Instruction manual

HBSR-SSR-IP low temperature switch for CO₂ refrigerant

For detection of refrigerant in low temperature applications such as flow, blast and spiral freezers
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Safety Instructions

CAUTION! Always read the instruction manual before commencing work! Heed all warnings to the letter! Installation of HBSC2-SSR-IP 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 places in the chapters where the information is relevant. The safety instructions and the warnings in particular, must always be read and adhered to.

<table>
<thead>
<tr>
<th>CAUTION!</th>
<th>Refers to a possible limitation of functionality or risk in usage.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE!</td>
<td>Contains important information about the product and provides further tips.</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

Intended use, conditions of use. The HBSC2-SSR-IP level switch is designed for level indication of refrigerant in industrial refrigeration systems. If the HBSC2-SSR-IP is to be used in a different way 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 errors and take necessary precautions before attempting to make replacements or repairs, so as to avoid collateral damage.

Disposal instructions: HBSC2-SSR-IP is constructed so that the modules easily can be removed and sorted for disposal.
**Introduction**

HBSC2-SSR-IP is an intelligent microprocessor controlled sensor with integrated temperature compensation. It is specially designed for refrigerant level detection in low temperature applications, such as flow, blast and spiral freezers or other low temperature applications. The temperature compensation also prevents ice formation on the switch and ensures that the electronic circuit works trouble free, even at very low temperatures.

**Measurement Principle**

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

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

**Design**

The sensor consists of a mechanical part and an electronic part. These can easily be separated by loosening the union on the housing. The sensor is designed in accordance with IP68 waterproof rating and materials used allows (Clean-in-place) CIP cleaning. This makes the sensor suitable for installation on food processing facilities, dairies, breweries etc.

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

Supply:
Voltage: 24 V DC ±10%
Current draw: Max 600 mA
Plug: M12, 5 pins

Output:
Function NO or NC
Permitted load on potential free contactless set 1A (24V DC)

Installation conditions:
Ambient temperature: -60...50°C
Refrigerant temperature: -55...+30°C
Max. operational pressure: 150 bar
Waterproof rating: IP68

Approvals:
EMC Emission: EN61000-3-2
EMC Immunity: EN61000-4-2
GOST R: No 0903044

Mechanical specifications:
Thread connection: ¾” NPT
Matr. – mechanical parts: AISI304/PTFE
Matr – electronic parts: PA46-GF30
Housing design: Front

Indication:
LED indication Green, yellow, and red

Accessories:
Low temp supply cable: HBxC-R-IP-M12/5
5 meters with M12 plug: suppl. with the sensor
Plug type: Straight
Cable type: TPE-OB grey
Cable size: 4 x 0,34 mm²
Cable glands: PG7 / M8

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.

Function
HBSC2-SSR-IP is a single point switch for level detecting of refrigerants, such as NH₃, HFC and brine.

The IP68 rating and the temperature compensation allows the sensor to be installed in harsh environments with low ambient temperatures and frequent defrosting cycles.

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

The sensor switches in the centre of the sensor’s cylindrical part, with a configurable hysteresis. Once the refrigerant is on the same level or above this point, the 3 green LEDs illuminate.

Application Examples
HBSC2-SSR-IP is a low temperature switch, which is well-suited for the detection of refrigerants at ambient temperatures as low as -50°C, such as for:
- Indication of high and low refrigerant level in liquid separators, pump separators, economisers, etc.
- on/off control of liquid injection in liquid separators, pump separators, economisers, etc.
- refrigerant level detection inside flow, blast or spiral freezers.
- Hot gas defrost safety sensor allowing only defrost when liquid line is drained.

**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 installation length of the sensor must be taken into account, since there must be at least 2mm between the sensor’s mechanical part and other fixed or moving parts.

3) Sufficient space for service and removal of sensor must be provided

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**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 vessel or other metal parts in its mounted position. If so, the sensor will not give out a correct signal.
Accessories:
a) HBxC-R-IP-M12/5, the sensor is supplied with this special low temp. cable of 5 meters length with a pre-mounted M12 connection plug.
b) HBxC-USB, for configuration purposes the HB USB communication cable is required
c) HBxC-Torque, for correct fixation of the supply cable this 0,6Nm torque screwdriver is needed

Power Connection
The sensor must be wired with the cable included. This is a special low temp cable with 4 cords. Length is 5 meters In case of replacement or damage, this can be orderet with spare part no HBxC-R-IP-M12/5.
The supply voltage is limited to 24V DC

![Power Connection Diagram]

Installation Guide
The HBSC2-SSR-IP is installed in a vessel or (stand)pipe.

To install HBSC2-SSR-IP, you must use a poly grip pliers, SW 32 (or shifting spanner), liquid gasket and a torque screwdriver.

