Data sheet

Trouble shooting
Liquid level sensors, 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 technology 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.

Compatibility

Product identification

HMI

Converter

From the gray label the readings listed below must be noted.
These are used for on-site identification of hardware/software compatibility and for dialog with Danfoss:

1. Code number

2. Serial number (last 6 digits)

3. Manufacturing date

Made in France
www.Danfoss.com
Liquid Level Sensor: **AKS 4100**
084H4501
S/N: F130000000183560
Manufacturing date: 29-NOV-2013
Input voltage: 14...30V DC

HMI display readings

The label readings above together with the software stated configuration will identify any possible compatibility problem between the HMI and the converter.

To manually get the software versions of the converter, sensor and HMI please follow the steps on page 2.

V1.08.01   CONV.
V1.22.00   SENSOR
V1.10.00   HMI EGF

Display after power on.

Versions

Path to software versions

Please follow the commands to the right to get to the Information menus 2.1.2, 2.1.3 and 2.1.4 and note the versions.

Default screen

```
            AKS 4100
DISTANCE
            xxxx 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
            2.1.2
         CON.FIRM.VER
```

- Press ▶

```
            AKS 4100
         CON.FIRM.VER
      VX . XX . XX  CONV
```

- Press ⬅ ▲ ▶

```
            AKS 4100
         SEN.FIRM.VER
      VX . XX . XX  SENSOR
```

- Press ⬅ ▲ ▶

```
            AKS 4100
         HMI.FIRM.VER
      VX . XX . XX  HMI EGFS
```

Note the versions:

VX . XX . XX	CONV. (Converter)	Menu 2.1.2
▌		
VX . XX . XX	SENSOR	Menu 2.1.3
▌		
VX . XX . XX	HMI	Menu 2.1.4
▌		

Factory software combinations

To the right is the list of the original paired software versions. These combinations are fully functional.

Manufacturing date Product label	HMI Menu 2.1.4	Converter Menu 2.1.2
31-Oct-2011	1.06	1.04
20-Feb-2012	1.07	1.06.01
14- May-2012	1.08	1.06.01
29-May-2012	1.08	1.07.01A
27-Sep-2012	1.09	1.07.02
17-Sep-2013	1.10	1.08.01

Software backwards compatibility

If, for some reason, the HMI or the converter has been replaced, other version combinations could have been introduced.

Between the different software versions there is to some extend backwards compatibility.

Below table includes green boxes for the allowed version combinations and red boxes for the not allowed combinations

Attention!
To avoid any problem derived from non compatible software versions it is very important to verify compatibility in the table. In case of any conflict between the two versions Danfoss recommends to replace the HMI display to an allowed software version.

| HMI	Converter				
	1.04	1.06.01	1.07.01A	1.07.02	1.08.01
1.06	🟩	🟩	🟩	🟥	🟥
1.07	🟩	🟩	🟩	🟥	🟥
1.08	🟩	🟩	🟩	🟥	🟥
1.09	🟥	🟥	🟥	🟩	🟥
1.10.00 EGFS	🟩	🟩	🟩	🟩	🟩
1.10.00 ERCJ	🟩	🟩	🟩	🟩	🟩

Mechanical

Cable version

The cable version is sensitive to variations of the surrounding geometry and materials.

Essential is to avoid these situations:
- Variations in standpipe diameter.
  In such cases Danfoss recommend the coaxial version.
- Cable not straightening out (missing or hanging counterweight) or cable touching intruding parts/tubing.
- Standpipe made of non-metallic material. Danfoss recommend the coaxial version.

If you are not sure whether the geometry is regular, Danfoss recommend the use of the coaxial version.
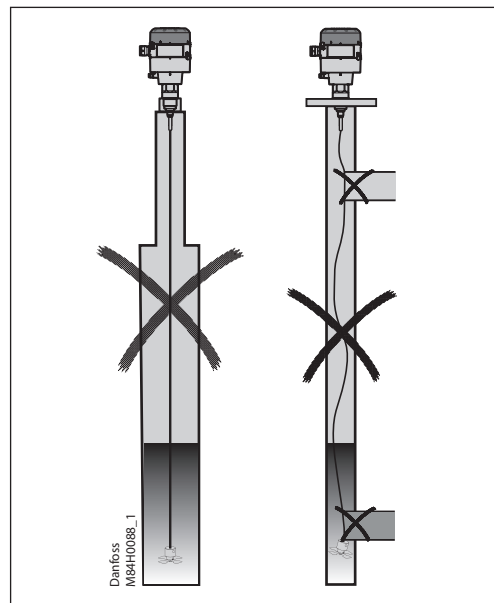
Mechanical assembly

It is important to keep the cavity in the upper cable connector dry and clean at all time prior to assembly. For this purpose the packaging includes a red cap to cover the top part.

