanical thread on the mechanical process connection AKS 4100: G1 in. pipe thread. Aluminium gasket included AKS 4100U: ¾ in. NPT *Coaxial D14* Mechanical process connection with 5 m / 197 in., Ø2 mm / 0.08 in. stainless cable and 14 mm / 0.55 in. outer stainless tube: Mechanical thread on the mechanical process connection AKS 4100: G1 in. pipe thread. Aluminium gasket included AKS 4100U: ¾ in. NPT Stainless steel tubes supporting the available probe length *Coaxial D22* Mechanical process connection with in 22 mm / 0.87 in. outer stainless tube. 8 mm / 0.3 in. inner rod. Mechanical thread on the mechanical process connection AKS 4100: G1 in. pipe thread. Aluminium gasket included AKS 4100U: ¾ in. NPT
	LCD display
Insertions (probe) length	*Coaxial D14* AKS 4100: 500, 800, 1000, 1200, 1500, 1700 and 2200 mm AKS 4100U: 19.2, 30, 45, 55, 65, 85 in. *Coaxial D22* AKS 4100: 280 mm AKS 4100U: 11.0 in.
	Single cable Ø2 mm / 0.08 in.: 800 – 5000 mm / 31.5-197 in.
Dead zone	This depends on the type of probe. (see pages 7 and 8)

Display and User interface

Display	Integrated LCD display
	128 × 64 pixels in 8-step greyscale with 4-button keypad
Interface languages	English (default), German, French, Spanish, Japanese, Chinese, Russian

Operating conditions

Temperature:

Ambient temperature	-40 – 80 °C / -40 – 175 °F For HMI : -20 – 60 °C / -4 – 140 °F
Storage temperature	-40 – 85 °C / -40 – 185 °F
Process connection temperature	**Standard** -60 – 100 °C / -76 – 212 °F

Pressure:

Operating pressure	**Standard:** -1 – 100 barg / -14.5 – 1450 psig

Technical data
(continued)

Other conditions:

Liquid dielectric constant (εr)	Cable version to be used in R717 / NH_3, HCFC and HFC εr, liquid > 5.6 Coaxial version is mandatory in R744 / CO_2 εr, liquid > 1.3
Vibration resistance	EN 60721-3-4 (1...9 Hz: 3 mm / 10...200 Hz:1g; 10g shock half-wave sinusoidal: 11 ms)
Protection category	IP 66/67 equivalent to NEMA type 4X (housing) and type 6P (probe)

Installation conditions

Dimensions and weights	See pages 13 and 14

Material

Housing	Aluminium
Coaxial D14 and D22 version	Standard: Stainless steel (1.4404 / 316L)
Single cable	Standard: Stainless steel (1.4401 / 316)
Process fitting	Standard: Stainless steel (1.4404 / 316L)
Gaskets	EPDM (-50...150 – -58...300 °F
Cable gland	Plastic (black)

Process connections

Thread:

Single cable Ø2 mm / 0.08"	AKS 4100: G1 inch pipe thread. Aluminium gasket included AKS 4100U: ¾ inch NPT
Coaxial D14 and D22 version	AKS 4100: G1 inch pipe thread. Aluminium gasket included AKS 4100U: ¾ inch NPT

Electrical connections

Power supply	**Terminals output:** 14-30 V DC Min./Max. Value for an output of 22 mA at the terminal. Ambient temperature limitations: -40 – 80 °C / -40 – 176 °F : 16 – 30 V DC -20 – 80 °C / -4 – 176 °F : 14 – 30 V DC
Current output load	RL [Ω] ≤ ((Uext -14 V)/20 mA). – Default (Error output set to 3.6 mA) RL [Ω] ≤ ((Uext -14 V)/22 mA). – (Error output set to 22 mA)
Cable gland	AKS 4100: PG 13, M20×1.5 ; (cable diameter: 6-8 mm (0.24-0.31in) AKS 4100U: ½ inch NPT
Cable entry capacity (terminal)	0.5-1.5 mm^2 (~20 – 15 AWG)

Input and output

Current output:

Output signal	4…20 mA or 3.8…20.5 mA acc. to NAMUR NE 43
Resolution	±3 µA
Temperature drift	Typically 75 ppm/K
Error signal	High: 22 mA; Low: 3.6 mA acc. to NAMUR NE 43; Hold (frozen value - not available with NAMURNE 43 compliant output.

Approvals and certification

CE	This device fufills the statutory requirements of the EMC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Valid for AKS 4100 - ***Not valid for AKS 4100U****:*	
	Pattern Approval Certificate of Measuring Instruments for the Russian Federation
EAC	In compliance with EMC regulations in the Russian Federation

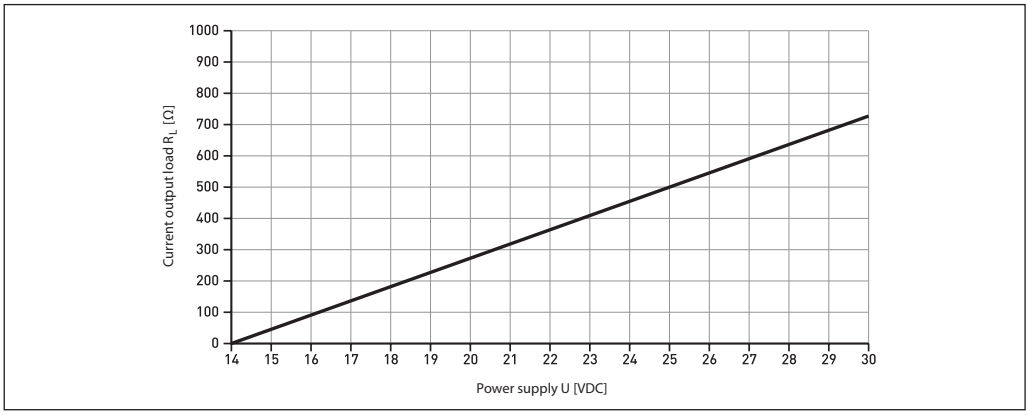
Other standards and approvals:

EMC	EMC Directives 2004 / 108 / EC and 93 / 68 / EEC in conjunction with EN 61326-1 (2006) and EN 61326-2-3 (2006). The device conforms to these standards if : - the device has a coaxial probe or - the device has a single probe that is installed in a metallic tank.
LVD	Low-Voltage Directives 2006 / 95 / EC and 93 / 68 / EEC in conjunction with EN 61010-1 (2001)
NAMUR	NAMUR NE 21 Electromagnetic Compatibility (EMC) of Industrial Process and Laboratory Control Equipment
	NAMUR NE 43 Standardization of the Signal Level for the Failure Information of Digital Transmitters

Technical data
(continued)

Minimum power supply voltage

Use this graph to find the minimum power supply voltage for a given current output load:



Minimum power supply voltage for an output of 22mA at the terminal

Note:
The signal converter can be programmed with or without mechanical process connector assembled.

Quick Setup (all values below are only examples)

- Connect the device to the power supply (see the section "Electrical installation / connection".
- Press (›) 3 times.

```
AKS 4100
QUICK SETUP ?
YES                NO
```

- Press (›)

```
AKS 4100
PROBE TYPE
SINGLE CABLE
```

- Press (▼) or (▲) to select between SINGLE, COAXIAL D14 and COAXIAL D22.
  Choose **SINGLE** and press (↵) to confirm.

```
AKS 4100
PROBE  LENGTH
05000 mm
```

- Press (›) to change the PROBE LENGTH.
  Press (›) to change the position of the cursor.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.

```
AKS 4100
SCALE 4 mA
04946 mm
```

- Press (›) to change of SCALE 4 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.

```
AKS 4100
SCALE 20 mA
00070 mm
```

- Press (›) to change of SCALE 20 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.

```
AKS 4100
QUICK SETUP
COMPLETED IN  8
```

- Wait for QUICK SETUP to complete 8-second timeout

```
AKS 4100
1.0.0
QUICK SETUP
```

- Press (↵) to confirm.

```
AKS 4100
1.0.0
STORE NO
```

- Press (▼) or (▲) to select either STORE NO or STORE YES.
  Press (↵) to confirm.

Default screen appears:

```
AKS 4100
DISTANCE
5000 mm
```

Quick Setup completed

You have the possibility of checking your settings by pressing (›) twice.

```
AKS 4100
SINGLE CABLE          5000 mm
(0%) 4 mA             4877 mm
(100%) 20 mA           120 mm
```

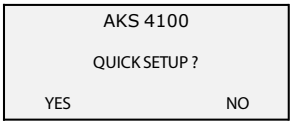
Press (↵) (▲) (↵) to return to default screen.

Note: The signal converter can be programmed with or without mechanical process connector assembled.

Quick Setup (all values below are only examples)

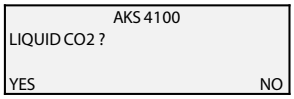
When CO_2 is used:

- Connect the device to the power supply (see the section "Electrical installation/ connection").
- Press (›) 3 times.

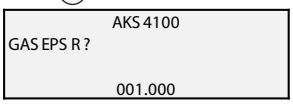


- Press (›)

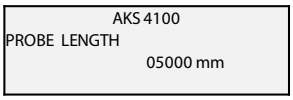
- Press (▼) or (▲) to select between SINGLE, COAXIAL D14 and COAXIAL D22. Choose **COAXIAL D14** and press (↵) to confirm.



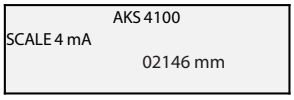
- Press (›) (YES) to confirm



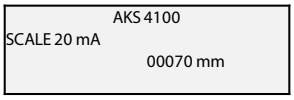
- Press (›) to change GAS EPS.R. (Select the correct value from the tables on page 20)
  Press (›) to change cursor-position.
  Press (▼) to decrease the value or (▲) to increase the value.
- Press (↵) to confirm.



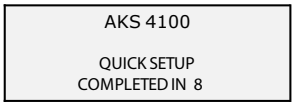
- Press (›) to change the PROBE LENGTH.
  Press (›) to change the position of the cursor.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.



- Press (›) to change of SCALE 4 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.



- Press (›) to change of SCALE 20 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.

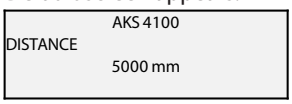


- Wait for QUICK SETUP to complete. Count down from 8 sec.

- Press (↵) to confirm.

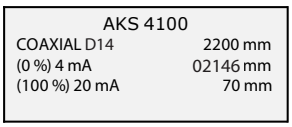
- Press (▼) or (▲) to select between STORE NO or STORE YES.
  Press (↵) to confirm.

Default screen appears:



Quick Setup completed

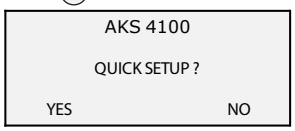
You have the possibility of checking your settings by pressing (›) twice.



Press (↵) (▲) (↵) to return to default screen.

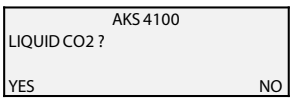
For all other refrigerants:

- Connect the device to the power supply (see the section "Electrical installation/ connection").
- Press (›) 3 times.

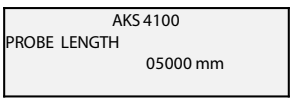


- Press (›)

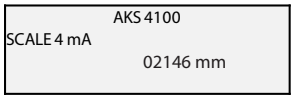
- Press (▼) or (▲) to select between SINGLE, COAXIAL D14 and COAXIAL D22. Choose **COAXIAL D14** and press (↵) to confirm.



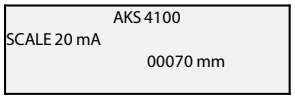
- Press (▲) (NO) to confirm



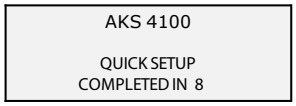
- Press (›) to change the PROBE LENGTH.
  Press (›) to change the position of the cursor.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.



- Press (›) to change of SCALE 4 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.



- Press (›) to change of SCALE 20 mA.
  Press (›) to change the cursor position.
  Press (▼) to decrease the value or (▲) to increase the value.
  Press (↵) to confirm.

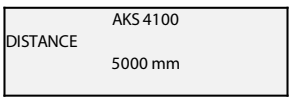


- Wait for QUICK SETUP to complete. Count down from 8 sec.

- Press (↵) to confirm.

- Press (▼) or (▲) to select between STORE NO or STORE YES.
  Press (↵) to confirm.

  Default screen appears:



Quick Setup completed

CABLE and COAXIAL version

Forcing mA output (all values below are only examples)

Default screen

AKS 4100
DISTANCE
5000 mm

- Press ›

AKS 4100
1.0.0
QUICK SETUP

- Press ▲

AKS 4100
2.0.0
SUPERVISOR

- Press ›

AKS 4100
2.0.0
_____

Enter password:
› ↵ ▼ ▲ › ↵

AKS 4100
2.1.0
INFORMATION

- Press ▲

AKS 4100
2.2.0
TESTS

- Press ›

AKS 4100
2.2.1
SET OUTPUT

- Press ›

AKS 4100
SET OUTPUT
3.5 mA

- Press ▼ to decrease the value or ▲ to increase the value.
  Press ↵ to confirm.

AKS 4100
SET OUTPUT
8 mA

- Press ↵ 4 times to return to default screen.

Default screen appears:

AKS 4100
DISTANCE
5000 mm

Force mA completed and disabled

Optional Procedure

If the temperature condition in the stand pipe is known, a constant (dielectric constant of the refrigerant gas) **can be** entered (parameter 2.5.3 GAS EPS.R), in order to obtain lower Top and Bottom Dead Zone values **(see pages 10 and 11)**.

Entering refrigerant dielectric gas constant (all values below are only examples)

Default screen

AKS 4100
DISTANCE
5000 mm

- Press ›

AKS 4100
1.0.0
QUICK SETUP

- Press ▲

AKS 4100
2.0.0
SUPERVISOR

- Press ›

AKS 4100
2.0.0
_____

Enter password:
› ↵ ▼ ▲ › ↵

AKS 4100
2.1.0
INFORMATION

- Press ▲ 4 times.

AKS 4100
2.5.0
APLICATION

- Press ›

AKS 4100
2.5.1
TRACING VEL.

- Press ▲ 2 times.

AKS 4100
2.5.3
GAS EPS. R

- Press › to change GAS EPS.R.
  (Select the correct value from the tables on page 20)
  Press › to change cursor-position.
  Press ▼ to decrease the value or ▲ to increase the value.

AKS 4100
GAS EPS. R
1.066

- Press ↵ to confirm.

AKS 4100
2.5.3
GAS EPS. R

- Press ↵ 3 times.

AKS 4100
1.0.0
STORE NO

- Press ▼ or ▲ to select between STORE NO or STORE YES.
  Select STORE YES by pressing ↵

Default screen appears:

AKS 4100
DISTANCE
5000 mm

Entering the dielectric constant of refrigerant gas completed

Saturated vapour dielectric constant (default value: 1.066)

R717 (NH_3)

Temperature range:
-60 – 50 °C / -76 – 122 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-60 – -42	-76 – -43	1.00
-41 – -18	42 – 0	1.01
-17 – -5	1 – 23	1.02
-4 – 4	24 – 39	1.03
5 – 12	40 – 54	1.04
13 – 18	55 – 64	1.05
19 – 24	65 – 75	1.06
25 – 28	76 – 82	1.07
29 – 33	83 – 91	1.08
34 – 37	92 – 99	1.09
38 – 40	100 – 104	1.10
41 – 44	105 – 111	1.11
45 – 47	112 – 117	1.12
48 – 50	118 – 122	1.13

R22

Temperature range:
-60 – 48 °C / -76 – 118 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-60 – -50	-76 – -58	1.00
-49 – -25	57 – -13	1.01
-24 – -10	-12 – 14	1.02
-9 – 0	15 – 32	1.03
1 – 8	33 – 46	1.04
9 – 15	47 – 59	1.05
16 – 21	60 – 70	1.06
22 – 26	71 – 79	1.07
27 – 31	80 – 88	1.08
32 – 35	89 – 95	1.09
36 – 39	96 – 102	1.10
40 – 42	103 – 108	1.11
43 – 45	109 – 113	1.12
46 – 48	114 – 118	1.13

R410A

Temperature range:
-65 – 15 °C / -85 – 59 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-65 – -47	-85 – -52	1.01
-46 – -35	-51 – -31	1.02
-34 – -26	-30 – -14	1.03
-25 – -19	-13 – -2	1.04
-18 – -13	-1 – 9	1.05
-12 – -8	10 – 18	1.06
-7 – -4	19 – 25	1.07
-3 – 0	26 – 32	1.08
1 – 4	33 – 40	1.09
5 – 7	41 – 45	1.10
8 – 10	46 – 50	1.11
11 – 12	51 – 54	1.12
13 – 15	55 – 59	1.13

R507

Temperature range:
-60 – 15 °C / -76 – 59 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-60 – -48	-76 – -54	1.01
-47 – -36	-53 – -32	1.02
-35 – -28	-31 – -18	1.03
-27 – -21	-17 – -6	1.04
-20 – -15	-17 – -5	1.05
-14 – -10	-4 – 14	1.06
-9 – -6	13 – 22	1.07
-5 – -2	23 – 29	1.08
-1 – 2	30 – 36	1.09
3 – 5	37 – 41	1.10
6 – 8	42 – 47	1.11
9 – 11	48 – 52	1.12
12 – 13	53 – 56	1.13
14 – 15	57 – 59	1.14

