Danfoss AKS 4100-AKS 4100U Liquid Level Sensor Installation Guide

Contents

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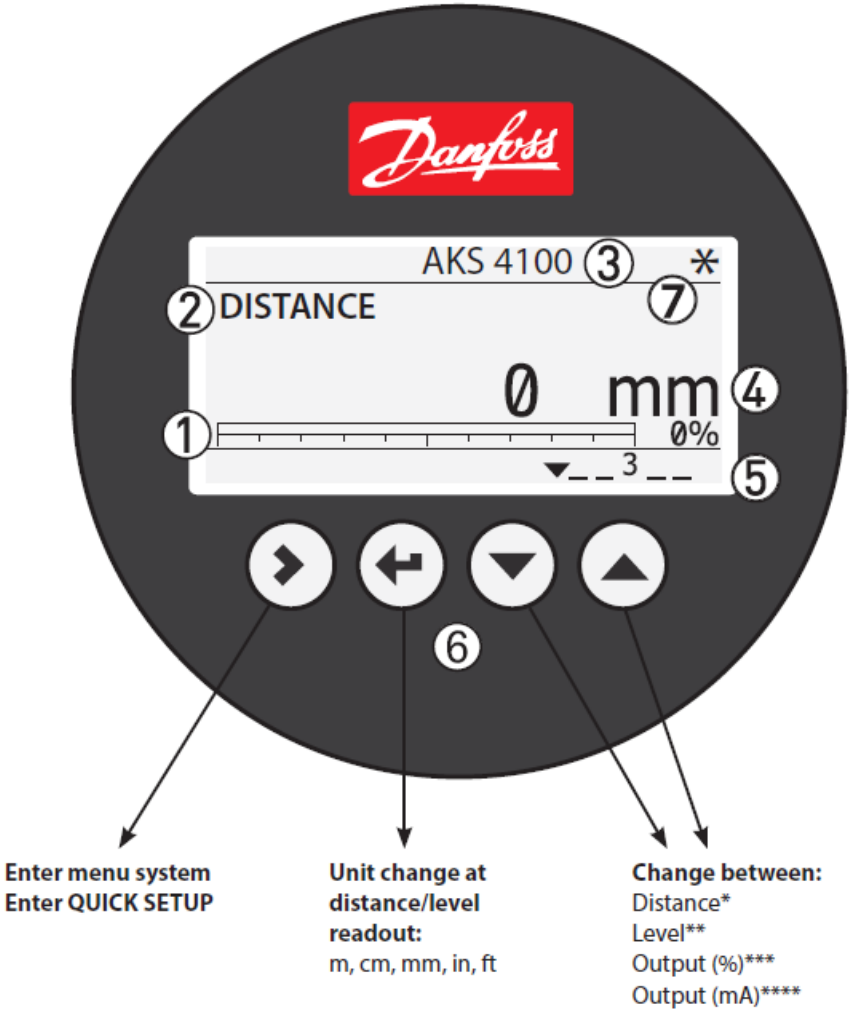
Installation guide

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 (Notication)
   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.

- 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 Figure 2).
- 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 2).
- 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 Figure 2).
- 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 . 2).



Please observe that AKS 4100/4100U is intended to always be installed in a standpipe (column/bypass/stilling well). A standpipe is commonly used when:

- Servicing the AKS 4100/4100U
- There is highly conductive foam in the tank.
- The liquid is very turbulent or agitated.
- AKS 4100/4100U Coaxial with or without HMI does not need any change of setting to operate.

Presetting:
4 mA : 230 mm / 9.1 in.
20 mA: 60 mm / 2.4 in.

Refrigerants

AKS 4100/4100U is designed to measure liquid level in R717(ammonia) applications.

