Instruction manual
HB switches with circular programmable electronic unit
Covers: HBSC2, HBSR, HBSR-HFC, HBSO-LT, HBSO1, HBSO2 & HBOR



Functionality

The switches are used for detecting liquid in gas or air (HBOR detects oil in liquid ammonia). The mechanical elements have different designs because they are optimized to different liquids. The switches use the capacitive measuring principle and react to the difference in dielectric constant between liquid and gas.

The electronic unit comes in two versions

- V-track version wit set screw connection with IP54 rating
- Union connection with IP65 rating

The switches have different calibration and parameter settings in the electronic unit, but the unit is the same. From May 2025 the settings can be changed by the user, and the setting must match the mechanical part. Switches delivered after September 2020 have a build in heater which will be in operation below 5°C to keep the sensor dry.

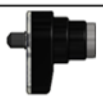
Standard switches available from HB-products

Switches from HB-products are suited for different fluids, different temperature ranges and supply voltages. The two tables show the recommended products.

Oil Switches

Supply voltage and recommended oil temperature Allowed temperature is typically higher	**PAO Mineral POE**	**POE (low temp.) PAG**	**Application**	**Design**	**Settings NO/NC NPN/PNP Available in special EX version** (different electronic unit)
24 V AC/DC low temp -30-40 °C (-22-104 °F)	HBSO1-LT	HBSO1-LT	Refrigeration		Programmable Ex
90-240 V AC - low temp -30-40 °C (-22-104 °F)	HBSO1-SSR-2-LT	HBSO2-SSR-2-LT	Refrigeration		Preset Relay output
24 V AC/DC - normal temp 0-80 °C (32-176 °F)	HBSO1	HBSO2	Refrigeration		Programmable Ex
90-240 V AC - normal temp 0-60 °C (32-140 °F)	HBSO1-SSR-2	HBSO2-SSR-2	Refrigeration		Preset Relay output
24 V AC/DC high or all temp 80-145 °C (176-293 °F) 0-145 °C (32-293 °F) changed settings	HBSO1-SSR-1-HT	HBSO2-SSR-1-HT	Oil separator or universal		Programmable Relay output
24 V AC/DC- Oil return switch -30-80 °C (-22-176 °F)	HBOR		Oil return system NH3		Programmable

Liquid Switches

Supply voltage, recommended liquid temperature and IP class Specified temperature range is typically wider	Liquid				
	R744 CO2 R600 Butane R600a Isobutane R290 Propane (In gas)	R507, R410a, R407c R404a, R22, R32, R134a, R1234yf, Other HFC/HFO (in gas and oil)	R717 NH3, Water Alcohols (In gas and oil)	Electronic part design	Settings NO/NC NPN/PNP EX version (different electronic unit)
24 V AC/DC – dry conditions -40-80 °C (-40-176 °F) IP54	HBSC2	HBSR-HFC HBSR	HBSR	 V-track connection	Programmable
24 V AC/DC – for wet and condensing applications IP65	HBSC2-U	HBSR-HFC-U HBSR-U	HBSR-U	 Treaded union	Programmable
90-240 V AC - normal temp -55-80 °C (-67-86 °F) IP54	HBSC2-SSR-2	HBSC-HFC-SSR-2 HBSC-HFC-SSR-2	HBSR-SSR-2		Preset Relay output
24 V AC/DC low ambient temp -55-30 °C (-67-86 °F) IP65	HBSC2-SSR-1/IP	HBSR-HFC-SSR-1/IP HBSR-SSR-1/IP	HBSR-SSR-1/IP		Programmable
Mechanical part design					

Installation outside the recommended temperature range

The HB-products web page has temperature specifications for the switches, and these will be different from the recommended temperature specifications. The switches will operate outside the recommended range but will not be optimal. For oil switches the switch point will change with temperature, and this means there is a risk that the switch will not detect oil or detect without oil. For sensors installed in low temperatures condensation might occur and water run into the connection between the mechanical and electrical unit. This might disturb the measurement. IP65 switches are recommended for these conditions

Labelling

The switches are delivered as NO/NC and NPN/PNP connection. The switches setting is printed on the small silver label on the switch together with the type code. On the same label you find manufacturing date and in the second row a unique manufacture batch number.

TYPE: **HBSO1** CONFIGURATION: **PNP/NO**

MANUFACTURE DATE: **DDMMYY**
manufacture batch number:467804

Safety Instructions

CAUTION! Read the instruction manual before commencing work! Heed all warnings. Installation of HBSR 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 damage resulting from not adhering to the above.

