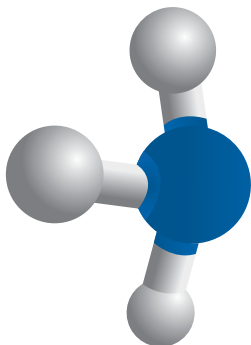
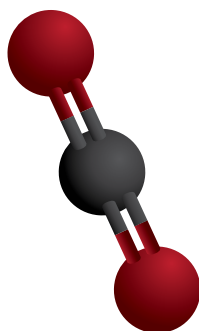




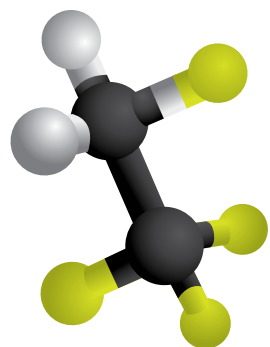
We increase uptime and efficiency in the industrial refrigeration industry



NH₃



CO₂



HFC





Introduction





This product catalogue is divided into three general sections, according to refrigerant type. The three sections focus on NH₃, CO₂, and HFC, respectively. A part from these sections, you can find introductory information on HB Products A/S, including what we work with, where we are represented, and which standards we are certified to comply with.

At the very end of the catalogue, you can find more general technical information, which can be used when you would like to learn more about the terms.

Each of the product sections contains an introductory overview of the products we can offer for the refrigerants. You can find these on the following pages:

Switches, sensor and controls for NH₃ industrial refrigeration installations

NH ₃ liquid	Function: NH ₃ liquid switch Application: Level switch in tanks Temperature: -30...+80°C Supply: 24 V AC/DC Output: PNP/NPN – 1A		Page 26
	Function: NH ₃ liquid switch Application: Level switch in tanks Temperature: -30...+80°C Supply: 90...240 V AC Output: Solid state relay – 1A		Page 30
	Function: NH ₃ liquid switch Application: Level switch in flow freezers Temperature: -60...+80°C Supply: 24 V DC Output: Solid state relay – 1A		
	Function: NH ₃ gas switch		

Function: NH ₃ level sensor Applications: Level measurement in standpipes Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA (PNP-1A)		Page 58
Function: NH ₃ level controller Applications: Level measurement in standpipes Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA (PNP-1A)		Page 62
Function: NH ₃ level controller Applications: Level measurement in standpipes Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA (PNP-1A)		Page 66
Function: Gas quality sensor/controller Applications: Gas quality measurement Temperature: -50...+80°C Supply: 24 V AC/DC		Page 80

Product selection

NH₃ - Page 24

CO₂ - Page 120

HFC - Page 174




Oil	Function: Oil switch Applications: Compressor crankcases, oil collectors/ tanks & oil separators. Temperature: -30...+80/120°C Supply: 90...240 V AC Output: Solid state relay – 1A		Page 46
	Function: Oil phase switch Applications: Oil pots and oil purgers Temperature: -30...+80°C Supply: 24 V AC/DC Output: PNP/NPN – 1A		Page 50
Phase change	Function: Oil phase switch Applications: Oil pots and oil purgers Temperature: -30...+80°C Supply: 90...240 V AC Output: Solid state relay – 1A		Page 54

Table of contents

About HB Products.....	4	CO₂ – sensors and controls.....	120
The history in brief	4	CO ₂ switch [HBSC2]	122
Global supplier	6	CO ₂ switch – High voltage [HBSC2-SSR]	126
From idea to final products.....	8	CO ₂ liquid switch – Ice proof [HBSC2-SSR/IP]	130
General design philosophy.....	10	Oil switch [HBSO]	134
Capacitive measurement.....	11	Oil switch – High Voltage [HBSO-SSR]	138
Why sensors and controls?	15	CO ₂ level sensor (tube) [HBLC-CO2]	142
NH3 – sensors and controls.....	19	CO ₂ float regulation [HBLC]	146
NH3 liquid switch [HBSR]	26	CO ₂ level controller [HBLT-C1]	152
NH3 liquid switch – High Voltage [HBSR-SSR]	30	CO ₂ Pressure sensor [HBPS]	156
NH3 liquid switch – Ice proof [HBSR-SSR/IP]	34	CO ₂ Temperature sensor [HBTS]	160
NH3/Co2 leakage switch [HBAC]	38	Oil controller [HBOC]	164
NH3/Oil switch [HBL5]	42	De frost sensor [HBDF]	168
Oil switch [HBSO]	46	HFC – sensors and controls.....	174
Oil switch – High Voltage [HBSO-SSR]	50	HFC liquid switch [HBSR-HFC]	176
Oil phase switch [HBOR]	54	HFC liquid switch – High Voltage [HBSR-HFC-SSR]	180
Oil phase switch – High Voltage [HBOR-SSR]	58	HFC liquid switch – Ice proof [HBLC-R-IP]	184
NH3 gas switch – Compressor protection [HBCP]	62	HFC gas switch – Compressor protection [HBCP]	188
NH3 level sensor (wire) [HBLT-Wire]	66	Oil switch [HBSO]	192
NH3 level sensor (AKS41) [HBLT-A1]	70	Oil switch – High Voltage [HBSO-SSR]	196
NH3 float regulation [HBLC]	74	HFC level sensor (wire) [HBLT-Wire]	200
NH3 level controller [HBLT-C1]	80	HFC level sensor (AKS41) [HBLT-A1]	204
NH3 Pressure sensor [HBPS]	84	HFC float regulation [HBLC]	212
NH3 Temperature sensor [HBTS]	88	HFC level controller [HBLT-C1]	216
NH3/Brine leakage sensor [HBPH]	92	HFC Pressure sensor [HBPS]	220
Oil controller [HBOC]	96	HFC Temperature sensor [HBTS]	224
Oil return controller [HBOR]	100	Oil controller [HBOC]	226
Gas quality sensor/controller [HBDX]	104	Gas quality sensor/controller [HBDX]	230
Gas leakage sensor [HBGS]	108	De frost sensor [HBDF]	234
De frost sensor [HBDF]	112	Technical terms and general knowhow	238
		What is NPN/PNP transistor output.....	238
		What is solids state relay output	239
		What is 4-20 mA signal	239
		What is a P-regulation	240
		Design recommendation – refrigerant switches.....	241
		Design recommendations – oil switches	241
		Design recommendations – level sensor	244
		Oil in refrigerations systems	245
		Design product standards	246

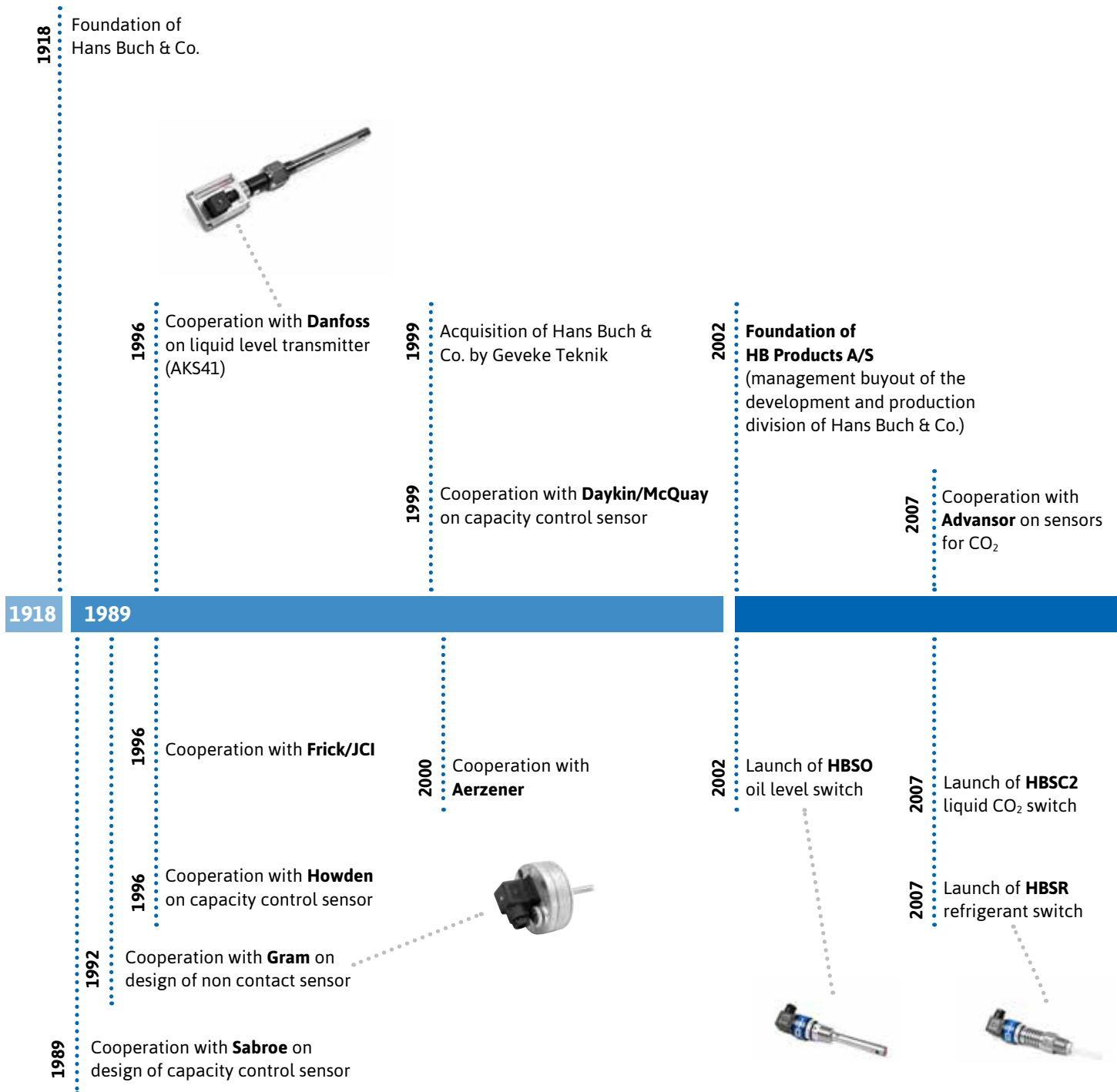


Products

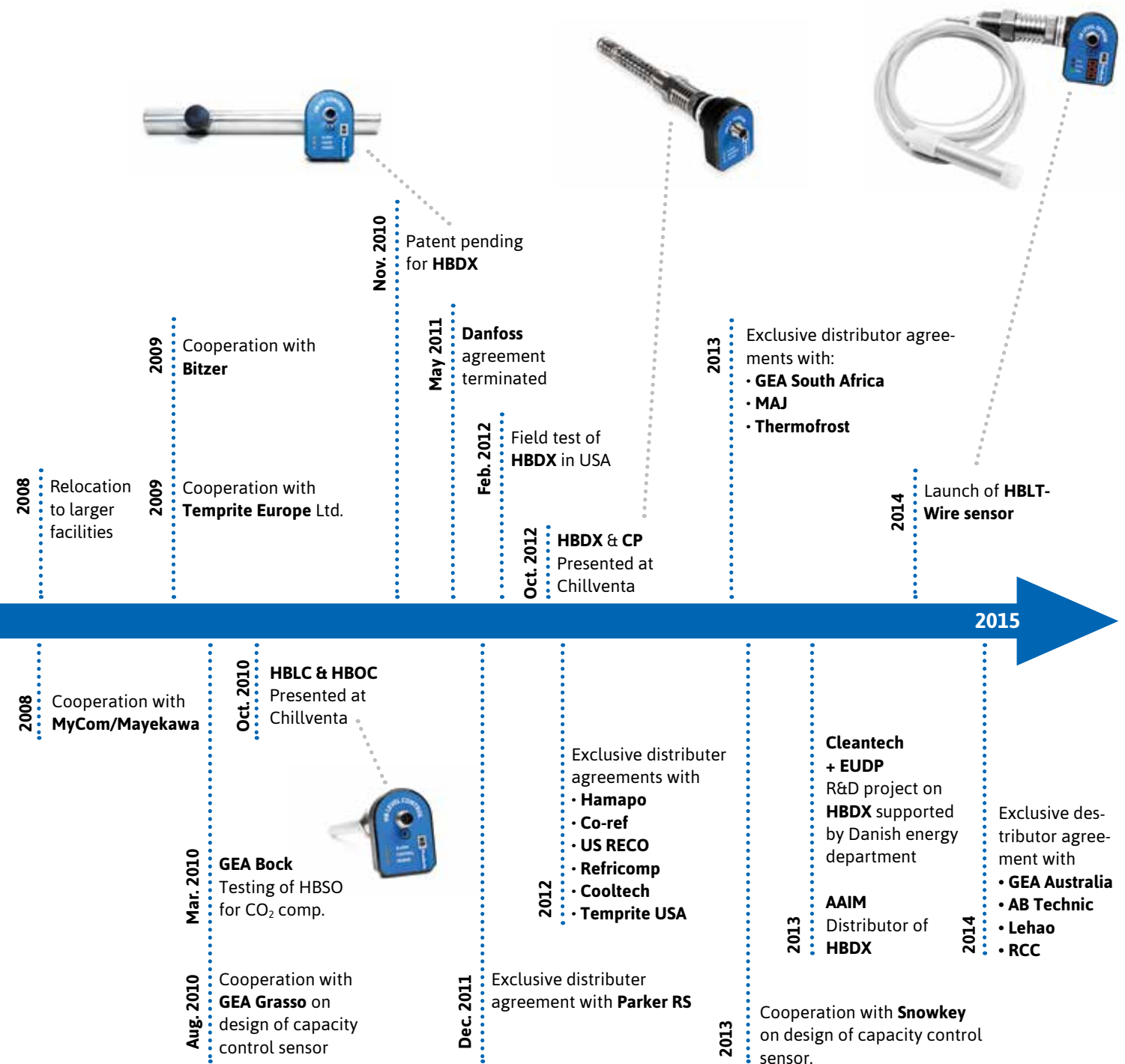
WE INCREASE
UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY

About HB

HB Products – dedicated to optimal solutions for level measurement



and control of oil and refrigerants.