To secure the correct assembly of the converter and cable connector a vertical press to the converter is needed. A mechanical stop indicates the right vertical position.

Remember to tighten the Allen key set bolt with 10 Nm during press down.

Dry and clean cavity →

Press down to the mechanical stop
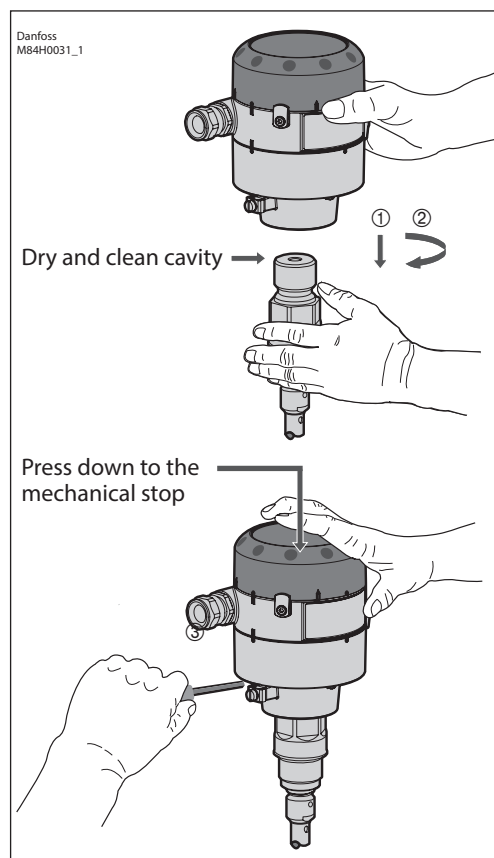
Electrical

Electrical requirements
(Power supply voltage)

The Signal converter requires a stable and pure DC power supply.

To check the power quality connect a voltmeter + and – terminals to the + and – terminals of the converter (+ to +, – to –) and keep this wiring throughout below testing.

Set the Voltmeter to DC Voltage.
The DC readings must be in the range of 14-30 V.

Switch the Voltmeter to AC Voltage.
The AC readings must be lower than 5 V.

If AC readings are above 5 V, the power supply does not meet the required quality.

Connector for HMI

- +

1. V DC

2. VAC
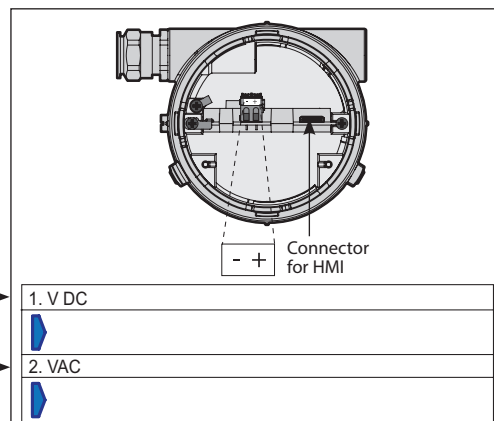
Signal current

Depending on the wiring between the AKS 4100 and the controller - PLC or EKC/EKE 347 - the signal current can vary.

It is important to have sufficient and identified current to the controller. Below is the path to a controlled forced mA output from the AKS 4100.

Just follow below commands and compare the readings of the forced mA output with the readings in the controller.
Remember to measure all current output possibilities of the AKS 4100. These are:
3.5, 4, 6, 8, 10, 12, 14, 16, 18, 20 and 22 mA.

If connected to EKC 347 controller:
Read the parameter u30 in EKC for comparison of the forced mA output of the AKS 4100.