R744 (CO_2)

Temperature range:
-56 – 15 °C / -69 – 59 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-56.0 – -42.0	-69 – -43	1.01
-41.0 – -28.0	-42 – -18	1.02
-27.0 – -17.0	-17 – 2	1.03
-16.0 – -9.0	3 – 16	1.04
-8.0 – -3.0	17 – 27	1.05
-2.0 – 2	28 – 36	1.06
3 – 7	37 – 45	1.07
8 – 11	46 – 52	1.08
12 – 14	53 – 58	1.09
15	59	1.10

R134a

Temperature range:
-60 °C – 50 °C / -76 – 122 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-60 – -42	-76 – -43	1.00
-41 – -18	-42 – -0	1.01
-17 – -4	1 – 25	1.02
-3 – 5	26 – 41	1.03
6 – 13	42 – 56	1.04
14 – 20	57 – 68	1.05
21 – 25	69 – 77	1.06
26 – 30	78 – 86	1.07
31 – 34	87 – 94	1.08
35 – 38	95 – 100	1.09
39 – 42	101 – 108	1.10
43 – 45	109 – 113	1.11
46 – 48	114 – 119	1.12
49 – 50	120 – 122	1.13

R404A

Temperature range:
-60 – 15 °C / -76 – 59 °F

Temperature [°C]	Temperature [°F]	Dielectric constant of refrigerant gas Parameter 2.5.3 GAS EPS.R
-60 – -47	-76 – -52	1.01
-46 – -35	-51 – -31	1.02
-34 – -26	-30 – -14	1.03
-25 – -19	-13 – -2	1.04
-18 – -14	-1 – 7	1.05
-13 – -9	8 – 16	1.06
-8 – -4	17 – 25	1.07
-3 – 0	26 – 32	1.08
1 – 3	33 – 38	1.09
4 – 6	39 – 43	1.10
7 – 9	44 – 49	1.11
10 – 12	50 – 54	1.12
13 – 15	55 – 59	1.13

How to change the language setting (Default: English)

Default screen

AKS 4100
DISTANCE
5000 mm

- Press ›

AKS 4100
1.0.0
QUICK SETUP

- Press ▲

AKS 4100
2.0.0
SUPERVISOR

- Press ›

AKS 4100
2.0.0
_____

Enter password: › ↵ ▼ ▲ › ↵

AKS 4100
2.1.0
INFORMATION

- Press ▲ 6 times

AKS 4100
2.7.0
DISPLAY

- Press ›

AKS 4100
2.7.1
LANGUAGE

- Press ›

AKS 4100
LANGUAGE
ENGLISH

- Press ▼ or ▲ to see the language possibilities
  Press ↵ to confirm.

AKS 4100
2.7.1
LANGUAGE

- Press ↵ 3 times

AKS 4100
2.0.0
STORE NO

- Press ▼ or ▲ to select between STORE NO or STORE YES.
  Select STORE YES by pressing ↵
  Default screen appears:

AKS 4100
DISTANCE
5000 mm

Language setup completed

Reset to factory setting

- Go to SUPERVISOR menu (see page 19).
- Go to parameter 2.9.4 Reset Factory.
- Select RESET FACTORY YES
- Press ↵ 3 times to return to default screen.

Factory reset completed.

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TOMORROW

Danfoss gas detection units
Types GD Basic and Basic+

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ENGINEERING
TOMORROW

Danfoss gas detection units
Types GD Basic and Basic+

The Basic and Basic+ gas detection units are used for monitoring and warning of hazardous gas concentrations. They can be used for detecting commonly used refrigerants. Depending on the application, they are available with an electrochemical or a semiconductor sensor.

The Basic and Basic+ gas detection units are intended to be connected to a central system like Gas Detection Controller Unit, or a PLC, by either Analog or RS485 open Modbus communications. The central system converts the alarm signal from the Basic unit to activation of alarm devices.

The gas detection units come with a factory default, 2-step alarm set-up ready for use. The integrated software enables the user to configure two individual alarm ranges. Alarm 1, a pre-alarm indicating the gas level has passed a predefined treshold 1, and - if the gas level passes predefined treshold 2 - the final alarm 2.

Features

- Digital, factory configured and pre-calibrated gas detectors for plug-and-play installation (no adjustment required)
- Easy configuration via intuitive user-interface; helps simplify operator handling and minimize risk of operational, settings and calibration errors
- Flexible connection - by either Analog or RS485 open Modbus communications
- Fieldbus wiring - connect and power up to 96 sensors, wire length max. 900 meter per segment; expansion modules permits additional segments
- Automatic self-diagnostics to ensure correct communication and operation
- Sensor seal cap to prevent premature exposure during installation
- Digital user interface ensures higher sensor accuracy
- Reduced risk of false alarms due to temperature compensated sensors
- Password protected alarm settings allowing authorized access only
- LED status signals and alarms
- Buzzer & Light option for local audio and visual alarms (Basic+)
- On-board acknowledge button to reset alarms and to verify the that no gas leaks are present
- Service alerts on unit, controller or both, readable via service tool Display
- Quick and precise calibration procedures - either by Plug & Play replacement sensors or calibration with gas. No potentiometers or multi-meters required
- For improved safety and to optimize the lifetime of the sensor, degenerated sensors with too low sensitivity (<30%) are rejected during calibration process.
- Conformity to EN 50271, EN 61010-1, ANSI/UL 61010 1, CAN/CSA-C22.2 No. 61010-1
- Enables regulatory compliance with EN 378:2016, ISO 5149:2014, IIAR 2-2017, and ASHRAE 15:2016

Working principle/Operation

One sensor can be connected to the Basic/ Basic+ sensor board via local bus. The Sensor board provides the power supply of the sensor and prepares the measured data for digital communication.

The operation menu of the Basic/Basic+ software is accessed through the connected Gas Detection Controller or via the dedicated GD Service tool (or PC tool). The Service tool (or PC tool) is plugged directly to the board of the unit. The interfaces allow the unit configuration, setting of the unit alarm levels and calibration of the attached sensor.
The service tool (or PC tool) can be used on all units across the Basic, Premium and Heavy Duty platforms.

The alarm signals can be handled by the Gas Detection Controller (or a PLC) via the 4-20 mA (2-10V) analog output or the RS485 open Modbus communication. For additional operational safety the changing of parameters is password protected allowing authorized access only. The factory default password can easily be customized.

Service and maintenance

The Basic/Basic+ gas detection units are calibrated either by replacing of sensor heads or by calibration with gas.

Plug & Play replacement sensors are pre-calibrated and factory certified for quick and easy calibration procedure. The sensor is connected to the local bus via a plug connection enabling easy and simple exchange of sensor instead of an on-site calibration. The internal X-change routine recognizes the exchanged sensor during the exchange process and restarts the measurement mode automatically. An LED indicates the correct procedure of the exchange operation. To ensure the proper functioning of the units and to prevent human errors, the sensor head can only be replaced by the same type and ppm range (exact replacement) that match the configuration. If a different sensor head is installed, the GD unit will show a communication error.

As an alternative, calibration with gas can be performed via the service tool (or PC tool), calibration gas with correct concentration and the Danfoss calibration adapter. The Danfoss gas detection units have an integrated, digital calibration interface and procedure, which makes the calibration process easy, accurate, and time-saving. No potentiometers or multi-meters required for the calibration. The calibration procedure requires significantly less calibration gas per calibration compared to traditional routines.

Specifications

Electrical

Power supply	19 – 29 V AC/DC, DC reverse-polarity protected
Power consumption (24 V DC)	Max. 250 mA (6 VA)

Outgoing line local bus

Power supply	5 V DC, 250 mA max., overload, short-circuit and reverse-polarity protected

Serial interface

Local bus	1-wire / 19200 baud
Fieldbus	RS 485 / 19200 baud
Tool bus	2-wire / 19200 baud

General

Temperature range	-30 °C to +50 °C (-22 °F to 122 °F)
Humidity range	15 - 90 % RH not-condensing
Storage temperature	+5 °C to +30 °C (41 °F to 86 °F)
Storage time	12 months

Physical

Housing	Type A
Material	Polycarbonate
Burning behaviour	UL 94 V2
Housing colour	Black
Dimensions (W x H x D in mm)	94 x 130 x 57
Weight (kg)	Approx. 0.3kg (0.8 lbs.)
Protection class	IP 65
Installation	Wall mounting
Cable entry	2 x M12 / 3 x M20
Wire connection: Power supply, fieldbus Analog output Local bus for sensor	 Screw-type terminals 0.25 to 2.5 mm^2 (25 AWG to 14 AWG) Screw-type terminals 0.25 to 1.3 mm^2 (25 AWG to 17 AWG) 3-pin plug connector
Cable lengths local bus for remote sensor board	Max. 5 m (16.4 ft.)

Directives

EMC directives 2014/30/EU
CE
Conformity to EN 50271, EN 61010-1 ETL listed to UL 61010-1 and CSA C22.2 No.61010-1 Enables regulatory compliance with EN 378:2016, ISO 5149:2014, IIAR 2-2017, and ASHRAE 15:2016

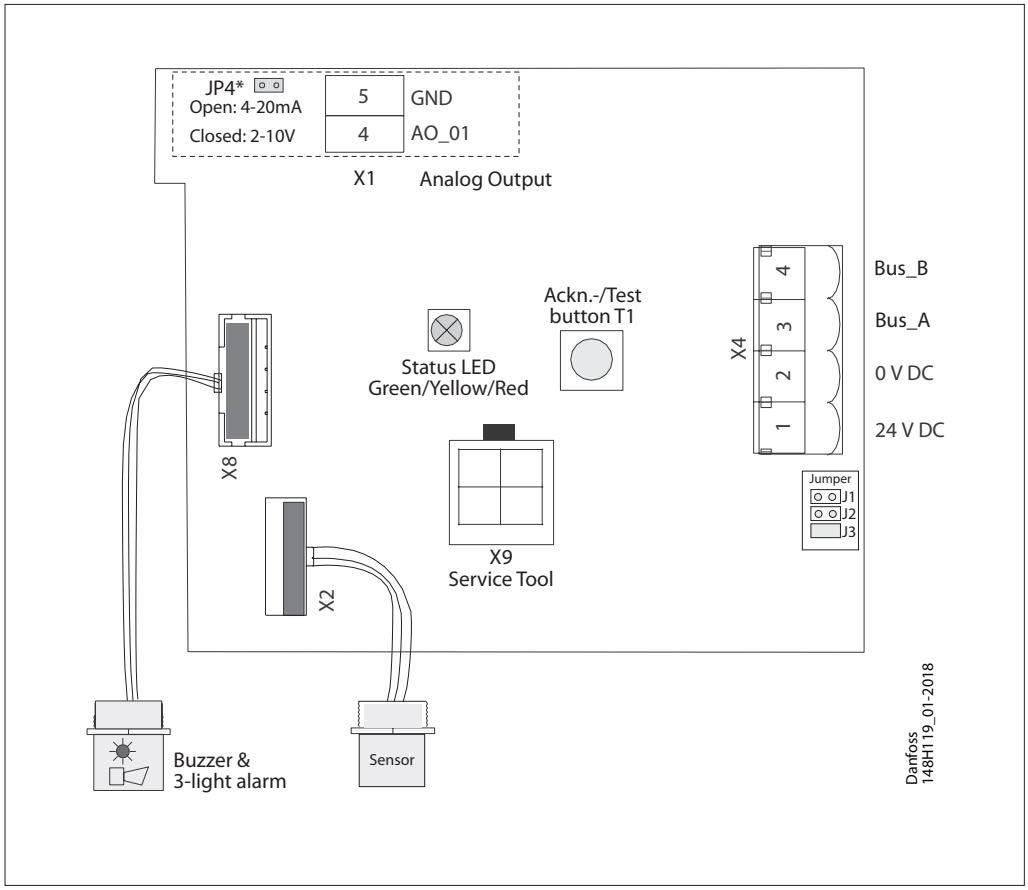
Analog output signal

Proportional, overload and short-circuit proof, load ≤ 500 Ohm 4 - 20 mA = measuring range 3.0 < 4 mA = underrange > 20 - 21.2 mA = overrange 2.0 mA = fault

Status LED / Buzzer & light (only Basic+)

Colour	3 color light: Green, yellow, red
Acoustic pressure	> 85 dB (A) (0.1 m distance)
Frequency	2300 Hz
Protection class	IP 65

Electrical connection



Status LED:

GREEN is power on.
- flashing if maintenance needed

YELLOW is an indicator of Error.
- when the sensor head is disconnected or not the expected type
- AO is activated but nothing connected
- flashing when sensor is in special mode (e.g. when changing parameters)

RED on alarm, similar to the buzzer & light alarm.

Ackn. -/Test button:

TEST - The button must be pressed for 20 sec.
- Alarm1 and Alarm2 is simulated, stop on release

ACKN. - Pressed while Alarm2, the audible warning switches off and goes back on after 5 min. when the alarm situation is still active.

* JP4 open → AO 4-20 mA (Default)
JP4 closed → AO 2-10 Volt

Fieldbus loop

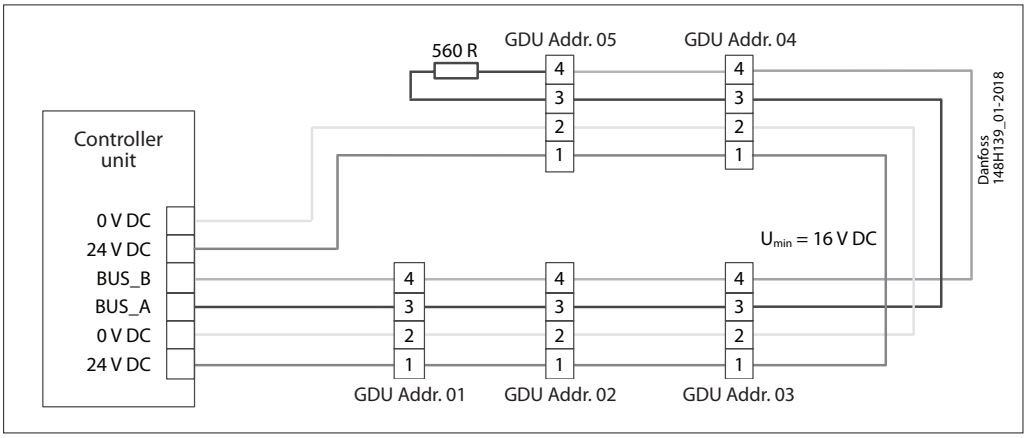
Each GD controller can handle up to 96 sensors and handle any mix of individual Gas detection units of the types Basic, Premium and Heavy Duty.

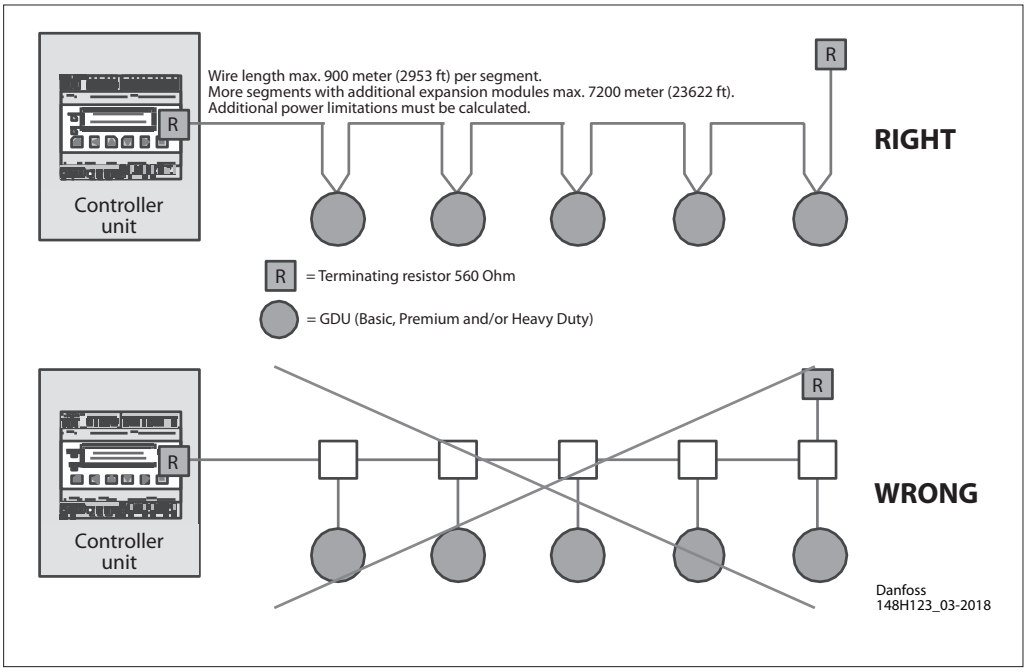
The max. recommended loop wire length is 900 meter (2953 ft) per segment.

With additional segments (and additional controller expansion modules) the max recommended loop wire length is 7200 meter (23622 ft).

The controller and the last GDU in each segment must be provided with a resistor of 560 Ohm. A Umin of 16 V DC must be secured at any spot in the loop.