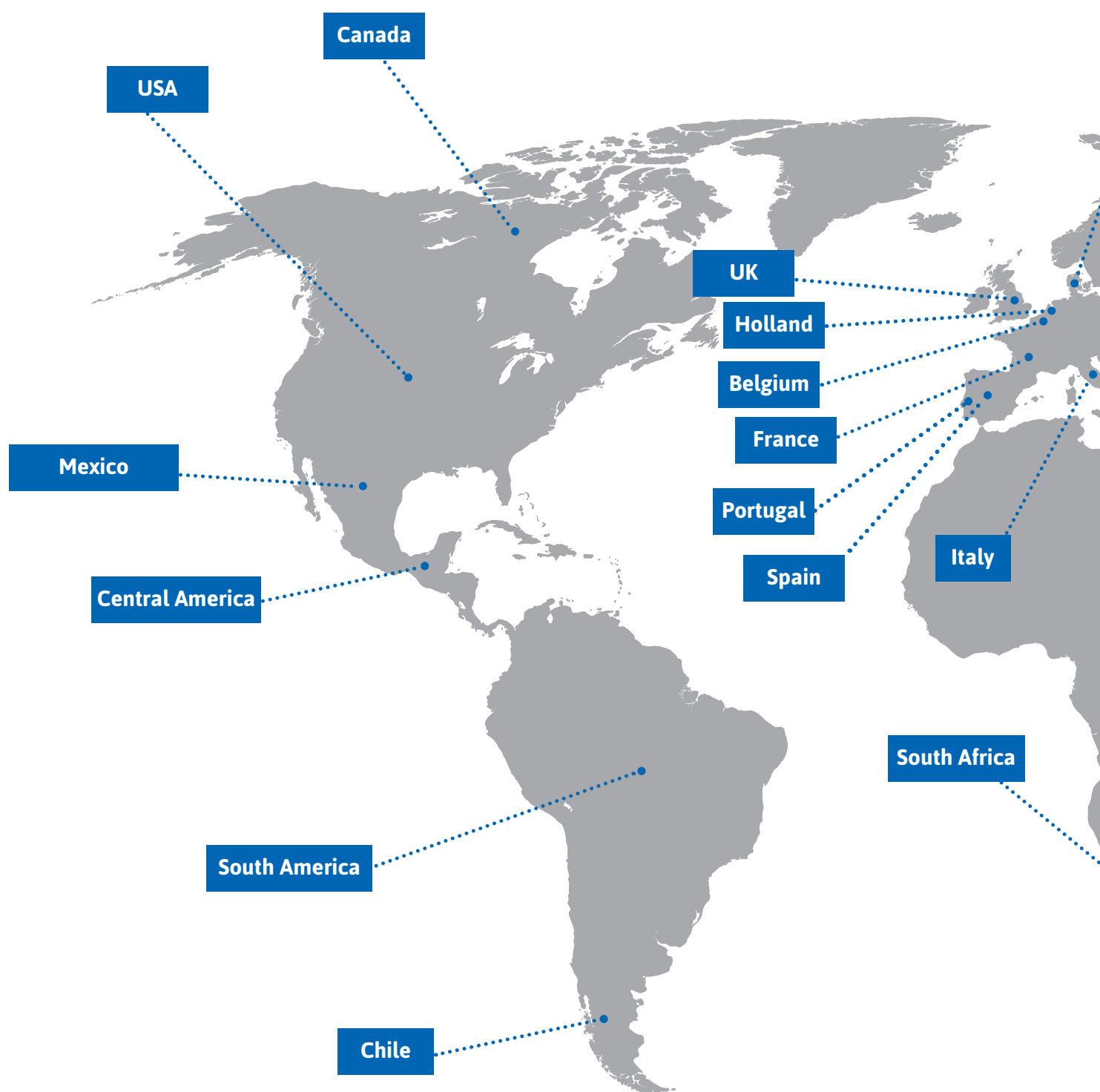


Global supplier by networks of agents

We are represented in many countries by local distributors. They are all trained in our products and support you with both technical issues and with how to best use our products. Today, we are represented in the countries below:

XXXXX

Here we are represented by agents

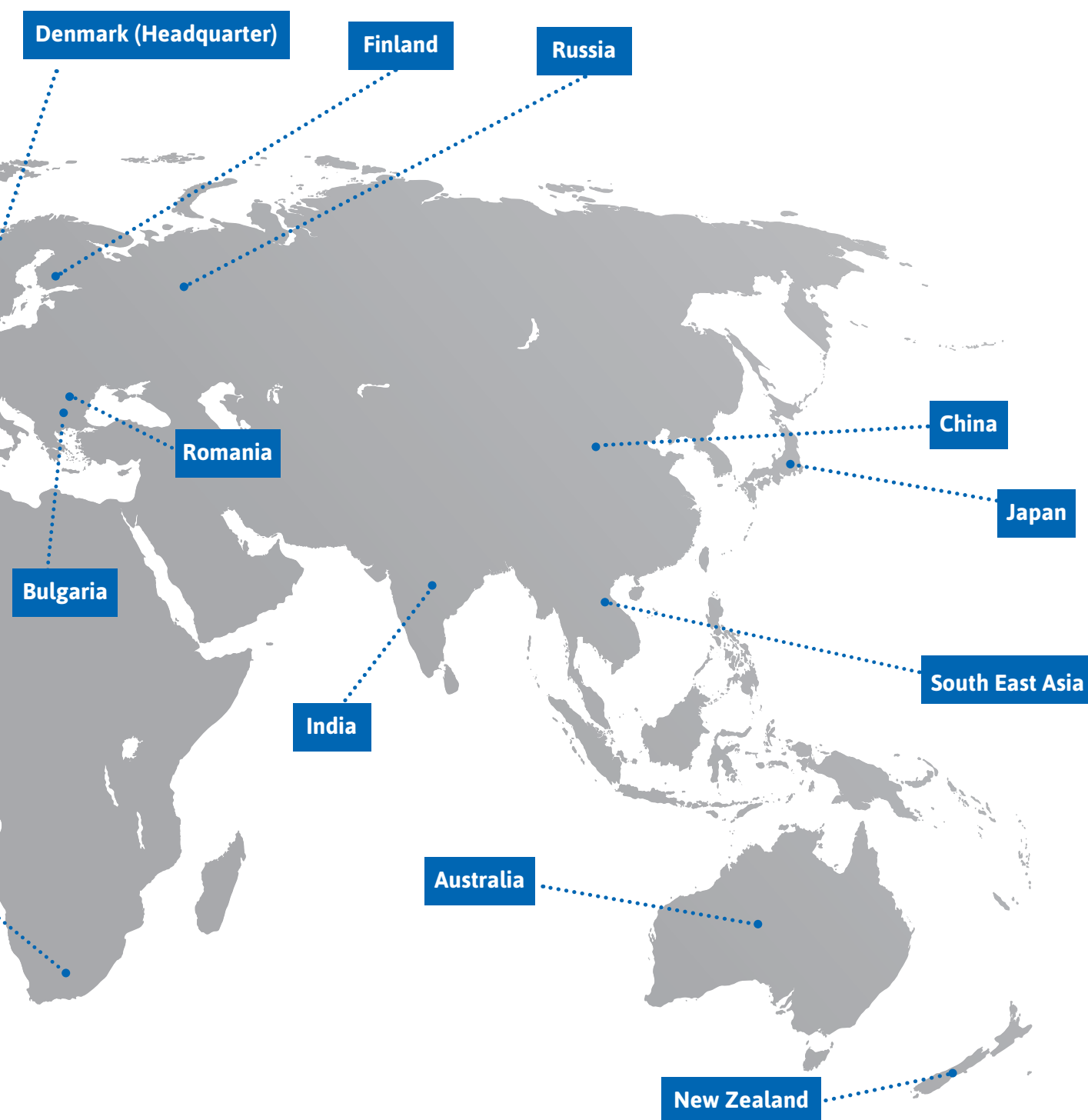


Supplier to the market leaders

We sell all over the world to the industry's suppliers of industrial refrigeration systems.

Here are a list of reference customers:

1. MyCom/Mayekawa
2. Nestlé
3. Advansor A/S
4. Gram Equipment
5. GEA Refrigeration Technologies
6. Johnson Controls Inc. (JCI/Frick/York/Sabroe)
7. Bitzer
8. Temprite
9. Howden
10. Daikin/McQuay
11. Aerezener Maschinenfabrik GmbH
12. Snowkey
13. Hill Phonix
14. Dorin

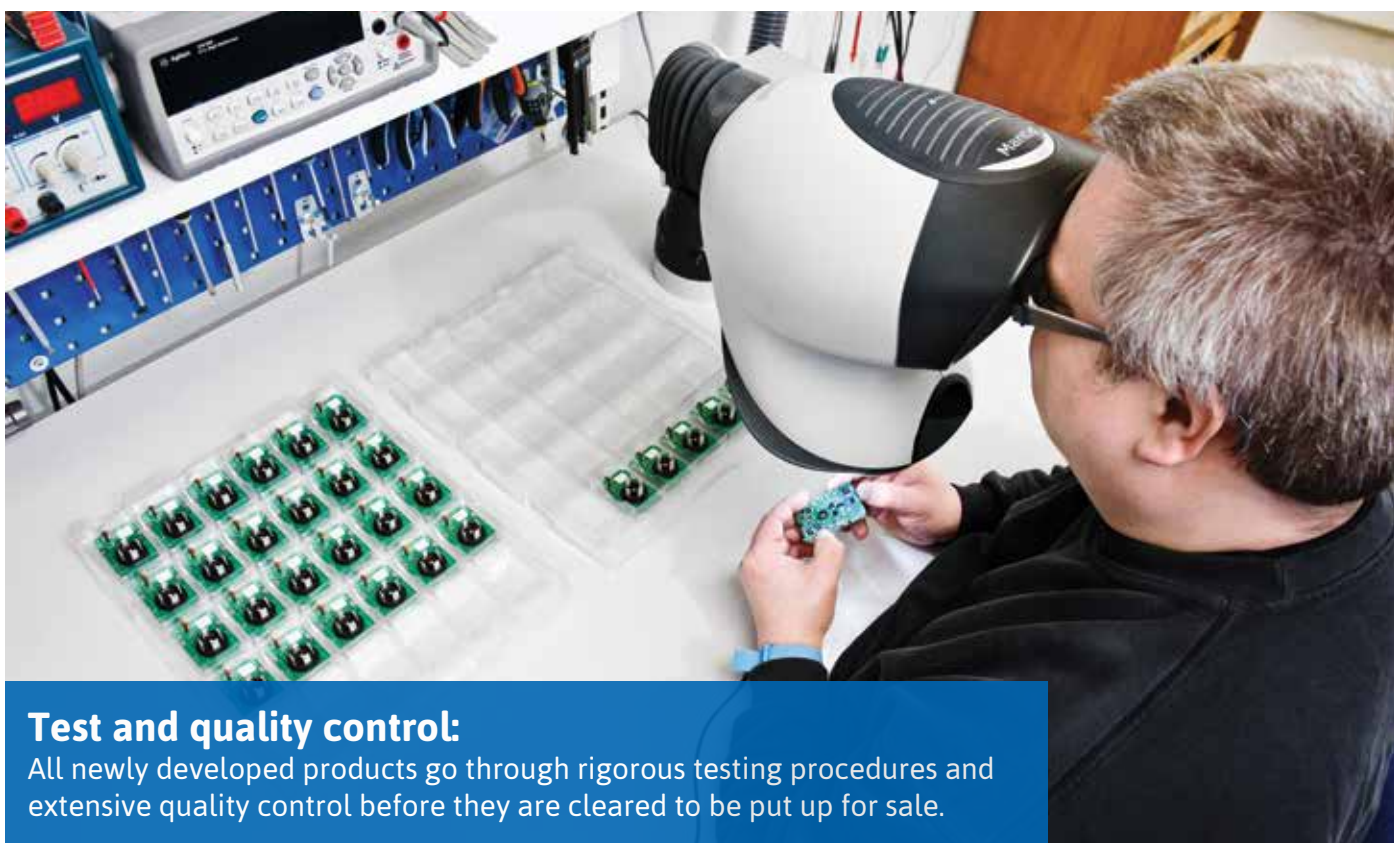


From idea to final product



Development & construction:

HB Products works continuously with the development and design of new products – in new materials and with new functionalities. By using the newest construction tools, the ideas are transformed into new unique products.



