

Data Sheet

# Trouble shooting - Liquid level sensors Type **AKS 4100** and **AKS 4100U**

Designed specifically to measure liquid levels in a wide range of refrigeration applications



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.

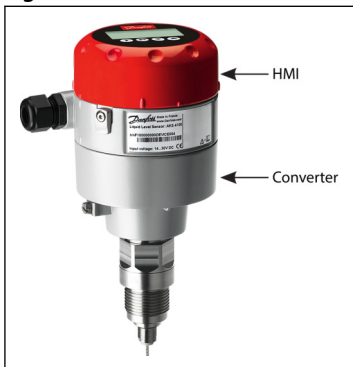
The electrical output is a 2-wired, loop powered 4–20 mA output signal, which is proportional to the refrigerant liquid level.

**Product specification**

**Compatibility**

**Product identification**

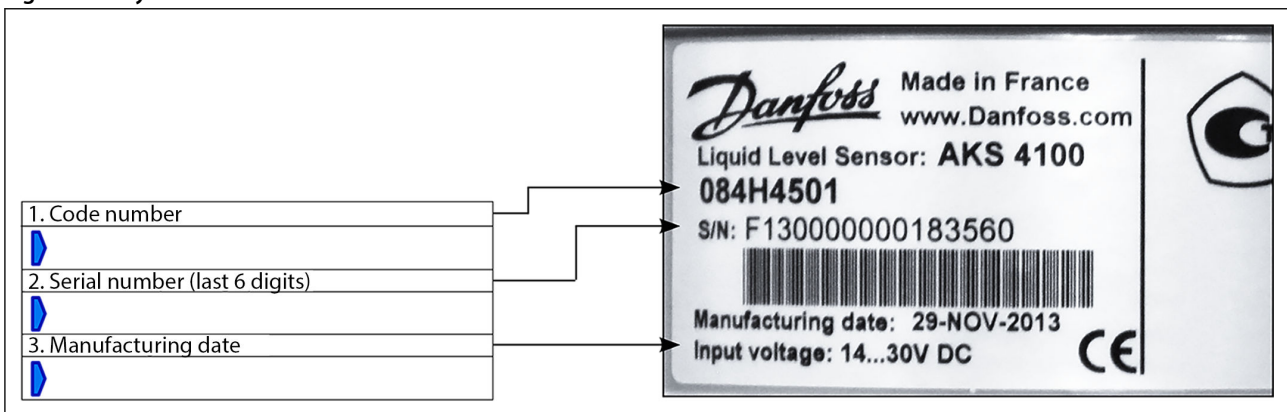
Figure 1: Product identification



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:

Figure 2: Gray label



**HMI display readings**

Figure 3: Display after power on



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.

## 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.

Figure 4: Information menu

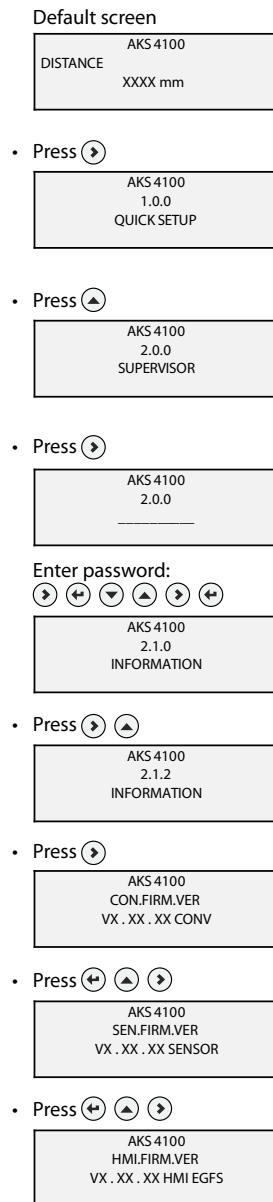


Figure 5: Note the versions

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.

**Table 1: Software versions**

Manufacturing date	Product label	HMI Menu 2.1.4	Converter Menu 2.1.2
31-Oct-11		1.06	1.04
20-Feb-12		1.07	1.06.01
14-May-12		1.08	1.06.01
29-May-12		1.08	1.07.01A
27-Sep-12		1.09	1.07.02
17-Sep-13		1.1	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 extent backwards compatibility.

