HB Products WE INCREASE UPTIME, SAFETY AND EFFICIENCY

Instruction manual

HBAC – Leakage switch
For the detection of leakage of CO2 into NH3

Introduction

Anyone who design and operate CO2/NH3 Cascade systems should be aware of the fatal consequences a leaking heat exchanger may have.

If a leak CO2 leak into ammonia ammonium carbamate will be formed.

Ammonia carbamate is a salt which crystalizes as a chemical reaction between Ammonia and CO2. The salt is corrosive, becomes solid and may cause system breakdown and possible damage to the entire system if not stopped.

Two different sensors area available for detection of ammonium carbamate:

- HBAC which is installed in liquid ammonia in shell and tube/plate heat exchangers
- HBX which is installed in the outlet from a plate heat exchanger (separate manual) and works in the gas and liquid mix

By means of the HBAC sensor system operators can shut down the plant avoiding total system break down.

Safety Instructions

CAUTION! Read the instruction manual before commencing work! Heed all warnings to the letter! Installation of HBAC 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 products, 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 particularly the warnings must always be read and adhered to.

	CAUTION! Refers to a possible limitation of functionality or risk of use. NOTE! Contains important information about the product and provides further tips. The person responsible for operation must commit to adhering to all the legislative requirements, preventing accidents, and doing everything to avoid damage to people and materials.

Intended use, conditions of use The HBAC switch is manufactured to detect leakage of CO2 into NH3. If HBAC is to be used in a different way or for another purpose, and if the operation of the product in this function is determined to be problematic, prior approval must be obtained from HB Products.

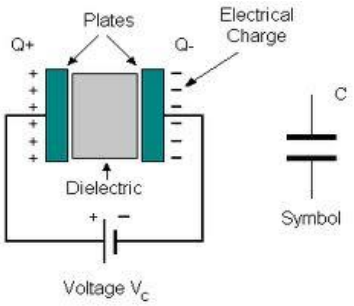
Prevention of collateral damage Make sure that qualified personnel assess any faults and take necessary precautions before attempting to make replacements or reparations, to avoid collateral damage.

Disposal instructions: HBAC is built so that the modules can easily be removed and sorted for disposal.

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.

Principally, a capacitor consists 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.



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.

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

Design

The sensor consists of a mechanical part and an electronic part. These are easily separated by loosening 2 set screws.
The electronic part is designed in accordance with IP65 waterproof rating and to withstand vibrations. The mechanical part is produced in AISI304/PTFE and tested to withstand high pressure.

Technical data

Connection:	
Supply:	24 V AC/DC ±10%
Current draw:	Max 50 mA
Current consumption:	< 30 mA
Plug:	DIN 0627/ISO4400
Required cable size:	3 x 0,34 mm^2
Required cable glands:	PG7 / M8
Output:	
Transistor output:	PNP, 1 A
Output function:	NC or NO

Mechanical specifications:	
Length of rod:	160 mm
Thread connection:	¾" NPT / BSP
Materials, mechanical:	AISI304/PTFE
Materials, electronic:	Nylon 6 (PA)
Indication:	
LED indication:	Green & red

Installation conditions:	
Ambient temperature:	-30…+50°C
Refrigerant temperature:	-60…+80°C
Max. operational pressure:	100 bar
Waterproof rating:	IP65
Vibrations:	IEC 68-2-6 (4g)
Authorisations:	
EMC Emission:	EN61000-3-2
EMC Immunity:	EN61000-4-2

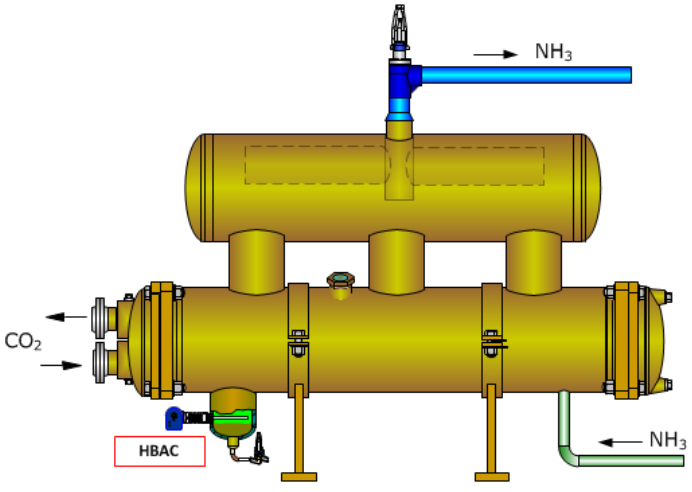
All terminals are protected against improper termination with a supply voltage up to 40 V. If the supply voltage is greater than 40 V the electronics will be damaged

Installation instructions

The following applies during installation:
1)The sensor must be installed in a threaded sleeve/pipe stub, this should be welded in a Horizontal position.