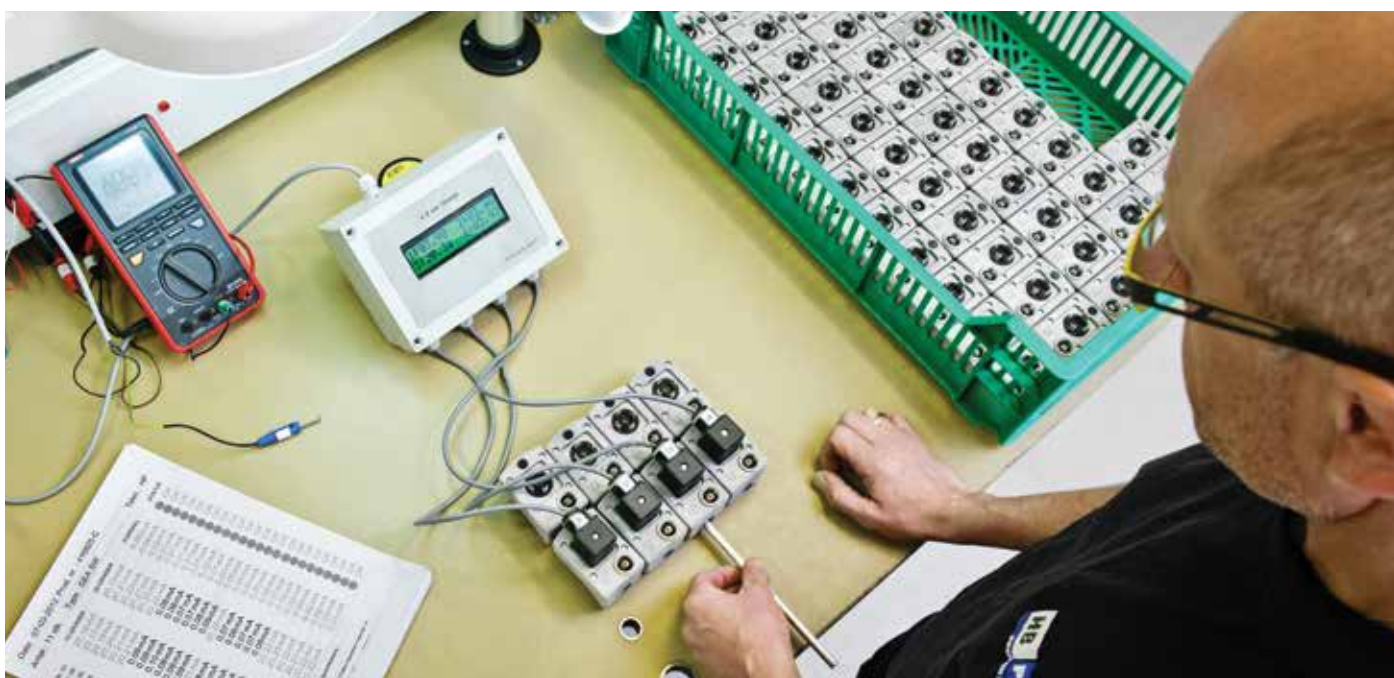
Test and quality control:

All newly developed products go through rigorous testing procedures and extensive quality control before they are cleared to be put up for sale.



Technology and craftsmanship:

HB Products is responsible for the production of sensors and control modules. In manufacturing, we take a craftsman's approach to our work, but in many areas of production we use modern and highly efficient manufacturing technology. This ensures quality down to the smallest detail.



Calibration:

In order to guarantee products with precise functionality and the best measuring capabilities, each product is calibrated before it is sent to general quality control.

General design philosophy

All products designed for refrigeration applications are designed by refrigeration engineers.

The in-house experience within product development, the electrical design, and the durability of the products makes it very advantageous for customers to use HB Products as a partner for design of reliable products.

Our core competences ensure trouble-free operating sensors no matter which conditions they are exposed to.

Our design and production technique ensures:



Complete **SEALING** of all electronic parts for reliable functionality in all environments



All sensors are **SHOCK** and **VIBRATION** proof



All inputs/outputs are protected against **REVERSE** voltage



All sensors are designed to operate at **HOT** and **COLD** temperatures



All sensors are **INDIVIDUALLY** tested and calibrated



Sensors are designed with **DETACHABLE** electronics for easy service



Capacitance Measurement

HISTORY

In the late 1940's a British firm pioneered the detection of CAPACITANCE between two electrodes. Capacitance, being influenced by the Dielectric Constant of the material being measured rather than the conductivity, indicated that the concept could be used in virtually any material. A new industry was born.

HB Products has 20+ years of experience in the development of electronic sensors, originally for the refrigeration industry, for use with Ammonia (R717), and today we evolved our sensor technology to work with all types of refrigerants even CO₂.

A capacitor is formed when a level-sensing electrode is installed in a vessel. The metal rod/electrode acts as one plate of the capacitor and the reference tube acts as the other plate. As the level rises, the air or gas normally surrounding the electrode is displaced by liquid having a different/higher dielectric constant. Capacitance instruments detect this change and convert it into a proportional output signal, 0 to 100% level.

The capacitance relationship is illustrated with the following equation:

$$C = 0.225 K (A/D)$$

where:

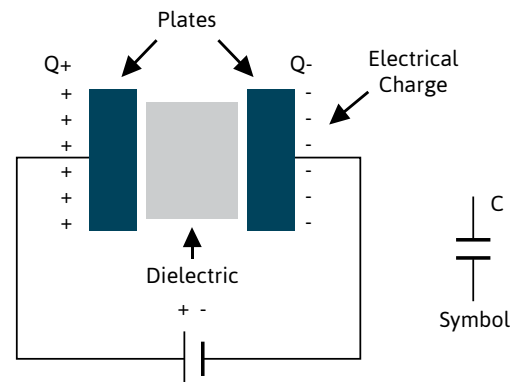
C = Capacitance in picoFarads "pF"

K = Dielectric constant of the material (relative permittivity)

A = Area of the inner electrodes in square inches

D = Distance between the electrodes in inches

The measured capacitance (pF valve) is converted by the HB sensor electronics into either an analogue 4-20 mA output signal, or a digital ON/OFF signal. All electronics are factory calibrated to specific fluids.



The HBLT-A1 sensor was the first product designed with the capacitive measuring technology. For many years, the sensors were sold by Danfoss under the name AKS41. The total number of installed sensors worldwide exceeds 35,000 units.

The dielectric constant (relative permittivity) is a numerical value on a scale of 1 to 100, which relates to the ability of the dielectric (material between the electrodes) to store an electrostatic charge. The dielectric constant of a material is determined in an actual test cell. Values for many materials are published. In actual practice, a capacitance change is produced in different ways, depending on the material being measured and the level electrode selection. However, the basic principle always applies. If a higher dielectric material replaces a lower one, the total capacitance output of the system will increase. If the electrode is made larger (effectively increasing the surface area) the capacitance output increases. Level measurement can be organized into two basic categories: the measurement of non-conductive materials and conductive materials.

Non-Conductive Liquids/Materials

(Nonconductor/insulations as glass, paper, Plastic and Oil) If a the dielectric constant is lower than 10, then the material act as Non-Conductive. (All HFC/Freon types and CO₂ is Non-Conductive)

Conductive Liquids/Materials

(transfer/conduct electric current) If the dielectric constant is higher than 10, then the liquid acts as conductive with conductivity value at minium 100 $\mu\text{S}/\text{cm}$ (tap water has a value from 500 to 1000 $\mu\text{S}/\text{cm}$). (Water, brine and Ammonia are Conductive)

Generally it is not necessary to calculate the actual capacitance, but it is extremely important to understand the principle and how it works. When we design a new capacitive sensor we always base it on practical experience, measuring and test.

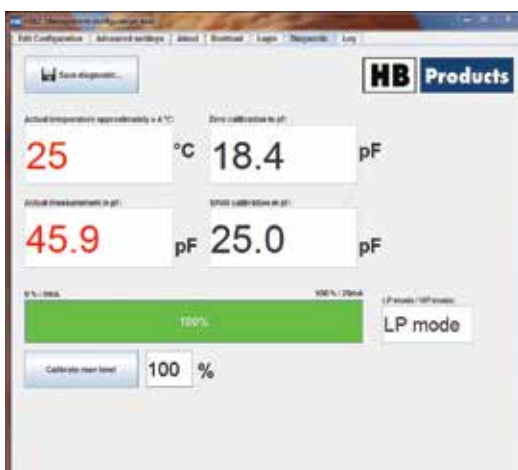
It is possible to calibrate a level sensor measuring Non-Conductive liquids in water, if you know the exactly difference between the dielectric constant.

Special Considerations

The most devastating effect on the accuracy of capacitive measurements is caused by the buildup of conductive material on the electrode surface. Non-conductive build-up is not as serious since it only represents a small part of the total capacitance. Oil is non-conductive, fine metal powders are examples of materials that are conductive.

Chemistry effect on the insulating material

The accuracy of the capacitive measurements can be affected by the absorbtion/swelling of refrigerant (Freon and CO₂) into the insulating material(PTFE). For the greatest accuracy, the sensor should be recalibrated after the system has operated for a time, when the refrigerant chemistry and level sensor have reached equilibrium. Measuring error caused by absorbtion will result in a small offset.



The programmable sensors all have a diagnostic functionality built in, where the actual pF is shown together with the sensor setting, zero calibration and span calibration. Calibration of these is possible on-site.

Dielectric Constant:	Temperature 20°C
Water/brine	80 (0°C is 88)
Ammonia (R717)	17 (-40°C is 22)
CO2 (R744)	1.5 (-40°C is 2.0)
Oil type PAO, PEO	2.2 Mineral and synthetic types
Oil type PAG	3.5 Synthetic types
R134a	9.24
R22	6.35
R410A	7.78
R507	6.97
Air	1.0
Ice	3.2

The dielectric constant of the material/liquid varies depending on type. If two or more liquids are mixed, this will also result in a change of the dielectric constant. For example, a small quantity of water will change the dielectric constant for R507.



The HB DX sensor is the first sensor in the world capable of measuring gas quality in a refrigeration system. The sensor has a 4-20 mA signal output, linear with the gas quality.

**Products**

WE INCREASE
UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY

We service you - world wide



HB Products is represented by a growing number of distributors all over the world. Our criteria for selecting business partners guarantees the customers professional and qualified consultancy and support - locally.

All our business partners are specialists within consultancy for components used in refrigeration systems. It is our intention, as well as the intention of our business partners, to keep a wide variety of sensors in stock; however, since these come in countless variants, we hope that you understand that they cannot all be kept in stock.

In the countries/regions where we do not yet have local business partners, enquiries must be sent to us.