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

**Table 2: Software versions compatibility**

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					

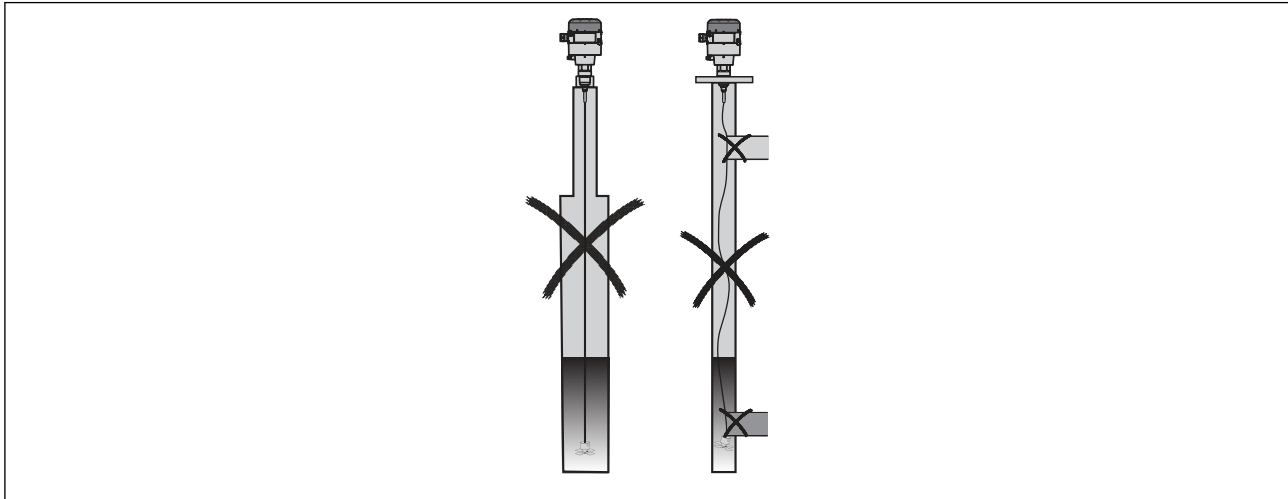
**NOTE:**

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.

## Mechanical

### Cable version

Figure 6: Cable version



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

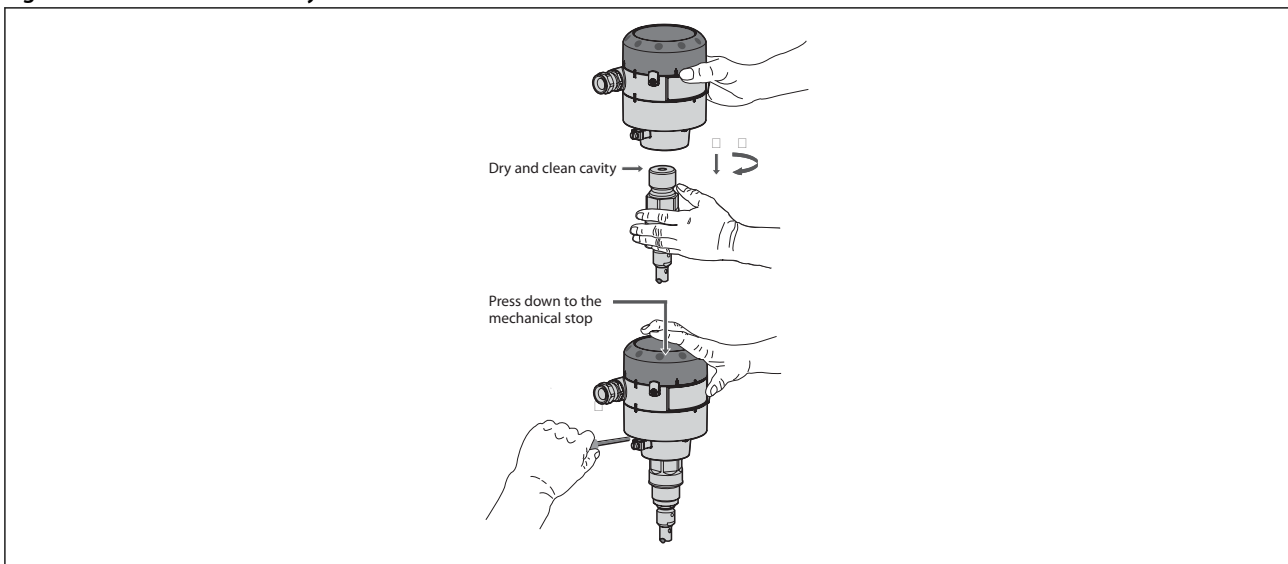
Essential is to avoid these situations:

- 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

Figure 7: 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.