Apply liquid gasket to the thread.
Mount the mechanical part in the vessel or standpipe and tighten with a torque corresponding to the thread type (80-150 Nm).

You may re-position the electronics for easy reading by loosening the union that secures the electronic part to the mechanical part.

After eventually re-positioning of the electronics it is important to tighten the union with a poly grip pliers. This in order to protect against moisture.

Mount supply cable (HBxC-IP-M12/5) to the electronics. In order to seal correctly the plug must be mounted with a torque screwdriver (0,6Nm) (part no HBxC-Torque)

NOTE! When connecting the supply cable make sure to tighten the nut appropriately. This in order to seal the connection and protect against moisture. It is strongly recommended to use a 0,6Nm torque screwdriver (part no HBxC-Torque)

NOTE! In case of de-mounting the electronics completely do not wipe off any silicone grease. This holds a gasket and protects against moisture.

LED Indication

LED indication:

1) 3 x green LED indicate refrigerant level
2) 1 x red LED indicates alarm (ALARM)
3) Yellow LED – calibration signal (CONTROL)
4) Green LED indicates 24 V DC supply (POWER)
Instruction manual – HBSC2-SSR-IP – Low temp switch (001-UK)

LED signal | ON/OFF | Functionality |
---|---|---|
Green (3x) | ON | Refrigerant detected |
Green (1x) | Flashes | Supply |
| OFF | No supply |
Yellow (1x) | Flash | Indicate magnet activation at calibration procedure |
Red (1x) | OFF | No alarm |
| Flashes | Mechanical rod not installed or missing connection to the rod or one times flash indicate calibration achieved. |

**Test and troubleshooting, electronic part**

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

![Separate the electronic part from the mechanical part.](image)

![Do not wipe off any silicone grease. This holds a gasket and protects against moisture.](image)

![After testing it is important to tighten the union with poly grip pliers. This in order to protect against moisture.](image)

The easiest way to carry out fault detection is to have a spare mechanical part available. The electronic part is mounted on the spare mechanical part and a cup/glass of water is used to test the function (see below).

**NOTE!** In case of fault, initially only the electronic part should be replaced. This allowing the system to be pressurized.
NOTE! The electrical properties of water allows testing of the sensor electronics without using ammonia. Re-calibration is NOT required!

Test and troubleshooting, mechanical part

Electronic tests should be completed prior to any attempts to perform fault finding on mechanical part. Test in situ is done by draining the vessel/stand pipe and use ohm meter to check insulation. If shorted the mechanical part must be exchanged.

Fault Detection

<table>
<thead>
<tr>
<th>Fault</th>
<th>Reason</th>
<th>Correction of fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>No LED are ON / no function</td>
<td>No supply to the sensor or defective cable/plug.</td>
<td>Check the power supply and the supply cable.</td>
</tr>
<tr>
<td>No output (3 x green LED light up but the output signal is not active)</td>
<td>Check if the sensor's output matches the control input; if it is an NO or NC respectively. See the output voltage instructions below</td>
<td>Create conformity between the sensor and the control so that the two are identical</td>
</tr>
<tr>
<td>No contact activation (red LED flashes)</td>
<td>There may be moisture between the electronic and the mechanical parts.</td>
<td>Separate the two parts and clean the spring tip.  Remember to apply silicone grease to the spring tip so as to avoid problems with moisture.</td>
</tr>
<tr>
<td>Delay in sensor activation</td>
<td>Can be caused by gas and formation of foam in the system.</td>
<td>Check if the sensor is placed optimal so that air and gas are avoided.</td>
</tr>
<tr>
<td>There is no correlation between the output signal and the measuring distance.</td>
<td>The sensor is not calibrated correctly.</td>
<td>Re-calibrate the sensor</td>
</tr>
</tbody>
</table>

Practical measurement of output signals:

NC: There should be no signal when it is in refrigerant.
NO: There should be a signal when it is in refrigerant.
Sensor Repair
In case of faults with the sensor, it will typically only be necessary to replace the electronics. Reach an agreement with the distributor about how to handle complaints.

Spare parts

<table>
<thead>
<tr>
<th>Pos</th>
<th>Specification</th>
<th>Type</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electronic part</td>
<td>PC-programmable</td>
<td>HBSC2-SSR-IP-EL</td>
</tr>
<tr>
<td>2</td>
<td>Mechanical part</td>
<td>¾”NPT thread</td>
<td>HBSC2-MEK-2</td>
</tr>
</tbody>
</table>

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

HB Products A/S – Bøgekildevej 21 – DK8361 Hasselager – support@hbproducts.dk – www.hbproducts.dk