Quality control and certification

HB Products and a number of our product series are certified, including our customer-customised sensors.



ISO 9001:2008 Since 2004, we have been ISO 9001:2008 (formerly 9001:2000) certified. This certification demonstrates our serious approach towards the products we develop, produce, sell, and service.



GOST R approvals. All our products with the exception of the range within capacity control are GOST R approved.



IECEx Protection Class: Ex ib IIC T5



cULus Protection Class: Class I,
Division 2 Group ABCD Hazardous



ATEX Protection Class: EEx ib iiC T5 acc. To DIN
EN 50020 – IEC 79-11-ANSI/UL 2279, pt.11

What does the industrial refrigeration industry gain from electronic components?

There is a great potential for energy and optimisation of operations in the industrial refrigeration industry. The natural way is using new technologies, implementation of intelligence as well as making gradual improvements in the refrigeration process, such as avoiding oil, air and water in places where these should not be. This article focuses on sensors as the first step towards the optimisation of refrigeration plants. Sensors are simple just like in all other industrial industries, but they are a pre-requisite for an optimised regulation of the refrigeration plant. Furthermore, sensors allow new possibilities as they may be successfully adjusted to specific applications.



From the very beginning, the industrial refrigeration industry has been characterised by mechanical solutions and has remained unchanged until today. Compared to the commercial refrigeration industry, the volume of the industrial refrigeration industry on a global scale is considerably smaller and may be seen as a niche market. Another reason why the mechanical solutions have been retained is that the market is influenced by 2 large manufacturers (Danfoss and Parker RS) due to their historically immense experience with mechanical solutions.

A very long time ago, the personnel were responsible for the service of plants, i.e. checking of liquid indicators, oil level, manometers, etc. Today, there is a strong financial incentive to optimise monitoring of plant operations in one display. It is also preferred that the plant operates 100% automatically: it closes down automatically in case of safety precautions or turns on an alarm if the plant requires inspection or maintenance. Here the electronic sensors are essential.

A short insight into the history of industrial refrigeration branch

The first types of instruments used in the refrigeration branch were a mechanical pressure sensor, thermometers, liquid indicators as well as mechanical/electrical switches. Later, the mechanical pressure sensor was replaced with electronic pressure transmitters, thermometers by electronic tempera-

ture displays, whereas liquid indicators were replaced with level sensors. During the last 10-15 years, the mechanical/electrical switches are gradually being replaced by electronic ones.

Some of the first mechanical solutions are still being widely used today. They are simple and do not require adjustment to other components.

What are the limitations of mechanical solutions?

Mechanical solutions have their limitations! The greatest disadvantage related to optimisation is that they are not able to transmit a signal to a control board, and their reaction time is long. Mechanical components are bound to wear out, they are affected by dirt and oil, and they are much more elaborate to mount. Furthermore, their maintenance is very expensive since the pressure in the system must be cut off before maintenance, and a new cooling agent must be filled in.

Limitations of mechanical switches: it is not possible to install intelligence as, for example, in electronic switches.

A mechanical switch is digital: either ON or OFF. This limits the mechanical switches from achieving the most optimal position and thus the effectiveness of the entire plant.

Furthermore, mechanical switches cannot identify the medium inside in the respective level (phase measurement).

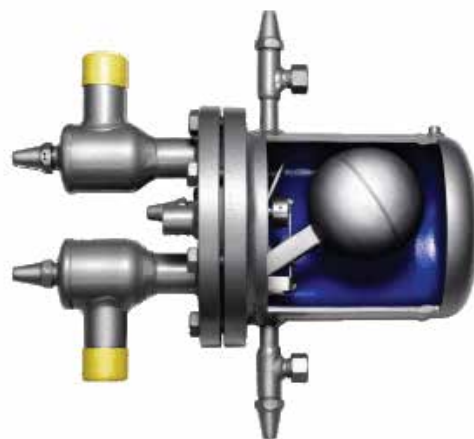


Mechanical flow switch. Compared to electronic switches, the mechanical flow switch is twice as expensive to install and requires maintenance.

Limitations of liquid indicators: liquid indicators are mainly affected by dirt in the system and also to some degree by oil. When liquid indicators are dirty, they do not function properly and may have difficulty to identify the actual level. If the level is higher than the liquid indicator is able to detect, several liquid indicators must be mounted on a vertical column. In situations where the level must be read from a vertical column, it may be difficult to identify the level in the system with

large fluctuations in a short period of time. This problem has been solved by measuring the level in a measurement meter, where wave movements are suppressed.

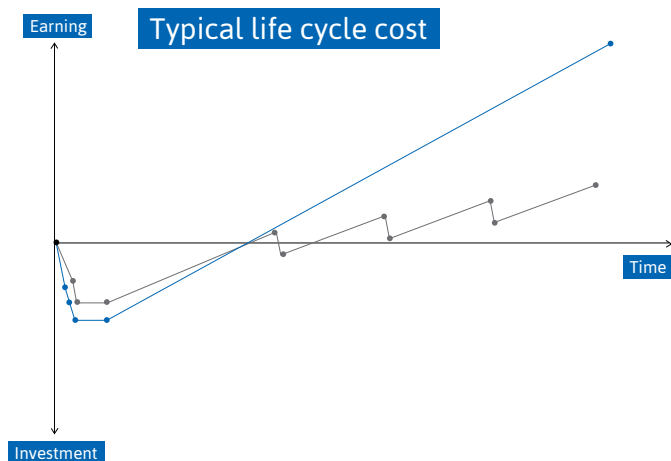
Limitations of mechanical level regulators: for instance, in chillers, level regulators are mounted that are in fact float switches, identical to the ones mounted in tanks. This restricts the mounting possibilities since the physical size and design require a certain location in the plant. Mechanical level regulators are also affected by the amount of oil in the system, because the oil may cause the valve to drop as well as cause wear on all moving parts. The valve is also digital, i.e. ON/OFF with no possibility to install intelligence.



Mechanical flow controller. Compared to an electronic flow controller, a mechanical flow controller is substantially larger and cannot be placed optimally in a chiller due to its size.

Are there any solutions to all mentioned limitations of using electronic sensors?

The answer is YES! Electronic sensors may also be used in other situations where there were no available solutions before. One of the greatest advantages of electronic sensors is that they have split design that allows performing diagnostics and maintenance without cutting off the pressure in the tank. Are there no disadvantages at all? YES and NO – sensors are usually very expensive to install, because it requires both mechanical installation and connection to the control board. If one should consider sensors from the latter point of view, then they are not the right choice. But if one considers sensors together with the life cycle costs of a refrigeration plant, then sensors will minimise the need for operating staff.

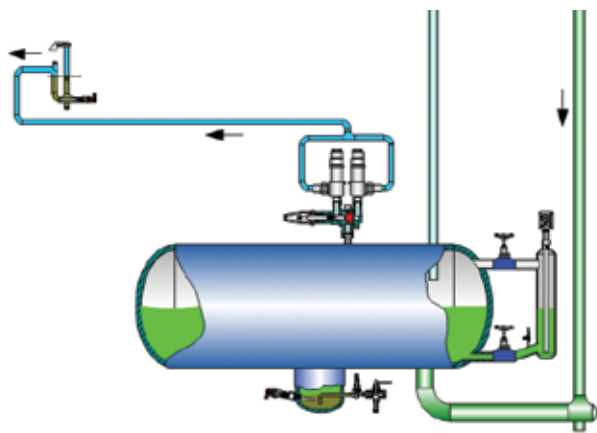


In the table, typical costs for the purchase and installation of mechanical and electronic components are indicated for the first period. The investment depends on the type, but in most cases the installation costs are slightly higher since the electronic components must be connected to the refrigeration system's controller. On the other hand, the revenue on electronic components is somewhat better, since the time needed for servicing and maintenance is eliminated.

Advantages and possibilities of electronic switches:

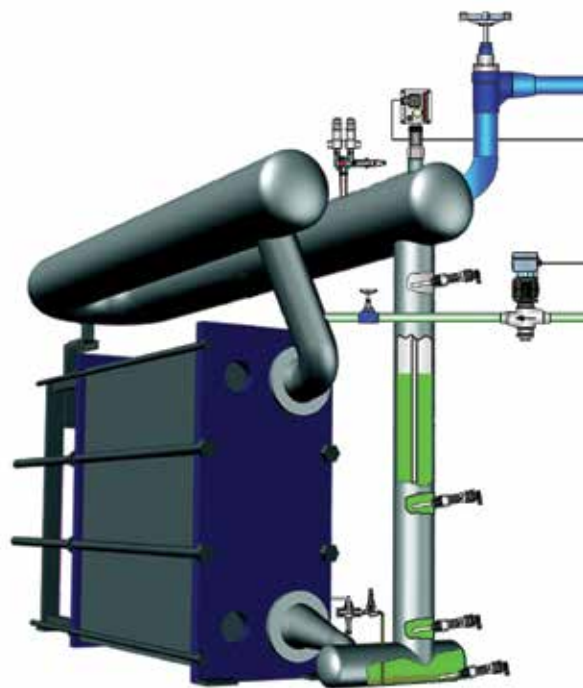
An electronic switch can replace either a liquid indicator or a mechanical float switch. The technology often applied in the branch is the capacitive principle, where the sensor measures the dielectric constant, and the measured signal is then processed in a microprocessor with an opportunity of several output signal types. The switch functionality allows installing the following applications:

- 1) Detect whether there is a specific level in the tank. In this application, the sensor has been programmed so that it activates only the cooling agent and not oil or dirt.



Electronic switches allow for many possibilities since they have built-in intelligent. Here you can see a sensor that sends a signal to the operator when the oil sump needs to be tapped. In conjunction with the safety valve, a sensor is placed at the outlet of the pipework, which sends a signal if the safety valves have been opened.

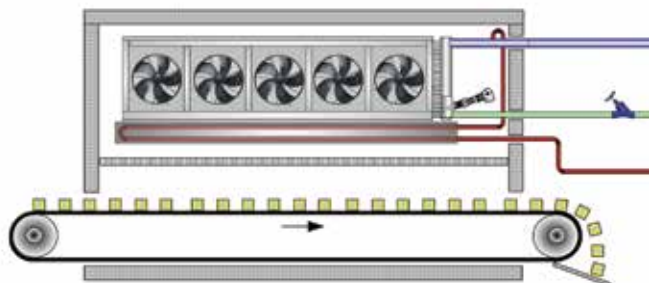
- 2) Detect whether there is a specific level in the oil tank, flow in a tube or oil in the compressor. In this application, the sensor has been programmed so that it activates only the oil and not the cooling agent. A mechanical solution or other electronic sensors with other measuring principles would not be able to measure this difference and would result in breakdown of the compressor.
- 3) Detect whether there is a specific medium at a defined level in the tank. In this application, the sensor functions as a phase difference indicator, i.e. it can signal whether the oil or cooling agent is present. The measurements are taken at the bottom of the tank where the oil is accumulated (ammonia plant). An operationally reliable identification was not possible before when oil draining was necessary.



U-tube plate heat exchangers from Alfa Laval are fitted with electronic level control, min./max. level, as well as alternative detection of oil in the outlet of the exchanger. This allows for automatic monitoring and control of the level in the plate heat exchanger, as well as safety monitoring.

- 4) Detect whether the pressure in the system has been too high, and thus whether the safety valve had been activated. The sensor is mounted at the outlet tube with the water seal function, and the oil is filled in the water seal. In this application, the operational improvement of safety valves is simultaneously performed since they are not disturbed by air or air traps in the tube system.

- 5) The electronic switch can replace liquid indicators in refrigeration tunnels that are used for identification of the level of cooling agent. This switch type may be used at -50 C and has a high level of tightness that allows high-pressure washing and high temperatures.



In the freeze tunnel, an ice-proof switch is used which provides an indication of the level of the cooling liquid. The alternative to this was sight glass, which was inappropriately placed and was therefore not always monitored, with the risk that the pipework might burst during defrost.

All application types may be mounted according to PED Directive category 4. At category 4 installation, signals must be doubled and connected according to the EN50156 standard via a safety relay or a safety PLC. There are several possibilities for this on the market, for example, Wieland's safety PLC Samos Pro complies with the requirements of the EN50156 standard.

