



Products

WE INCREASE
UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY

Instruction manual

HBSO - Oil Level Switch

– High Temp (+80°...120°C)

For detecting oil in refrigeration systems





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Safety Instructions

CAUTION! Read the instruction manual before commencing work! Heed all warnings to the letter! Installation of the oil switch 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.

	<p>CAUTION! Refers to a possible limitation of functionality or risk of use.</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 HBSO-HT switch is made to detect high temperature (+80..+120°C) oil type PAO, PEO, PAG & mineral used in refrigeration systems. If HBSO is to be used in a different way or with 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, so as to avoid collateral damage.

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

Introduction

HBSO-HT high temperature model is a level switch for detecting common high temperature (+80..+120°C) lubricating oils in refrigeration systems.

Typically it is installed in/on the compressor and the oil separator, but it is also suited for installation in other locations in the oil system.

The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle allows it, among other things, to detect oil without detecting refrigerant.

It is calibrated so that it is unaffected by oil spray and only allows a small amount of foam.

The sensor is also constructed so as to resist high pressure and temperatures.

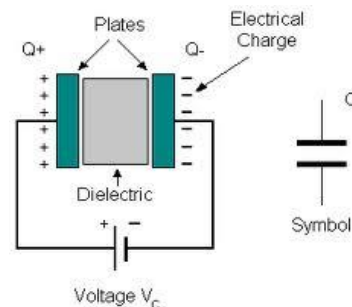
Measurement principle

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 is changes.



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.

HB Products sensors are calibrated so that they differentiate between conductive and non-conductive liquids. In refrigeration systems, the oil, HFC's 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 pushes it from 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.



Technical data

Connection:

Supply:	24 V AC/DC
Current consumption:	30 mA
Plug:	M12 – DIN 0627
Required cable size:	3 x 0,34 mm ²
Required cable glands:	PG7 / M8

Output:

Solid state relay output:	24 VAC/DC-1A
Output function:	NC or NO

Installation conditions:

Ambient temperature:	-30...+50°C
Oil temperature:	+80...+120°C
Max. operational pressure:	150 bar
Waterproof rating:	IP65
Vibrations:	IEC 68-2-6 (4g)

Authorisations:

EMC Emission:	EN61000-3-2
EMC Immunity:	EN61000-4-2

Oil type:

HBSO	PAO, PEO, PAG & Mineral
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Mechanical specifications:

Thread connection:	½", ¾" & 1 1/8"
Materials, mechanical:	AISI304/PTFE
Materials, electronics:	Nylon 6 (PA)
Weight:	500 g

Indication:

Level indication:	3 x LED (green)
Power supply:	1 x LED (green)

Function

HBSO-HT is a high temperature level switch for detecting PAO, PAG & PEO lubricating oils in refrigeration systems. Typically, it is installed in/on the compressor and the oil separator, but it is also suited for installation in other locations in the oil system.

The sensor differentiates between oil and refrigerant gas, so that the electrical signal from the sensor changes when the oil level drops below/rises above the level 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 oil is on the same level or above this point, 3 LEDs light up (irrespective of the output relay NO/NC).

Examples of usage

HBSO-HT is intended for use in refrigeration systems, including

Screw and piston compressors, as

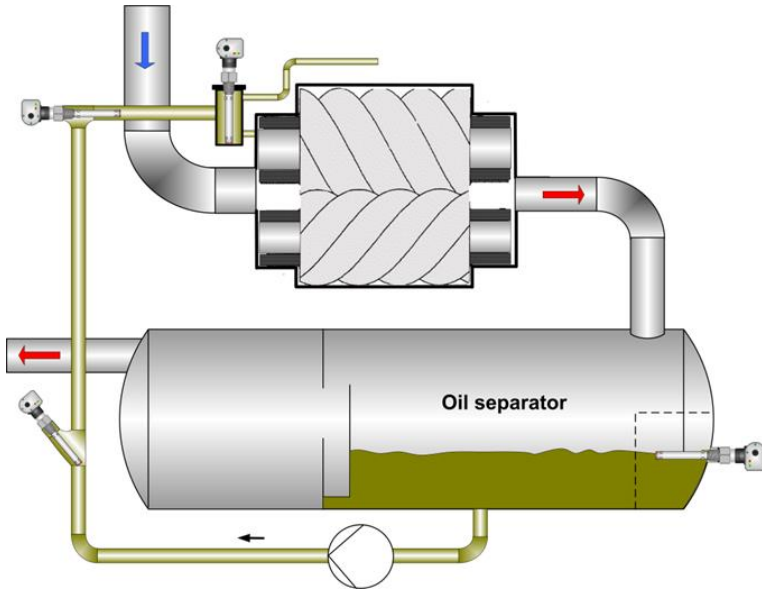
1. level alarm for low oil levels for protecting against damage
2. ensuring that there is oil during start-up and operation