Basic data

AKS 4100/4100U is a passive 2-wire 4 – 20 mA sensor that is loop powered. Supply Voltage 14 – 30 V DC min/max. value for a max. output of 22 mA at the terminal

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

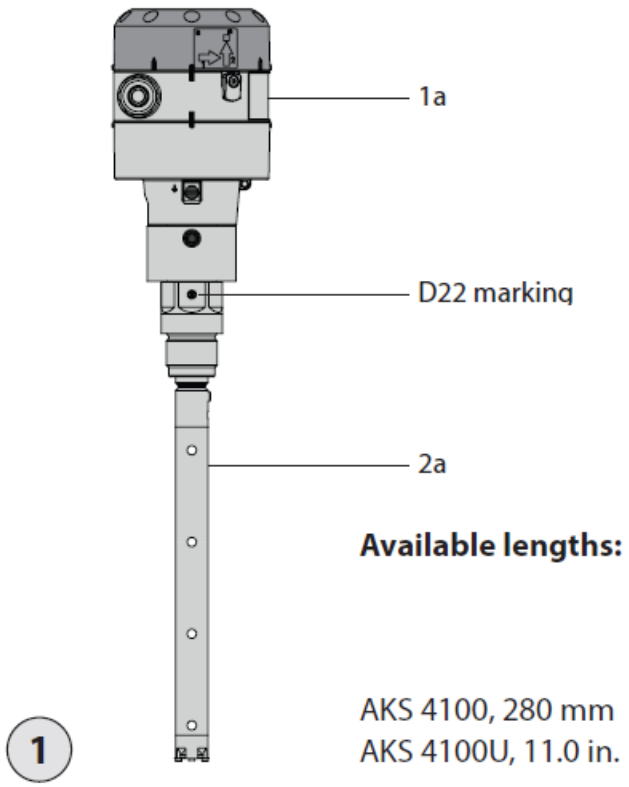
- **Cable gland**
  - AKS 4100 PG 13, M20×1.5 ; (cable diameter: 6-8 mm (0.24-0.31in.)
  - AKS 4100U ½ in. NPT
  - Terminals (spring loaded) 0.5-1.5 mm2 (~20-15 AWG)
- **Enclosure**
  - IP 67 (~NEMA type 4X)
  - Refrigerant temperature -60 – 100 °C / -76 – 212 °F
- **Refrigerants**
  - The listed refrigerants are qualified and approved by Danfoss: R717 / NH3: -40 – 50 °C / -40 – 122 °F
  - Ambient temperature -40 – 80 °C / -40 – 175 °F
  - For HMI : -20 – 60 °C / -4 – 140 °F
  - Process pressure -1 – 100 barg / -14.5 – 1450 psig
  - Mechanical process connection 280 mm / 11 in. . 8 mm / 0.3 in. inner rod.
  - AKS 4100 G1 inch pipe thread.
- **Aluminium gasket included**
  - AKS 4100U ¾ in. NPT

(Further details in the data sheet)

Mechanical Installation

Preparations prior to Mechanical Installation Disassemble the Signal Converter from the Mechanical process connection (use 5´mm hex key, see fig. 3). Fit the red protection cover on top of the Mechanical process connection to protect it againt any moisture or dirt paticles.

Content supplied (fig. 1)



1. Signal Converter (with or without HMI)
2. Mechanical process connection

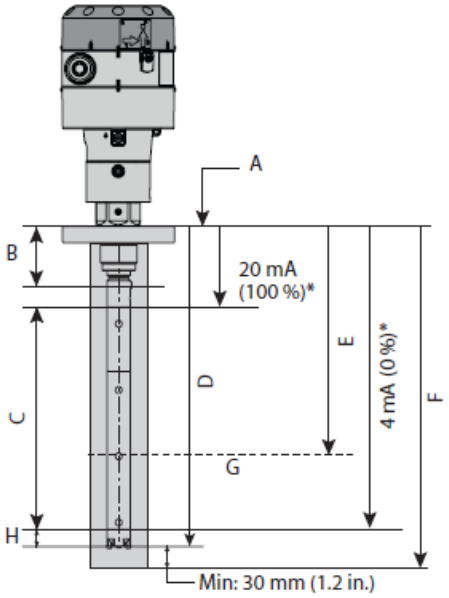
If factory setting needs adjustment Probe length, scale 4 mA and 20 mA for HMI Quick Setup.
Probe length: 280 mm / 11 in.

