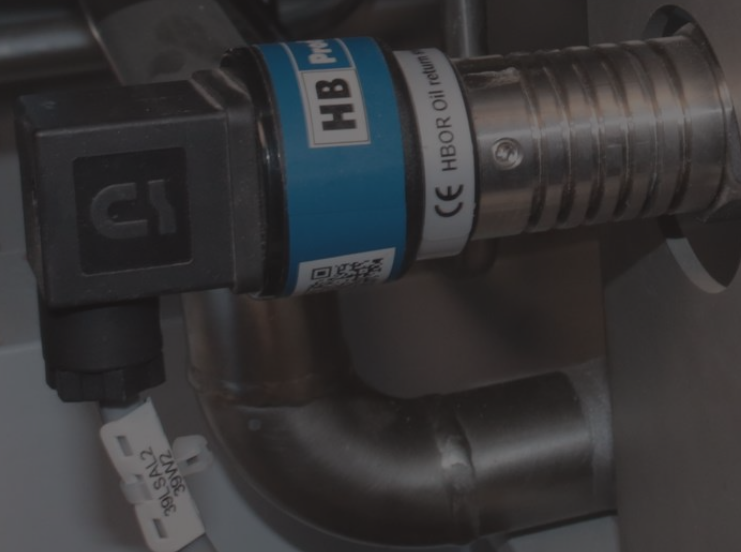


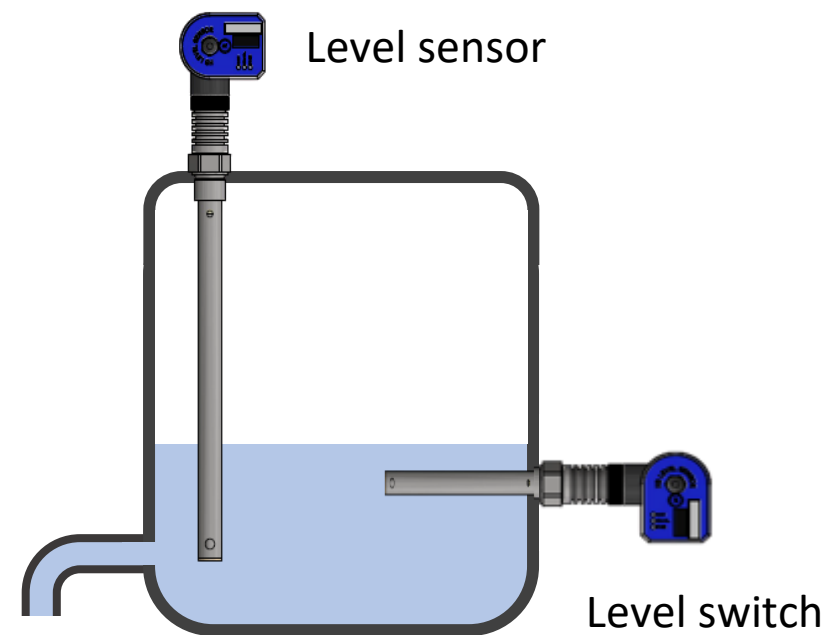
LIQUID LEVEL SWITCHES

Detection and control of liquid levels



WHY CHOOSE OUR LIQUID LEVEL SWITCHES?

- No moving parts
- Long track record
 - On the market since 1996
 - Sold all around the world
 - Annual sale >10.000 pcs.
- Measures the presence of liquid in gas
- Split design – the electronic head can be replaced without evacuating the system
- Suited for high pressure up to 150 bars and aggressive liquids like NH₃
- Suited for media temperatures from -60°C to 145°C
- Can control a valve directly



MEASUREMENT PRINCIPLE

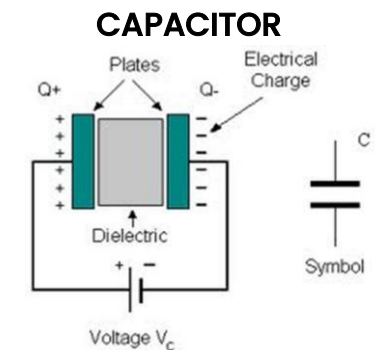
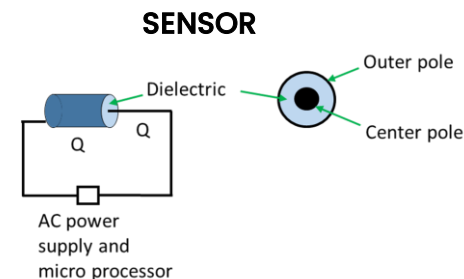
The switch uses the capacitive measurement principle like most of the switches and sensors from HB Products.

