

Instruction manual

HBLT-A2 – LEVEL SENSOR

For analog measurement of NH₃ in refrigeration systems as well as conductive liquids in other applications (like H₂O).




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Safety Instructions

CAUTION! Always read the instruction manual before commencing work! Heed all warnings to the letter! Installation of the sensor requires technical knowledge of both refrigeration and electronics. Only qualified personnel should work with the product. The technician must be aware of the consequences of an improperly installed sensor, and must be committed to adhering to the applicable local legislation.

If changes are made to type-approved equipment, this type approval becomes void. The product's input and output, as well as its accessories, may only be connected as shown in this guide. HB Products assumes no responsibility for damages resulting from not adhering to the above.

Explanation of the symbol for safety instructions. In this guide, the symbol below is used to point out important safety instructions for the user. It will always be found in places in the chapters where the information is relevant. The safety instructions and the warnings in particular, must always be read and adhered to.

	<p>CAUTION! Refers to a possible limitation of functionality or risk in usage.</p> <p>NOTE! Contains important information about the product and provides further tips.</p> <p>The person responsible for operation must commit to adhering to all the legislative requirements, preventing accidents, and doing everything so as to avoid damage to people and materials.</p>
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Intended use, conditions of use. The level sensor is designed for continuous measurement of liquid NH₃ in refrigeration systems. If the sensor is to be used in a different way and if the operation of the product in this function is determined to be problematic, prior approval must be obtained from HB Products.

Prevention of collateral damage Make sure that qualified personnel assess any errors and take necessary precautions before attempting to make replacements or repairs, so as to avoid collateral damage.

Disposal instructions: The sensor is constructed so that the modules can easily be removed and sorted for disposal.

Introduction

HBLT-A2 is an intelligent sensor with an in-built microprocessor. It is designed for continuous level measurement of liquid NH₃ refrigerant in refrigeration systems or water level in other types of applications.

The sensor emits a 4-20mA analog signal, which is proportional to the liquid level.

4 mA when the sensor does not register liquid and 20 mA when the entire sensor is surrounded by liquid.

Key features

- Plug and Play:
no calibration required when installed on NH₃ systems
- Service friendly:
Electronic head and sensor rod can be separated without emptying the vessel.
- Damping of output signal.
- Improved calibration:
Range/signal output can be adapted to suit the actual application.
- LED Display:
3 digit LED display shows the liquid level measured in the vessel in percent. (Not available in /S – stepper motor control version).

Measurement Principle

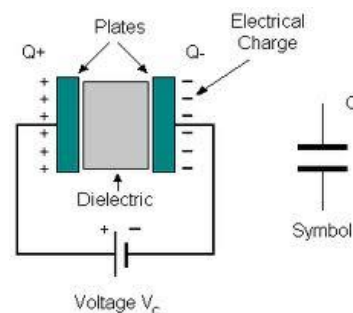
The sensor is a capacitive sensor. The capacitive measurement principle is based on the electrical properties in the proximity of a capacitor. A capacitor is an electrical component that is capable of building and sustaining an electrical charge.

A capacitor does basically consist of two plates. When a charge is applied to a plate, the other plate will be charged with the opposite polarity and retain the charge until it has been grounded. The magnitude of the charge (the capacitance) that can be generated depends, among other things, on what is found between the plates. The substance between the plates is referred to as a dielectric.

Rather than the two plates, the sensor for level measurement is shaped as a cylindrical rod. When liquid covers the sensor, the measured capacity is changed.

HB Products sensors are calibrated so that they differentiate between conductive and non-conductive liquids.

In refrigeration systems, oil and HFC are not regarded as conductive fluids, whereas refrigerants such as ammonia and brine are regarded as conductive.



The conductivity of a material can vary depending on temperature, chemical composition, and the homogeneity of the material, and therefore it can in some cases require a different factory calibration.

Design and Function

The sensor consists of a mechanical part and an electronic part. These are easily separated by a finger nut. The electronic part is designed in accordance with IP65 waterproof rating and so as to resist vibrations.

The mechanical part is produced in AISI304/PTFE and tested to withstand high pressure.

The sensor is a very accurate analog level transmitter for continuous measurement of liquid NH₃ on refrigerant plants or H₂O in other applications. Additionally it may serve as high level switch, since the build-in switch function gives alarm signal at 100% level.