- Scale 4 mA: (for max. measuring range)
- Probe Length
- Bottom dead zone (see. 2)
- Scale 20 mA:(for max. measuring range:)
- Top dead zone (see 2) Example (AKS 4100)

Given conditions:
Probe length: 280 mm
Refrigerant: NH3, –10°C

The gas constant Er is always adjusted from the Quick Setup

- Probe length: = 280 mm
- SCALE 4 mA setting for max. measuring range:
- Probe length (280 mm)
- Bottom dead zone (**see fig . 2)** (40 mm) = 240 mm / 9.4 in.



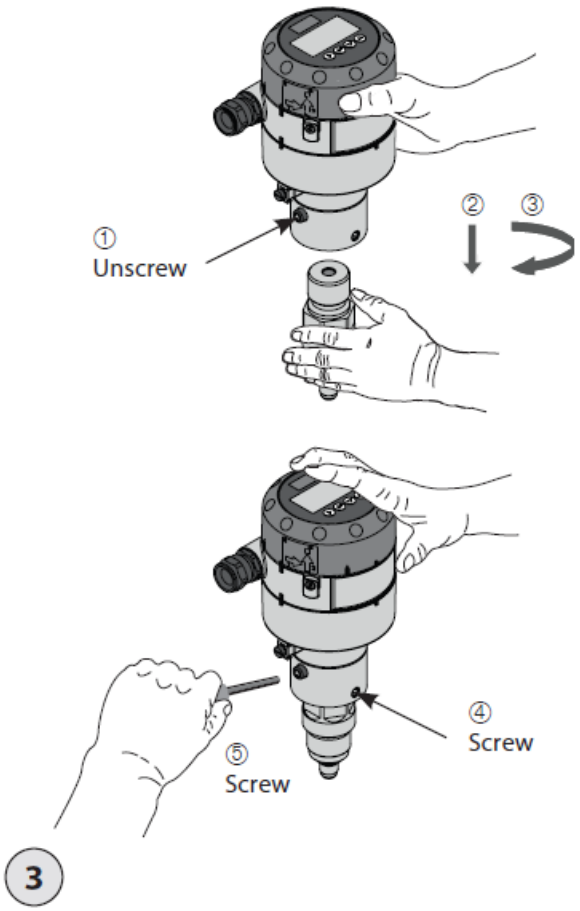
A	Reference point
B	Top dead zone
C	Measuring range
D	Probe length
E	Distance
F	Inner length of stand-pipe
G	Surface level
H	Buttom dead zone (see tables)

- SCALE 20 mA Setting for Max.
- Measuring range: = Top dead zone (see 2) = 60 mm / 2.4 in.

From page 6:
Dielectric constant of refrigerant gas parameter 2.5.3 GAS EPS.R = 1.02

How to mount the AKS 4100/4100U Converter (see fig 3)

1.



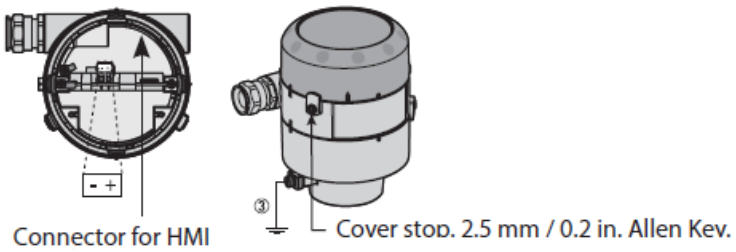
Unscrew the set and ventilation screws with a 5 mm Hexagon key in the Signal converter.

2. Push the Signal Converter downwards to stop on the Mechanical process connection
3. Turn the Signal Converter to the wanted position.
4. Screw the set screw with a 5 mm Hexagon key.
5. Screw the ventilation screw with a 5 mm Hexagon key.