Advantages and possibilities of electronic level sensors:

Level measurements in tanks are also performed according to the capacitive principle, where the same advantages are reached as for switches, i.e. the sensor is less affected by oil and dirt. The function is also the same, where the sensor measures the dielectric constant and the level that is turned into charging (capacity). The level of charging is linear with the level in the tank. Also here, the signal is processed in the microprocessor with an opportunity to adjust it to a specific application. Usually, a 4-20 mA signal is used from the sensor as a linear indication of the level in the tank. In addition to the function of measuring the level, the microprocessor has a range of other functions:

- 1) Alarm limit may be set in the area 0-100 %.
- 2) A filter may be installed that subdues the signal and provides an average measurement in case of wave ripples in the tank. Allows mounting the sensor directly in the tank during the welding of the measurement meter.



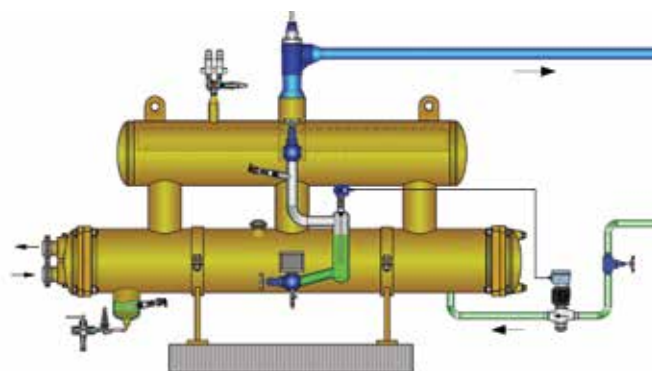
Economisers are fitted with an electronic level control, and min./max. level switches are installed in the tank. Similarly, a switch is installed for detecting the oil level in the oil sump. This allows for automatic operation of the receiver, as well as the possibility of controlling the liquid level.

- 3) In addition to measuring, the sensor can also function as a regulator, i.e. pump or valve control may be performed directly from the sensor. This allows reducing board installation costs.

Advantages and possibilities of electronic level regulators:

An electronic level regulators are merely a short level bar with the same regulating functions as described in point 3 under level sensor. The set-up functions of the microprocessor in this application have been expanded. Here, it is possible to set:

- 1) Regulation functions: low or high pressure switch.
- 2) Min. or max. alarm
- 3) Set point and P-band



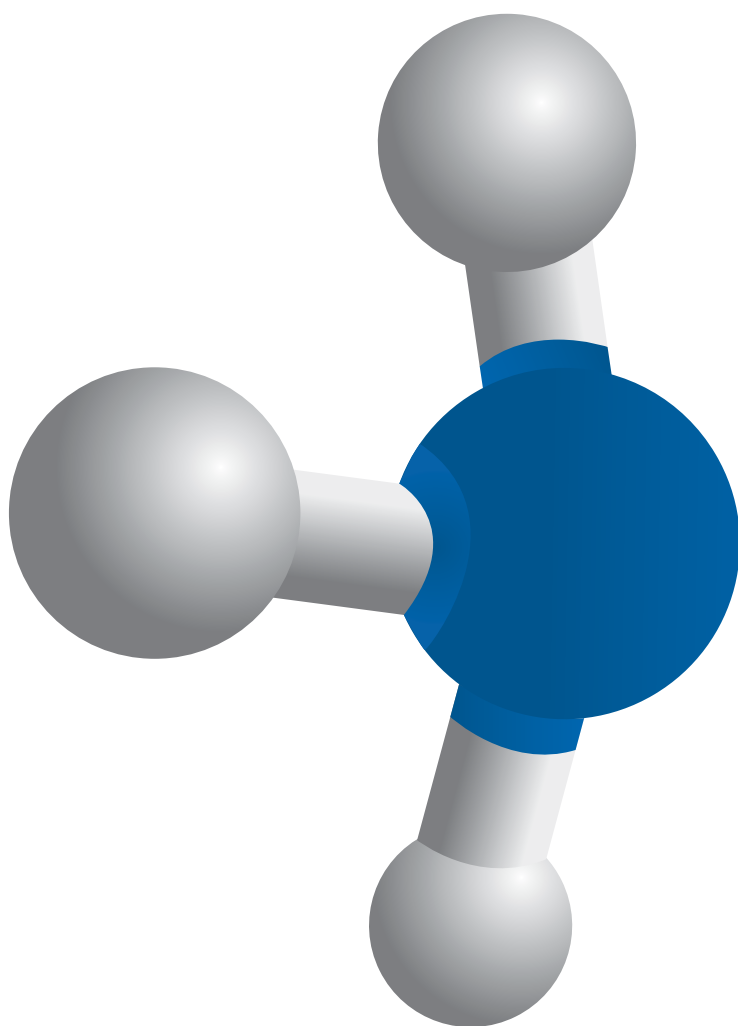
Chillers are fitted with an electronic level control. The minimalist design of the control system allows for better placement of the control system and the liquid level in the chiller.

- 4) Output function: NC or NO

In addition to programming functions, this solution is considerably more flexible in relation to the mounting, and the regulation may be performed at a more optimal location.



NH₃

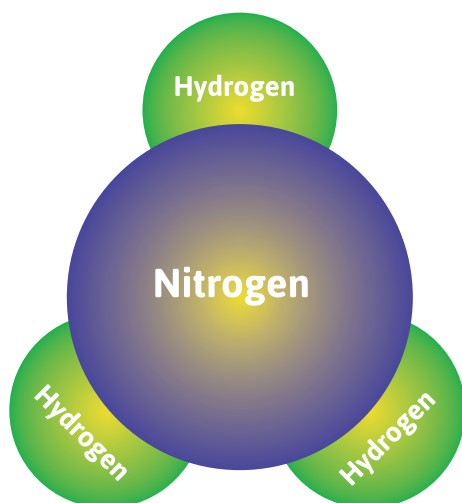


Why Use Ammonia (NH₃) for Industrial Refrigeration?

In 1876, Carl Von Linde used ammonia for refrigeration for the first time in a steam compression machine. Other refrigerants, like CO₂ and SO₂, were also commonly used until the 1920s.

The development of CFC in the US tipped the scales in favour of these refrigerants, because CFC refrigerants were seen as harmless and particularly stable chemicals when compared to all other refrigerants used at the time. The environmental consequence of the release of refrigerants on a massive scale could not be anticipated back then. CFC refrigerants were marketed as safe refrigerants, which resulted in a growing demand and success for CFC.

Ammonia came under a great deal of pressure due to the success of CFC, but it retained its position especially in large industrial systems and within food preservation.



Ammonia is the most environmentally friendly refrigerant

In the 1980s, the harmful effects of the CFC refrigerants became apparent, and the general perception was that CFC refrigerants contributed to the destruction of the ozone layer and towards global warming. This led to the Montreal protocol (1989) where almost all countries agreed to phase out CFC over a defined timeframe.

In light of the severity of the damage that CFC/HCFC emissions cause to the atmosphere and the effect on global warming, the execution of the plan was hastened in connection with the revision of the Montreal protocol 1990, 1992 Copenhagen, and 1998 Kyoto, Japan. HCFC refrigerants must

also be phased out, and Europe is leading the way in this process.

Many countries in Europe have stopped using HCFC refrigerants, and new refrigerants as well as well-tested and reliable refrigerants like ammonia and CO₂ are being considered for various new applications.

A number of advantages

Ammonia has a number of advantages, which have been demonstrated through the use of ammonia refrigeration systems over many decades.

Energy efficiency

Ammonia is one of the most efficient refrigerants, with an application area ranging from high to low temperatures. With the ever increasing focus on energy use, the ammonia refrigeration system is a safe and sustainable choice for the future. A flooded ammonia system will typically be 15-20% more efficient than a corresponding DX R404A. New developments of NH₃ and CO₂ combinations have further contributed to increasing efficiency. Cascade systems with NH₃/CO₂ are extremely efficient for low and very low temperatures (below -40° C), while NH₃/CO₂ brine systems are about 20% more efficient than traditional brine solutions.

The environment

Ammonia is the most environmentally friendly refrigerant. It belongs in the group of so-called "natural" refrigerants and has both a GWP (Global Warming Potential) and an ODP (Ozone Depletion Potential) of zero.

Safety

Ammonia is a toxic refrigerant and it is also flammable in certain concentrations. Therefore, it must be handled with care, and all ammonia refrigeration systems must be developed in accordance with safety standards. In contrast to other refrigerants, ammonia has a characteristic smell that can be detected even in very low concentrations. This acts as a warning even in case of small ammonia leaks. A combination of ammonia and CO₂ (as cascade or brine) could be a good and efficient solution if it is necessary to reduce the ammonia level.



When installing ammonia refrigeration systems, an ammonia leak detector must be installed to ensure the safety of the personnel.

Smaller pipe sizes

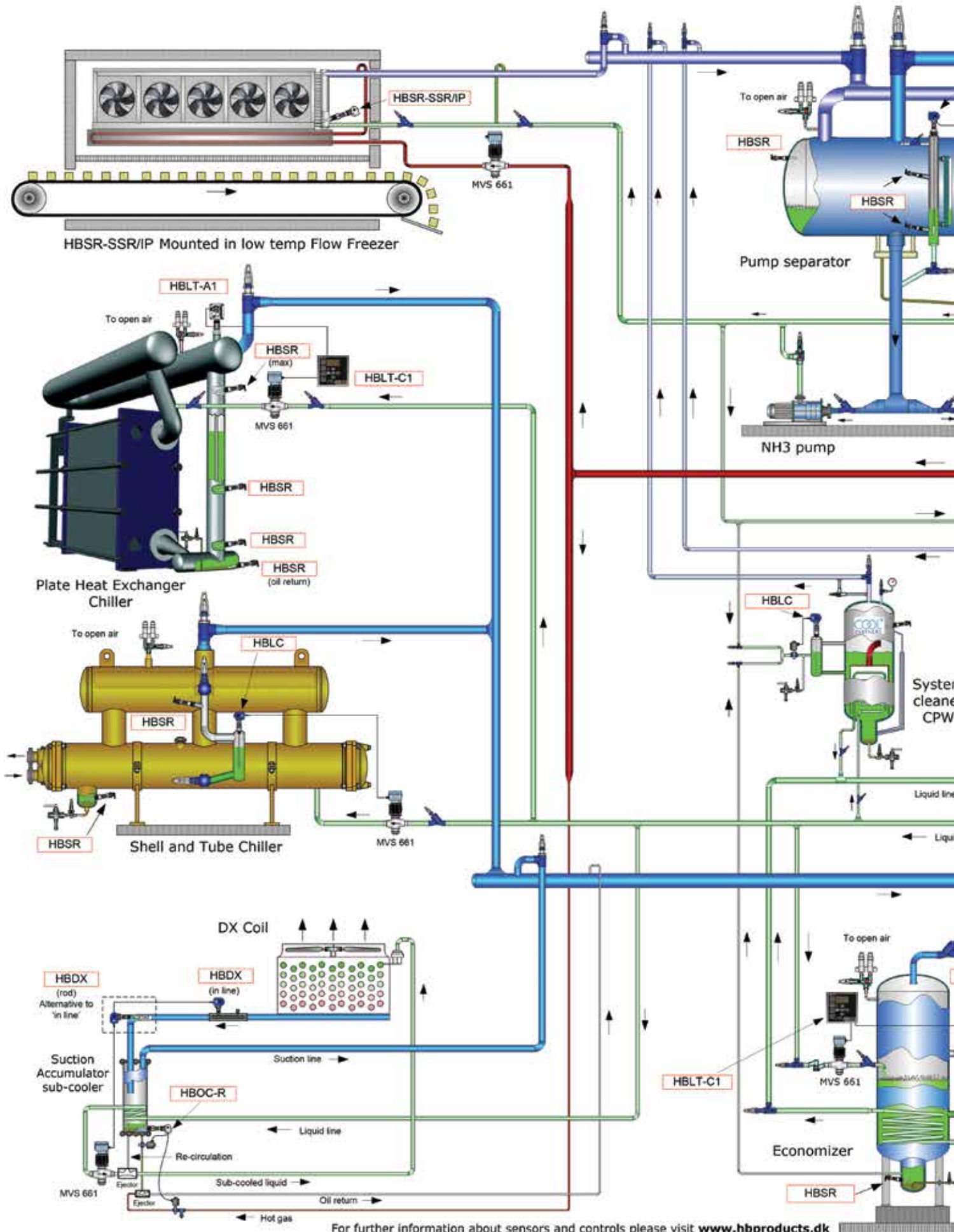
Ammonia requires a smaller pipe diameter than most chemical refrigerants, for both the vapour and liquid phase.