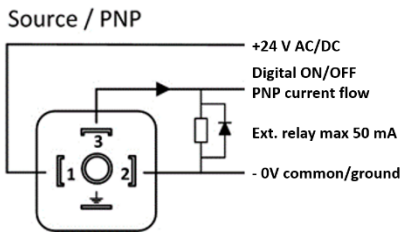
Intended use, conditions of use. The switch is manufactured to detect liquid. If the switch is to be used in a different way or for another purpose, and if the operation of the product in this function is determined to be problematic, prior approval must be obtained from HB Products.

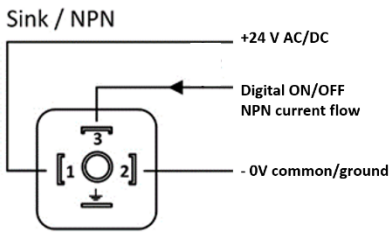
Prevention of collateral damage. Make sure that qualified personnel assess any faults and take necessary precautions before attempting to make replacements or reparations, to avoid collateral damage.

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

Electrical connections

The switch can be supplied with 24V±10% AC or DC. A standard ISO 4400 connector is used. The power consumption will depend on the temperature due to a built-in heater. Wiring is done according to the drawings below depending on the version PNP or NPN. For the PNP versions a relay can be applied between pin 2 and pin 3.





The switch is predefined as NO (normally open) or NC (normally closed) and this refers to the contact in the switch, in dry condition.

Switching

All switches except HBOR switch on when liquid is detected. This means a NO switch close the contact when liquid is detected, and a NC opens the contact when in liquid

HBOR is different: it switches off when oil is detected

All switches except HBOR

NO (normally open)
Contact is open when no liquid is detected and closes when liquid is detected

No liq. detection
Liquid detection

NC (normally closed)
Contact is closed when no liquid is detected and opens when liquid is detected

No liq. detection
Liquid detection

HBOR only

NO (normally open)
Contact is open when oil is detected and closes when no oil is detected

Oil detection
No oil detection

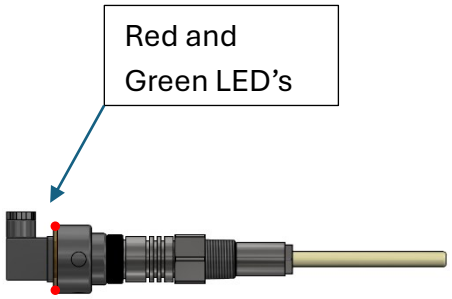
NC (normally closed)
Contact is closed when oil is detected and opens when no oil is detected

Oil detection
No oil detection

LED indication

4 x red LED´s indicate liquid/oil detection.
4 x green LED´s flashing indicate no detection, but sensor is active.
4 x red flashing LED´s indicate no connection to mechanical unit.

Irrespective of the output function (NO/NC) LED´s are activated when liquid is detected.

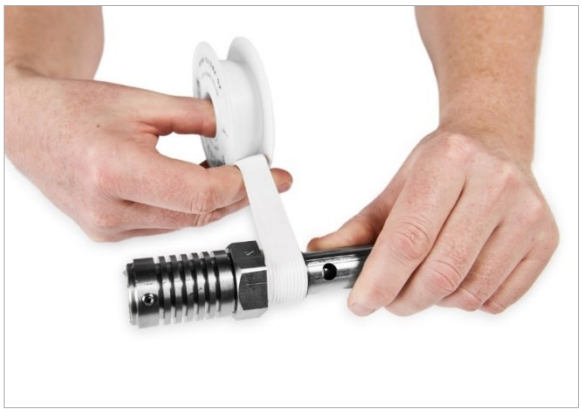


Mechanical installation

The switch with NPT thread is installed in a vessel or compressor, using Teflon tape or liquid sealant.

Switches with a straight tread (BSPP) is delivered with a washer kept in place by a plastic spring. The plastic spring should be removed before installation.

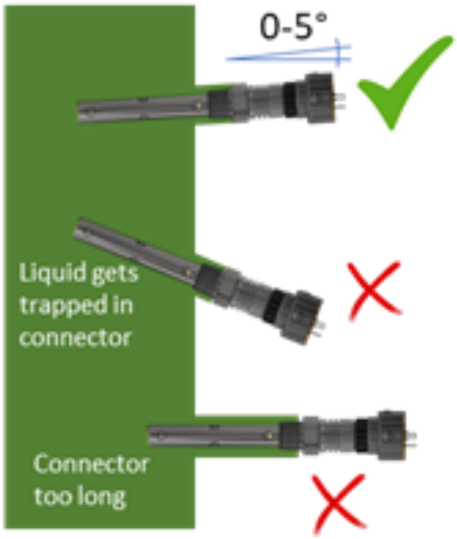
Switches installed in ammonia, water and alcohol have a mechanical element covered with PTFE. This is a part of the switch and should remain on when installed.