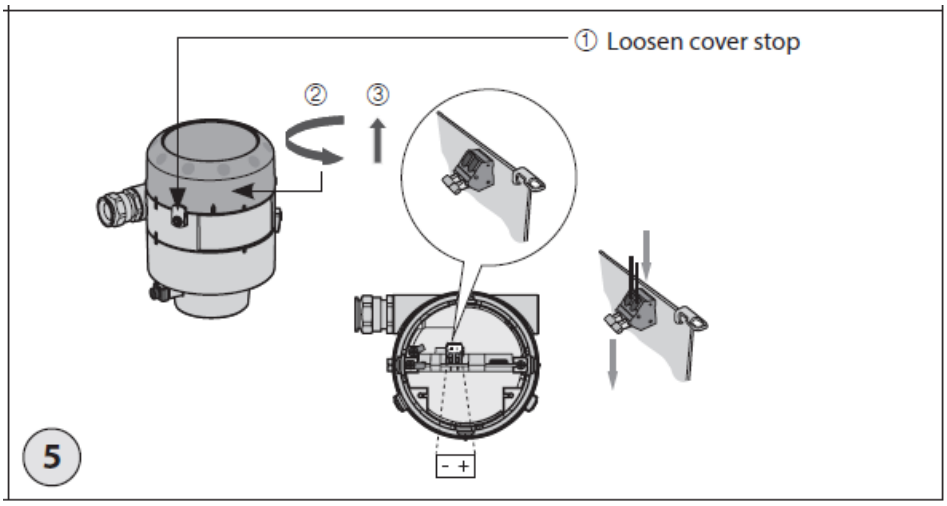
Electrical installation / connection

Output terminals (fig. 4 and 5)

1.



4



Current output –

2. Current output +
3. Grounding terminal

Electrical installation procedure

1. Use a 2.5 mm Allen wrench to loosen the cover stop.
2. Remove the terminal compartment cover from the housing.
3. Do not disconnect the wire from theterminal compartment cover.
   Put the terminal compartment cover adjacent to the housing.
4. Connect the wires to the device.
   Tighten the cable entry glands.
5. Attach the terminal compartment coverto the housing.
6. Use a 2.5 mm Allen wrench to tighten the cover stop.

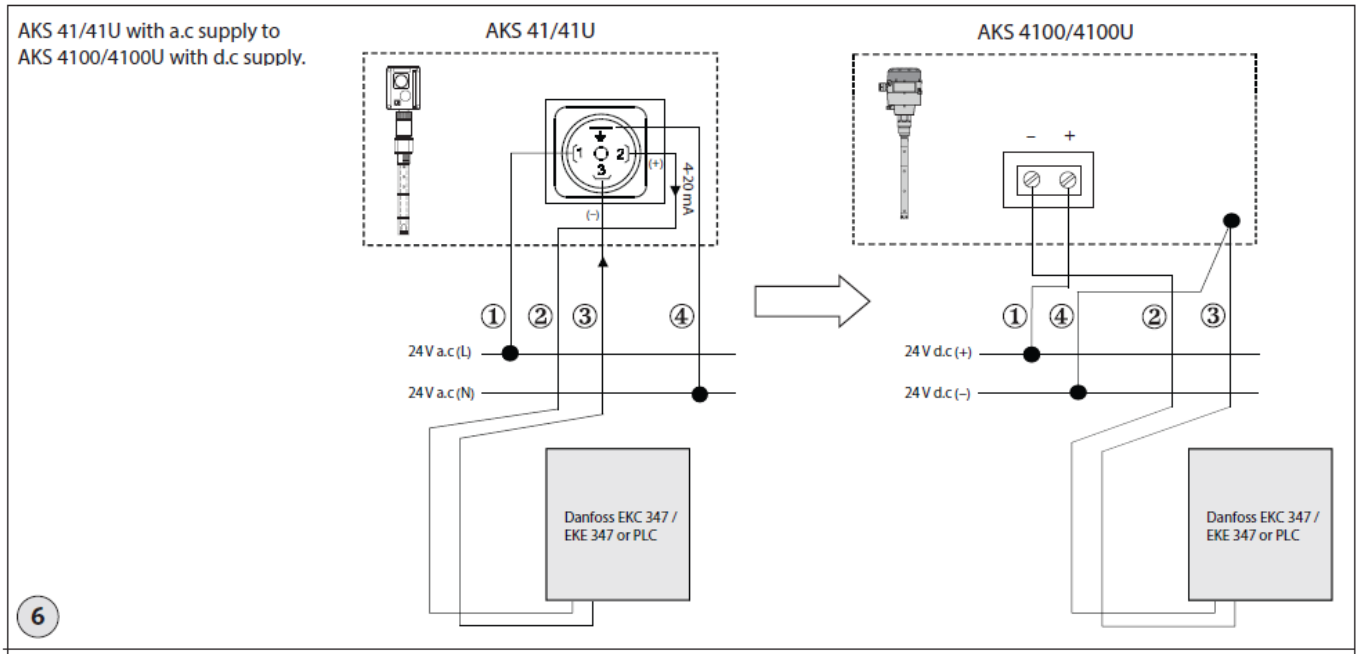
Note:
The signal converter can be programmed with or without mechanical process connector assembled.