If connected to PLC controller:
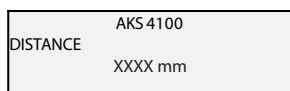Ask local operator how to read incoming current and compare.
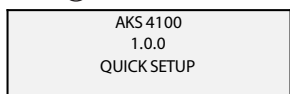
Note!
Not all controllers allow a current signal below 4 mA from the AKS 4100.
A configured lowest signal of 3.5 mA will in these cases often result in an error reading on the controller.
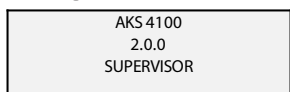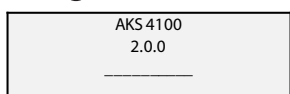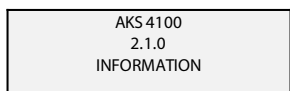

How to force mA output

Default screen

```
        AKS 4100
DISTANCE
        XXXX 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
```
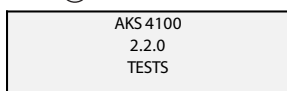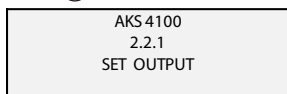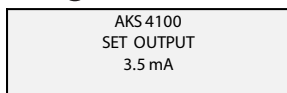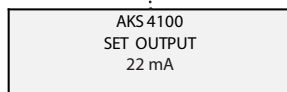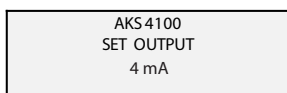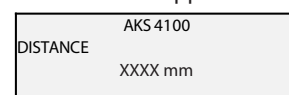
The HMI reading is now 3.5 mA.
Compare with the controller and assure the controller reading is 3.5 mA.

• Press ▼ or ▲ to scroll to any value of mA in the above shown list.
Note matching readings from the controller in the table to the right.

```
        AKS 4100
        SET OUTPUT
        4 mA
```

⋮

```
        AKS 4100
        SET OUTPUT
        22 mA
```

• Press ↩ 4 times to return to default screen.

Default screen appears:

```
        AKS 4100
DISTANCE
        XXXX mm
```

Forced mA completed and disabled

HMI reading mA	Controller reading mA
3.5	
4	
6	
8	
10	
12	
14	
16	
18	
20	
22	

System fault location

Symptom	Possible cause		Action
Rebooting - Not possible to access the setup menu. - Crash or reboot after accessing the setup menu. - Showing "Starting up…" continuously. - Configurations are not saved.	a)	Incompatible software versions in HMI and converter respectively. See table on page 2.	Identify potential conflict between softwares as described on pages 1 and 2. If not possible to get to Information menu (2.1.2 to 2.1.4) identify the converter from the label and test a HMI which for sure is compatible.
No reaction/ Frozen level - Device stays on level ~ 80%, seems "frozen"	a)	Non-regular geometry of the standpipe (see page 3)	Increase the parameter blocking distance or detection delay up to the level frozen value (see Danfoss installation guide). The value of the blocking distance/ detection delay must be outside the measuring range.
	b)	Standpipe dimensions out of specification (see Danfoss installation guide)	
	c)	Manufacturing date before Sept. 2013	If the values of blocking distance/ detection delay cannot be increased further replace the AKS 4100 to a coaxial type (if cable type) or an AKS 4100 (any type) produced after Sep. 2013.
Black-/ interrupted display - After HMI connection - no display. - No access to converter setup.	a)	Interrupted cable wiring between HMI and converter.	Check the flat cable and connector. Replace the HMI according to compatibility table on page 2.
Unstable/ wrong measurements - Periodic fluctuating measurements.	a)	Incompatible softwares between HMI and converter.	Check the compatibility according to table on page 2.
	b)	Inductor problem on early versions.	Replace with the latest HMI version.
Moisture in display - Water leaking through glass sealing.	a)	Early versions less water resistant.	Replace with the latest HMI version.
Smell of NH₃ - Leakage inside-out of Ammonia - Display window discolored/ lost transparency	a)	Weak sealings in some early versions.	**HMI [1]):** Replace the HMI with a new version. **Mechanical process connection:** *Date code before February 2013:* Replace the mechanical process connection with a new version. *Date code after February 2013:* No need to replace the mechanical process connection

[1) **Please note!**
- HMI replaced after March 16, 2014 and marked externally with an "**A**"
- Mechanical process connection replaced after February 2013 and marked with a date code.

A small amount of ammonia may still be smelled when HMI is dismounted. **This represent no safety risk.**
All components are well protected and the AKS 4100/4100U continues to measure and send the 4-20 mA signal corresponding to the liquid level.

Prior to contacting Danfoss; please collect these data:

Data from the grey product label.

Code number	
Serial number	
Manufacturing date	

Data from HMI menu

Software versions	**Converter (2.1.2)**	
	Sensor (2.1.3)	
	HMI (2.1.4)	
Probe length (2.3.4)		
Blocking distance (2.3.2)		
4 mA (2.4.3) =		mm
20 mA (2.4.4) =		mm
Coaxial or Cable		
Refrigerant		
Refrigerant temperature		
Refrigerant pressure		

Notes