Oil separators

3. to indicate min/max level so as to be able to regulate accordingly

Oil pipe system

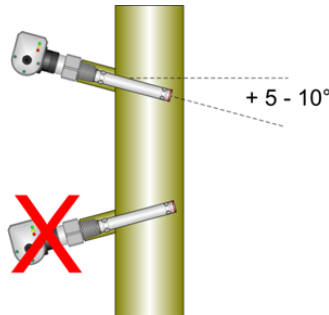
4. as an indication of oil flow



Installation instructions

The following applies during installation:

- 1) In case the sensor is installed in a threaded sleeve/pipe stub, this should be welded at a 5-10° **upwards angle** relative to the horizontal, so as to prevent the formation of liquid pockets.
- 2) The sensor should not be installed vertically, since there can be a risk that gas pockets displace the oil from the sensor.
- 3) Installation on the compressor can take place using an adaptor or flange, given that the following is taken into account:



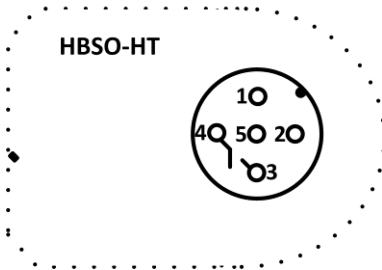
NOTE! So as to avoid touching parts of the compressor or container and risking damage or operational problems, the sensor's installation length must be taken into account. There must be at least 2mm between the sensor's mechanical part and other fixed or moving parts.



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

HBSO-HT is delivered with relay output.



Supply 24V AC/DC, minimum 30 mA

1 = Brown +

2 = White -

3 = Blue – DO - Potential free solid state, 1 A

4 = Black – DO - Potential free solid state, 1 A

Installation guide

HBSO-HT is installed on either a threaded sleeve or with a flange that corresponds to the sensor's external thread. The sensor is sealed with Teflon tape or liquid gasket or solid gasket depending on the thread type.

Thread type	Sealing type
½" BSPP	Bonded seals - $\varnothing 21,65/26,70 \times 1,25$
¾" BSPP	Bonded seals - $\varnothing 27,30/32,50 \times 1,25$
1 1/8" UNF	Bonded seals - $\varnothing 29,33/36,58 \times 2,34$

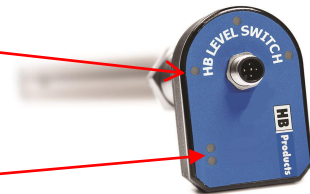
LED indication

LED indication: 3 x green LEDs indicate oil level

Irrespective of the output function NO/NC, LEDs are activated by means of the oil level.

Power supply:

1 x LED (green)