Start up:

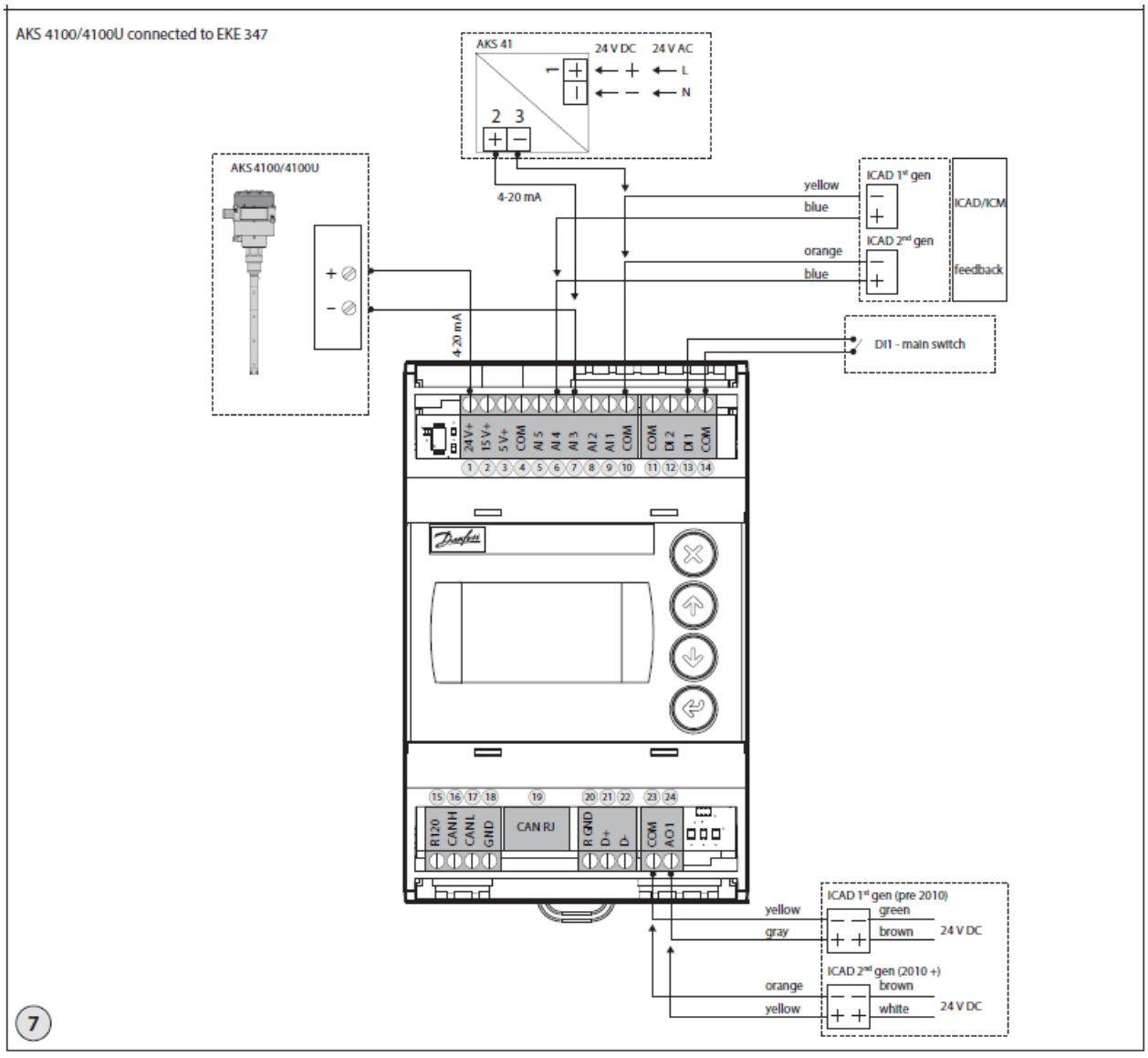
- Connect the converter to the power supply.
- Energize the converter.