Technical data

Supply:		Mechanical specifications:	
Supply:	24 V AC/DC ±10%*	Thread connection:	¾" NPT or 1" BSPP
Current draw:	Max 50 mA	Materials - mechanical parts:	AISI304/PTFE
Plug:	M12, 5 pins - DIN 0627	Materials - electronic parts:	Nylon 6 (PA)
		Housing design:	Angle
Output:		Calibration & indication:	
Analog output:	4-20 mA	Calibration	Press-button
Permitted load on potential free contactless set	1A (24V DC)	LED indication:	Green, yellow, and red
Installation conditions:		Cable specification:	
Ambient temperature:	-30...50°C	Supply cable, 5 meters:	HBxC-M12/5
Refrigerant temperature:	-60...+60°C	Cable size:	5 x 0.34 mm ²
Max. operational pressure:	100 Bar	Cable glands:	PG7 / M8
Waterproof rating:	IP65	Plug type:	Straight
		Cable type:	PVC-OB grey
Authorisations:		Accessories:	
EMC Emission:	EN61000-3-2	Configuration tool:	HB-TOOL (free)
EMC Immunity:	EN61000-4-2	Configuration cable:	HBxC-USB
		Plug converter:	HBxC-M12/DIN

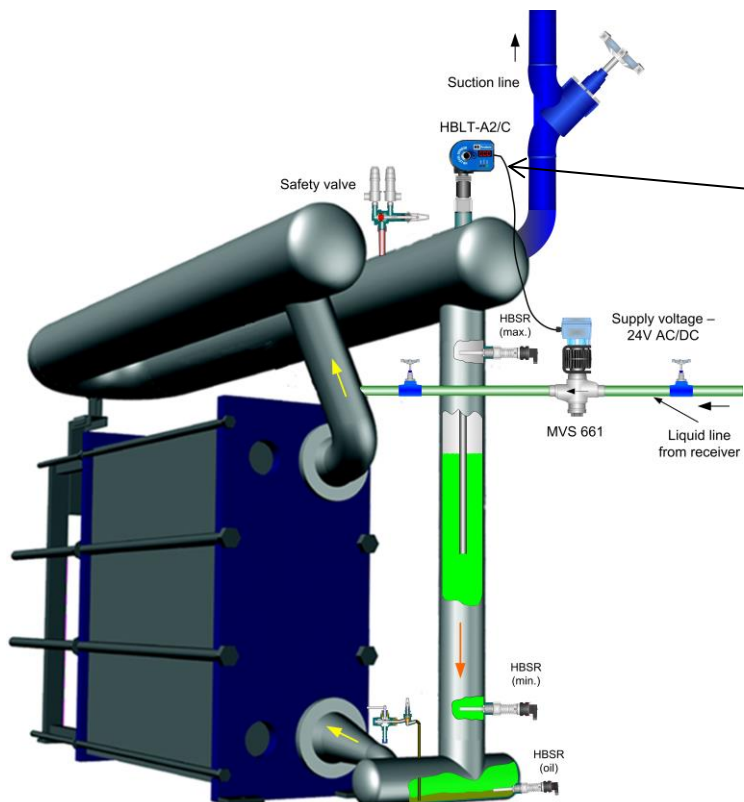


NOTE! All terminals are protected against improper termination with a supply voltage up to 40 V. If the supply voltage is greater than 40 V the electronics will be damaged.

Please note! Supply Voltage may differ from the data given in the manuals. Applicable will always be the sensor label.