Fault detection

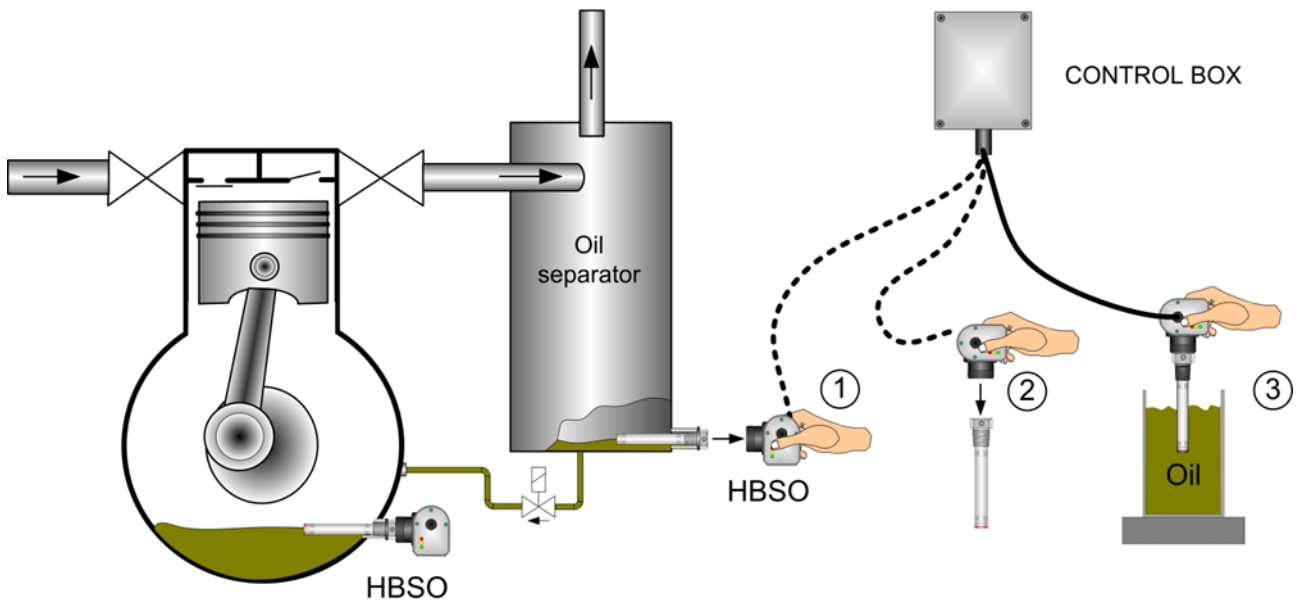


NOTE! Fault detection on the electronic function can be carried out without **releasing pressure** from the system or disassembling the mechanical part from the sensor.



IMPORTANT! In case of removing the mechanical part, make sure the system is de-pressurized

The easiest way to carry out fault detection is to have an extra mechanical part available.



The electronic part to be tested is installed on the extra mechanical part.
 The electronics can easily be tested using a container with oil (see illustration).
 If the electronics switch the way they are supposed to during the test, one can exclude the possibility of a fault on the sensor.



NOTE! LED is always activated when approx. half of the sensors are covered or immersed in oil, irrespective of the sensor's output function NC/NO.

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

Fault	Possible Reason	Correction of fault
No LED is on when the sensor is in the medium.	No supply to the sensor or defective cable/plug.	Check the power supply or replace the power supply cable.
No output (3 x green LED are on but the output signal is not active)	Check if the sensor's output matches the control's input; if it is a NO or NC respectively. See the output charge instructions below.	Create alignment between the sensor and control so that the two are identical.
No contact activation (3 x green LED are not on, even though liquid should activate the sensor)	There may be dirt between the electronic housing and the mechanical housing.	Separate the two parts and clean the spring tip.
Delay in sensor activation	1) Can be caused by a gas pocket that displaces the liquid.	1) Install the sensor so that the gas pockets cannot displace the liquid
Output and 3xLED are activated constantly, even though liquid is not in contact with the sensor.	Threaded sleeves are installed with negative slope so that liquid can collect in the threaded sleeves which activate the sensor.	Place the threaded sleeves according to the instructions. See installation.

Function of charge output on pin 3 & 4:

NC: There should be no signal when it is in oil.

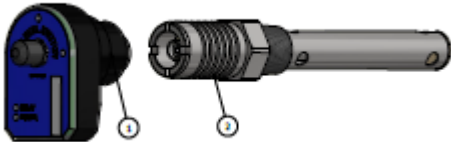
NO: There should be a signal when it is in oil.

Sensor repair:

The sensor electronics are completely embedded 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 complain procedures must be followed before returning the sensor.

Spare parts



Position	Specification	Type	Part number
1	Electronic part – HBSO-HT	NO	HBSO-SSR/NO-HT-EL
		NC	HBSO-SSR/NC-HT-EL
2	Mechanical part	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		½" BSPT	HBSO1-MEK-3
		¾" BSPT	HBSO1-MEK-4
		½" BSPP	HBSO1-MEK-5
		¾" BSPP	HBSO1-MEK-6
		1 1/8 UNEF	HBSO1-MEK-7

Further information

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

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