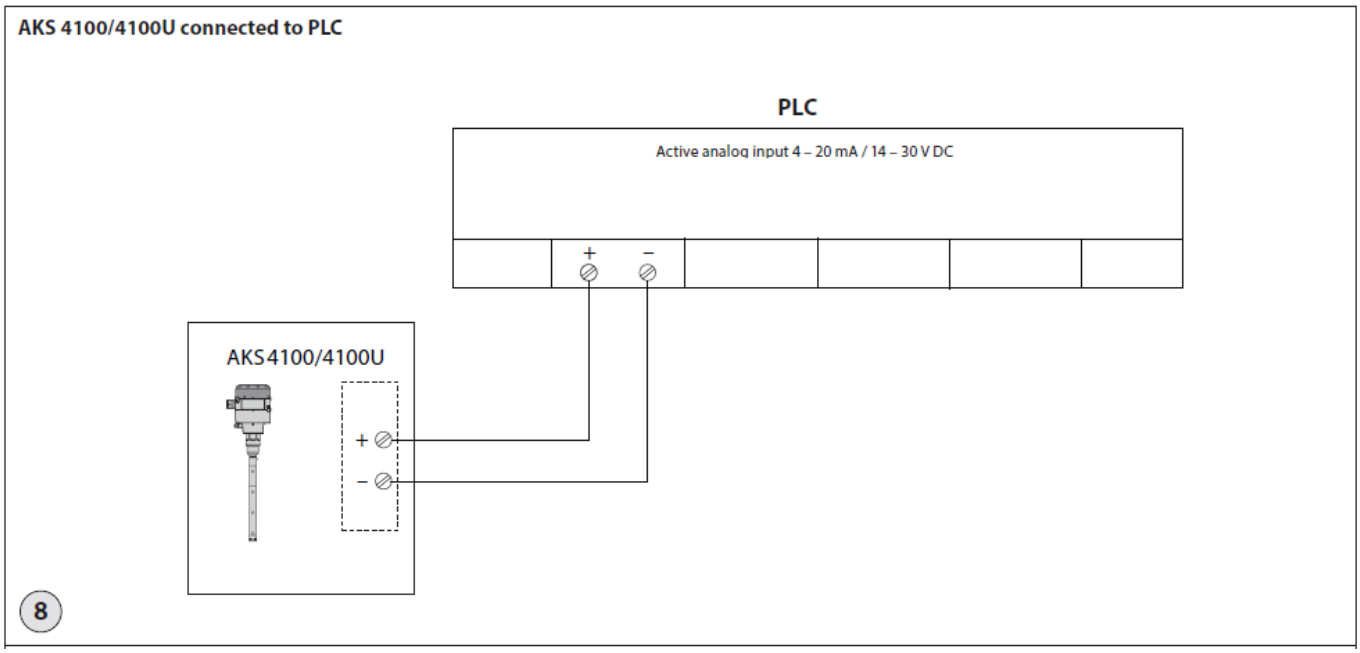
Devices with the HMI display option only: After 10 seconds the screen will display
“Starting up”. After 20 seconds the screen will display the software version numbers. After 30 seconds the default screen (fig. 9) will appear.
Precausions when changing from AKS 41/41U to the AKS 4100/4100U:

Please note:
The AKS 41/41U can be used with AC and
DC supply, but the AKS 4100/4100U can
only be used with a DC supply. Follow the instructions in fig. 6.



Connecting to controller or PLC
Follow the instructions in fig. 7 or 8.





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

Quick Setup (all values below are only examples)

When used in NH3

- 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 **COAXIAL D22** and press (↵) to confirm.

```
AKS 4100
LIQUID CO2 ?
YES                NO
```

- Press (▲) (NO) to confirm

```
AKS 4100
PROBE LENGTH
280 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
230 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
60 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. Count down from 8 sec.