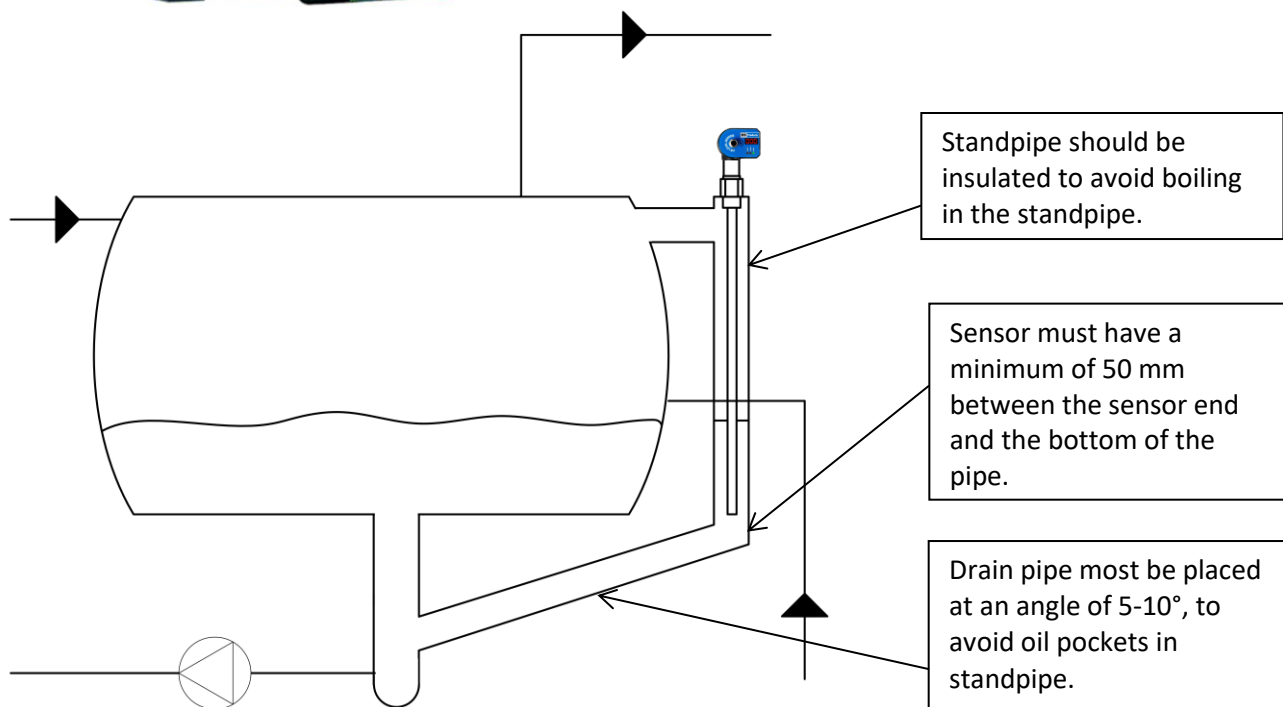
Application Examples

HBLT-A2 is designed for level measurement of liquid NH₃ in chillers, pump separators, coolers and condensers. eg:



HBLT/C-A2-xx
Sensor with integrated cable for direct control of 4-20 mA controlled modulating valve like Siemens MVS-series or Danfoss ICM-series or similar.

HBLT/S-A2-xx
Sensor with integrated cable for direct control of stepper motor valves. HBLT/S-version is without LED display.



Installation Instructions

Mount the sensor rod in a standpipe or vessel with $\frac{3}{4}$ " NPT respectively 1" BSPP thread connection. When installed on an ammonia installation and the sensor has the appropriate length just apply power and the transmitter is in operation.



CAUTION! In case of welding work on the unit, please make sure that proper earthing is carried out to avoid damaging the electronics.

Mounting instruction



Figure 1: To install the sensor Teflon tape (NPT) or sealing washer (BSPP) is required.



Figure 2: Add Teflon tape to thread for NPT-version.

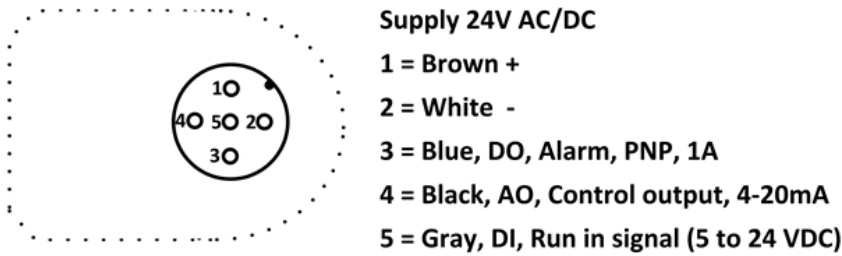


Figure 3: Mount the sensor on the vessel. Torque 80-150 Nm.

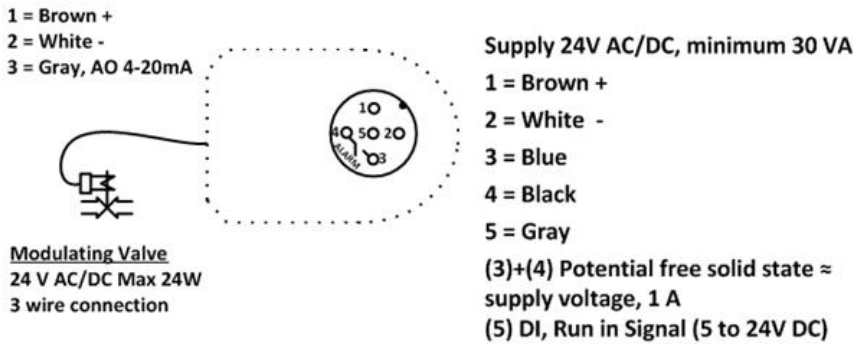
Power connection

The sensor is supplied with a 5 cord cable with an M12 connection plug.