In principle, the switch acts as a large capacitor where the liquid or gas is the dielectric, which fills the gap between the two poles. The capacitance is based on the dielectric constant of the fluid between the center pole and the outer pole. Different liquids have different dielectric constants, and some of them are shown in the blue box.

The electronic unit applies a low voltage, high-frequency AC to the switch element to measure the capacitance. The measured capacitance and base dielectric parameters allow the switch to detect liquid.



Dielectric Constant:	Temperature 20°C
Water/brine	80 (0°C is 88)
Ammonia	17 (-40°C is 22)
CO2	1.5 (-40°C is 2.0)
Oil type PAO, PEO Oil type PAG	2.2 Mineral and synthetic types 3.5 Synthetic types
R134a	9.24
R22	6.35
R410A	7.78
R507	6.97
R1234ze	7.7
Air and gas	1.0
Ice	3.2



WHAT DOES THE SENSOR CONSIST OF?

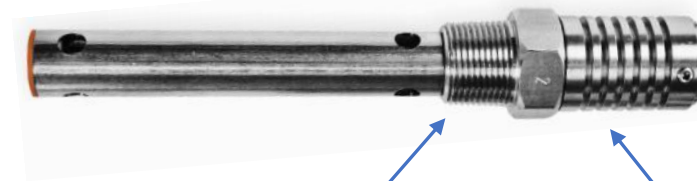
- Split design
- Different mechanical elements for different liquids
- Large or small electronic unit
- Large units can be configured
- Large unit can control a solenoid valve



THE MECHANICAL PARTS

The mechanical part is made in different designs customized to the temperature range and type of liquid.

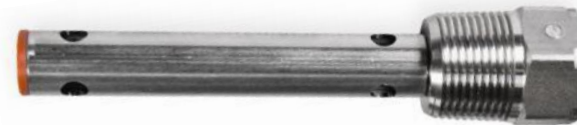
Oil and refrigerant - high temperature



Different treads NPT, BSPP & BSPT and different sizes $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1" are available

Cooling extension is used for elevated temperatures

Oil and refrigerant - normal temperature



V-track connection with set screws is used for normal and elevated temperatures



THE MECHANICAL PARTS

Oil low temperature

Extension is used
for low
temperatures



Treaded union is
used for low
temperatures

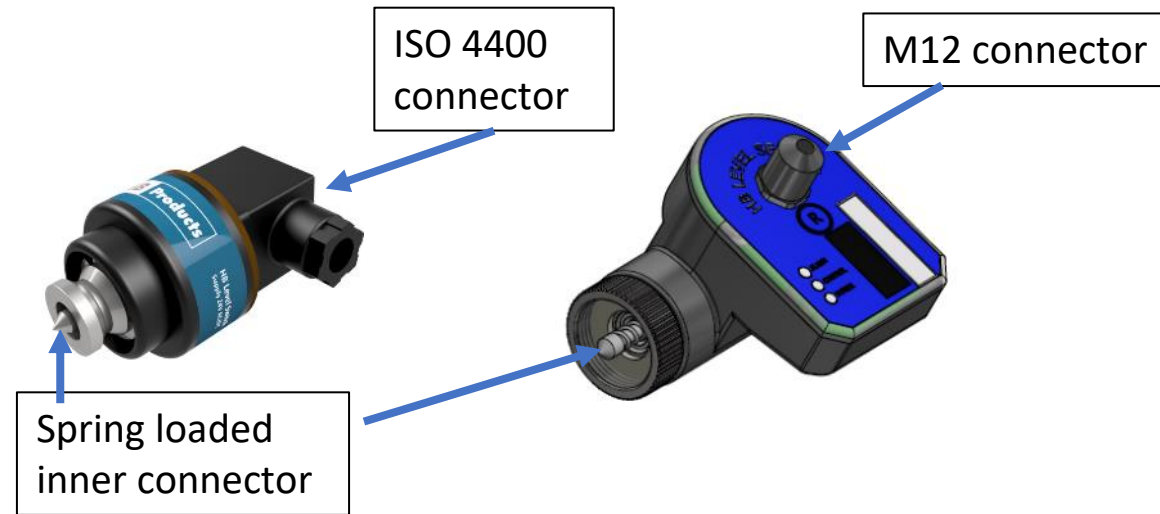
Ammonia and water - all temperatures

PTFE covered rod without
outer pipe is used for
ammonia and water




THE ELECTRONIC ELEMENT

- Spring loaded inner connector
- Housing with outer connector
- Electronic circuit board
- M12 connector
- Cable for valve control (optional)



