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IN THE REFRIGERATION INDUSTRY

Instruction manual

HBLC-OIL-x-x – LEVEL SENSOR
For analogue measurements of PAO, M & E oil types

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Safety Instructions

CAUTION! Always read the instruction manual before commencing work! Heed all warnings to the letter! Installation of the sensor 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 equipment, 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 the chapters where the information is relevant. The safety instructions and the warnings in particular, must always be read and adhered to.

	CAUTION! Refers to a possible limitation of functionality or risk in usage. NOTE! Contains important information about the product and provides further tips. The person responsible for operation must comply with all the legislative requirements with regards to accident prevention, and take all necessary care to avoid damage to both people and materials.

Intended use, conditions of use. The level sensor is designed for continuous measurement of oil. If the sensor is to be used for a different application and if the operation of the product in this application is considered to be problematic, prior approval must be obtained from HB Products.

Prevention of collateral damage Make sure that only qualified personnel work with the sensor and that all necessary precautions are taken before attempting to make replacements or repairs, so as to avoid any collateral damage.

Disposal instructions: The sensor is constructed so that the modules can easily be removed and sorted for disposal.

Introduction

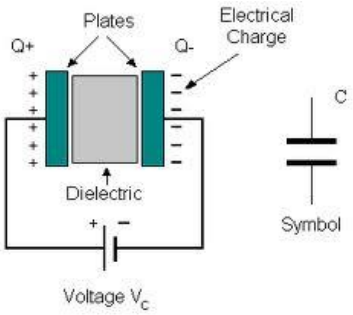
HBLC-OIL is an intelligent sensor with a built-in microprocessor. It is designed for continuous level measurement of PAO, M & E oil types. The sensor emits a 4-20mA analogue signal, which is proportional to the liquid level.

The construction of the sensor makes it suitable for systems with pressure of up to 150 bar.

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.

A capacitor basically 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 the two plates, the sensor for level measurement is shaped as a cylindrical rod. When liquid covers the sensor, the measured capacity is changed.

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, oil, HFC and liquid CO2 are not regarded as conductive fluids, whereas refrigerants such as ammonia and brine are regarded as conductive.

Design and Function

The sensor consists of a mechanical part and an electronic part. These are easily separated by loosening 2 grub screws or, for housings with mounting tabs, by pressing the sensor 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 the IP65 waterproof rating and so as to resist vibrations.

The mechanical part is produced in AISI304/PTFE and tested to withstand high pressure.

The sensor is a very accurate analogue level transmitter for continuous measurement of liquid CO2 or HFC on refrigerant plants. Additionally it may serve as high level switch, since the in-built switch function gives an alarm signal at the 100% level.

Technical data

Supply:	
Supply:	24 V AC/DC ±10%*
Current draw:	Max 50 mA
Plug:	M12, 5 pins - DIN 0627
Output:	
Analogue output:	4-20 mA
Permitted load on potential free contactless set	1A (24V DC)
Installation conditions:	
Ambient temperature:	-30…50°C
Refrigerant temperature:	-55…+30°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
GOST R:	No 0903044

Mechanical specifications:	
Thread connection:	¾" NPT & BSPP
Materials - mechanical parts:	AISI304/PTFE
Materials - electronic parts:	Nylon 6 (PA)
Housing design:	Front
Calibration & indication:	
Calibration	Press-button
LED indication:	Green, yellow, and red
Cable specification:	
Supply cable, 5 meters:	HBxC-M12/5
Cable size:	5 x 0,34 mm^2
Cable glands:	PG7 / M8
Plug type:	Angle - 90°
Cable type:	PVC-OB grey
Accessories:	
Threaded 1" BSP adapter with alu. gasket	HBS/ADAP/8/2

NOTE! 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 that specified on the sensor label.

Installation Instructions

The following applies to the design of the system:

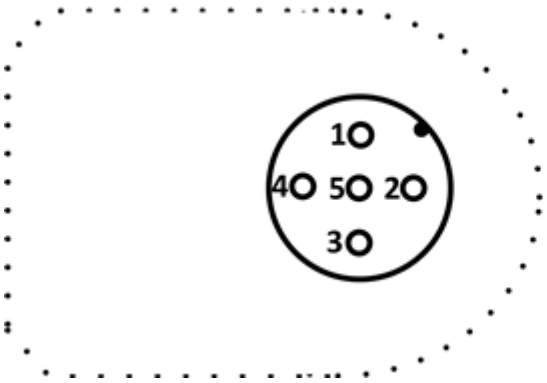
1) It must be installed in a vertical position
2) The sensor should be installed in a stand pipe where the flow stream and turbulence are minimised.
3) The sensor is installed and is supplied with a standard non-shielded cable. If EMC is greater than described in EN 61326, a shielded cable must be used.

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

NOTE! The sensor element must not touch the tank or other metal parts in its mounted position. If so, the sensor will not give out a correct signal.