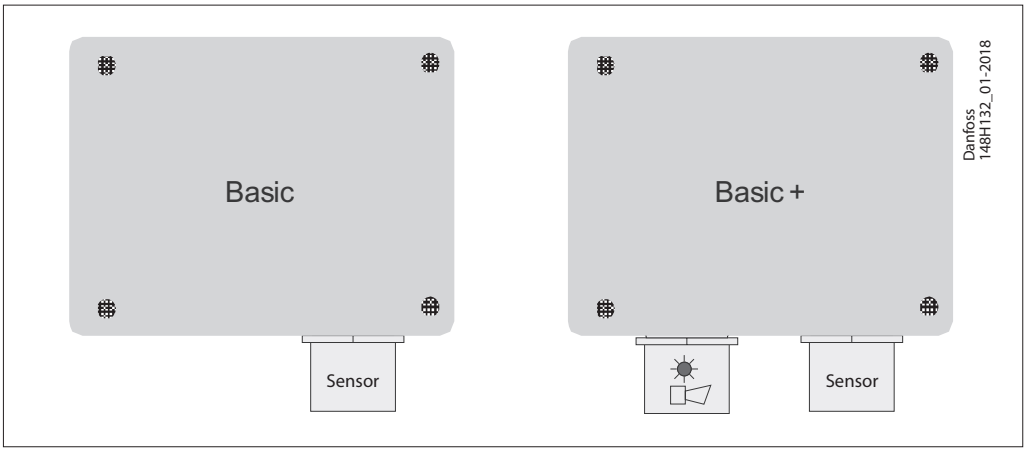
Below figure shows how to make proper connections between the controller and each GDU.





General information

- Cable gland not mounted but enclosed
- 4 mounting ears included
- Sensor head mounted bottom right
- Alarm device (Buzzer & Light) mounted bottom left (only Basic +)

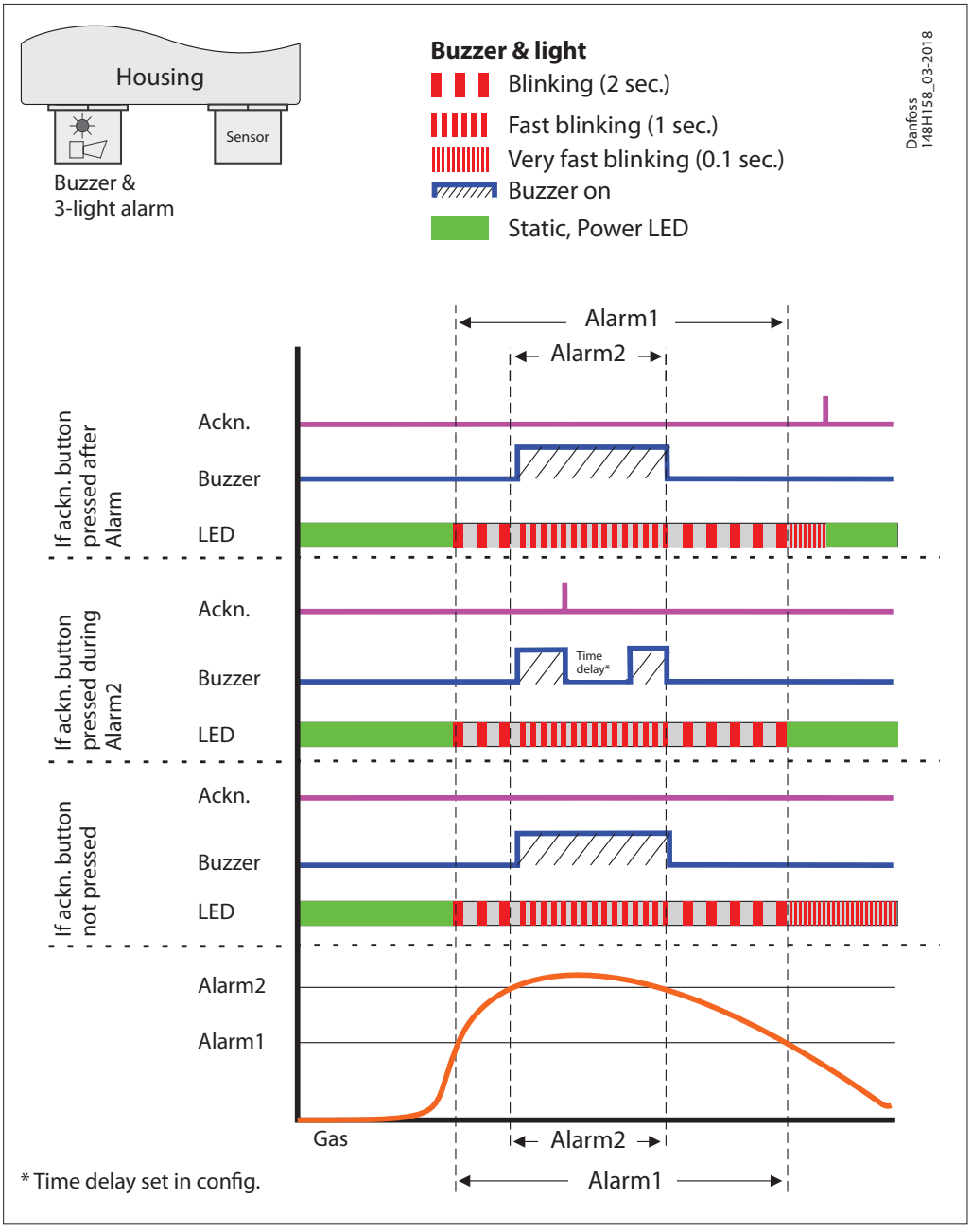


Gas types and thresholds

Sensor	Sensor Type	ppm range	Alarm 1	Alarm 2	Hysteresis
Ammonia EC 100	Electrochemical	0-100	25 ppm	35 ppm	2 ppm
Ammonia EC 300	Electrochemical	0-300	25 ppm	150 ppm	2 ppm
Ammonia EC 1000	Electrochemical	0-1000	500 ppm	900 ppm	25 ppm
Ammonia SC 1000	Semiconductor	0-1000	500 ppm	900 ppm	25 ppm
HFC R404A, R507 SC2000	Semiconductor	0-2000	500 ppm	900 ppm	25 ppm

Hysteresis = 5% of Alarm1 (rounded up to the next higher integer)

Alarm scheme



Ordering

Type	Model	Refrigerant	Sensor	ppm range	Alarm ppm	Temp. Range [°C]	Temp. Range [°F]	Code number
GDA	Basic	Ammonia	Electrochemical	0-100	25/35	-30 to +50	-22 to 122	**148H6000**
	Basic+*	Ammonia	Electrochemical	0-100	25/35	-30 to +50	-22 to 122	**148H6001**
	Basic	Ammonia	Electrochemical	0-300	25/150	-30 to +50	-22 to 122	**148H6008**
	Basic+*	Ammonia	Electrochemical	0-300	25/150	-30 to +50	-22 to 122	**148H6009**
	Basic	Ammonia	Electrochemical	0-1000	500/900	-30 to +50	-22 to 122	**148H6014**
	Basic+*	Ammonia	Electrochemical	0-1000	500/900	-30 to +50	-22 to 122	**148H6015**
	Basic	Ammonia	Semiconductor	0-1000	500/900	-10 to +50	14 to 122	**148H6023**
	Basic+*	Ammonia	Semiconductor	0-1000	500/900	-10 to +50	14 to 122	**148H6024**
GDHF	Basic	R404a, R507a, R32, R125, R407c, R434a, R488a, R410a	Semiconductor	0-2000	500/900	-10 to +50	14 to 122	**148H6045**
	Basic+*	R404a, R507a, R32, R125, R407c, R434a, R488a, R410a	Semiconductor	0-2000	500/900	-10 to +50	14 to 122	**148H6046**

* incl buzzer & Light

Spare parts and accessories

Description	Code number
Replacement sensor - Ammonia EC 100	**148H6200**
Replacement sensor - Ammonia EC 300	**148H6201**
Replacement sensor - Ammonia EC 1000	**148H6202**
Replacement sensor - Ammonia SC 1000	**148H6203**
Replacement sensor - HFC R404A, R507 SC 2000	**148H6210**
Controller unit	**148H6231**
Controller solution (controller + enclosure)	**148H6221**
Warning module (wire break monitoring module)	**148H6223**
Controller expansion module	**148H6222**
Service tool	**148H6224**
PC tool	**148H6235**
Calibration adapter	**148H6232**
Buzzer & light - acoustic buzzer and optic led	**148H6225**
Air duct set	**148H6236**
Seal cap	**148H6227**
Splash guard	**148H6226**
Gateway for controller	**148H6228**

Accessories overview

Controller unit
Used for a centralized monitoring and warning. The input signals for the controller are collected via RS485 Modbus or analog communication. The controller can handle up to 96 digital sensors via Fieldbus and four (4) analog input. An additional 28 analog input is possible using seven (7) expansion modules (4-20 mA signal interface). The total number of connected sensors should not exceed 128 sensors. The controller unit can be employed as pure analog controller, as analog/digital, or as digital controller. Configuration is menu-driven via the keypad. For fast and easy configuration, the PC Tool is recommended.

Controller solution
Controller unit placed in an enclosure ready to be connected to a power source. A separate UPS for the controller is available.

Warning module (wire break monitoring module)
The warning module is used for monitoring the circuiting to the warning/alarm devices on a centrally controlled gas detection system. Wire breaks or wire interruptions in the alarm device loop will be reported to the central control.

Controller expansion module
The gas detection Controller Expansion module is used for expansion of the cable coverage in terms of number of loops and the total wire length. Each Controller Unit can handle up to 7 Expansion modules allowing additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.

Service tool
For interface with units with no display (Basic, Basic+, Premium, Premium+). Acts as a portable display and can be connected to all Danfoss gas detection units. (Heavy Duty w. adapter).

PC tool
The PC tool is a menu-driven and standalone software used for easy addressing, parameter setting, calibration, and data logging of the Basic, Premium and Heavy Duty gas detection units, and the controller unit.

Calibration adapter
The calibration adapter is required for connecting the calibration gas container, via the flow regulator, to the sensor head on the gas detection units. (Two variants, One for Basic and Premium plastic head sensors; one for heavy duty and Premium remote metal head sensors.).

Buzzer & light - acoustic buzzer and optic led
Can be installed in Basic or Premium units providing a local alarm.

Air duct set
The air duct set is specially designed to capture the airflow in air ducts. It can be connected to the standard sensor heads, except from Heavy Duty gas detection units.

Seal cap
Airtight seal cap to protect the sensor head against premature exposure during installation. The seal cap is mounted on new sensors (complete units and replacement sensors) but is also available as an accessory.

Splash guard
To protect the sensor head against water exposure during wash-down cleaning and rinsing operations.

Gateway for controller
The gateway is an addition to the controller and used for communicating via Modbus TCP/IP.

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Danfoss gas detection units

Types GD Premium, Premium+, Premium Duplex, Premium Remote, Premium Flex and Premium Uptime

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Danfoss gas detection units

Types GD Premium, Premium+, Premium Duplex, Premium Remote, Premium Flex and Premium Uptime

The Premium line gas detection units are used for monitoring and warning of hazardous gas concentrations. They can be used for detecting most commonly used refrigerants. Depending on the application and model, each unit is available with one or two of 4 sensor types.

The Premium line gas detection units are intended as Stand-alone, or connected to a central system like Gas Detection Controller Unit, or a PLC.

As stand-alone the on-board relays can be used for activation of alarm devices, while the Analog or RS485 Modbus connection to a central system allows additional centralized monitoring and alarm activation.

4 out of the 6 Premium models have integrated Display/keypad for direct access to the user interface

The gas detection units come with a factory default, 2-step alarm set-up ready for use. The user interface enables the user to configure two individual alarm settings. Alarm 1, a pre-alarm indicating the gas level has passed a predefined treshold 1 , and - if the gas level passes predefined treshold 2 - the final alarm 2.

Features

- Digital, factory configured and pre-calibrated gas detectors for plug-and-play installation (no adjustment required)
- Easy configuration via Display/keypad (some models) and intuitive user-interface; helps simplify operator handling and minimize risk of operational, settings and calibration errors
- Stand-alone (integrated relays) and/or flexible connection to central controller - by either Analog or RS485 open Modbus communications
- Wide selection of refrigerants, sensor types and detection ranges
- 2 Sensor versions available
- Remote sensor location possible
- Fieldbus wiring - connect and power up to 96 sensors, wire length max. 900 meters (2953 ft) per segment; expansion modules permits additional segments
- Automatic self-diagnostics to ensure correct communication and operation
- Sensor seal cap to prevent premature exposure during installation
- Digital user interface ensures higher sensor accuracy
- Reduced risk of false alarms due to temperature compensated sensors
- Password protected alarm settings allowing authorized access only
- LED status signals and alarms
- Buzzer & Light option for local audio and visual alarms (Premium+, Premium Uptime)
- On-board acknowledge button to reset alarms and to verify that no gas leaks are present
- Service alerts on unit, controller or both, readable via service tool Display
- Quick and precise calibration procedures - either by Plug & Play replacement sensors or calibration with gas. No potentiometers or multi-meters required
- For improved safety and to optimize the lifetime of the sensor, degenerated sensors with too low sensitivity (<30%) are rejected during calibration process.
- Conformity to EN 50271, EN 61010-1, ANSI/UL 61010 1, CAN/CSA-C22.2 No. 61010-1
- Enables regulatory compliance with EN 378:2016, ISO 5149:2014, IIAR 2-2017, and ASHRAE 15:2016

Working principle/Operation

One (or two) sensor(s) are connected to the Premium sensor board via local bus. The Sensor board provides the power supply of the sensor(s) and prepares the measured data for digital communication.

The operation menu of the Premium software is accessed through the Display (if fitted), or the connected Gas Detection Controller, or via the dedicated GD Service tool (or PC tool). The Service tool (or PC tool) is plugged directly to the board of the unit. These interfaces with Display allow the unit configuration, setting of the unit alarm levels and calibration of the attached sensor(s).

The service tool (or PC tool) can be used on all units across the Basic, Premium and Heavy Duty platforms.

For Stand-alone units the alarm signals are handled by the unit software, which activates the integrated relays directly. For central controlled units the alarm signals are handled by the Gas Detection Controller (or a PLC) via the 4-20 mA (2-10V) analog output or the RS485 open Modbus communication.

For additional operational safety the changing of parameters is password protected allowing authorized access only. The factory default password can easily be customized.

Service & maintenance

The Premium line gas detection units are calibrated either by replacing of sensor heads or by calibration with gas.

Plug & Play replacement sensors are pre-calibrated and factory certified for quick and easy calibration procedure. The sensor is connected to the local bus via a plug connection enabling easy and simple exchange of sensor instead of a calibration. The internal X-change routine recognizes the exchanged sensor during the exchange process and restarts the measurement mode automatically. An LED indicates the correct procedure of the exchange operation. To ensure the proper functioning of the units and to prevent human errors, the sensor head can only be replaced by the same type and ppm range (exact replacement) that match the configuration. If a different sensor head is installed, the GD unit will show a communication error.

As an alternative, calibration with gas can be performed via the service tool (or PC tool), calibration gas with correct concentration and the Danfoss calibration adapter. The Danfoss gas detection units have an integrated, digital calibration interface and procedure, which makes the calibration process easy, accurate, and time-saving. No potentiometers or multi-meters required for the calibration. The calibration procedure requires significantly less calibration gas per calibration compared to traditional routines.

Specifications

Electrical

Power supply	24 V DC ± 20 %, reverse-polarity protected
Power consumption (24 V DC)	Max. 210 mA (5.1 VA)
Alarm relays (3)	250 V AC, 5 A, potential-free, contacts (SPDT)
Transistor output (2) (connector X13)	24 V DC / 0.1 A (switching to plus) (only at 24 V DC power supply)
Analog output signal (1)	Proportional, overload and short-circuit proof, load ≤ 500 Ohm 4 - 20 mA = measuring range 3.0 < 4 mA = underrange > 20 - 21.2 mA = overrange 2.0 mA = fault
Output for local bus	5 V DC, 250 mA max. Overload, short-circuit and reverse-polarity protected

Ambient conditions

Temperature range	Sensor dependant. See ordering section.
Humidity range	15 - 95 % RH not-condensing
Storage temperature	+5 °C to +30 °C (+41 °F to +86 °F)
Storage time	12 months

Serial interface

Local bus	1-wire / 19200 Baud
Fieldbus	RS 485 / 19200 Baud
Tool bus	2-wire / 19200 Baud

Physical

Housing	Type C	Type E (Premium Uptime)
Material	Polycarbonate	
Combustion	UL 94 V2	
Housing colour	Black	
Dimensions (W x H x D in mm)	130 x 130 x 75	130 x 130 x 99
Weight (kg)	Approx. 0.6 kg	Approx. 0.7 kg
Protection class	IP 65	
Installation	Wall mounting	
Cable entry	Standard 6 x M20/25	
Wire connection: Local bus (SC2) Digital input, analog output Power supply, relays	 3-pin connector Screw-type terminal min. 0.25 mm², max. 1.3 mm² (min. 25 AWG, max. 17 AWG) Screw-type terminal min. 0.25 mm², max. 2.5 mm² (min. 25 AWG, max. 14 AWG)	
Cable lengths local bus for Remote Sensor Board	Max. 5 m (16.4 ft.)	

