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

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

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.
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

1. Press

AKS 4100
1.0.0
QUICK SETUP

2. Press

AKS 4100
2.0.0
SUPERVISOR

3. Press

AKS 4100
2.0.0

Enter password:

aks

4. Press

AKS 4100
2.1.0
INFORMATION

5. Press

AKS 4100
2.1.2

CON.FIRM.VER

6. Press

AKS 4100
2.1.3

SEN.FIRM.VER

7. Press

AKS 4100
2.1.4

HMI.FIRM.VER

Note the versions:

<table>
<thead>
<tr>
<th>VX . XX . XX</th>
<th>Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONV. (Converter)</td>
<td>2.1.2</td>
</tr>
<tr>
<td>SENSOR</td>
<td>2.1.3</td>
</tr>
<tr>
<td>HMI</td>
<td>2.1.4</td>
</tr>
</tbody>
</table>
Factory software combinations
To the right is the list of the original paired software versions. These combinations are fully functional.

<table>
<thead>
<tr>
<th>Manufacturing date</th>
<th>HMI Menu 2.1.4</th>
<th>Converter Menu 2.1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-Oct-2011</td>
<td>1.06</td>
<td>1.04</td>
</tr>
<tr>
<td>20-Feb-2012</td>
<td>1.07</td>
<td>1.06.01</td>
</tr>
<tr>
<td>14-May-2012</td>
<td>1.08</td>
<td>1.06.01</td>
</tr>
<tr>
<td>29-May-2012</td>
<td>1.08</td>
<td>1.07.01A</td>
</tr>
<tr>
<td>27-Sep-2012</td>
<td>1.09</td>
<td>1.07.02</td>
</tr>
<tr>
<td>17-Sep-2013</td>
<td>1.10</td>
<td>1.08.01</td>
</tr>
</tbody>
</table>

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.

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.

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

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**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)

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.

**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.

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### How to force mA output

**Default screen**

- Press the HMI button
  - DISTANCE AKS 4100 XXXX mm
  - A button
  - AKS 4100 1.0.0 QUICK-SETUP
  - A button
  - AKS 4100 2.0.0 SUPERVISOR
  - A button
  - AKS 4100 2.0.0

**Enter password:**

  - AKS 4100
  - INFORMATION

**Press**

- AKS 4100
  - TESTS

- AKS 4100
  - 2.2.0

- AKS 4100
  - 2.2.1

- AKS 4100
  - SET OUTPUT

- AKS 4100
  - 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.

- Press 4 times to return to default screen.

**Default screen appears:**

<table>
<thead>
<tr>
<th>HMI reading mA</th>
<th>Controller reading mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Symptom</td>
<td>Possible cause</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Rebooting</strong></td>
<td>a) Incompatible software versions in HMI and converter respectively. See table on page 2.</td>
</tr>
<tr>
<td></td>
<td>- Not possible to access the setup menu.</td>
</tr>
<tr>
<td></td>
<td>- Crash or reboot after accessing the setup menu.</td>
</tr>
<tr>
<td></td>
<td>- Showing “Starting up...” continuously.</td>
</tr>
<tr>
<td></td>
<td>- Configurations are not saved.</td>
</tr>
<tr>
<td><strong>No reaction/ Frozen level</strong></td>
<td>a) Non-regular geometry of the standpipe (see page 3)</td>
</tr>
<tr>
<td></td>
<td>b) Standpipe dimensions out of specification (see Danfoss installation guide)</td>
</tr>
<tr>
<td></td>
<td>c) Manufacturing date before Sept. 2013</td>
</tr>
<tr>
<td><strong>Black-/ interrupted display</strong></td>
<td>a) Interrupted cable wiring between HMI and converter.</td>
</tr>
<tr>
<td></td>
<td>- After HMI connection - no display.</td>
</tr>
<tr>
<td></td>
<td>- No access to converter setup.</td>
</tr>
<tr>
<td><strong>Unstable/ wrong measurements</strong></td>
<td>a) Incompatible softwares between HMI and converter.</td>
</tr>
<tr>
<td></td>
<td>b) Inductor problem on early versions.</td>
</tr>
<tr>
<td><strong>Moisture in display</strong></td>
<td>a) Early versions less water resistant.</td>
</tr>
<tr>
<td><strong>Smell of NH₃</strong></td>
<td>a) Weak sealings in some early versions.</td>
</tr>
<tr>
<td></td>
<td>- Leakage inside-out of Ammonia</td>
</tr>
<tr>
<td></td>
<td>- Display window discolored/ lost transparency</td>
</tr>
</tbody>
</table>

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

Software versions:
- Converter (2.1.2)
- Sensor (2.1.3)
- HMI (2.1.4)

Data from HMI menu:
- 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