Better heat transfer

Ammonia has better heat transfer properties than most chemical refrigerants, which enables the use of equipment with a smaller cooling surface. This way, the costs associated with establishing new systems are lower. Since these characteristics also benefit the thermodynamic efficiency of the system, the operational costs will also be lower.

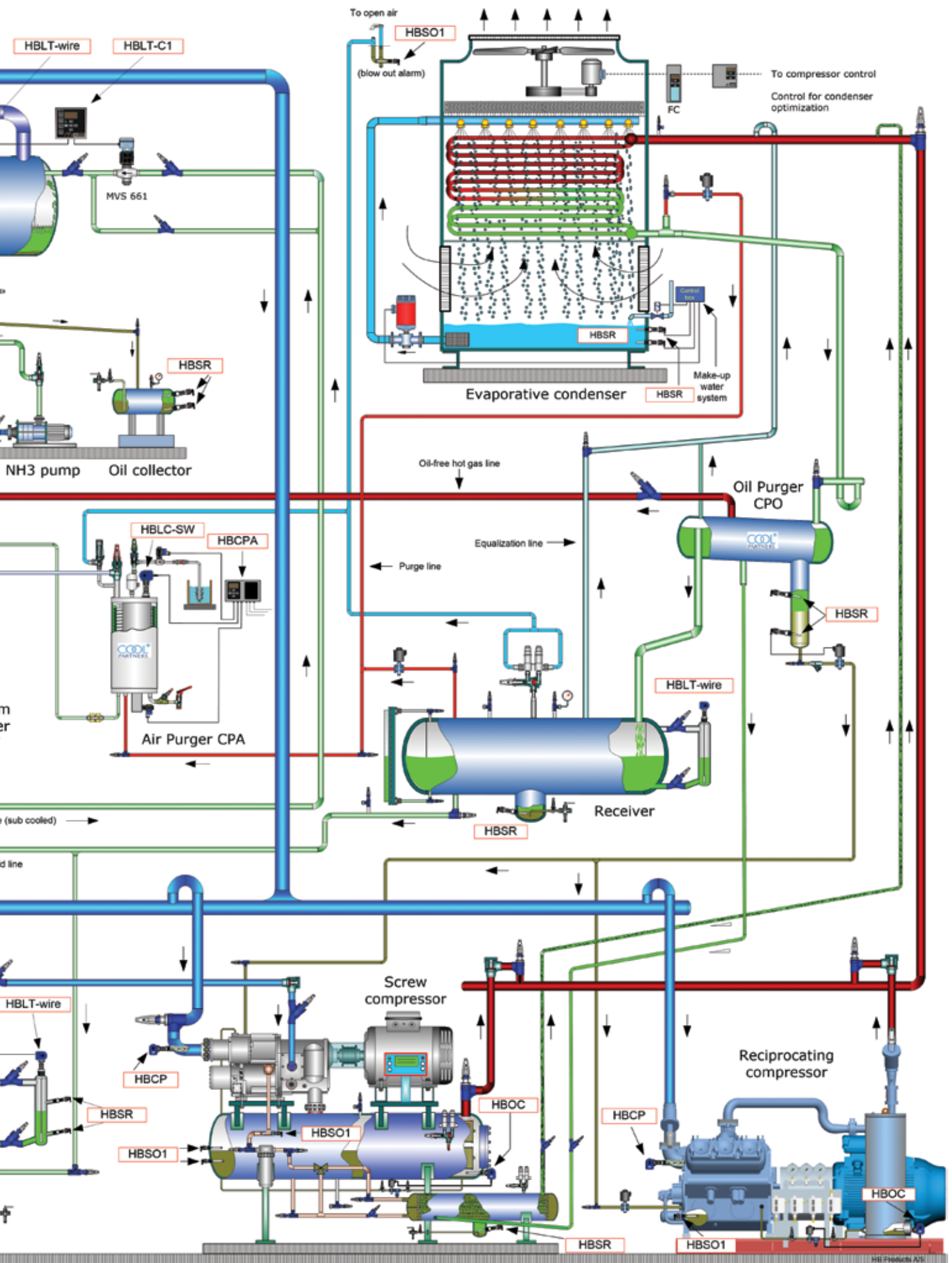
Refrigerant price

In many countries, the expenses associated with ammonia (per kg) are substantially lower than the price of HFC, CFC or HCFC. This advantage is even greater due to the fact that ammonia has a lower density in liquid form. Furthermore, any refrigerant leakage would be limited when using ammonia, since it would quickly be discovered due to the air smell. Ammonia is not a universal refrigerant and it is particularly suitable for industrial and heavy commercial applications. Ammonia's toxicity, flammability, and compatibility with materials must always be considered in the assessment. Furthermore, it should be mentioned that a large number of ammonia refrigeration systems exist globally, where these challenges are being successfully managed.



For further information about sensors and controls please visit www.hbproducts.dk

ant - principle












Switches, sensor and controls for NH3 industrial refrigeration installations

ON/OFF switches

NH3 liquid	Function: NH3 liquid switch Application: Level switch in tanks Temperature: -30...+80°C Supply: 24 V AC/DC Output: PNP/NPN – 1A		Page 26
	Function: NH3 liquid switch Application: Level switch in tanks Temperature: -30...+80°C Supply: 90...240 V AC Output: Solid state relay		Page 30
	Function: NH3 liquid switch Application: Level switch in flow freezers Temperature: -60...+80°C Supply: 24 V DC Output: Solid state relay – 1A		Page 34
	Function: NH3/CO2 leakage switch Application: Leakage switch in heat exchangers Temperature: -60...+80°C Supply: 24 V DC Output: PNP - 1 A		Page 38
	Function: NH3/Oil liquid switch Application: Liquid switch in industrial refrigerant systems Temperature: -60...+80°C Supply: 24 V DC Output: PNP - 1 A		Page 42
Oil	Function: Oil switch Application: Compressor crankcases, oil collectors/tanks & oil separators. Temperature: -30...+80/120°C Supply: 24 V AC/DC Output: PNP/NPN – 1A		Page 46
	Function: Oil switch Applications: Compressor crankcases, oil collectors/tanks & oil separators. Temperature: -30...+80/120°C Supply: 90...240 V AC Output: Solid state relay		Page 50
Phase change	Function: Oil phase switch Applications: Oil pots and oil purgers Temperature: -30...+80°C Supply: 24 V AC/DC Output: PNP/NPN – 1A		Page 54
	Function: Oil phase switch Applications: Oil pots and oil purgers Temperature: -30...+80°C Supply: 90...240 V AC Output: Solid state relay		Page 58
NH3 GAS	Function: NH3 gas switch Application: Compressor protection sensor Temperature: -30...+80°C Supply: 24 V AC/DC Output: PNP – 1A		Page 62

Sensor and controls

NH ₃ liquid	Function: NH₃ level sensor - Wire Applications: Level measurement in standpipes Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA/ PNP-1A		Page 66
	Function: NH₃ level sensor - Rod Applications: Level measurement in standpipes Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA		Page 70
	Function: Intelligent "Float level regulation" Applications: Float regulation in e.g. chillers Temperature: -30...+80°C Supply: 24 V AC/DC Output: 4...20 mA/ PNP-1A		Page 74
	Function: Level controller Applications: Level control on e.g. pump separators Temperature: -30...+80°C Supply: 24 V AC/DC / 90-240 V AC Output: 4...20 mA/ 3x solid state relays-3/5A		Page 80
	Function: Pressure sensor Applications: Pressure measurement in refrigeration systems Temperature: 40...+125°C Supply: 9...32 V DC Output: 4...20 mA		Page 84
	Function: Temperature sensor Applications: Temperature measurement in refrigeration systems Temperature: -50...+130°C Output: PT100 / PT1000		Page 88
	Function: pH sensor Applications: Ammonia leakage in to brine line Temperature: -10...+95°C Supply: 24 V DC Output: 4...20 mA		Page 92
Oil	Function: Oil level controller / Management Applications: Oil separator, oil tanks , oil purgers or compressors Temperature: -30...+80°C Supply: 24 V DC Output: Solid Stat relay		Page 96
Phase change	Function: Oil switch with build in controller Applications: Oil level controller in oil pot Temperature: -60...+80°C Supply: 24 V DC Output: Solid state relay - 1A		Page 100
NH ₃ Gas	Function: Gas quality sensor / DX controller Applications: Gas quality measurement Temperature: -50...+80°C Supply: 24 V AC/DC Output: 4...20 mA/ PNP-1A		Page 104
	Function: Gas leakage sensor Applications: Safety switch/sensor for gas leakage detection Temperature: -25...+80°C Supply: 24 V DC Output: 1A + 4...20 mA		Page 108
Ice	Function: Ice thickness sensor Applications: Evaporator - Defrost on demand. Temperature: -60...+80°C Supply: 24 V DC Output: 4...20 mA		Page 112

NH3 Refrigerant switch - 24 V AC/DC

Proven sensor technology for simple transistor output PNP/NPN and NO/NC output function.

Designed for the industrial refrigeration industry - max pressure 100 bar.

Split design which allows for easy installation and diagnosis. The electronic part can be easily disconnected by 2 screws.

Clear indication with LED when refrigerant is detected.

24 V AC/VC voltage supply.

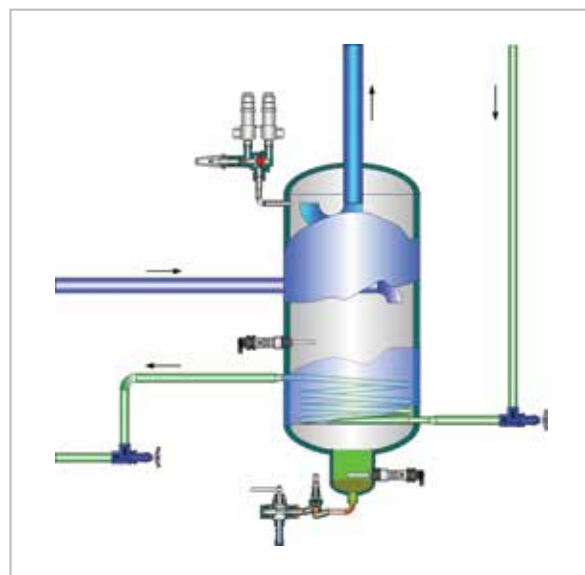


Functional description

HBSR is a level switch for the detection of NH3 and Brine refrigerants.

Typically it is installed in/on the refrigerant vessels, pump separators, economisers or heat exchanger.

The sensor is specially built to resist high pressure and low temperatures.

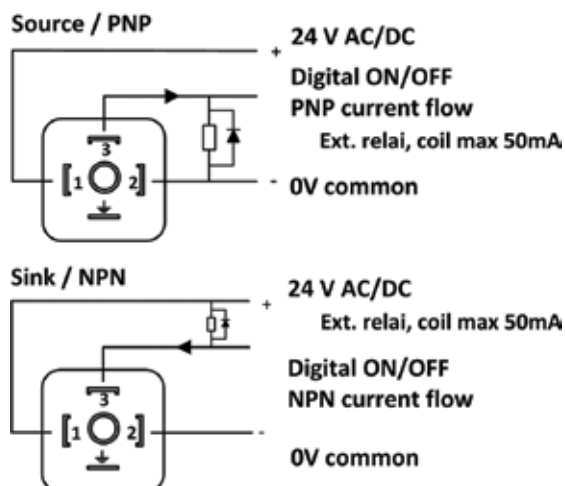


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	4 x red	Max pressure	100 bar
Cable specification *		Protection degree	IP65
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included.