Directives

EMC directives 2014/30/EU
Low voltage directive 2014/35/EU
CE
Conformity to EN 50271, EN 61010-1 ETL listed to UL 61010-1 and CSA C22.2 No.61010-1 Enables regulatory compliance with EN 378:2016, ISO 5149:2014, IIAR 2-2017, and ASHRAE 15:2016

Display (not Premium and Premium+)

Temperature range	-20°C to +50°C (-4°F to 122°F)
LCD	Two lines, 16 characters each, background highlighted in two colours
Operation	Menu driven via six push-buttons
Power consumption	5 V, 60 mA, 0.3 VA

Status LED

Colour / Mode	Red / yellow / green (alarm – fault – operation - service)
Protection class	IP 65

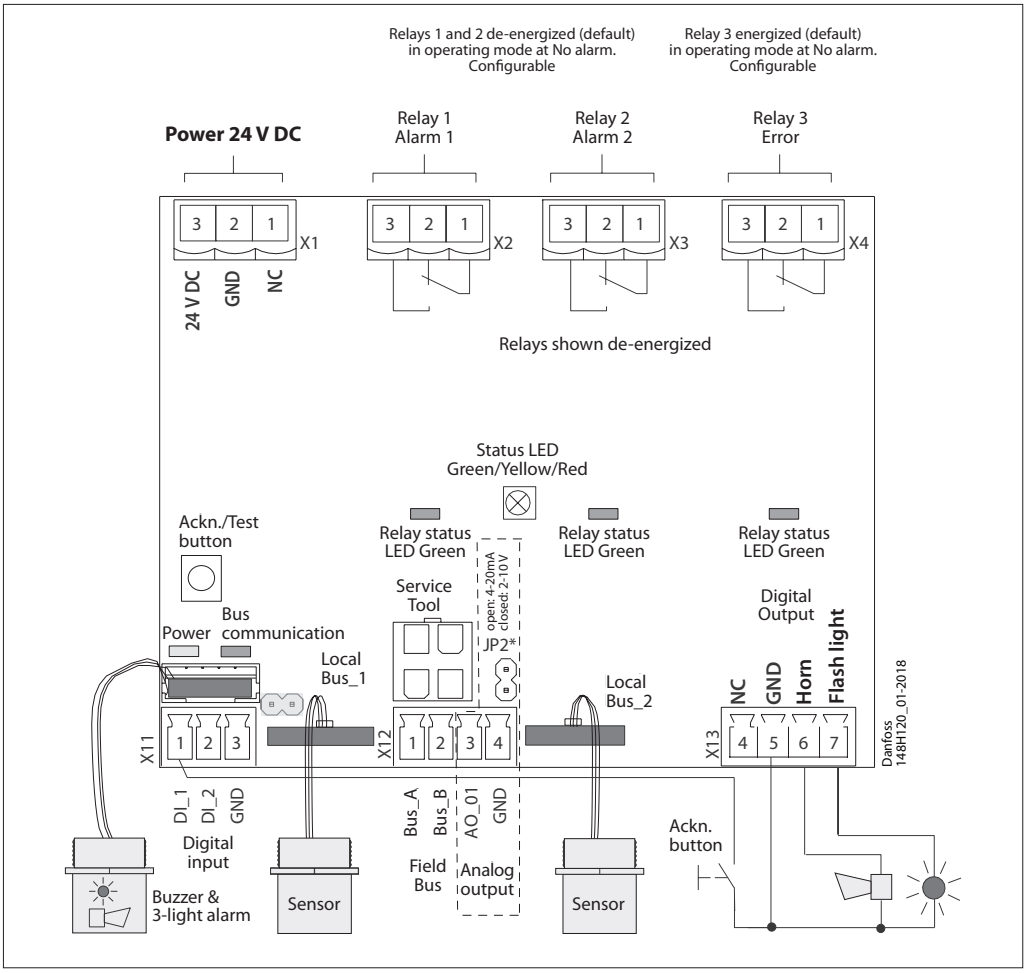
Warning buzzer

Acoustic pressure	> 85 dB (A) (0.1 m distance)
Frequency	2300 Hz
Protection class	IP 65

UPS (only Premium Uptime)

Power unit with wide range input	90 -240 V AC - 50/60 Hz
Output rating	15 VA
Rechargeable battery	12 V, 0.8 Ah
Operating time	> 60 min

Electrical connection



Status LED:

GREEN is power on.
- flashing if maintenance needed

YELLOW is an indicator of Error.
- when the sensor head is disconnected or not the expected type
- AO is activated but nothing connected

RED on alarm, similar to the Buzzer & light alarm.

Ackn. -/Test button:

TEST - The button must be pressed for 20 sec.
- Alarm1 and Alarm2 is simulated, stop on release

ACKN. - Pressed while Alarm2, the audible warning switches off and goes back on after 5 min. when the alarm situation is still active.

* JP2 open → AO 4-20 mA (Default)
JP2 closed → AO 2-10 Volt

Function

Digital outputs with 3 relays

Action	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
	Relay 1 (Alarm1)	Relay 2 (Alarm2)	Flashlight X13-7	Horn X13-6	Relay 3 (Fault)	LED
Gas signal < alarm threshold 1	OFF	OFF	OFF	OFF	ON	GREEN
Gas signal > alarm threshold 1	ON	OFF	OFF	OFF	ON	RED Slow blinking
Gas signal > alarm threshold 2	ON	ON	ON	ON	ON	RED Fast blinking
Gas signal ≥ alarm threshold 2, but ackn. button pressed	ON	ON	ON	OFF after delay ON		RED Fast blinking
Gas signal < (alarm threshold 2 - hysteresis) but >= alarm threshold 1	ON	OFF	OFF	OFF	ON	RED Slow blinking
Gas signal < (alarm threshold 1 - hysteresis) but not acknowledged	OFF	OFF	OFF	OFF	ON	RED Very fast blinking
No alarm, no fault	OFF	OFF	OFF	OFF	ON	GREEN
No fault, but maintenance due	OFF	OFF	OFF	OFF	ON	GREEN Slow blinking
Communication error	OFF	OFF	OFF	OFF	OFF	YELLOW

Fieldbus loop

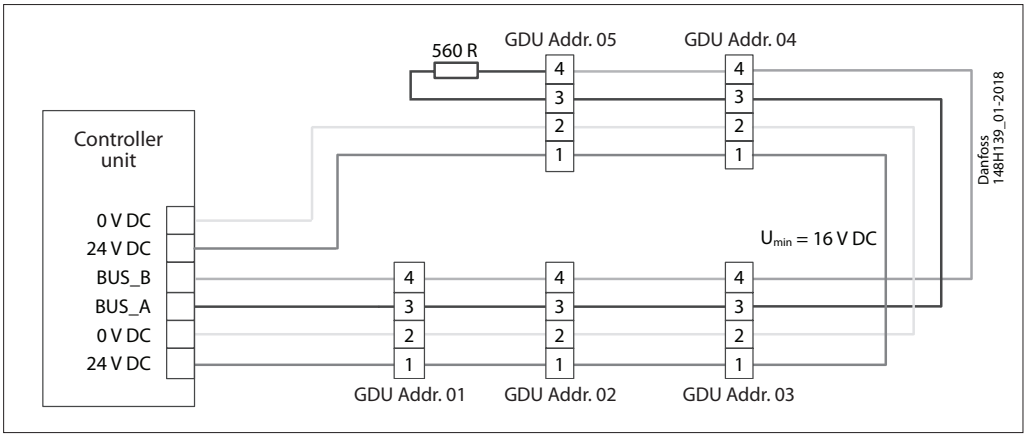
Each GD controller can handle up to 96 sensors and handle any mix of individual Gas detection units of the types Basic, Premium and Heavy Duty.

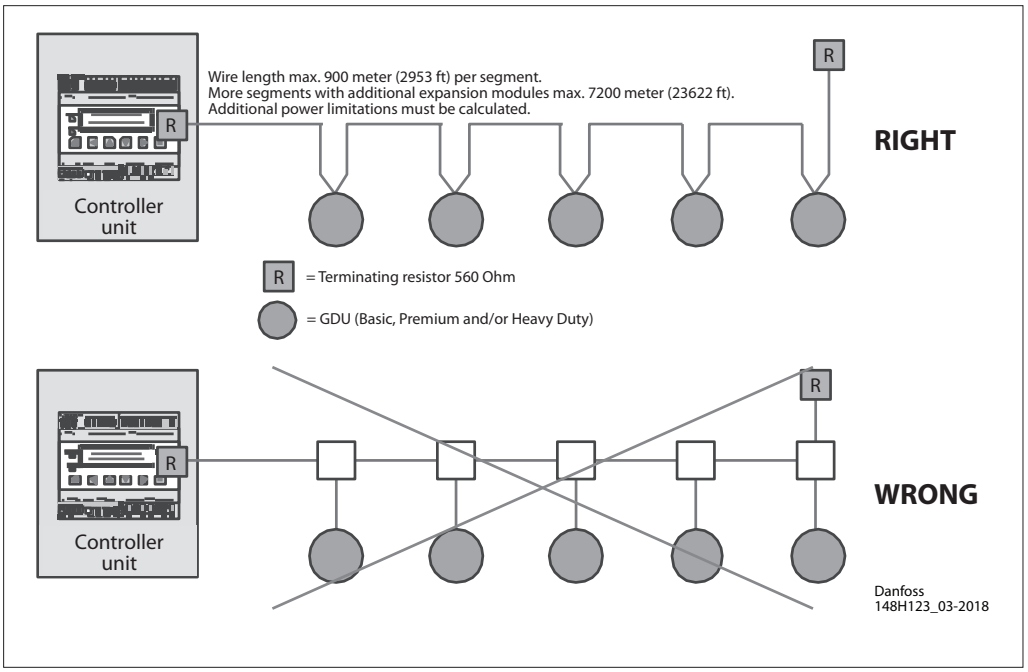
The max. recommended loop wire length is 900 meter (2953 ft) per segment.

With additional segments (and additional controller expansion modules) the max recommended loop wire length is 7200 meter 23622 ft).

The controller and the last GDU in each segment must be provided with a resistor of 560 Ohm. A Umin of 16 V DC must be secured at any spot in the loop.

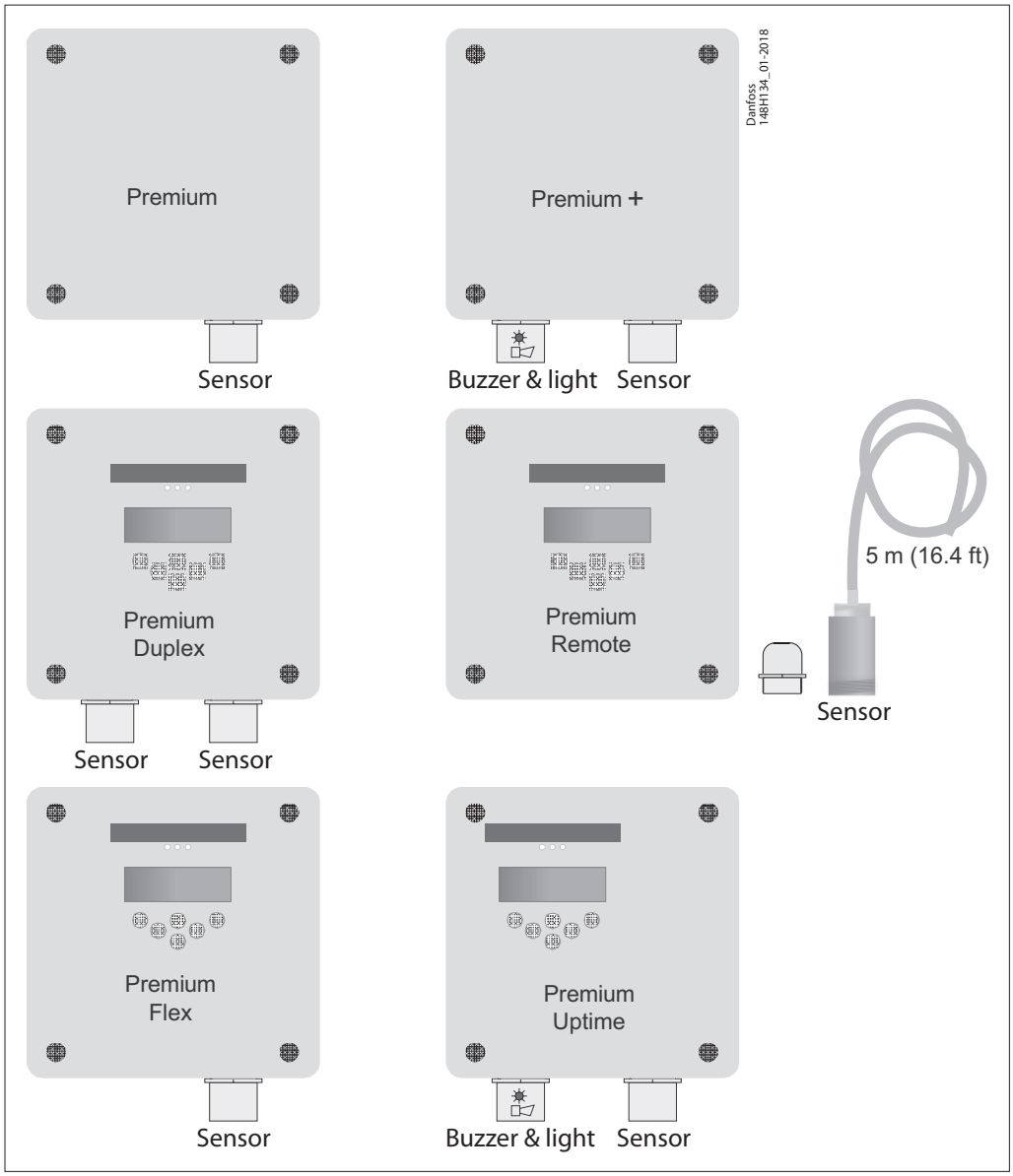
Below figure shows how to make proper connections between the controller and each GDU.





General info

- Cable gland not mounted but enclosed
- 4 mounting ears included
- Sensor head mounted bottom right (not Premium Remote)
- Alarm device (buzzer & 3 light alarm) mounted bottom left (only Premium +, Premium Uptime)

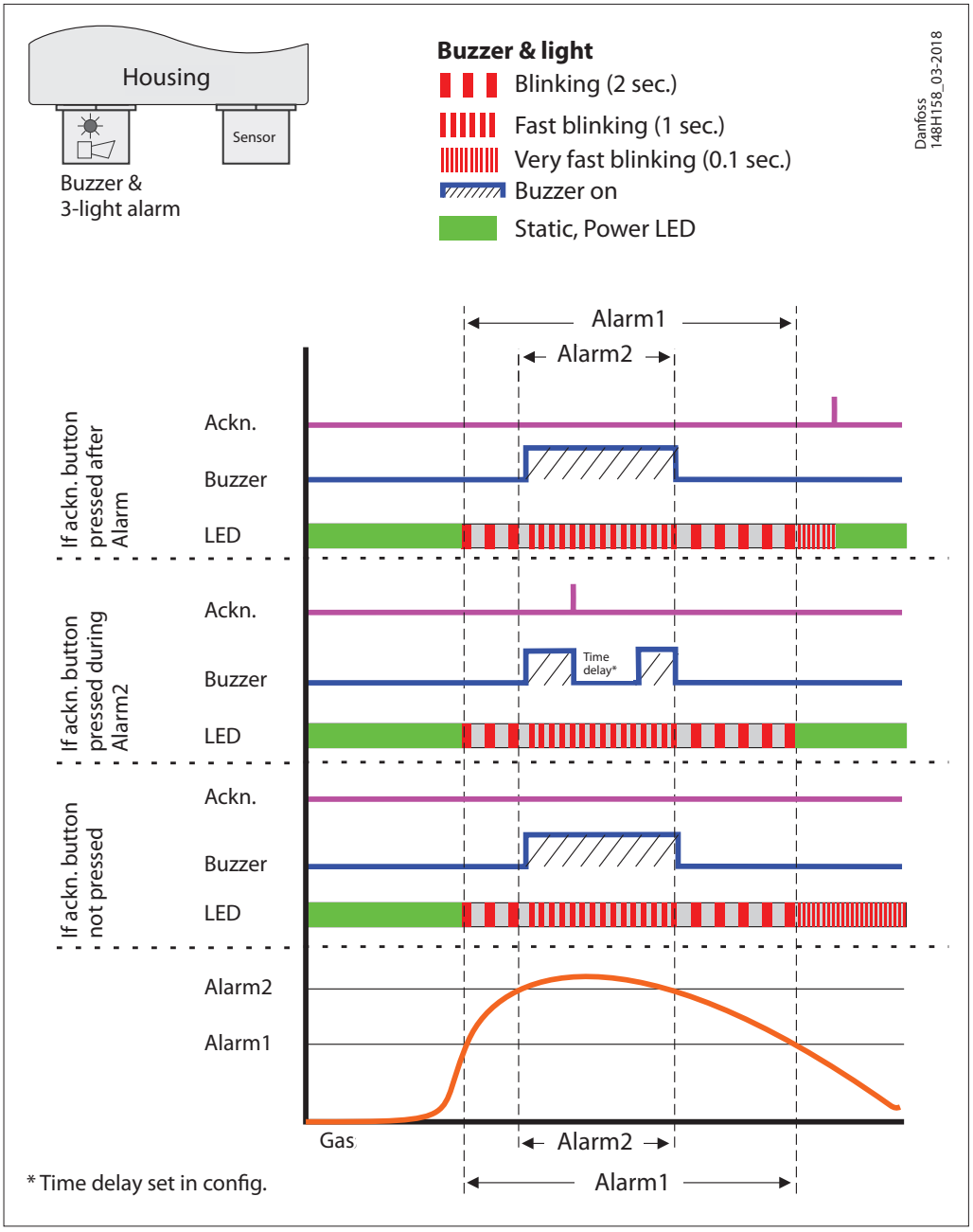


Gas types and thresholds

Sensor	Sensor Type	ppm range	Alarm1	Alarm2	Hysteresis
Ammonia EC 100	Electrochemical	0-100	25 ppm	35 ppm	2 ppm
Ammonia EC 300	Electrochemical	0-300	25 ppm	150 ppm	2 ppm
Ammonia EC 1000	Electrochemical	0-1000	500 ppm	900 ppm	25 ppm
Ammonia EC 5000	Electrochemical	0-5000	1000 ppm	4500 ppm	50 ppm
Ammonia SC 1000	Semiconductor	0-1000	500 ppm	900 ppm	25 ppm
Ammonia SC 10000	Semiconductor	0-10000	5000 ppm	9000 ppm	250 ppm
Ammonia P LEL	Pellistor	0-140000	21% LEL (30000 ppm)	21% LEL (30000 ppm)	1%
CO2 IR 20000 (2% Vol)	Infrared	0-20000	5000 ppm	9000 ppm	250 ppm
CO2 IR 50000 (5% Vol)	Infrared	0-50000	10000 ppm	18000 ppm	500 ppm
HCFC R123 SC 2000	Semiconductor	0-2000	500 ppm	900 ppm	25 ppm
HFC R404A, R507 SC 2000	Semiconductor	0-2000	500 ppm	900 ppm	25 ppm
HFC R134A SC 2000	Semiconductor	0-2000	500 ppm	900 ppm	25 ppm
HC R290/Propane P 5000	Pellistor	0-5000	800 ppm	2500 ppm	40 ppm

Hysteresis = 5% of Alarm1 (rounded up to the next higher integer)
Alarm thresholds can have the same value, therefore the relays and/or the buzzer and LED can be triggered together.