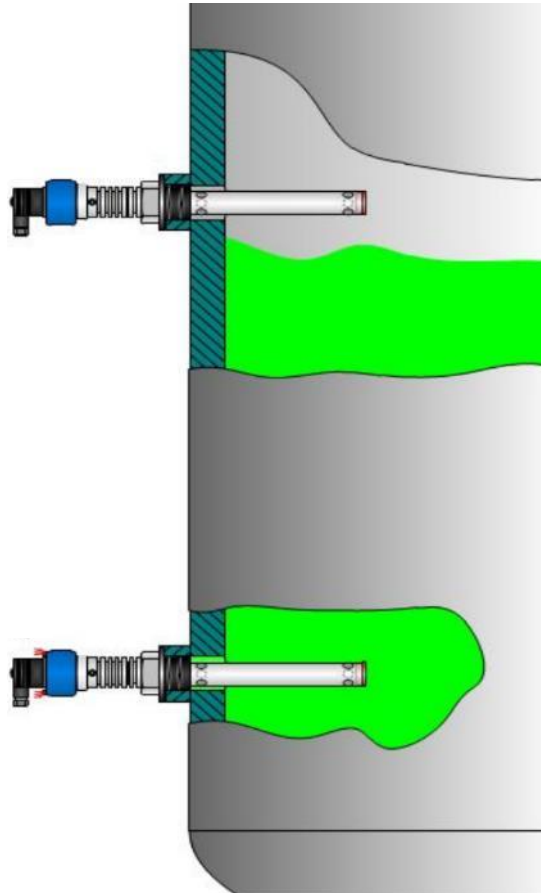
THE ELECTRICAL UNIT



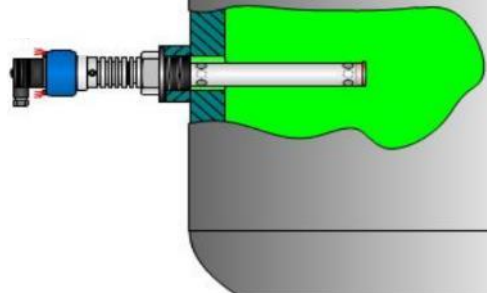
	Small circular unit	Large oval unit	Large oval unit with cable
Electrical connection	ISO 4400 4 pin connector	M12 5 pin connector	M12 5 pin connector & cable for control
Output	PNP or NPN	Potential free relay	Potential free relay and digital DC output
Setting	NO/NC	NO/NC	NO/NC
Mechanical connection	V-track or union	V-track or union	V-track or union
Settings	Factory setting only	Can be modified	Can be modified
ATEX/EX option 	No	Yes	No

FUNCTIONALITY OF THE SWITCHES

No
detection



Detection
of liquid



**Large electronic
unit**



Power LED flashing green



3 LED's constant green and
Power LED flashing green

**Small electronic
unit**















4 LED's Flashing green







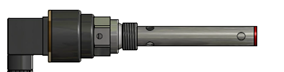
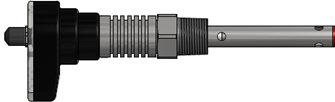



4 LED's constant red




LIQUID LEVEL SWITCHES: PRODUCT OVERVIEW

Supply voltage, recommended liquid temperature and IP class Specified temperature range is typically wider	Liquid				
	R744 CO2 R600 Butane R600a Isobutane R290 Propane	R507, R410a, R407c R404a, R22, R32, R134a, R1234yf, R1234ze Other HFC/HFO	R717 NH3, Water Alcohols	Electronic part design	Settings NO/NC NPN/PNP EX version (different electronic unit)
24 V AC/DC – dry conditions -40-50 °C (-40-122 °F) IP54	HBSC2	HBSR-HFC HBSR	HBSR	 V-track connection	Preset 
24 V AC/DC – elevated temp. 50-80°C 122-176 °F) IP54	HBSC2	HBSR-HFC	HBSR-HP	 V-track connection	Preset 
24 V AC/DC – for wet and condensing applications IP66	HBSC2-U	HBSR-HFC-U HBSR-U	HBSR-U	 Treaded union	Preset 
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) IP66	HBSC2-SSR-1/IP	HBSR-HFC-SSR-1/IP HBSR-SSR-1/IP	HBSR-SSR-1/IP		Can be changed 
Mechanical part design					