Fasten the mechanical part with a suitable tool to a torque 80-150Nm depending on thread material and type

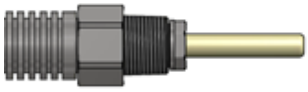
All switches can be installed horizontally except for switches in cold conditions, where the liquid has high viscosity. For these switches, make sure liquid can drain from the switch. This can be done by sloping the switch 0- 5 degrees downwards.

Long weld adapters should be avoided because gas pockets can build up and disturb the measurement.



Distance to other items

The distance between the mechanical part and other metal parts depends on the switch type. For all switches you must make sure the liquid can leave the switch when the level is lowered

3 mm **Liquid must be able to enter and leave**		Switches with an outer pipe HBOR & HBSC2
10 mm **Min. 15 mm in long connecting pipes**		Switches with PTFE covered probe HBSR & HBOR

Mounting the electronic unit

The electronic unit is mounted with either a threaded union or with two set screws in a V-track. The threaded union is mainly used for switches operating in cold conditions. The set screws are tightened with a torque of 5 Nm and the threaded union is tightened firmly by hand or by using pliers to secure a good electrical connection.

For cold installations where condensation occurs the treaded union should be used to avoid poor contact between electrical contact between mechanical and electrical unit.

Disconnect the electronic unit by loosening the treaded union or the two set screws.

Programming

The electronic unit can be programmed if labeled “Programmable”

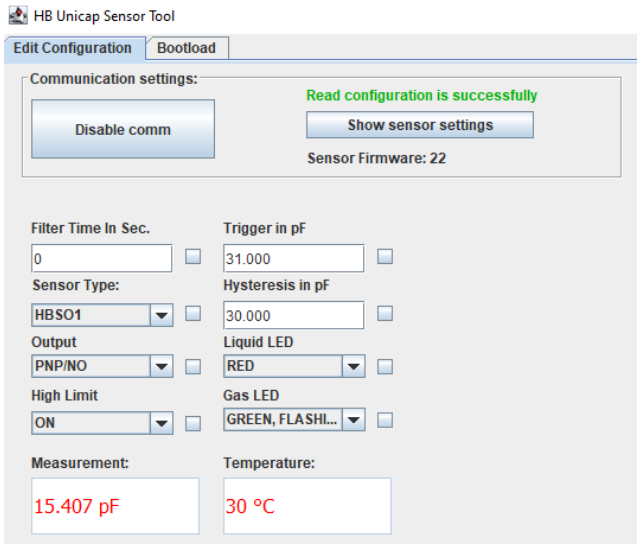
You can connect the switch to the HB Tool by using a USB cable and an adapter with these codes.

HBxC-USB
HBxC-Adapt-DIN/M12

You can change the following parameters

- Filter time
- Output: PNP/NPN and NO/NC
- High limit – which is an additional setpoint, where it switches back (can’t be adjusted)
- Trigger point and hysteresis
- LED’s color and pattern

The “sensor type” can be changed, but the switch point will not automatically change the switch point



Type	Triggerpoint pF	Hysteresis pF
HBSR ½" NH3	23,0	22,1
HBSR ¾" NH3	21,0	20,1
HBOR ½"	24,0	23,1
HBOR ¾"	21,9	21,1
HBSC2 ½"	24,4	23,9
HBSC2 ¾"	35,5	34,6
HBSO1	20,1	19,2
HBSO2	26,5	24,2
HBSR ½" HFC	21,3	20,5
HBSR ¾" HFC	19,2	18,3
HBSO1 1-1/8”	20,3	19,4

Detailed parameter description

Filter time

The measurement is averaged over a period, and the filter time is the period

Output

The output can be changed between

- PNP/NO
- PNP/NC
- NPN/NO
- NPN/NC

High limit

If high limit is set to “ON” the detection stops and not triggered when the limit is reached. This means it works as an additional setpoint. The value can’t be adjusted in the tool

Trigger point and hysteresis

This is the value, measured in pF, at which the electronic unit switches and it remains switched until the hysteresis is reached going down. The trigger point is typically 1pF above hysteresis for a normal switch and it prevents rapid changes

LED’s color and pattern

The LED’s can be changed if needed, but pls remember it makes support difficult

Fault detection

In case of fault, it is normally enough to replace the electronic part.

Fault	Possible Reason	Correction of fault
No LED is on when the sensor is in the medium and connected to power.	No supply to the sensor or defective cable/plug.	Check the power supply or replace the power supply cable.
Output and 4xLEDs are constantly activated, even though liquid is not in contact with the sensor.	Water or moisture shortcut the sensor between the mechanical and electrical parts. Or Faulty calibration	Use a sensor with treaded union or dry the parts and make a suitable cover against water Or Recalibrate

Sensor repair:

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

If you have a faulty product, please contact the HB Products dealers/distributors.
Their complaints procedures must be followed before returning the sensor.

Further information

For any inquiries or further information, please don't hesitate to contact us at support@hbproducts.dk.

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