Alarm scheme



Ordering

Premium = Standard
Premium + = Standard + Buzzer & light warning device
Premium Duplex = Standard + 2nd sensor + Display and keyboard
Premium Remote = Remote sensor (stainless steel) with 5m cable (2nd cable gland needed) not mounted but enclosed + Display and keyboard
Premium Flex = Standard + Display and keyboard
Premium Uptime = Standard + Buzzer & light warning device + Display and keyboard + UPS

Type	Model	Refrigerant	Sensor	ppm range	Alarm ppm	2nd Sensor ppm (Alarm ppm)	Remote sensor ppm (Alarm ppm)	Buzzer & Light	Display	UPS	Temp. Range °C	Temp. Range °F	Code number
GDA	Premium	Ammonia	Electrochemical	0-100	25/35						-30 to +50	-22 to 122	**148H6002**
	Premium+	Ammonia	Electrochemical	0-100	25/35			x			-30 to +50	-22 to 122	**148H6003**
	Premium Duplex	Ammonia	Electrochemical Pellistor	0-100	25/35	0-140000 (30000)			x		-20 to +50	-4 to 122	**148H6004**
	Premium Remote	Ammonia	Electrochemical				0-100 (25/35)		x		-20 to +50	-4 to 122	**148H6005**
	Premium Flex	Ammonia	Electrochemical	0-100	25/35				x		-20 to +50	-4 to 122	**148H6006**
	Premium Uptime	Ammonia	Electrochemical	0-100	25/35			x	x	x	0 to +40	32 to 104	**148H6007**
	Premium	Ammonia	Electrochemical	0-300	25/150						-30 to +50	-22 to 122	**148H6010**
	Premium+	Ammonia	Electrochemical	0-300	25/150			x			-30 to +50	-22 to 122	**148H6011**
	Premium Duplex	Ammonia	Electrochemical Pellistor	0-300	25/150	0-140000 (30000)			x		-20 to +50	-4 to 122	**148H6012**
	Premium Flex	Ammonia	Electrochemical	0-300	25/150				x		-20 to +50	-4 to 122	**148H6013**
	Premium	Ammonia	Electrochemical	0-1000	500/900						-30 to +50	-22 to 122	**148H6016**
	Premium+	Ammonia	Electrochemical	0-1000	500/900			x			-30 to +50	-22 to 122	**148H6017**
	Premium Duplex	Ammonia	Electrochemical Pellistor	0-1000	500/900	0-140000 (30000)			x		-20 to +50	-4 to 122	**148H6018**
	Premium Remote	Ammonia	Electrochemical				0-1000 (500/900)		x		-20 to +50	-4 to 122	**148H6019**
	Premium Flex	Ammonia	Electrochemical	0-1000	500/900				x		-20 to +50	-4 to 122	**148H6020**
	Premium Uptime	Ammonia	Electrochemical	0-1000	500/900			x	x	x	0 to +40	32 to 104	**148H6021**
	Premium	Ammonia	Semiconductor	0-1000	500/900						-10 to +50	14 to 122	**148H6025**
	Premium+	Ammonia	Semiconductor	0-1000	500/900			x			-10 to +50	14 to 122	**148H6026**
	Premium Flex	Ammonia	Semiconductor	0-1000	500/900				x		-10 to +50	14 to 122	**148H6027**
	Premium+	Ammonia	Electrochemical	0-5000	1000/4500			x			-30 to +50	-22 to 122	**148H6028**
	Premium Remote	Ammonia	Electrochemical				0-5000 (1000/4500)		x		-20 to +50	-4 to 122	**148H6029**
	Premium Uptime	Ammonia	Electrochemical	0-5000	1000/4500			x	x	x	0 to +40	32 to 104	**148H6030**
	Premium	Ammonia	Semiconductor	0-10000	5000/9000						-10 to +50	14 to 122	**148H6032**
	Premium+	Ammonia	Semiconductor	0-10000	5000/9000			x			-10 to +50	14 to 122	**148H6033**
	Premium Remote	Ammonia	Semiconductor				0-10000 (5000/9000)		x		-10 to +50	14 to 122	**148H6034**
	Premium+	Ammonia	Pellistor	0-140000	30000			x			-25 to +50	-13 to 122	**148H6036**
	Premium Duplex	Ammonia	Semiconductor Pellistor	0-1000	500/900	0-140000 (30000)			x		-10 to +50	14 to 122	**148H6037**
	Premium Flex	Ammonia	Pellistor	0-140000	30000				x		-20 to +50	-4 to 122	**148H6038**
GDC	Premium Flex	CO_2	Infrared	0-20000	5000/9000				x		-20 to +50	-4 to 122	**148H6040**
	Premium Flex	CO_2	Infrared	0-50000	10000/18000				x		-20 to +50	-4 to 122	**148H6041**
GDHC	Premium	R123	Semiconductor	0-2000	500/900						-10 to +50	14 to 122	**148H6042**
	Premium+	R123	Semiconductor	0-2000	500/900			x	x		-10 to +50	14 to 122	**148H6043**
	Premium Flex	R123	Semiconductor	0-2000	500/900				x		-10 to +50	14 to 122	**148H6044**
GDHF	Premium	R404a, R507a, R32, R125, R407c, R434a, R488a, R410a	Semiconductor	0-2000	500/900						-10 to +50	14 to 122	**148H6047**
	Premium+	R404a, R507a, R32, R125, R407c, R434a, R488a, R410a	Semiconductor	0-2000	500/900			x			-10 to +50	14 to 122	**148H6048**
	Premium Flex	R404a, R507a, R32, R125, R407c, R434a, R488a, R410a	Semiconductor	0-2000	500/900				x		-10 to +50	14 to 122	**148H6049**
	Premium	R134a, R407a, R416a, R417a, R422a, R422d, R427a, R437a, R438a, R449a, R407f, R450a	Semiconductor	0-2000	500/900						-10 to +50	14 to 122	**148H6050**
	Premium+	R134a, R407a, R416a, R417a, R422a, R422d, R427a, R437a, R438a, R449a, R407f, R450a	Semiconductor	0-2000	500/900			x			-10 to +50	14 to 122	**148H6051**
	Premium Flex	R134a, R407a, R416a, R417a, R422a, R422d, R427a, R437a, R438a, R449a, R407f, R450a	Semiconductor	0-2000	500/900				x		-10 to +50	14 to 122	**148H6052**
GDH	Premium	R290/Propane	Pellistor	0-5000	800/2500						-30 to +50	-22 to 122	**148H6053**
	Premium+	R290/Propane	Pellistor	0-5000	800/2500			x			-30 to +50	-22 to 122	**148H6054**
	Premium Flex	R290/Propane	Pellistor	0-5000	800/2500				x		-20 to +50	-4 to 122	**148H6055**

Spare parts and accessories

Description	Code number
Replacement sensor - Ammonia EC 100	**148H6200**
Replacement sensor - Ammonia EC 300	**148H6201**
Replacement sensor - Ammonia EC 1000	**148H6202**
Replacement sensor - Ammonia SC 1000	**148H6203**
Replacement sensor - Ammonia EC 5000	**148H6204**
Replacement sensor - Ammonia SC 10000	**148H6205**
Replacement sensor - Ammonia P LEL	**148H6206**
Replacement sensor - CO2 IR 20000	**148H6207**
Replacement sensor - CO2 IR 50000	**148H6208**
Replacement sensor - HCFC R123 SC 2000	**148H6209**
Replacement sensor - HFC R404A, R507 SC 2000	**148H6210**
Replacement sensor - HFC R134a SC 2000	**148H6211**
Replacement sensor - HC R290/Propane P 5000	**148H6212**
Remote sensor - Ammonia EC 100 (length: 5m (16.4 ft.) - External thread M30 x 1.5)	**148H6213**
Remote sensor - Ammonia EC 1000 (length: 5m (16.4 ft.) - External thread M30 x 1.5)	**148H6214**
Remote sensor - Ammonia EC 5000 (length: 5m (16.4 ft.) - External thread M30 x 1.5)	**148H6215**
Remote sensor - Ammonia SC 10000 (length: 5m (16.4 ft.) - External thread M30 x 1.5)	**148H6216**
Controller unit	**148H6231**
Controller solution (controller + enclosure)	**148H6221**
Controller solution Uptime	**148H6237**
Warning module (wire break monitoring module)	**148H6223**
Controller expansion module	**148H6222**
Service tool	**148H6224**
PC Tool	**148H6235**
Calibration adapter	**148H6232**
Calibration adapter for remote sensors	**148H6233**
Buzzer & light - acoustic buzzer and optic led	**148H6225**
Air duct set	**148H6236**
Seal cap	**148H6227**
Remote kit	**148H6238**
Splash guard	**148H6226**
NPT adapter for remote sensor (M30 x 1.5 to NPT ¾ in.)	**148H6234**
Gateway for controller	**148H6228**

Accessories overview

Controller unit
Used for a centralized monitoring and warning. The input signals for the controller are collected via RS485 Modbus or analog communication. The controller can handle up to 96 digital sensors via Fieldbus and four (4) analog input. An additional 28 analog input is possible using seven (7) expansion modules (4-20 mA signal interface). The total number of connected sensors should not exceed 128 sensors. The controller unit can be employed as pure analog controller, as analog/digital, or as digital controller. Configuration is menu-driven via the keypad. For fast and easy configuration, the PC Tool is recommended.

Controller solution
Controller unit placed in an enclosure ready to be connected to a power source. A separate UPS for the controller is available.

Warning module (wire break monitoring module)
The warning module is used for monitoring the circuiting to the warning/alarm devices on a centrally controlled gas detection system. Wire breaks or wire interruptions in the alarm device loop will be reported to the central control.

Controller expansion module
The gas detection Controller Expansion module is used for expansion of the cable coverage in terms of number of loops and the total wire length. Each Controller Unit can handle up to 7 Expansion modules allowing additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.

Service tool
For interface with units with no display (Basic, Basic+, Premium, Premium+). Acts as a portable display and can be connected to all Danfoss gas detection units. (Heavy Duty w. adapter).

PC tool
The PC tool is a menu-driven and standalone software used for easy addressing, parameter setting, calibration, and data logging of the Basic, Premium and Heavy Duty gas detection units, and the controller unit.

Calibration adapter
The calibration adapter is required for connecting the calibration gas container, via the flow regulator, to the sensor head on the gas detection units. (Two variants, One for Basic and Premium plastic head sensors; one for heavy duty and Premium remote metal head sensors.).

Buzzer & light - acoustic buzzer and optic led
Can be installed in Basic or Premium units providing a local alarm.

Air duct set
The air duct set is specially designed to capture the airflow in air ducts. It can be connected to the standard sensor heads, except from Heavy Duty gas detection units.

Seal cap
Airtight seal cap to protect the sensor head against premature exposure during installation. The seal cap is mounted on new sensors (complete units and replacement sensors) but is also available as an accessory.

Remote kit
Enabling installation of a sensor head in plastic housing 5m (16.4 ft.) from the unit. This means that the gas detection unit can be placed outside the room where the sensor is placed to detect hazardous gases, allowing reading of and interfacing with the unit without entering the dedicated space. Basic and Premium gas detection units.

Splash guard
To protect the sensor head against water exposure during wash-down cleaning and rinsing operations.

NPT adapter
The NPT adapter is a steel fitting for installation of remote sensors into NPT threads; it converts the standards M30 X 1.5 thread of the Stainless Steel remote sensor head into an External NPT ¾" thread for more convenient installation.

Gateway for controller
The gateway is an addition to the controller and used for communicating via Modbus TCP/IP.

ENGINEERING
TOMORROW

Danfoss gas detection unit
Type GD Heavy Duty

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Danfoss gas detection unit
Type GD Heavy Duty

The Heavy Duty gas detection units are used for monitoring and warning of hazardous Ammonia gas concentrations. They are intended for ATEX/ IECEx applications and consists of a robust flame-proof metal enclosure that can be kept closed after wiring, since programming (configuration) is performed by magnetic field to the display via a magnetic pen.Depending on the application, they are available with an electrochemical, a semiconductor or a Pellistor sensor covering a wide range of ppm.

The Heavy Duty gas detection units are intended as Stand-alone, or connected to a central system like Gas Detection Controller Unit, or a PLC.

As stand-alone the on-board relay can be used for activation of alarm devices, while the Analog or RS485 Modbus connection to a central system allows additional centralized monitoring and alarm activation.

The gas detection units come with a factory default, 2-step alarm set-up ready for use. The integrated software enables the user to configure two individual alarm ranges. Alarm 1, a pre-alarm indicating the gas level has passed a predefined threshold 1, and - if the gas level passes predefined threshold 2 - the final alarm 2.

Features

- Digital, factory configured and pre-calibrated gas detectors for plug-and-play installation (no adjustment required)
- Easy configuration via Display and Magnetic pen and intuitive user-interface; helps simplify operator handling and minimize risk of operational, settings and calibration errors
- Stand-alone (integrated relay) and/or flexible connection to central controller - by either Analog or RS485 open Modbus communications
- Wide selection of sensor types and detection ranges
- Display background color indicating alarm or communication fault by turning red
- Fieldbus wiring - connect and power up to 96 sensors, wire length max. 900 meters (2953 ft) per segment; controller expansion modules permits additional segments and alarm relays
- Automatic self-diagnostics to ensure correct communication and operation. On board fault relay.
- Sensor seal cap to prevent premature exposure during installation
- Digital user interface ensures high sensor accuracy
- Reduced risk of false alarms due to temperature compensated sensors
- Password protected alarm settings allowing authorized access only
- LCD display with status LED
- Magnetic pen/On-board acknowledge button to reset alarms and to verify that no gas leaks are present
- Service alerts on unit, controller or both, readable via service tool Display
- Quick and precise calibration procedures - either by Plug & Play replacement sensors or calibration with gas.
- No potentiometers or multi-meters required
- For improved safety and to optimize the lifetime of the sensor, degenerated sensors with too low sensitivity (<30%) are rejected during calibration process.
- Conformity to Ex d EN60079-0, -1, Ex d IEC 60079-0, -1, EN 50402, EN 61508-1, -2, -3, EN 50271
- Certificate BVS 15 ATEX E 129 X, IECEx 16.0038 X
- Enables regulatory compliance with EN 378:2016, ISO 5149:2014, IIAR 2-2017, and ASHRAE 15:2016

Working principle/Operation

One sensor is connected to the Heavy Duty sensor board via local bus. The Sensor board provides the power supply of the sensor and prepares the measured data for digital communication.

The operation menu of the Heavy Duty software is accessed through the Display via a Magnetic pen, or the connected Gas Detection Controller, or via the dedicated GD Service tool (or PC tool). The Service tool (or PC tool) is plugged directly to the board of the unit by use of an adapter. These interfaces allow the unit configuration, setting of the unit alarm levels and calibration of the attached sensor.

The service tool (or PC tool) can be used on all units across the Basic, Premium and Heavy Duty platforms.

For Stand-alone units the alarm signals are handled by the unit software, which activates the integrated relay directly. For central controlled units the alarm signals are handled by the Gas Detection Controller (or a PLC) via the 4-20 mA (2-10V) analog output or the RS485 open Modbus communication.