```
AKS 4100
1.0.0
QUICK SETUP
```

- Press (↵) to confirm.

```
AKS 4100
1.0.0
STORE NO
```

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

Default screen appears:

```
AKS 4100
DISTANCE
250 mm
```

Quick Setup completed

How to force mA output (all values below are only examples)

Default screen

AKS 4100
DISTANCE
250 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:

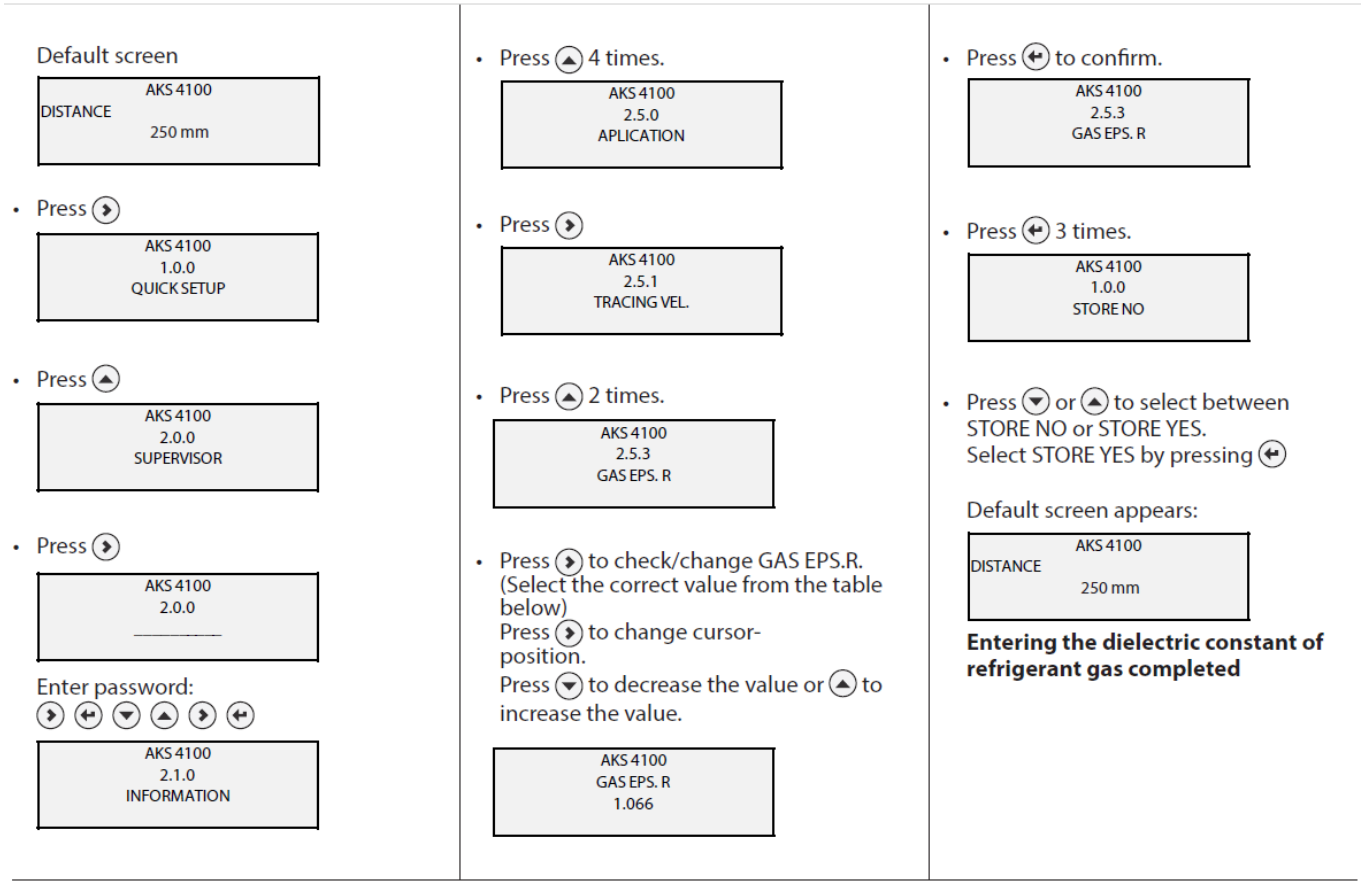
AKS 4100
DISTANCE
250 mm

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 fig. 2).

How to enter dielectric constant of refrigerant gas (all values below are only examples)

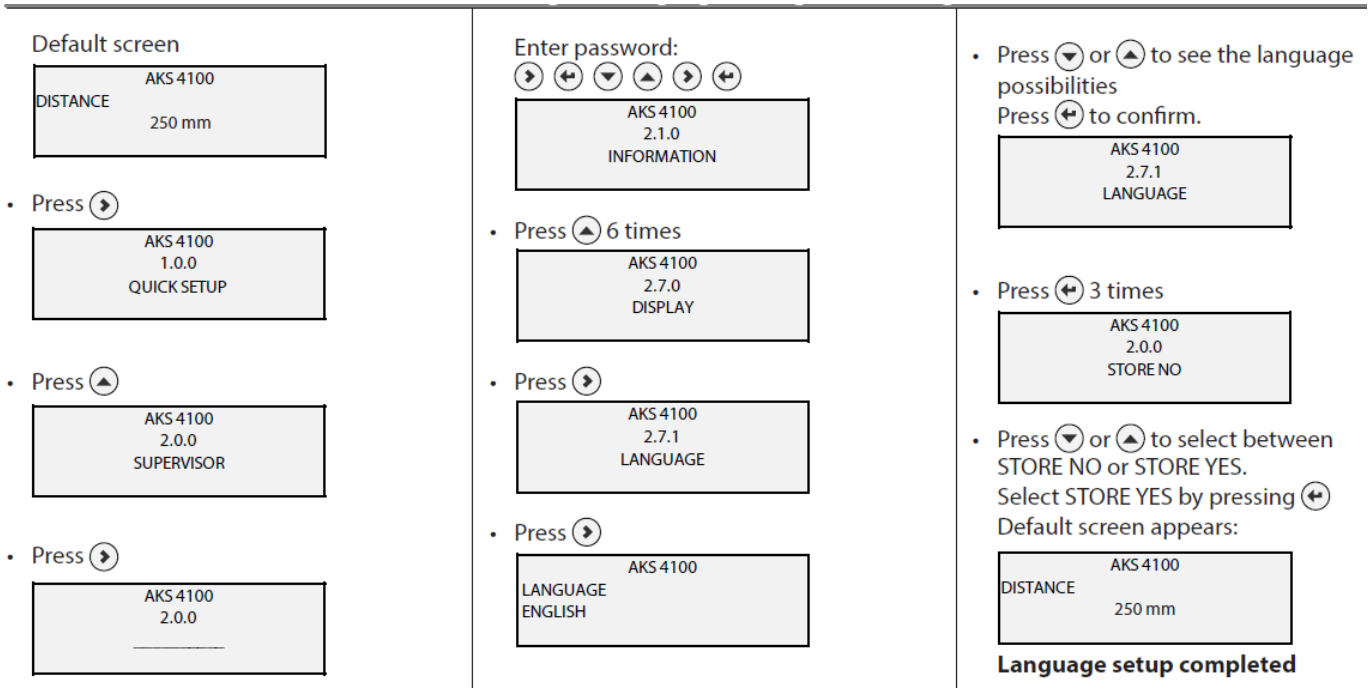


Saturated vapour dielectric constant (default value: 1.066)

R717 (NH3)
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

How to change the language setting (Default: English)

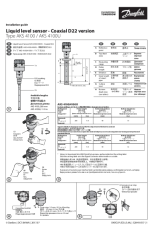


Reset to factory settings

- Go to SUPERVISOR menu (see page 7).
- Go to parameter 2.9.4 Reset Factory.
- Select RESET FACTORY YES

- Press  times to return to the default screen.
- Factory reset completed.

Documents / Resources

	Danfoss AKS 4100-AKS 4100U Liquid Level Sensor [pdf] Installation Guide AKS 4100, AKS 4100U, AKS 4100-AKS 4100U Liquid Level Sensor, AKS 4100-AKS 4100U, Liquid Level Sensor, Level Sensor, Sensor

References

- User Manual