Power connection

The sensor must be wired with a 4 cord cable with a M12 connection plug
Colour codes in the below diagram are related to the cables offered by HB.
The supply voltage is limited to 24V AC/DC



Supply 24V AC/DC

1 = Brown – Power supply +

2 = White - Power supply -

3 = Blue - DO, Alarm, PNP/NPN, 1A

4 = Black - AO, Level output, 4-20mA

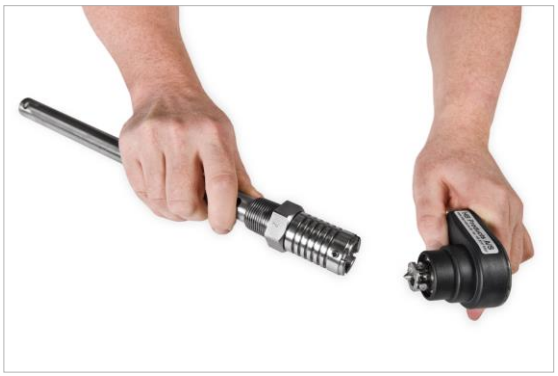
5 = Gray - Not in use (data only)

Installation guide

The sensor is installed in standpipe or directly in the container. Liquid gasket is applied to the thread.

To install the sensor, you must use a 2.5 mm Allen key, shifting spanner, and gasket, depending on the type of thread.

Loosen the two set screws that secure the electronic part and the mechanical part.



Separate the electronic part from the mechanical part. he hub of the two parts has been applied Molykote grease type 111 silicone compound to minimize moisture penetration. Do not wipe off the grease

Apply liquid gasket / Teflon to the conical thread.

Mount the electronic part in the container or standpipe and tighten (80-150 Nm).

Mount the electronic part and tighten the two set screws. Optionally apply Molykote grease 111 silicone compound before the two parts are assembled.

LED indication

LED indication:

1) Green LED indicates 24 V AC/DC supply (blinks during operation)
2) Yellow LED – in connection with calibration
3) Red LED indicates ALARM at 100%

LED Signal	ON/OFF/Frequency	Functionality
Green	ON	Supply
	OFF	No supply
Yellow	ON	Activated during calibration
	OFF	Normal operation
Red	ON	Alarm is activated after 10 seconds with 100% level
	OFF	No alarm

Alarm Reset & Calibration

Alarm Reset: The alarm is reset by pressing "R" for 5 seconds.

The level transmitter comes pre-calibrated for PAO, Me and E types of oil. Calibration is normally not required unless a high measurement accuracy is required.

Calibration instructions:
0% or 100% for calibration **can be carried out independent of each other.** We recommend only calibrating at 0% if a high degree of accuracy is desired.

Instruction for 0% calibration:

1) The sensors calibration function should be connected via the HB tool. See instruction for PC connection and configurations parameters in separate manuals. Connect the supply cable
2) Disconnect the power cable
3) Empty the tank
4) Activate "R" for 5 seconds to activate calibration mode = Yellow LED is on (ON) during the 5 second activation and turns off (OFF) when calibration mode is activated.
5) Activate "R" once = Yellow LED blinks once. Afterwards, the green LED blinks to confirm calibration. In case a smaller measurement area is desired, a recalibration can be performed.
6) Connect the PC Tool again and disconnect the calibration function in the tool.
7) Connect the power cable.

Instruction for 100% calibration:

1) The sensors calibration function should be connected via the HB tool. See instruction for PC connection and configurations parameters in separate manuals. Connect the supply cable
2) The supply cable is connected
3) Fill the tank to 100%.
4) Activate "R" for 5 seconds to activate calibration mode = Yellow LED is on (ON) during the 5 second activation and turns off (OFF) when calibration mode is activated.
5) Follow the instructions under "Configurations Instructions" regarding the installation of drivers in the program.
6) Activate "R" twice = Yellow LED blinks twice. Afterwards, the green LED blinks to confirm calibration.
7) Connect PC Tool again and disconnect the calibration function in tool.
8) Connect the power cable.

Installation of HB Configurations Tool

See separate manual.

PC Configuration

See separate manual.

Fault detection

General:

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

NOTE! Fault detection and/or changing the electronic function can be carried out without releasing pressure from the system or disassembling the mechanical part of the sensor.

Fault detection

Fault	Reason	Correction of fault
No LED is lit / no function	No supply to the sensor or defective cable/plug.	Check the power supply and the supply cable.
No contact activation	There may be dirt between the electronic housing and the mechanical housing.	Separate the two parts and clean the spring tip. Remember to apply silicone grease to the spring tip so as to avoid any problems with moisture.
Delay in sensor activation	Can be caused by gas and formation of foam in the system.	Check that the sensor is placed optimally, so that gas and air are avoided.
There is no correlation between the output signal and the measuring distance.	The sensor is not calibrated correctly.	Perform calibration.

Sensor Repair

In case of faults with the sensor, it will typically be necessary to replace only the electronics.
Sensor electronics are fully encapsulated and can therefore not be repaired.
Complaint cases are handled by the HB products dealers/distributor.
Consideration must be given to the complaint procedures before returning the sensor.

Spare parts

Position	Description	Specification	Part number
1	Mechanical parts	¾" NPT - 150 mm	HBLC-CO2-1.5-2-MEK
		¾" NPT - 300 mm	HBLC-CO2-3-2-MEK
		¾" NPT - 500 mm	HBLC-CO2-5-2-MEK
		¾" NPT - 800 mm	HBLC-CO2-8-2-MEK
		¾" NPT - 1000 mm	HBLC-CO2-10-2-MEK
		¾" BSP - 150 mm	HBLC-CO2-1.5-6-MEK
		¾" BSP - 300 mm	HBLC-CO2-3-6-MEK
		¾" BSP - 500 mm	HBLC-CO2-5-6-MEK
		¾" BSP - 800 mm	HBLC-CO2-8-6-MEK
		¾" BSP - 1000 mm	HBLC-CO2-10-6-MEK
2	Electronic part	PC-programmable	HBLC-OIL-EL

Further information's

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