For additional operational safety the changing of parameters is password protected allowing authorized access only. The factory default password can easily be customized.

Service and maintenance

The Heavy Duty gas detection units are calibrated either by replacing of sensor heads or by calibration with gas.

Plug & Play replacement sensors are pre-calibrated and factory certified for quick and easy calibration procedure. The sensor is connected to the local bus via a plug connection enabling easy and simple exchange of sensor instead of a calibration. The internal X-change routine recognizes the exchanged sensor during the exchange process and restarts the measurement mode automatically. An LED indicates the correct procedure of the exchange operation.

To ensure the proper functioning of the units and to prevent human errors, the sensor head can only be replaced by the same type and ppm range (exact replacement) that match the configuration. If a different sensor head is installed, the GD unit will show a communication error.

As an alternative, calibration with gas can be performed via the service tool (or PC tool), calibration gas with correct concentration and the Danfoss calibration adapter. The Danfoss gas detection units have an integrated, digital calibration interface and procedure, which makes the calibration process easy, accurate, and time-saving. No potentiometers or multi-meters required for the calibration. The calibration procedure requires significantly less calibration gas per calibration compared to traditional routines.

Specifications

Electrical

Power supply	16 – 28 V DC
Power consumption (24 V DC)	90 mA, max. 130 mA
Control unit	Microprocessor with 12 bit converter resolution
Digital filter	Averaging in order to increase the EMC immunity
Visual indications	2 LEDs for operation, alarm and communication
Analog output signal (active)	Proportional, overload and short-circuit proof, load ≤ 500 Ω 4 – 20 mA = measuring range 3.0 < 4 mA = underrange > 20 – 21.2 mA = overrange 2 mA = fault > 21.8 mA = fault High
Serial interface	Serial data bus
Fault relay	Max. 30 V AC/DC, 1 A
Alarm relay	Max. 30 V AC/DC, 1 A
LCD	2 x 16 characters, 3 status LEDs, 4 menu operating elements

Sensor data

Gas type	**Flammable gases**	**Toxic gases**	**HCFC, HFC, HFO**
Sensor element	Pellistor	Electro Chemical	Semiconductor
Measuring range	0 - 100 % LEL	0 - 1000 ppm / 0 - 5000 ppm	0 - 10000 ppm
Response time	t_{90} < 20 sec. NH_3	t_{90} < 40 sec. for NH_3	t_{90} > 120 sec. for NH_3

Sensor head housing

Material	CrNi Stahl: 1.4404
Dimensions (d x H)	30 x 56 mm (1.18 x 2.20 in.)
Protection class	Gas inlet IP64, with option splash-proof IP65
Thread	External thread M30 x 1.5

Environmental conditions

Humidity	15 to 90% r.H.
Operating temperature	P: -25 °C to +60 °C / EC: -25 °C to +50 °C / SC: -10 °C to +50 °C

Physical characteristics

Case / colour	Aluminium pressure die-casting / light grey RAL 7032, epoxy coating
Dimensions (d x H)	95 x 82 mm
Weight	Ca. 1.3 kg
Protection class	Housing protection IP66 to IP68 (depending on the cable glands used)
Mounting	Wall mounting (sensor head downwards)
Cable entry	1 x ¾ in. (Ansi B1.20.1)
Wire connection	Spring-type terminal, 0.08 to 2.5 mm^2 AWG 28 - 12
Wire length	Max. load 500 Ω (= wire resistance + controller input resistance)

ATEX marking

Ex II2G Ex d IIC T4 Gb, CE 0158

Options:

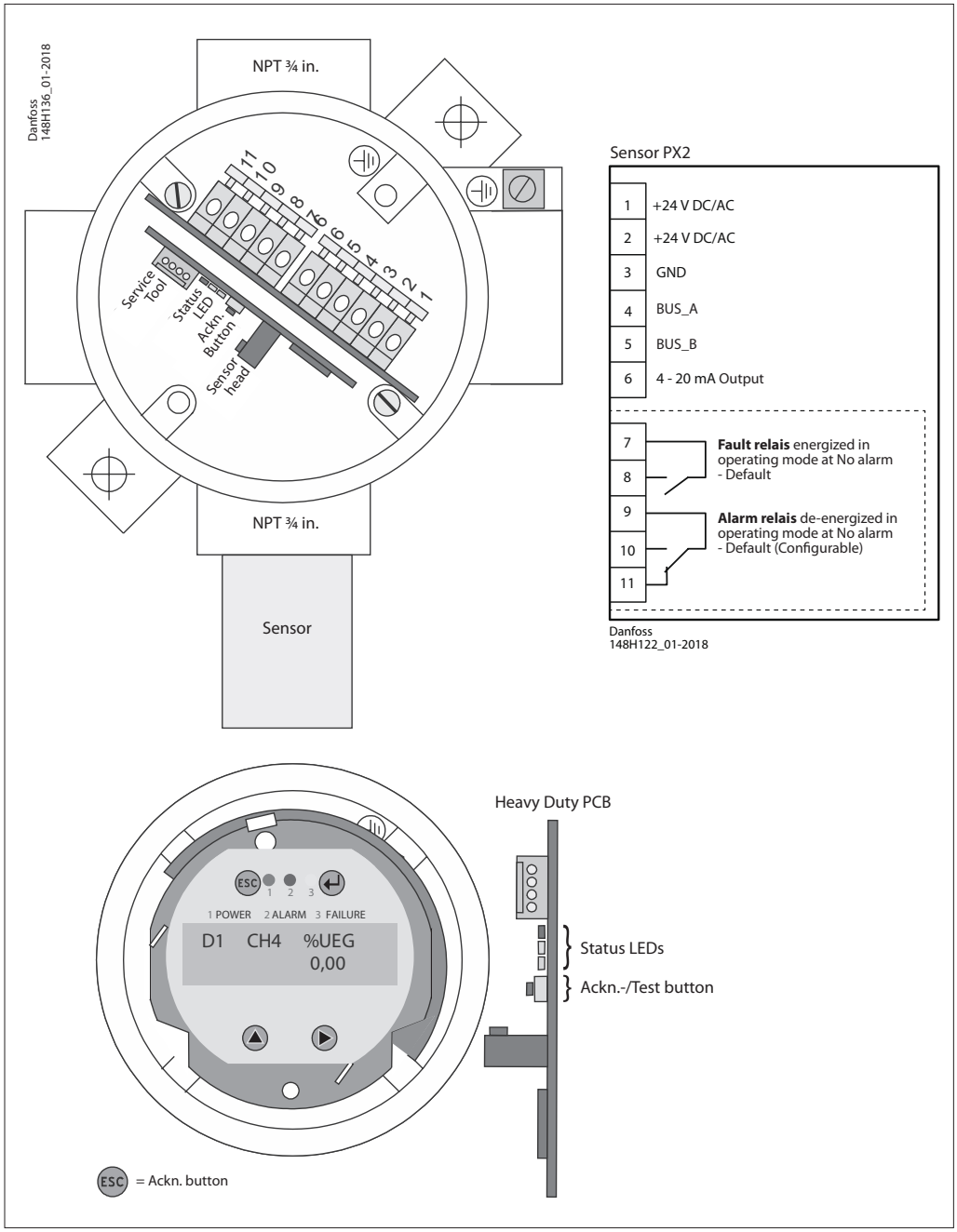
LCD display

LCD	Two lines, 16 characters each, background highlighted in two colours
Operation	Menu driven via four magnetic buttons
Power consumption	5 V, 60 mA, 0.3 VA

Status LED

Colour / Mode	Red / yellow / green (alarm – fault – operation - service)
Protection class	IP 65

Electrical connection



On board LED is similar to the display LED:
Green (1) is power on
- Flashing if maintenance needed

Yellow (2) is an indicator of Error.
- when the sensor head is disconnected or not the expected type
- AO is activated but nothing connected

Red (3) on alarm

On board Ackn. -/Test button:
Test: The button must be pressed for 20 sec.
- Alarm is simulated, stop on release

Ackn.: Pressed while Alarm2, the audible warning switches off and goes back on after 5 min. when the alarm situation is still active (also possible over ESC button (use the magnetic pen).

Fieldbus loop

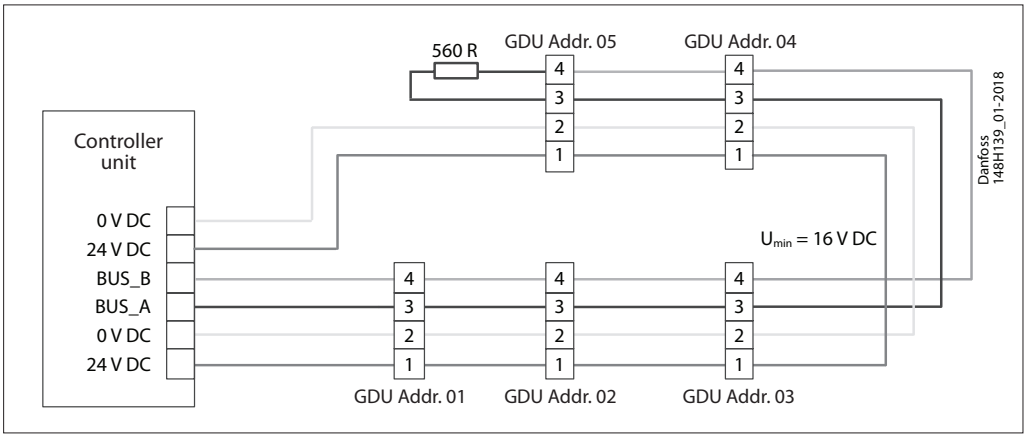
Each GD controller can handle up to 96 sensors and handle any mix of individual Gas detection units of the types Basic, Premium and Heavy Duty.

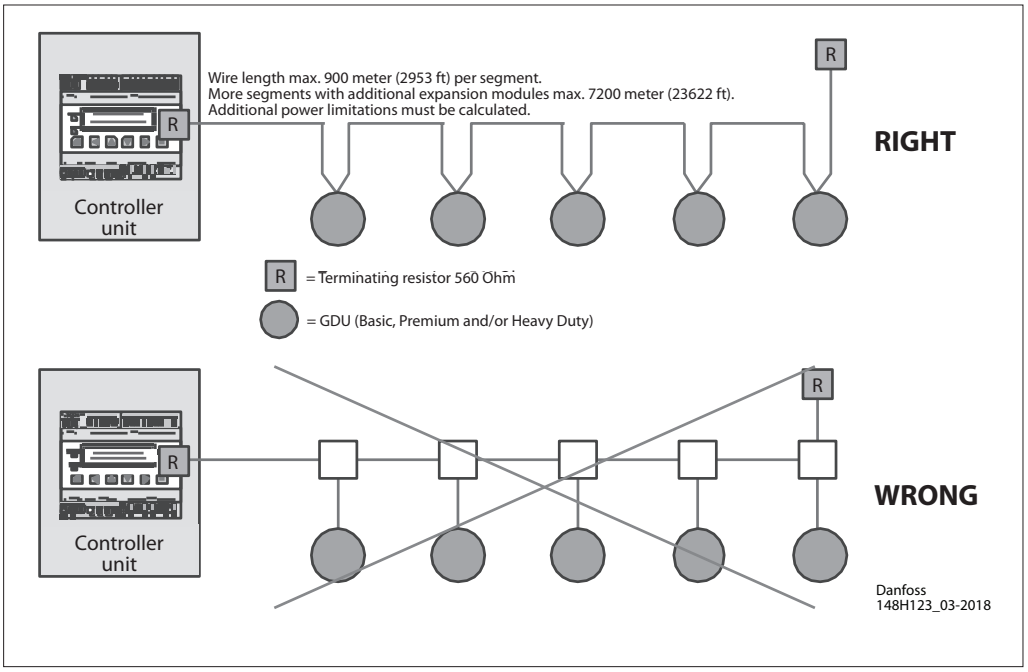
The max. recommended loop wire length is 900 meter (2953 ft) per segment.

With additional segments (and additional controller expansion modules) the max recommended loop wire length is 7200 meter (23622 ft).

The controller and the last GDU in each segment must be provided with a resistor of 560 Ohm. A Umin of 16 V DC must be secured at any spot in the loop.

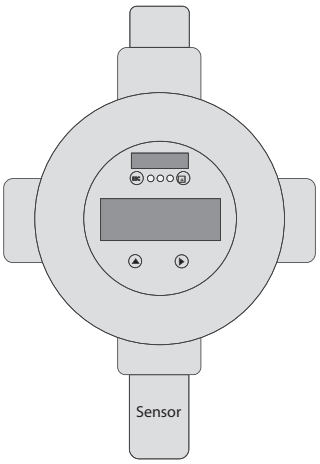
Below figure shows how to make proper connections between the controller and each GDU.





General info

- Cable gland mounted
- Sensor head (SX1) mounted bottom



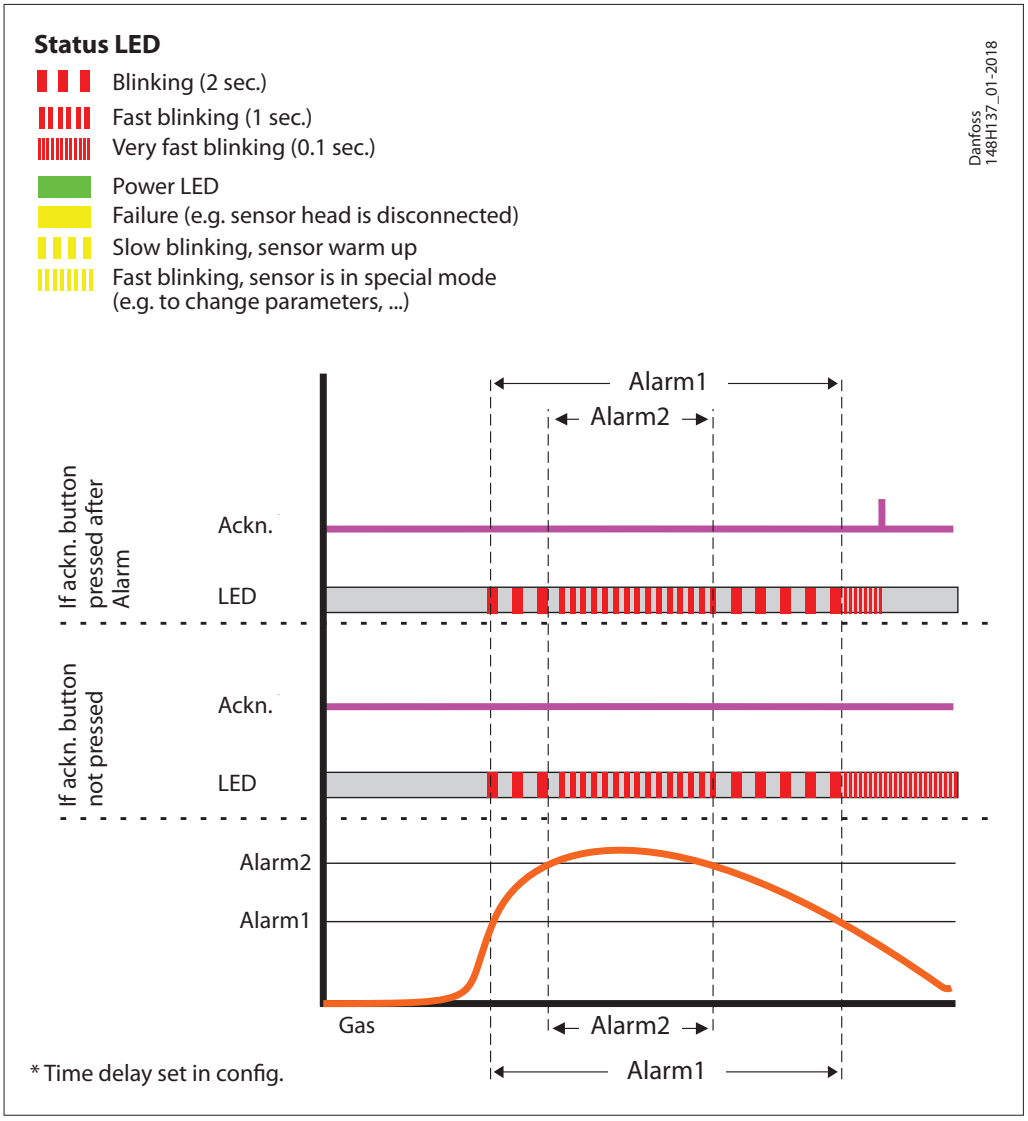
Heavy Duty

Gas types and thresholds

Sensor	Sensor Type	ppm range	Alarm 1	Alarm 2	Hysteresis
Ammonia EC 1000	Electrochemical	0-1000	500 ppm	900 ppm	25 ppm
Ammonia EC 5000	Electrochemical	0-5000	1000 ppm	4500 ppm	50 ppm
Ammonia SC 10000	Semiconductor	0-10000	5000 ppm	9000 ppm	250 ppm
Ammonia P LEL	Pellistor	0-140000 (0-100% LEL)	21% LEL (30000 ppm)	21% LEL (30000 ppm)	1% LEL

Hysteresis = 5% of Alarm1 (rounded up to the next higher integer)
Alarm thresholds can have the same value, therefore the relays and LED can be triggered together.