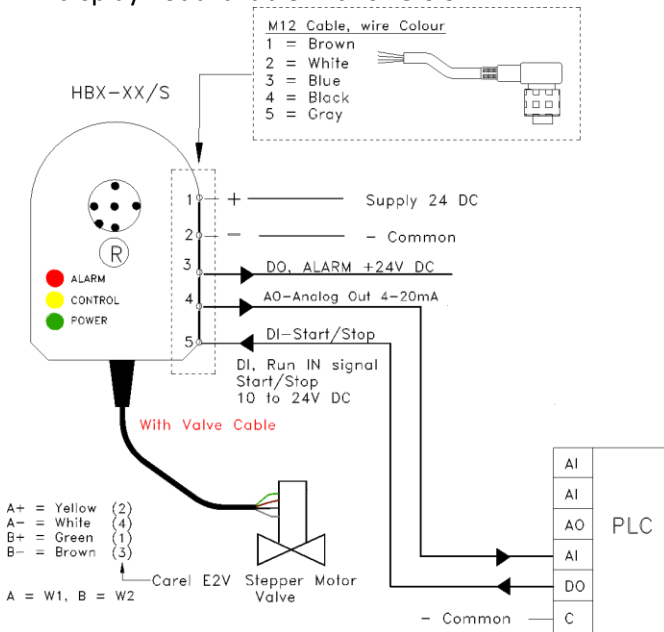
HBLT-A2: With common supply and M12 control cable.



HBLT/C-A2: With separate supply and integrated cable for direct control of a 4-20 mA regulated modulating valve. LED display included:



HBLC/S-A2: with separate supply and integrated cable for direct control of stepper motor regulated valve. LED display not available in this version:



Accessories

If an HBLT-A1 sensor is replaced with an HBLT-A2 sensor, the below listed accessory is available. The cable converter fits the old DIN-plug from an HBLT-A1 in one end and the HBLT-A2 with M12 in the other end.



Converting/adapter cable:
DIN43650-4pin (male) til M12 – DIN 0627. Cable length:
0,30 m.

Ordering code: HBxC-M12/DIN

LED indication

- 1) Green LED indicates 24 V DC supply; it blinks during operation. If "run-in" is not used, this function must be deactivated in the tool.
- 2) Yellow LED indicates control.
The blink sequence indicates if the valve is closing or opening.
- 3) Red LED indicates high or low level alarm, depending upon the setup.



3-digit display: (not available on /S stepper motor control version.)

- 1) Showing 0...100 % linearly corresponding to 4...20 mA.

LED Signal	ON/OFF/Frequency	Functionality
Green	ON	Supply voltage connected
	Flash	Run In start signal / in operation.
	OFF	No supply voltage
Yellow	ON	Activation of valve control / and during calibration
	OFF	Valve control not active
Red	ON	Alarm, high or low level, depending upon the setup.
	Flash	Does not detect and sensor probe
	OFF	No alarm
Yellow + Red	Flash	Power supply not sufficient
	OFF	No alarm

Calibration:

Zero or 100% calibration can be carried out independently of each other. HBLT-A2 level sensor is delivered pre-calibrated. For normal use, calibration is not necessary. If the signal changes over time, we recommend new calibration by use of PC-based HB-TOOL. See further instructions in separate manual for HB-TOOL.

Installation of HB Configurations Tool – HB-TOOL

See separate manual.

PC Configuration

See separate manual.

Fault detection

General: In case of fault, it is enough to only replace the electronic part.



NOTE! Fault detection and/or changing the electronic function can be carried out without releasing pressure from the system or disassembling the mechanical part of the sensor.

Fault detection

Fault	Reason	Correction of fault
No LED is on / not operating.	No supply to the sensor or defective cable/plug	Check and find faults in the power supply, or replace the supply cable.
Yellow and red LED flash.	Power supply is not sufficient.	Install proper power supply.
Valve open and close to fast.	Refrigerant is boiling in the standpipe	Increase “filter” settings and eventually increase P-band as well.
No contact activation	There may be dirt between the electronic housing and the mechanical housing.	Separate the two parts and clean the spring tip. Remember to apply silicone grease to the spring tip so as to avoid problems with moisture
Delay in sensor activation	May be caused by gas and bubbles in the system.	Check if the sensor is placed optimally so that gas is avoided.
The valve is not performing the control function well enough.	Oil has accumulated in the level indicator glass which cannot escape.	Drain the level indicator of oil and, if necessary, clean the oil from the rod.
There is no alignment between the output signal and the level in the level indicator.	The sensor is incorrectly calibrated.	Perform calibration.

Sensor Repair

In case of faults with the sensor, it will typically only be necessary to replace the electronics. Please contact your local distributor about how to handle complaints.

Spare Parts

Position	Description	Specification	HB Part number
1	Electronic part	PC-programmable	HBLT-A2-EL
2	Mechanical parts	Length	HBLT-MEK-xx (Length)
3	Control cable	M12 / 5 mtr (5 cord)	HBxC-M12/5 Straight
4	A1 to A2 adapter cable	DIN to M12 0.30 mtr	HBxC-M12/DIN
5	USB Programming Cable	M12 to USB	HBxC-USB

Further Information

For further information, please visit our website, www.hbproducts.dk, or send an email to: support@hbproducts.dk.

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