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

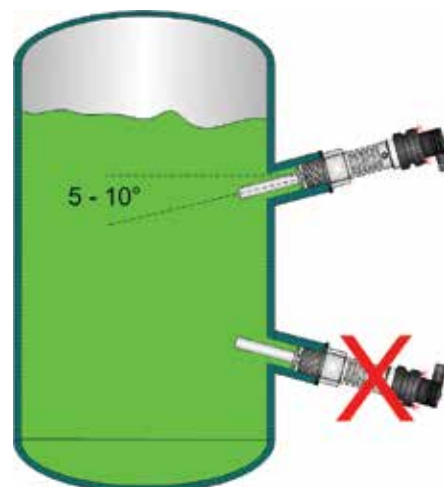
NC: no signal when it is red

NO: signal when it is red

4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type (G)	Ordering code
PNP / NO	3/4" NPT	HBSR-PNP/NO-2
PNP / NC	3/4" NPT	HBSR-PNP/NC-2
PNP / NO	3/4" BSPP	HBSR-PNP/NO-6
PNP / NC	3/4" BSPP	HBSR-PNP/NC-6
NPN / NO	3/4" NPT	HBSR-NPN/NO-2
NPN / NC	3/4" NPT	HBSR-NPN/NC-2
NPN / NO	3/4" BSPP	HBSR-NPN/NO-6
NPN / NC	3/4" BSPP	HBSR-NPN/NC-6

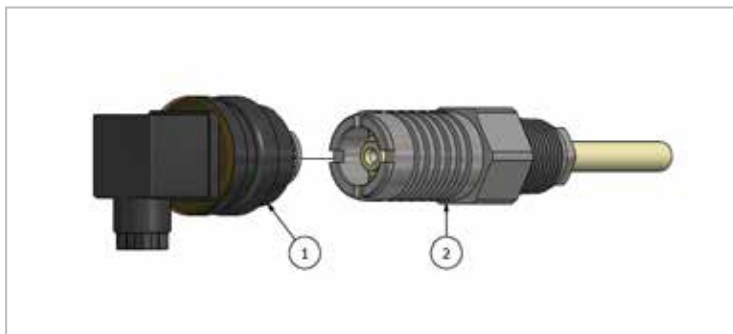


Mechanical dimensions



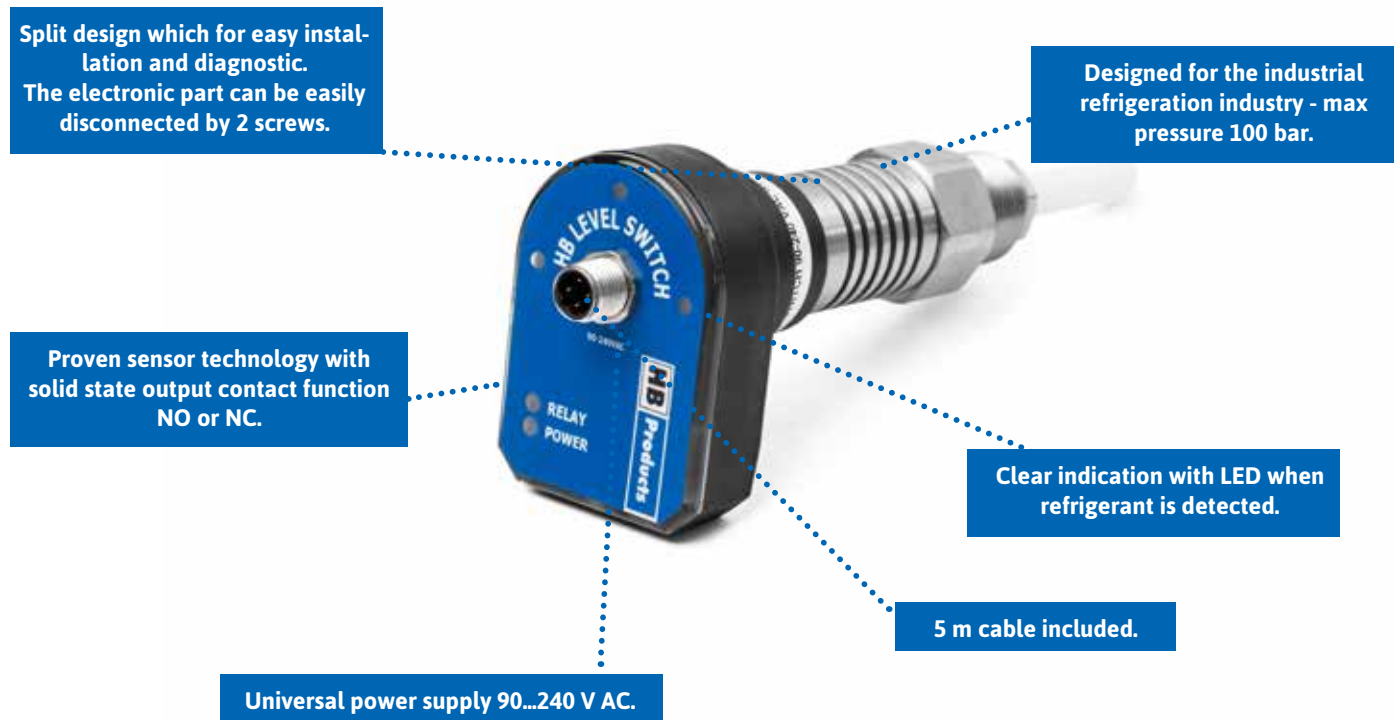
Thread to be sealed with conductive liquid sealing to ensure ground connection.

Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PNP/NO	HBSR-EL/PNP/NO
		PNP/NC	HBSR-EL/PNP/NC
		NPN/NO	HBSR-EL/NPN/NO
		NPN/NC	HBSR-EL/NPN/NC
2	Mechanical part	¾" NPT	HBSR-MEK-2
		¾" BSPP	HBSR-MEK-6

NH3 Refrigerant switch - 90...240 V AC



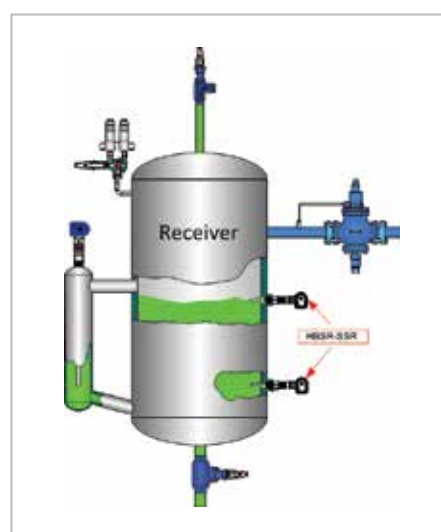
Functional description

HBSR is a level switch for the detection of NH3 and Brine refrigerants.

Typically it is installed in/on the refrigerant vessels, pump separators, economisers or heat exchanger.

The sensor is specially built to resist high pressure and low temperatures.

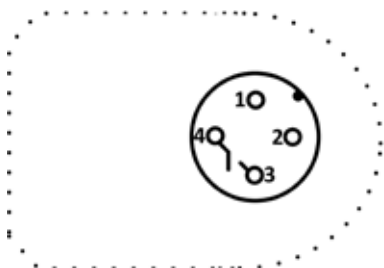
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.



Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	193x51x72
Output		Environmental conditions	
Output type	Solid state relay - 40W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

1 = Brown: 90...240 V supply

2 = White : 90...240 V supply

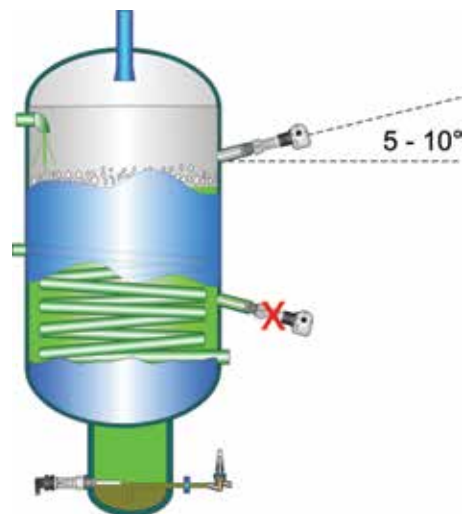
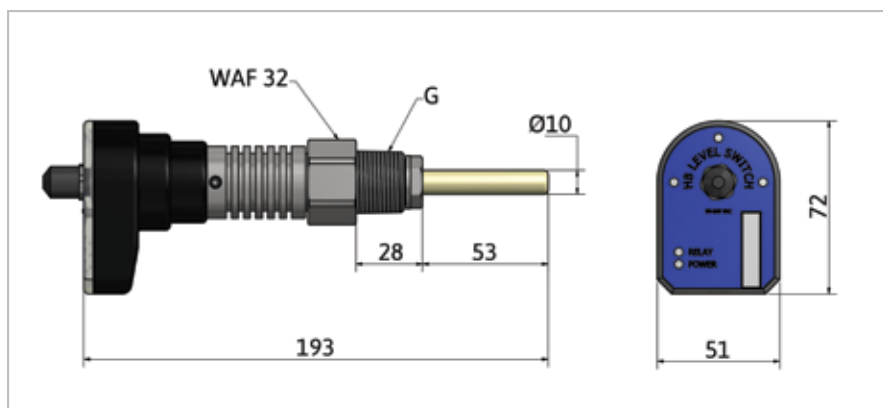
3 = Blue: SSR output – max 240 V AC

4 = Black: SSR output – max 240 V AC

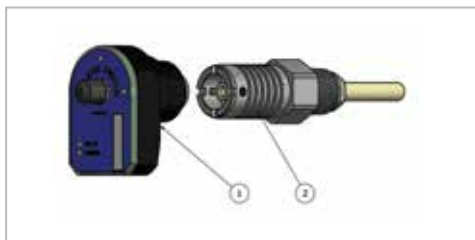
Ordering code

Output	Thread type	Ordering code
Solid state relay - NO	3/4" NPT	HBSR-SSR-2/NO-2
Solid state relay - NO	3/4" BSPP	HBSR-SSR-2/NO-6
Solid state relay - NC	3/4" NPT	HBSR-SSR-2/NC-2
Solid state relay - NC	3/4" BSPP	HBSR-SSR-2/NC-6

Mechanical dimensions

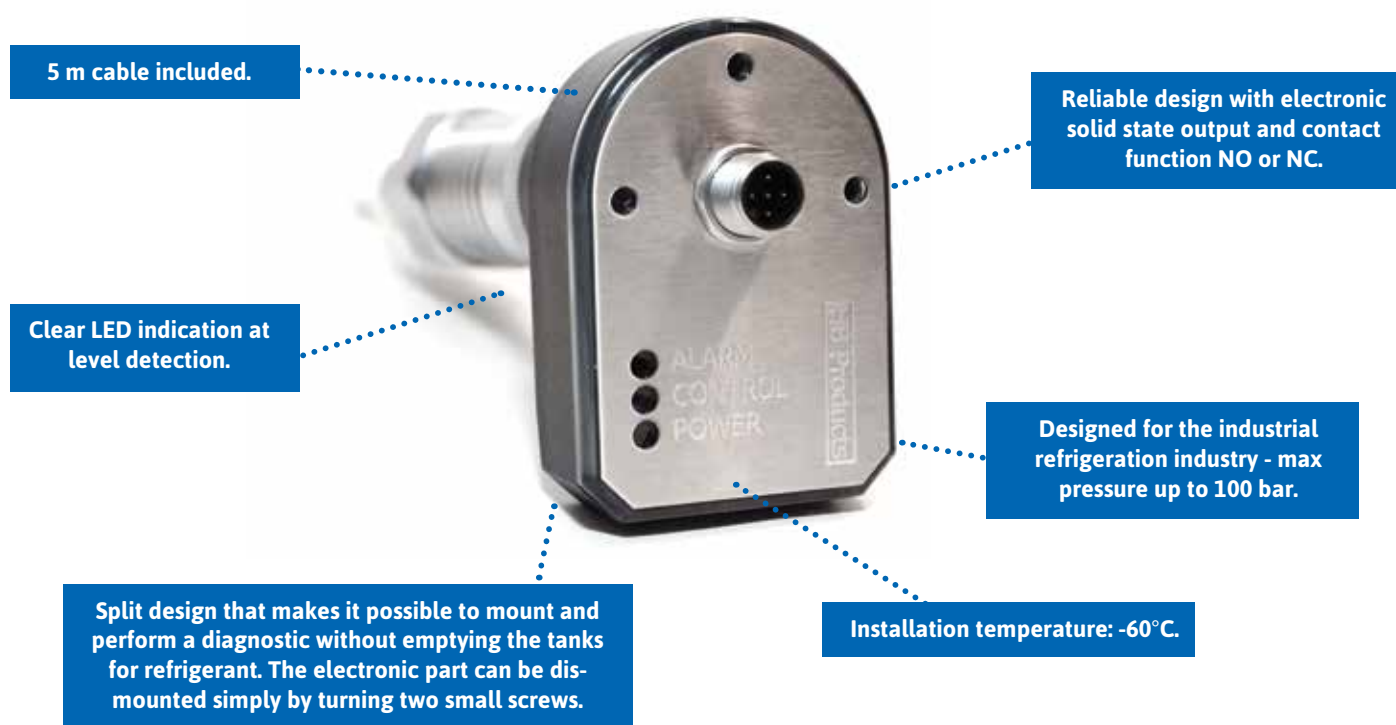


Spare parts



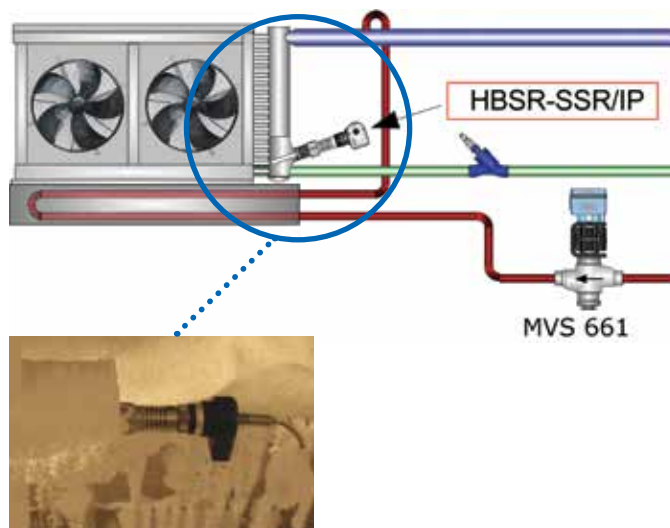
Position	Specification	Type	Ordering code
1	Electronic part	NO	HBSR-SSR -2/NO-EL
		NC	HBSR-SSR -2/NC-EL
2	Mechanical part	¾" NPT	HBSR-MEK-2
		¾" BSPP	HBSR-MEK-6

