

Instruction manual

HBSR – NH₃ & Brine switch

For the detection of refrigerants and/or phase separation between oil and ammonia



Introduction

HBSR is a level switch for detection of liquid refrigerants NH₃ and brine types.

Typically it is installed in/on the receiver, pump separators, economisers, heat exchangers, or as an oil-accumulation-alarm in ammonia systems.

The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle enable it, among

other things, to detect phase separation between oil and ammonia.

The sensor is also built to resist high pressure and low temperatures.

HBSR is not suited for use on CO₂ and HFC systems. Here the HBSC2 and HBSR-HFC switch type must be used.

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.

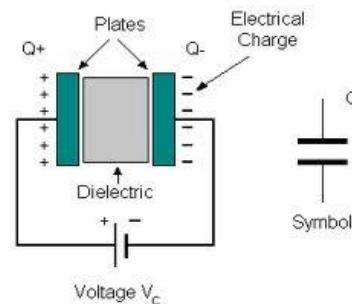
Rather than two plates, the sensor for level measurement is shaped as a cylindrical rod. When liquid covers the sensor, the measured capacity changes.

HB Products sensors are calibrated so that they differentiate between conductive and non-conductive liquids. In refrigeration systems, the oil, HFCs and liquid CO₂ are not regarded as conductive fluids, whereas refrigerants such as ammonia, and brine are regarded as conductive.

Design

The sensor consists of a mechanical part and an electronic part. These are easily separated by loosening 2 grub screws, or for mechanisms with mounting tabs, by pressing the electronic part in towards the mechanical part and turning the housing counter-clockwise until a wave washer presses it out of the

mounted position. The electronic part is designed in accordance with IP65 waterproof rating and so as to withstand vibrations. The mechanical part is produced in AISI304/PTFE and tested to withstand high pressure.



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.

Technical data

Connection:

Supply:	24 V AC/DC $\pm 10\%$
Current draw:	Max 50 mA
Current consumption:	< 10 mA
Plug:	DIN 43 650
Required cable size:	3 x 0,34 mm ²
Required cable glands:	PG7 / M8

Mechanical specifications:

Thread connection:	$\frac{3}{4}$ " NPT / BSP
Materials, mechanical:	AISI304/PTFE
Materials, electronic:	Nylon 6 (PA)

Output:

Transistor output:	PNP or NPN
Output function:	NC or NO

Indication:

LED indication :	4 x LED (red)
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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
GOST-R:	No 0903044

* Max temperature for switches manufactured after May 2014, with the batch number VUxxxxxxx. For batch number Vxxxxxxx produced before May 2014, the maximum temperature is +35 °C.



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.

Function

HBSR is a level switch for detecting common refrigerants, including NH₃ and brine, but it can also be used for oil return management in ammonia refrigeration systems.

Typically it is installed in/on the receivers, pump separators, economisers, heat exchangers, or as an oil-accumulation-sensor on ammonia systems.

The sensor differentiates between refrigerant, gas, and oil, so that the electrical signal from the sensor changes when the liquid level drops below/rises above the level that it was installed at.

The sensor is calibrated to switch in the centre of the sensor's cylindrical part, with a hysteresis of about 1 mm.

When the refrigerant is on the same level or above this point, 4 LEDs light up (irrespective of the output relay NO/NC).

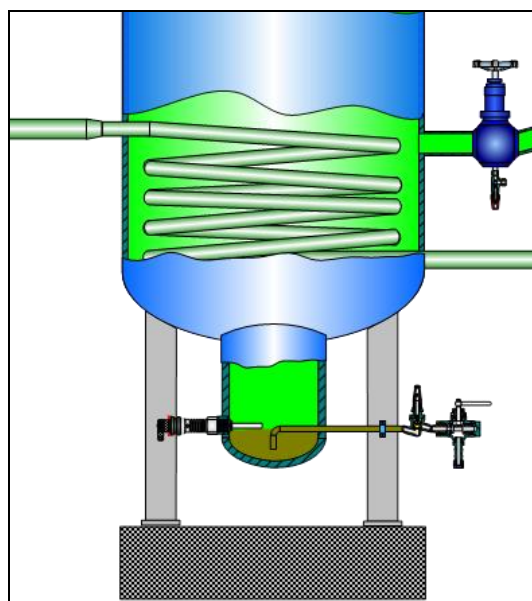
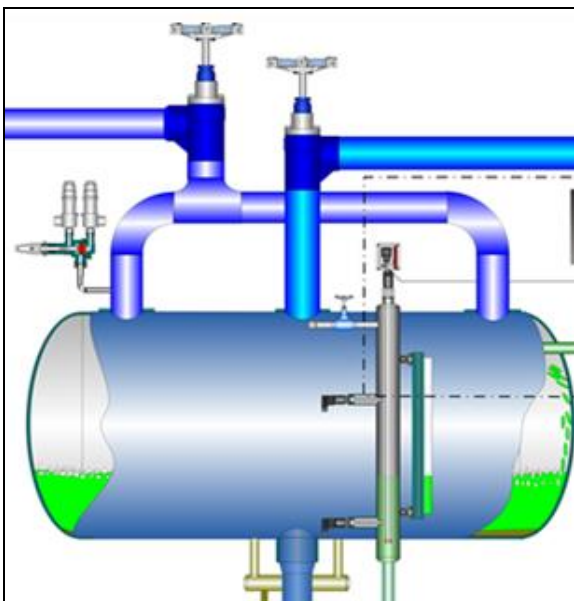
Examples of usage

The HBSR switch is well suited to be used for

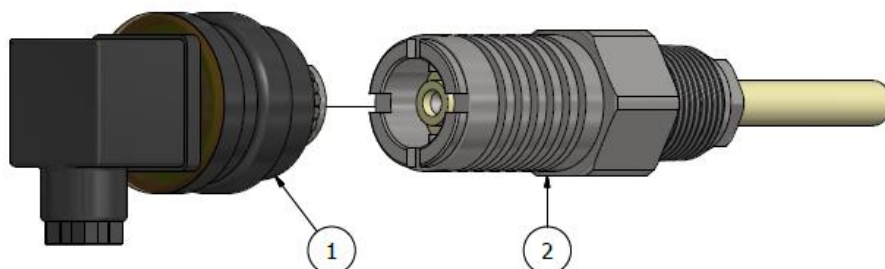
- Indication of high and low refrigerant levels in liquid separators, pump separators, economisers, and inter coolers.
- on/off control of liquid injection in liquid separators, pump separators, economisers, and inter mediate coolers

On ammonia refrigeration systems, it can also be used for

- Indication of accumulated oil in oil sumps, oil pots, liquid separators, economisers, inter mediate coolers. It is used here with a reversed contact function for automatic oil discharge/drainage.



Spare parts



Position	Specification	Type	Part number
1	Electronic part	PNP/NO	HBSR-EL/PNP/NO
		PNP/NC	HBSR-EL/PNP/NC
		NPN/NO	HBSR-EL/NPN/NO
		NPN/NC	HBSR-EL/NPN/NC
2	Mechanical part	3/4" NPT	HBSR-MEK-2
		3/4" BSPP	HBSR-MEK-6