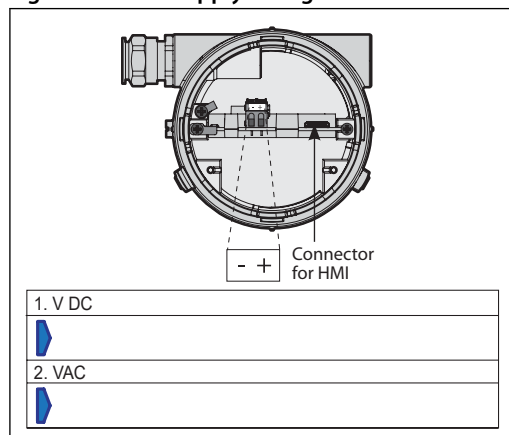
To secure the correct assembly of the converter and cable connector a vertical press to the converter is needed. A mechanical stop indicates the right vertical position.

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

## Electrical

### Electrical requirements (Power supply voltage)

Figure 8: Power supply voltage



**1. V DC** Set the Voltmeter to DC Voltage

**2. V AC** Switch the Voltmeter to AC 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.

### 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.

#### **i** 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.

Figure 9: How to force mA output

**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

Table 3: System fault location

Symptom	Possible cause	Action
<p><b>Rebooting</b></p> <ul style="list-style-type: none"> <li>• Not possible to access the setup menu</li> <li>• Crash or reboot after accessing the setup menu</li> <li>• Showing "Starting up..." continuously</li> <li>• Configurations are not saved</li> </ul>	<p>a) Incompatible software versions in HMI and converter respectively. See table on page 2</p>	<p>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.</p>
<p><b>No reaction/ Frozen level</b> Device stays on level ~ 80%, seems "frozen"</p>	<p>a) Non-regular geometry of the standpipe (see page 3) b) Standpipe dimensions out of specification (see Danfoss installation guide) c) Manufacturing date before Sept. 2013</p>	<p>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. 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.</p>
<p><b>Black-/ interrupted display</b> After HMI connection - no display. - No access to converter setup.</p>	<p>a) Interrupted cable wiring between HMI and converter.</p>	<p>Check the flat cable and connector. Replace the HMI according to compatibility table on page 2.</p>
<p><b>Unstable/ wrong measurements</b> Periodic fluctuating measurements.</p>	<p>a) Incompatible softwares between HMI and converter. b) Inductor problem on early versions.</p>	<p>Check the compatibility according to table on page 2. Replace with the latest HMI version.</p>
<p><b>Moisture in display</b> Water leaking through glass sealing.</p>	<p>a) Early versions less water resistant.</p>	<p>Replace with the latest HMI version.</p>
<p><b>Smell of NH<sub>3</sub></b> Leakage inside-out of Ammonia Display window discolored/ lost transparency</p>	<p>a) Weak sealings in some early versions.</p>	<p><b>HMI<sup>(1)</sup></b>: Replace the HMI with a new version <b>Mechanical process connection:</b> <i>Date code before February 2013:</i> Replace the mechanical process connection with a new version. <i>Date code after February 2013:</i> No need to replace the mechanical process connection</p>

## Trouble shooting - Liquid level sensors, type AKS 4100 and AKS 4100U

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<sup>(1)</sup> 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 dismantled. **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:**

Collect these data:

Figure 10: Data Form

Data from the grey product label.	Code number	<input type="text"/>
	Serial number	<input type="text"/>
	Manufacturing date	<input type="text"/>
Data from HMI menu	Software versions	Converter (2.1.2) <input type="text"/> Sensor (2.1.3) <input type="text"/> HMI (2.1.4) <input type="text"/>
	Probe length (2.3.4)	<input type="text"/>
	Blocking distance (2.3.2)	<input type="text"/>
	4 mA (2.4.3) =	<input type="text"/> mm
	20 mA (2.4.4) =	<input type="text"/> mm
	Coaxial or Cable	<input type="text"/>
	Refrigerant	<input type="text"/>
	Refrigerant temperature	<input type="text"/>
	Refrigerant pressure	<input type="text"/>

## Certificates, declarations, and approvals

### **Mandatory: Intro to Certificates, declarations, and approvals**

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

### **Valid approvals**

Table 4: Valid approvals

File name	Document type	Document topic	Approval authority
GOST FR.C.29.004.A 51938	Measuring - Performance Certificate		
UA.10146.D.00075-19	UA Declaration	EMCD/LVD	LLC CDC EURO-TYSK
033F0689.AA	EU Declaration	EMC	Danfoss
MD 033F0686.AH	Manufacturers Declaration	PED	Danfoss
033F0695.AA	Manufacturers Declaration	China RoHS	Danfoss
0F18749.513467890YTN	Pressure - Safety Certificate	CRN	TSSA
0F19272.2	Pressure - Safety Certificate	CRN	TSSA

Table 5: Approvals and certification

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

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