Alarm scheme



Ordering

Type	Model	Refrigerant	Sensor	ppm	Alarm ppm	Temp. Range [°C]	Temp. Range [°F]	Code number
GDA	Heavy Duty	Ammonia	Electrochemical	0-1000	500/900	-25 to +50	-13 to 122	**148H6022**
	Heavy Duty	Ammonia	Electrochemical	0-5000	1000/4500	-25 to +50	-13 to 122	**148H6031**
	Heavy Duty	Ammonia	Semiconductor	0-10000	5000/9000	-10 to +50	14 to 122	**148H6035**
	Heavy Duty	Ammonia	Pellistor	0-140000	30000	-25 to +60	-13 to 140	**148H6039**

Spare parts and accessories

Description	Code number
Replacement sensor - Heavy Duty Ammonia EC 1000	**148H6217**
Replacement sensor - Heavy Duty Ammonia EC 5000	**148H6218**
Replacement sensor - Heavy Duty Ammonia SC 10000	**148H6219**
Replacement sensor - Heavy Duty Ammonia P LEL	**148H6220**
Controller unit	**148H6231**
Controller solution (controller + enclosure)	**148H6221**
Controller solution Uptime	**148H6237**
Warning module (wire break monitoring module)	**148H6223**
Controller expansion module	**148H6222**
Service tool	**148H6224**
PC Tool	**148H6235**
Calibration adapter Heavy duty	**148H6233**
Gateway for controller	**148H6228**
Magnetic pen	**148H6229**

Accessories overview

Controller unit
Used for a centralized monitoring and warning. The input signals for the controller are collected via RS485 Modbus or analog communication. The controller can handle up to 96 digital sensors via Fieldbus and four (4) analog input. An additional 28 analog input is possible using seven (7) expansion modules (4-20 mA signal interface). The total number of connected sensors should not exceed 128 sensors. The controller unit can be employed as pure analog controller, as analog/digital, or as digital controller. Configuration is menu-driven via the keypad. For fast and easy configuration, the PC Tool is recommended.

Controller solution
Controller unit placed in an enclosure ready to be connected to a power source. A separate UPS for the controller is available.

Warning module (wire break monitoring module)
The warning module is used for monitoring the circuiting to the warning/alarm devices on a centrally controlled gas detection system. Wire breaks or wire interruptions in the alarm device loop will be reported to the central control.

Controller expansion module
The gas detection Controller Expansion module is used for expansion of the cable coverage in terms of number of loops and the total wire length. Each Controller Unit can handle up to 7 Expansion modules allowing additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.

Service tool
For interface with units with no display (Basic, Basic+, Premium, Premium+). Acts as a portable display and can be connected to all Danfoss gas detection units. (Heavy Duty w. adapter).

PC tool
The PC tool is a menu-driven and standalone software used for easy addressing, parameter setting, calibration, and data logging of the Basic, Premium and Heavy Duty gas detection units, and the controller unit.

Calibration adapter
The calibration adapter is required for connecting the calibration gas container, via the flow regulator, to the sensor head on the gas detection units. (Two variants, One for Basic and Premium plastic head sensors; one for heavy duty and Premium remote metal head sensors.).

Gateway for controller
The gateway is an addition to the controller and used for communicating via Modbus TCP/IP.

Magnetic pen
The pen is used to operate the Heavy Duty unit display. The Heavy Duty enclosure does not permit direct touch.

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Danfoss gas detection
Controller unit

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Danfoss gas detection
Controller unit

The gas detection Controller Unit is used for a centralized monitoring and warning of hazardous gas concentrations. The input signals for the controller are collected from the local gas detection units of the types Basic, Premium and Heavy Duty via RS485 Fieldbus or Analog communication. In total 96 gas detection sensors can be handled via Fieldbus + 4 via Analog directly on the controller (+28 additional possible if expansion modules added).

The Controller Unit comes with 4 alarm relays available for external looped alarm devices. Additional relays and sensor wiring loops is possible by adding Expansion modules to the controller.

Each local gas detection unit is assigned a unique address in the Controller and by continuous communication with the individual GDU's the Controller reacts on alarm signals from the local GDU. The parameter setting and the actual state of each local GDU can be read in the Controller display.

Features

- For connection of up to 96 sensors via fieldbus + 32 via Analog"(when 7 expansion modules added)
- Easy configuration via intuitive user-interface; helps simplify operator handling and minimize risk of operational setting errors
- Simple commissioning by standard parameter configuration
- Flexible connection to local gas detection units by either Analog or RS485 fieldbus communications
- Fieldbus wiring: Wire length up to 900 meters (2953 ft.) per segment.
- 4 relays for external alarm device circuits
- Up to 7 Expansion modules possible; allows additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.
- Automatic self-diagnostics to ensure correct communication and operation
- Relay for communication error
- 6 menu languages
- Password protected settings allowing authorized access only
- Service alerts on display
- Conformity to EN 50545-1
- Enables regulatory compliance with EN 378:2016, ISO 5149:2014,

Specifications

Electrical

Power supply	24 V DC ± 20 %
Power consumption (24 V DC)	4 W, 150 mA
Analog input (4)	4 to 20 mA, overload and short-circuit- protected, input resistance 200 Ω
Tension for external analog transmitter	24 V DC (same as power supply), max. 100 mA / per sensor
Analog output (2) configurable for each input	Proportional, overload and short-circuit- protected, charge ≤ 500 Ω 4 - 20 mA = measuring range 3.0 < 4 mA = underrange >20 – 21.2 mA = overrange 2.0 mA = fault
Alarm relay (4)	250 V AC, 5 A, potential-free, change-over (SPDT)
Fault relay (1)	250 V AC, 5 A, potential-free, normally open contact (SPST)

Visualization

LCD	Two lines, 16 characters each, illuminated
Status LED (4)	Operation – fault – 1st alarm – ≥ 2nd alarm
Operation	6 push-buttons
Menu language (selectable)	German, English, Dutch, USA, French, Swedish

Interface fieldbus

Transceiver	RS 485 / 19200 Baud

Gases

Digital and analog sensors for toxic, combustible & refrigerant gases

Environmental

Humidity	15 – 95 % RH non-condensing
Working temperature	-5 °C to +40 °C (23 °F to 104 °F)
Storage temperature	0 °C to +40 °C (32 °F to 104 °F)

Physical

Enclosure	Plastic housing ABS
Colour	RAL 7035
Protection class	IP 40
Weight	0.3 kg (0.8 lb.)
Packaging volumes	Ca. 4.4 l
Mounting	Top DIN rail mounting, installation in distribution box
Dimensions (Controller unit)	(W x H x D) 106 x 110 x 62 mm (4.2 x 4.3 x 2.4 in.)
Dimensions (Controller Solution)	(W x H x D) 298 x 420 x 140 mm (11.7 x 16.5 x 5.5 in.)
Wire connection: Power supply ..... Output ..... Input	 Screw type terminal: 2.5 mm² (14 AWG) 2 x spring type terminal: min. 0.5 mm², max. 1.5 mm² (22 to 16 AWG) Spring type: min. 0.5 mm², max. 1.5 mm² (22 to 16 AWG)

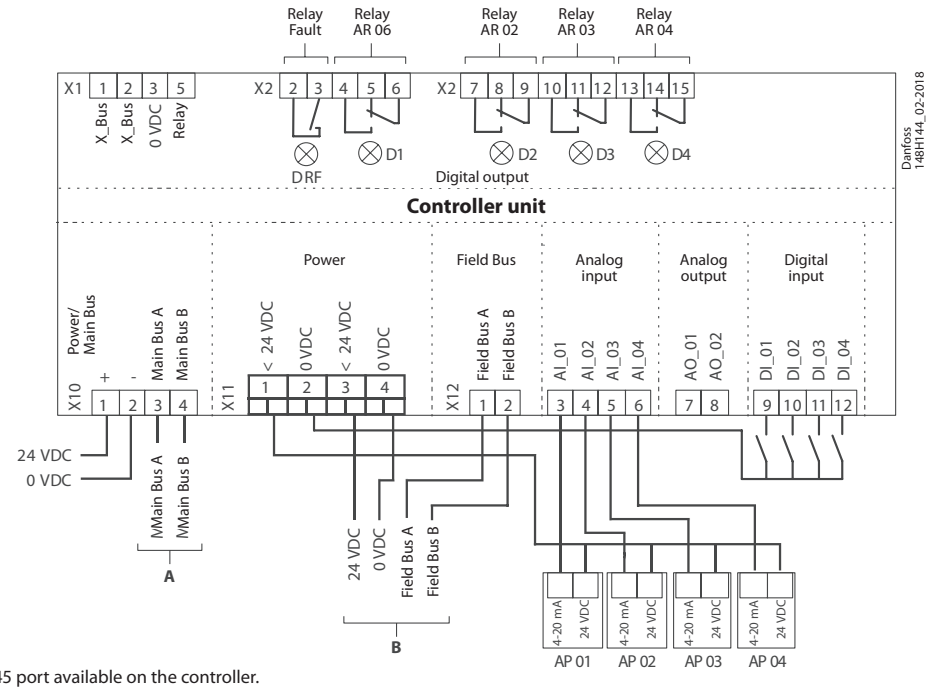
Guidelines

EMC – Directive 2014/30/EU
Low voltage directive 2014/35/EU
CE
EN 50545-1, EN 50271

Interface ModBus RTU RS 485

Function	Transmission of current and average values, alarm and relay status, and analog output states in MODBus RTU RS 485 protocol to external devices

Electrical connection



RJ45 port available on the controller.

Fieldbus loop

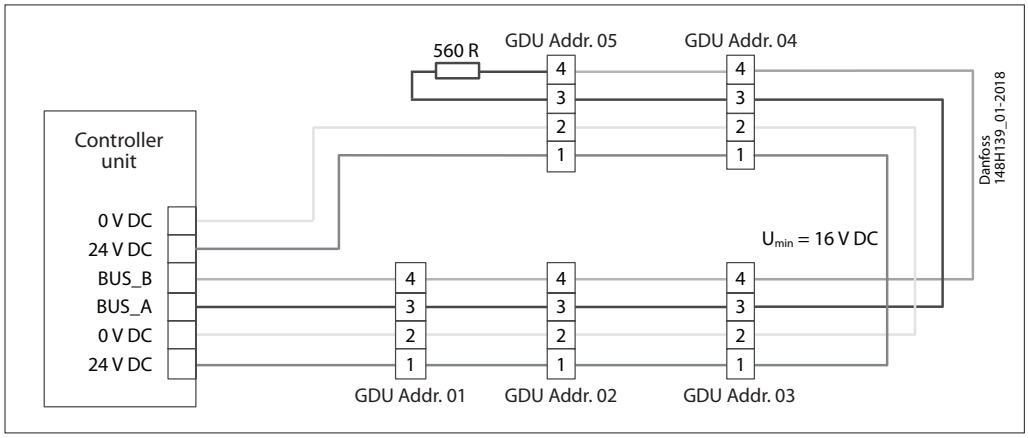
Each GD controller can handle up to 96 sensors and handle any mix of individual Gas detection units of the types Basic, Premium and Heavy Duty.

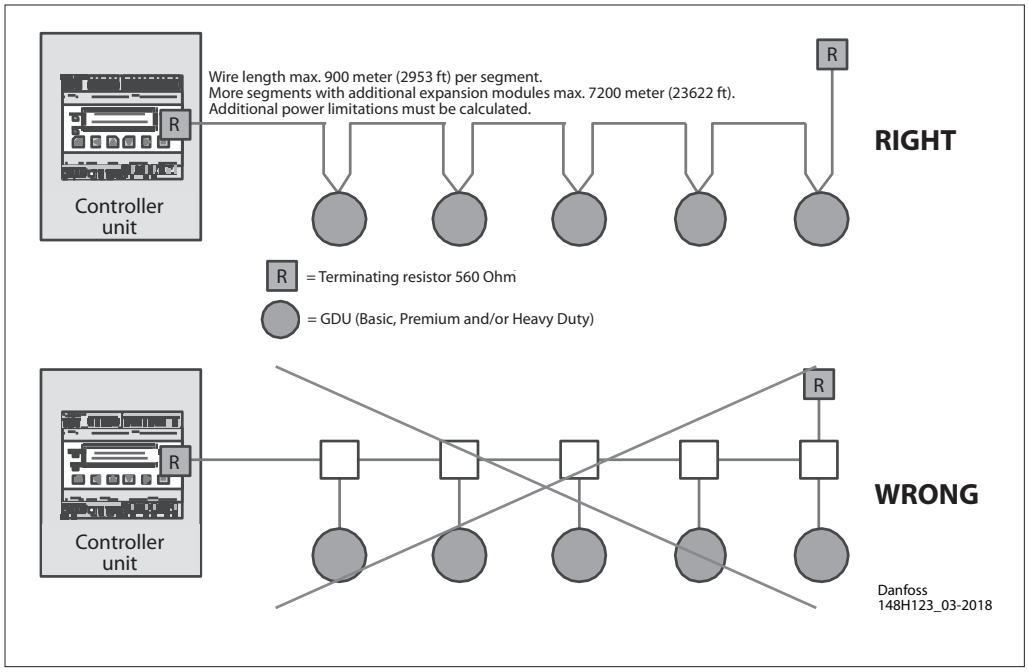
The max. recommended loop wire length is 900 meter (2953 ft) per segment.

With additional segments (and additional controller expansion modules) the max recommended loop wire length is 7200 meter (23622 ft).

The controller and the last GDU in each segment must be provided with a resistor of 560 Ohm. A Umin of 16 V DC must be secured at any spot in the loop.

Below figure shows how to make proper connections between the controller and each GDU.





Ordering

Description	Code number
Controller unit	**148H6231**
Controller solution (controller + enclosure)	**148H6221**
Controller solution Uptime	**148H6237**
Warning module (wire break monitoring module)	**148H6223**
Controller expansion module	**148H6222**
Gateway for controller	**148H6228**

Controller solution
Controller unit placed in an enclosure ready to be connected to a power source. A separate UPS for the controller is available.

Warning module (wire break monitoring module)
The warning module is used for monitoring the circuiting to the warning/alarm devices on a centrally controlled gas detection system. Wire breaks or wire interruptions in the alarm device loop will be reported to the central control.

Controller expansion module
The gas detection Controller Expansion module is used for expansion of the cable coverage in terms of number of loops and the total wire length. Each Controller Unit can handle up to 7 Expansion modules allowing additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.

Gateway for controller
The gateway is an addition to the controller and used for communicating via Modbus TCP/IP.

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Danfoss gas detection
Expansion module

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Danfoss gas detection
Expansion module

The gas detection Controller Expansion module is used for expansion of the cable coverage in terms of number of fieldbus loops and the total wire length. Each Controller Unit can handle up to 7 Expansion modules allowing 7 additional loops of 900 meters (2953 ft) length available for local Gas Detection Units. Communication between the Controller, the Expansion modules and the Gas Detection Units is done via Analog or RS485 fieldbus.

Additional 4 relays for external looped alarm devices is made available for each Expansion module.

Expansion modules can be installed close to the Controller (Controller Solution) or alternatively in the field.

Features

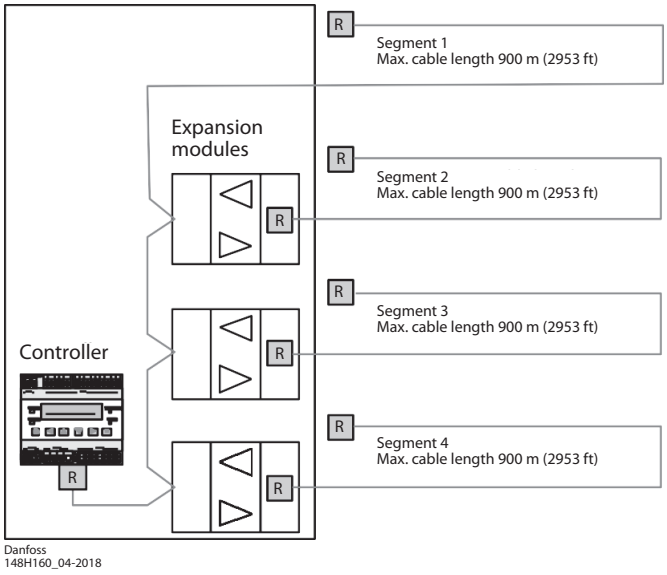
- For extension of the covered site area for gas detection sensors
- 4 relays for external alarm device circuits per Expansion module
- Up to 7 Expansion modules per Controller possible; allows additional 7 segments with a total of 7200 meters (23622 ft.) wiring and a total of 32 relays for alarm device circuits.
- Flexible connection to local gas detection units by either Analog or RS485 fieldbus communications
- Located in Controller Solution or in the field
- Easy configuration via intuitive user-interface; helps simplify operator handling and minimize risk of operational setting errors
- Simple commissioning by standard parameter configuration
- Enables regulatory compliance with EN 378:2016, ISO 5149:2014,

Installation/Connection

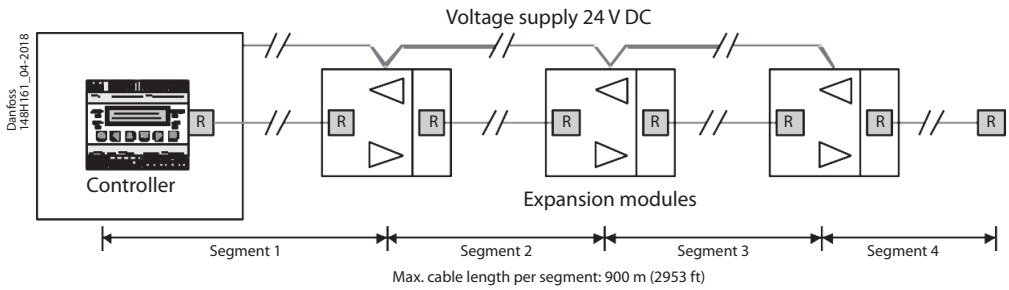
Expansion modules are installed close to the Controller (Controller Solution) or in the field. Examples shown below:

Each cable end must be applied a Resistor of 560 Ohm.