OIL LEVEL SWITCHES: PRODUCT OVERVIEW



Supply voltage and recommended oil temperature Allowed temperature is typically higher	PAO Mineral	POE 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)	HBSO-LT		Refrigeration		Preset 
90-240 V AC - low temp -30-40 °C (-22-104 °F)	HBSO-SSR-2-LT		Refrigeration		Preset Relay output
24 V AC/DC - normal temp 0-60 °C (32-140 °F)	HBSO1	HBSO2	Refrigeration		Preset 
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 - medium temp 40-100 °C (104-212 °F)	HBSO1-MT	HBSO2-MT	Heat pump		Preset
24 V AC/DC high or all temp 90-145 °C (194-293 °F) 0-145 °C (32-293 °F) changed settings	HBSO-SSR-1-HT		Oil separator or universal		Can be changed Relay output
24 V AC/DC- Oil return switch -30-80 °C (-22-176 °F)	HBOR		Oil return system NH3		Preset

SPECIAL SWITCHES FOR OIL AND LEAKAGE DETECTION

Product type	product	Detect	Suited for	Application	Design
Oil Pot Controller	HBOR/C	Oil in ammonia liquid	Ammonia	Controls a valve based on detection of oil in the bottom of vessel filled with liquid ammonia	
Oil Management Control Switch	HBOC/C	Oil in gas	Oil in any gas/air	Controls a valve based on detection of oil. Used in, compressors, separators and other vessels	
Leakage Switch for Ammonia/CO2 Cascade Systems	HBAC	Ammonia carbamate in ammonia	Ammonia/CO2	Detects ammonia carbamate created when CO2 leak into ammonia in cascade systems	

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Liquid Level Switches

HB Products offers a wide range of capacitive-level switches for refrigeration and industrial use. Due to the capacitive principle, the switches are optimized and calibrated for different groups of liquids and different working conditions.

All switches consist of a mechanical and an electrical part. The mechanical part has no moving elements and is insensitive to contamination. The electrical part is available in simple pre-calibrated versions with 24 V or 50-240V supply and more advanced versions, which can be calibrated on-site and even control a solenoid valve directly. All switches can be supplied with both AC and DC and we have both 24 V NPN/PNP output as well as solid state.

All the electronic units suitable for low temperatures have a built-in heater, which will protect them against normal condensation, but for wet conditions, we have IP66 versions.

The mechanical parts are available with different thread types and sizes like 1/2", 3/4" or 1". Most switches detect liquid in gas or air, but we can also operate in two immiscible liquids like oil in ammonia or oil in water.

The typical pressure rating is 150 bar.

These **interactive** tables can help guide you to the different variants.

24 V AC/DC liquid switches

Liquid temperature Recommended liquid temperature and if also specified temperature range is typically water	24V AC/DC		Liquid in gas				Oil in ammonia or water
	PAO all Metal oil	PNP all Metal oil	RT44 CO2 R404A, R410A, R412A, R413A, R414A, R415A, R416A, R417A, R418A, R419A, R420A, R421A, R422A, R423A, R424A, R425A, R426A, R427A, R428A, R429A, R430A, R431A, R432A, R433A, R434A, R435A, R436A, R437A, R438A, R439A, R440A, R441A, R442A, R443A, R444A, R445A, R446A, R447A, R448A, R449A, R450A, R451A, R452A, R453A, R454A, R455A, R456A, R457A, R458A, R459A, R460A, R461A, R462A, R463A, R464A, R465A, R466A, R467A, R468A, R469A, R470A, R471A, R472A, R473A, R474A, R475A, R476A, R477A, R478A, R479A, R480A, R481A, R482A, R483A, R484A, R485A, R486A, R487A, R488A, R489A, R490A, R491A, R492A, R493A, R494A, R495A, R496A, R497A, R498A, R499A, R500A, R501A, R502A, R503A, R504A, R505A, R506A, R507A, R508A, R509A, R510A, R511A, R512A, R513A, R514A, R515A, R516A, R517A, R518A, R519A, R520A, R521A, R522A, R523A, R524A, R525A, R526A, R527A, R528A, R529A, R530A, R531A, R532A, R533A, R534A, R535A, R536A, R537A, R538A, R539A, R540A, R541A, R542A, R543A, R544A, R545A, 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