2)The installation length of the sensor must be considered since there must be at least 20 mm between the sensor's mechanical part and other fixed or moving parts.

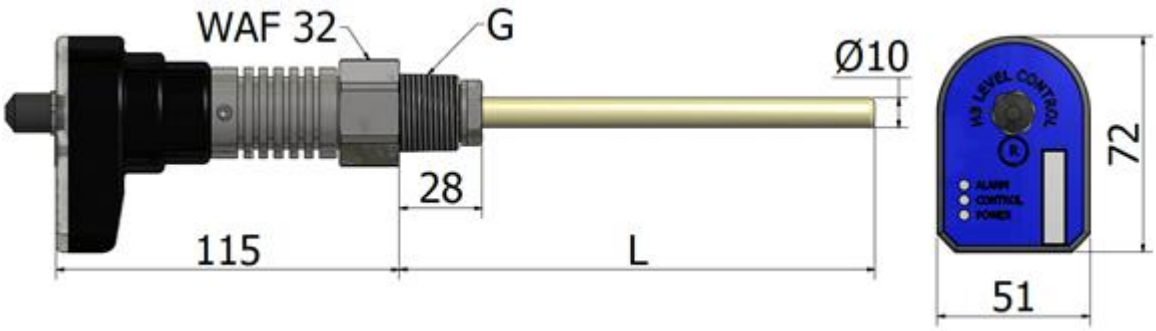
3) The sensor must be placed in the NH3 section in a position where the leakage will appear.



Cascade heat exchanger

Preferable as close to the bottom of the cascade heat exchanger, as the salty crystal will sink to the bottom.

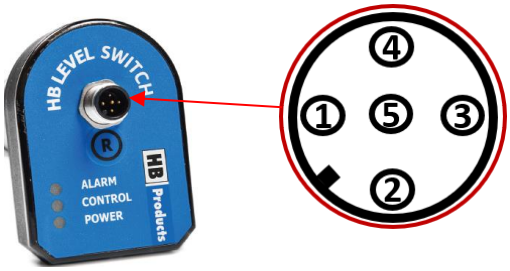
Installation Guidelines:
Ammonia carbamate has a higher density than liquid ammonia which means it will sink to the bottom of the vessel. The sensor must be positioned as low as possible to get a fast detection. The flow of liquid might move the salt around.
The sensor cannot operate correctly if covered by oil, but it can detect oil via the analog output, but it requires special settings made on request only.



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

Power connection

HBAC can be delivered with a NO or NC output.
The sensor can provide two types of alarm depending on the device connected to the sensor.



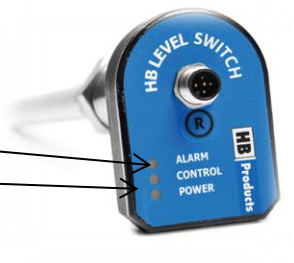
1	brown	+24 VDC or 24 V AC
2	White	- common or 24 V AC
3	Blue	Digital Alarm Output
4	Black	Analog Output 4-20 mA
5	Grey	Communication

It can provide a digital alarm on pin 3, when a leak occurs and at the same time the mA signal exceeds 16mA. Both or one the two alarm outputs can be used.

LED indication

Irrespective of the output function NO/NC, Alarm LED is activated at a leakage.

Alarm LED is activated when sensor detects leakage
Power LED flash when the power is on

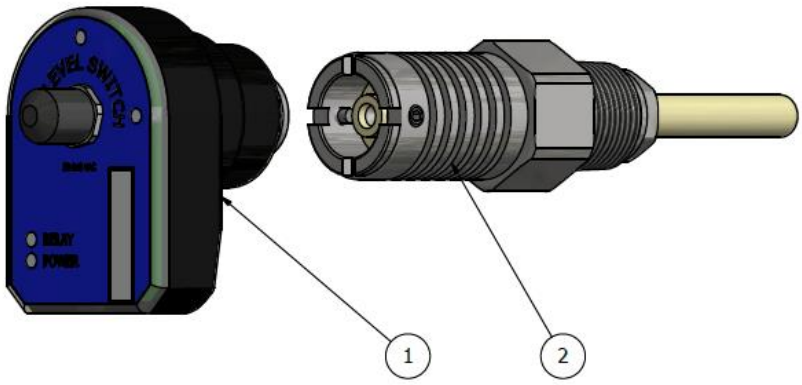


Sensor repair

The sensor electronics are completely sealed and can therefore not be repaired.
In case of faults with the sensor, it will typically only be necessary to replace the electronics.

Complaint cases are handled by the HB Products dealers/distributors.
Their complaints procedures must be followed before returning the sensor.

Spare parts



Position	Specification	Type	Part number
1	Electronic part	NO	HBAC-EL/NO
		NC	HBAC-EL/NC
2	Mechanical part	¾" NPT	HBLC-MEK-1.6-2
		¾" BSPP	HBLC-MEK-1.6-6

Further information

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

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