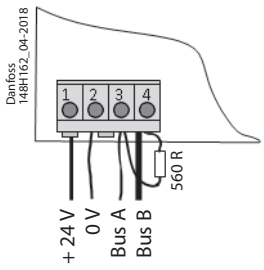
Expansion modules installation in Controller Solution. Resistor R (560 Ohm)



Expansion modules installation in the field. Resistor R (560 Ohm)



Each Cable end applied 560 Ohm



Specifications

Electrical

Power supply	24 V DC ± 20 %
Power consumption	3 W, 120 mA
Analog input (4)	4 to 20 mA, overload and short-circuit protected, input resistance 200 Ω
Tension for external analog transmitter	24 V DC (same as power supply), max. 100 mA / per sensor
Analog output (2) configurable for each input	Proportional, overload and short-circuit- protected, charge ≤ 500 Ω 4 - 20 mA = measuring range 3.0 < 4 mA = underrange > 20 – 21.2 mA = overrange 2.0 mA = fault
Alarm relay (4)	250 V AC, 5 A, potential-free, change-over (SPDT)

Interface fieldbus

Transceiver	RS 485 / 19200 Baud

Environmental

Humidity	15 – 95 % RH non-condensing
Working temperature	-10 °C to +40 °C (14 °F to 104 °F)
Storage temperature	0 °C to +40 °C (32 °F to 104 °F)

Physical

Enclosure	Plastic housing ABS
Colour	Black
Protection class	IP 40
Weight	0.2 kg (0.5 lb.)
Packaging volumes	Ca. 4.4 l
Mounting	Top hat DIN rail mounting
Dimensions	(W x H x D) 104 x 86 x 56 mm (4.1 x 3.4 x 2.2 in.)
Wire connection: Power supply Output Input	 Screw type terminal: 2.5 mm² (14 AWG) 2 x spring type terminal: min. 0.5 mm², max. 1.5 mm² (22 to 16 AWG) Spring type: min. 0.5 mm², max. 1.5 mm² (22 to 16 AWG)

Directives

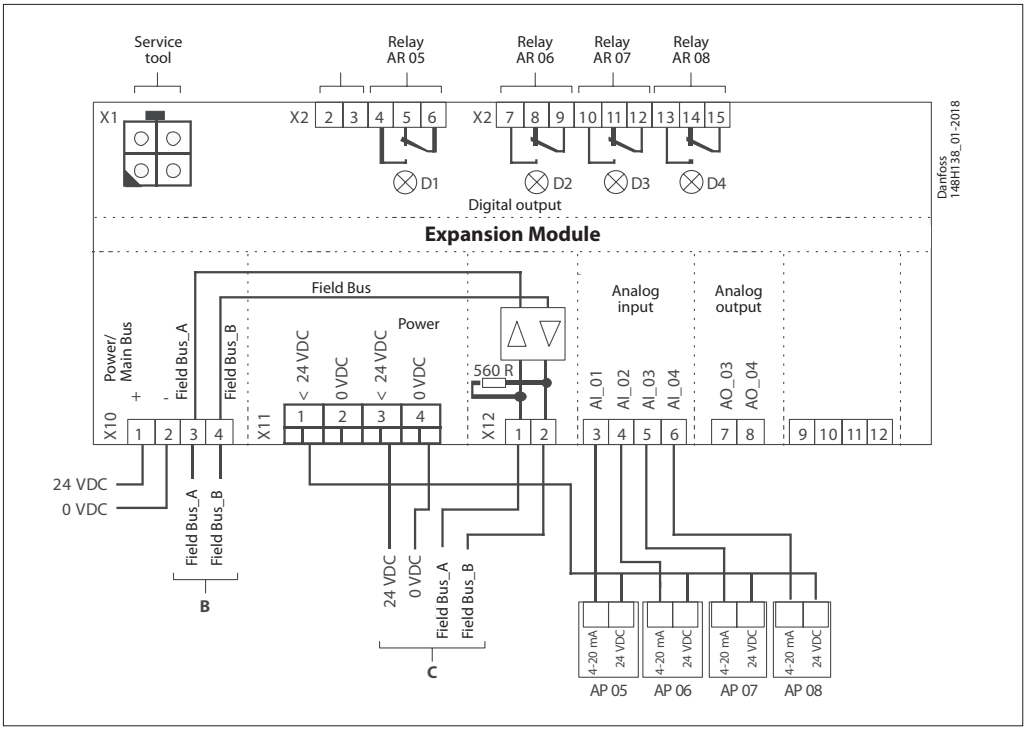
EMC Directive 2014/30/EU
Low voltage directive 2014/35/EU
Conformity to: EN 50 545-1, EN 50271, EN 61010-1:2010, ANSI/UL 61010-1, CAN/CSA-C22.2 No. 61010-1

Options - control of external warning devices

Power supply of the external warning devices	24 V DC
Measuring resistance at the warning device	12 kΩ, 0.5 W, 5 %

Note:
If expansion modules are distributed along the communication bus it is recommended that each be powered by a separate DC power supply with only the ground connected to the bus.

Wiring configuration



Ordering

Description	Code number
Expansion module	**148H6222**

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Danfoss gas detection
Warning module

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Danfoss gas detection
Warning module

The gas detection warning module is used for increasing safety of a centrally controlled gas detection system by managing the warning/alarm devices and continuous monitoring the circuiting to the warning/alarm devices. Potential wire breaks or wire interruptions in the alarm device loop will be detected immediately and reported to the central control.

Communication with the controller takes place via the RS 485 fieldbus interface.

Warning modules can be installed close to the Controller (Controller Solution) or alternatively in the field.

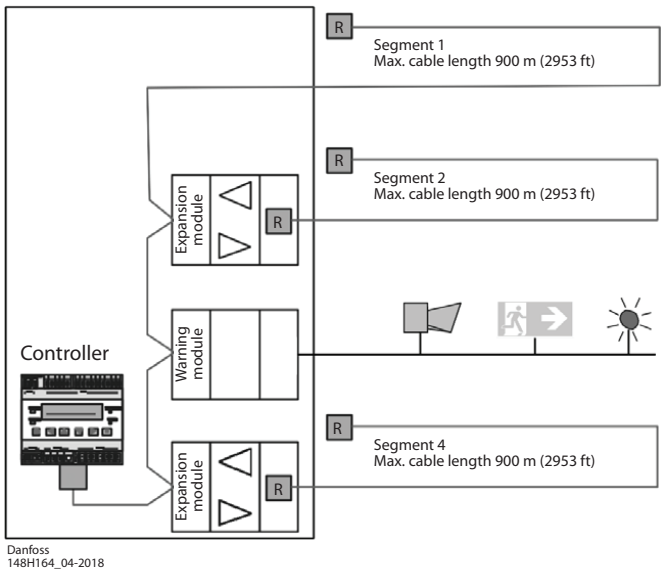
Features

- Testing of the warning/alarm device circuiting with intervals < 1 minute
- Flexible connection to local gas detection units by either Analog or RS485 fieldbus communications
- Located in Controller Solution or in the field
- Easy configuration via intuitive user-interface; helps simplify operator handling and minimize risk of operational setting errors
- Simple commissioning by standard parameter configuration
- Conformity to Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU, EN 50271 / IEC 615078, EN 61010-1, ANSI / UL 61010 1, CAN / CSA-C22.2 No. 61010-1

Installation/Connection

Expansion modules are installed close to the Controller (Controller Solution). See example below

Warning module installation in controller solution



Specifications

Electrical

Power supply	16 – 29 V DC, reverse-polarity protected
Power consumption (24 V DC) only MSB2 board	100 mA (2.4 VA)

Digital input

Signal input	Potential-free contact
Function	Acknowledge or test function

Analog output

Analog output signal	Proportional, overload and short-circuit proof, load ≤ 500 Ohm 4 - 20 mA = measuring range 3.0 < 4 mA = underrange >20 - 21.2 mA = overrange 2.0 mA = fault

Digital output

Alarm relays (2)	250 V AC, 5 A, potential-free, changeover contact (SPDT)

General

Temperature range	-10 °C to +50 °C (+14 °F to +122 °F)
Humidity range	15 - 95 % RH non-condensing
Storage temperature	-10 °C to +40 °C (+14 °F to +104 °F)
Storage time	6 months

Serial interface

Fieldbus	RS 485 / 19200 Baud
Tool bus	2-wire / 19200 Baud

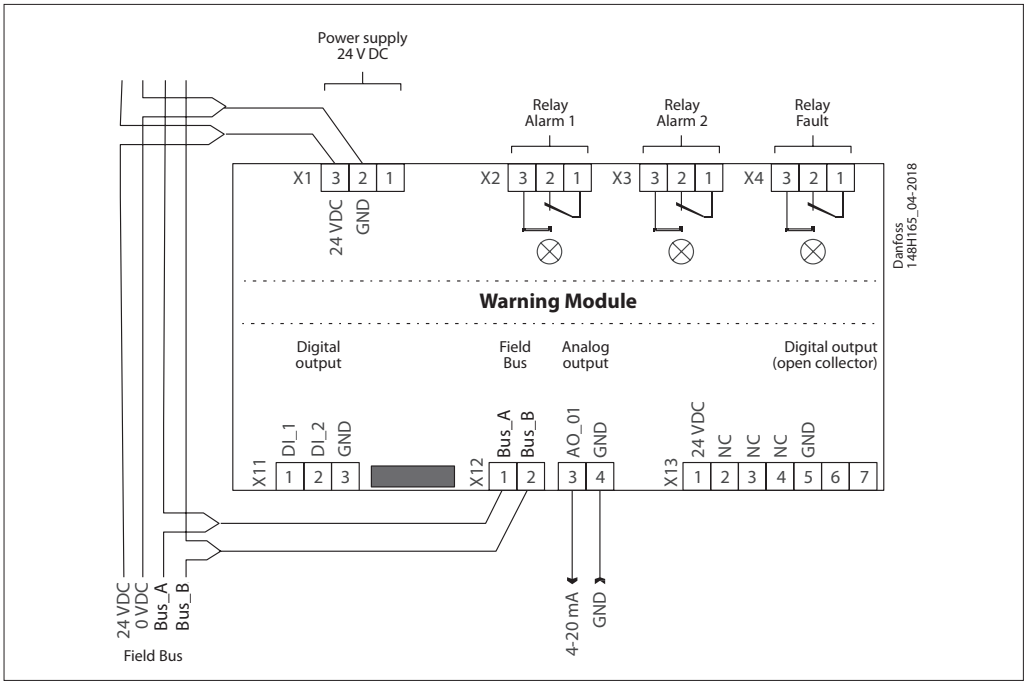
Physical

Protection class	IP 65
Wire connection: Fieldbus Digital input, analog output Power supply, relays	 Screw-type terminal min. 0.25 mm², max. 2.5 mm² Screw-type terminal min. 0.25 mm², max. 1.3 mm² Screw-type terminal min. 0.25 mm², max. 2.5 mm²

Standards & regulations

EMC Directive 2014/30/EU
Low voltage directive 2014/35/EU
Conformity to: EN 50271 / IEC 615078, EN 61010-1:2010, ANSI/UL 61010-1, CAN/CSA-C22.2 No. 61010-1E

Wiring configuration



Ordering

Description	Code number
Warning module	**148H6223**

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Danfoss gas detection
PC tool

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Danfoss gas detection
PC tool

The gas detection PC tool is a menu-driven and stand alone software used for easy Addressing, Parameter setting, Calibration and Data logging of the Basic, Premium and Heavy Duty gas detection units. Furthermore, it handles Parameter setting and Memory Read of the gas detection Controller including peripherals (Expansion module - Warning module). Power for this tool is provided from the PC via the standard USB connection.

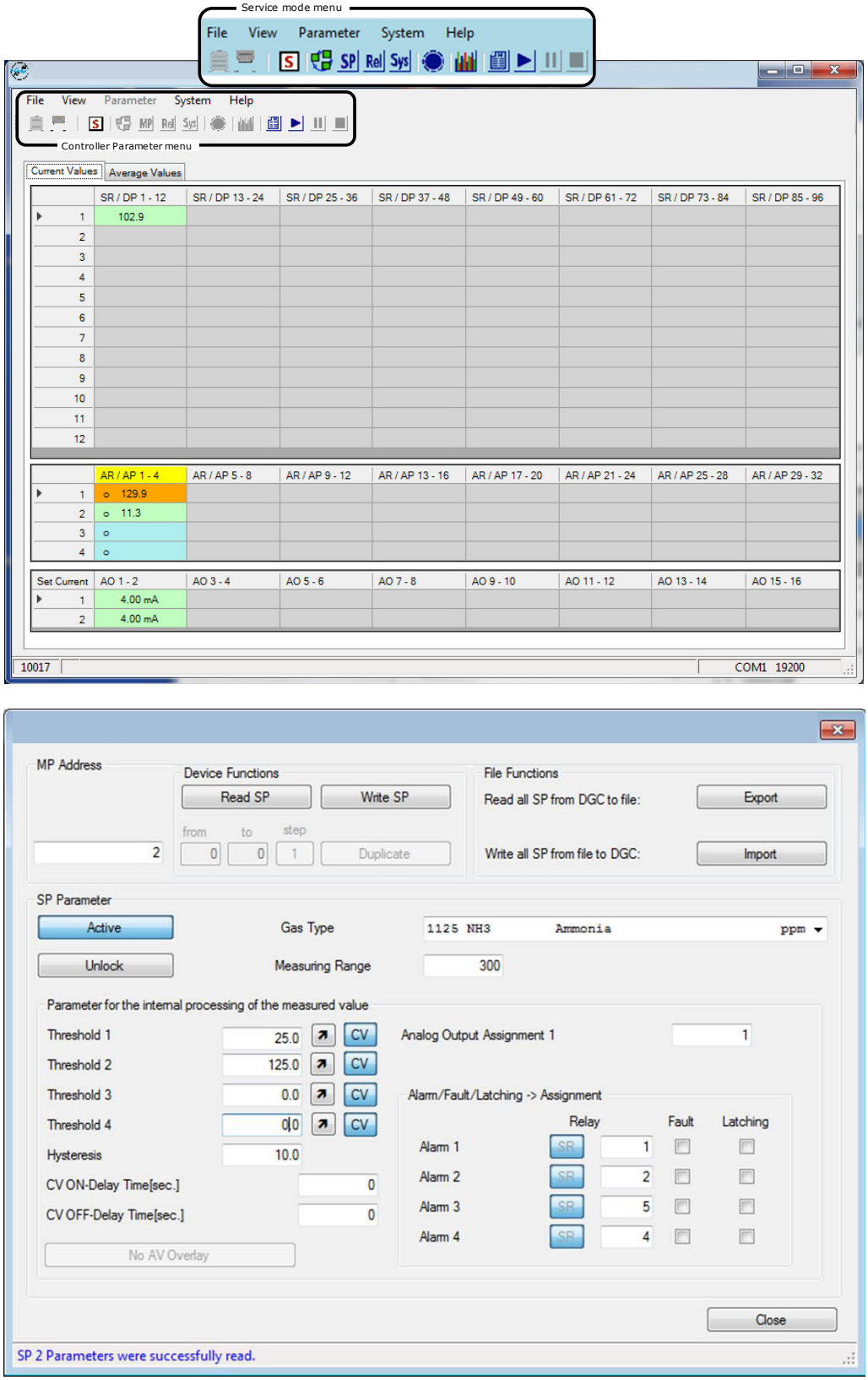
The USB connection to the PC and the plug connection to the service tool port in the device are galvanic isolated.

The tool is Plug and Play and installation is performed automatically.

Features

- Addressing, Calibration and Parameterization of all Danfoss gas detection units.
- Long-term recording on hard disk in .csv format
- Monitoring of all measuring values at a glance, live
- Handling and print of calibration report
- Password protected
- Runs on WINDOWS 7/8/10
- EMC directives 2014/30/EU, CE
- Conformity to:
  EN 61010-1:2010
  ANSI/UL 61010-1
  CAN/CSA-C22.2 No. 61010-1

Screen menu



Service mode parameter setting/reading.

Specifications

Electrical

Power supply	5 V DC from PC
Serial interface central bus	RS485 / 19200 Baud

Ambient conditions

Temperature range	-10 °C bis +40 °C (14 °F to 104 °F)
Humidity range	0 - 90 % RH not-condensing

Physical

Housing	Polycarbonate black
Dimensions	110 x 60 x 40 mm
Weight	Approx. 200 g
Protection class	IP 65
Cable length	1.50 m

Standards & regulations

EMC Directive 2014/30/EU
CE
Conformity to: EN 61010-1:2010, ANSI/UL 61010-1, CAN/CSA-C22.2 No. 61010-1

Ordering

Description	Code number
PC tool	**148H6235**