Ice proof switch



Functional description

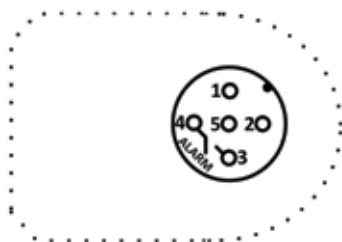
HBSR-SSR/IP is a level switch for detecting liquid in refrigeration systems. Typically, it is installed in/on the receiver, but it is also suited for installation in other locations where a level indication is required. The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle as well as its special construction allows it to withstand high pressure and low refrigerant temperatures.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V DC	Thread connection	3/4" NPT
Power/current consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	SSR- 1A / 24 V AC/DC	Ambient temperature	-60...+50°C
Output function	NC or NO	Refrigerant temperature	-60...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply 24V DC

1 = Brown +

2 = White -

3 = Blue - Potential free solid state, 1 A

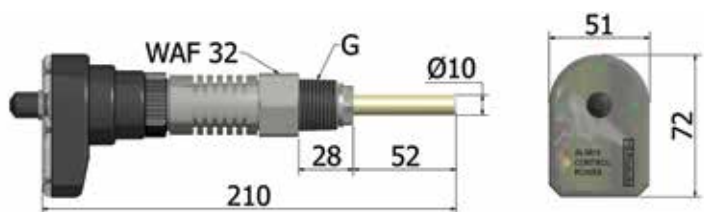
4 = Black - Potential free solid state, 1 A

5 = Gray Not in use (data only)

Ordering code

Output	Thread type	Ordering code
NC / NO - programmable	3/4" NPT	HBSR-SSR-1/IP-2

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBSR-SSR-1/IP-EL
1	Mechanical part	3/4" NPT	HBSR-MEK-SSR/IP

NH₃/CO₂ leakage switch

CO₂ leakage detection in NH₃ cascade heat exchanger.

LED indication for power and alarm status.

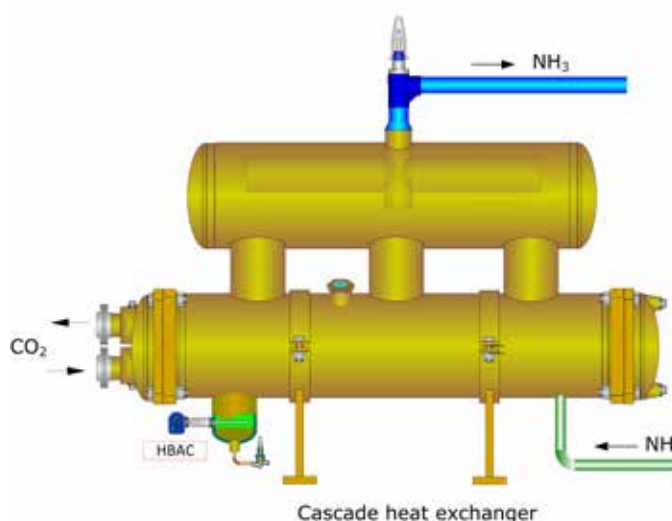
Simple to install with a sleeve.
A cost-optimized solution.

Single Shared design that make it easy to install and diagnostics. The electronic part can be easily removed from the mechanical part by two small screws.



Functional description

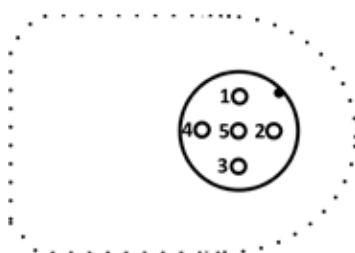
HBAC is used for detecting leakage in cascade systems. The sensor triggers an alarm if there is an NH₃ leak in the CO₂ part. A leak results in several hours of cleaning the pipes and heat exchanger. If a CO₂ leak occurs in the NH₃ part, salt crystals are formed. These salt crystals are very corrosive and lead to clogging of the parts. If the leak is not stopped in time, it can lead to extensive damage to the heat exchanger, pipes, and pump. The sensor detects even very small leaks.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V DC	Thread connection	3/4" NPT
Power/current consumption	50 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	100 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP, 1 A	Ambient temperature	-60...+50°C
Output function	NC or NO	Refrigerant temperature	-60...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply 24V AC/DC

1 = Brown +

2 = White -

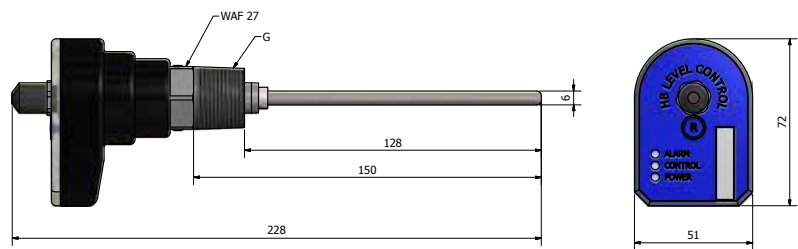
3 = Blue, DO, Alarm, PNP/NPN, 1A

4 & 5 = not in use

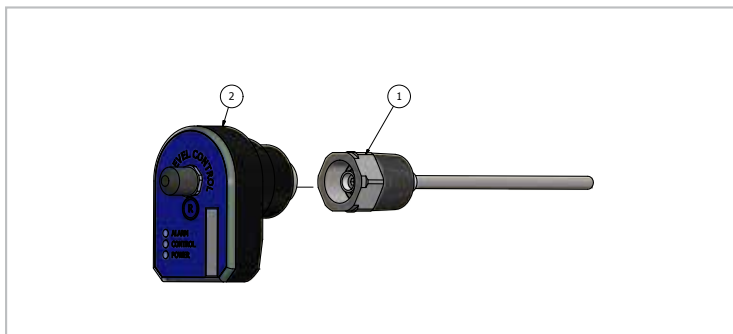
Ordering code

Output	Thread type	Ordering code
NO	3/4" NPT	HBAC-1.6-NO-2
NC	3/4" NPT	HBAC-1.6-NC-2
NO	3/4" BSPP	HBAC-1.6-NO-6
NC	3/4" BSPP	HBAC-1.6-NC-6

Mechanical dimensions

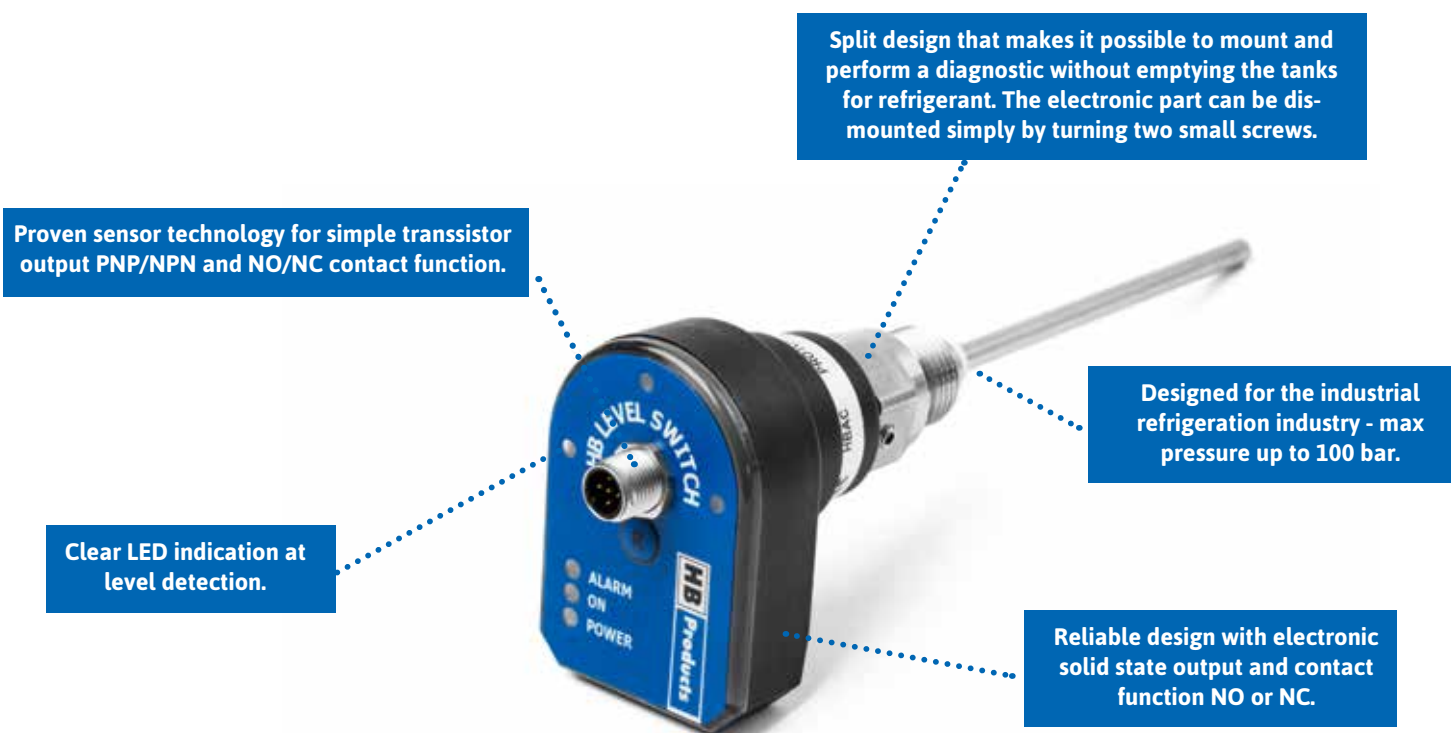


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	NO	HBAC-NO-EL
		NC	HBAC-NC-EL
2	Mechanical part	¾" NPT	HBAC-MEK-2
		¾" BSPP	HBAC-MEK-6

NH3/Oil switch



Functional description

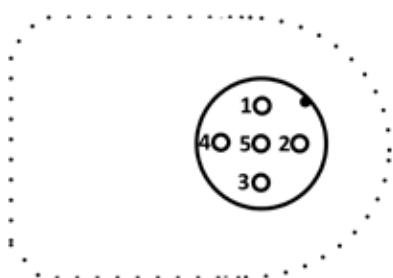
HBLS is a level switch for detecting NH3 refrigerant and oil in industrial refrigeration systems. Typically it is installed on fluid tanks, also suitable for mounting other places where you need level indication of both NH3 refrigerant and oil.

The sensor is specially built to resist high pressure and low temperatures.

Technical data

Power supply		Mechanical specifications	
Voltage	24 V DC	Thread connection	3/4" NPT
Power/current consumption	50 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	100 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP, 1 A	Ambient temperature	-60...+50°C
Output function	NC or NO	Refrigerant temperature	-60...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8	Accessories	(to be ordered separate)
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply 24V AC/DC

1 = Brown +

2 = White -

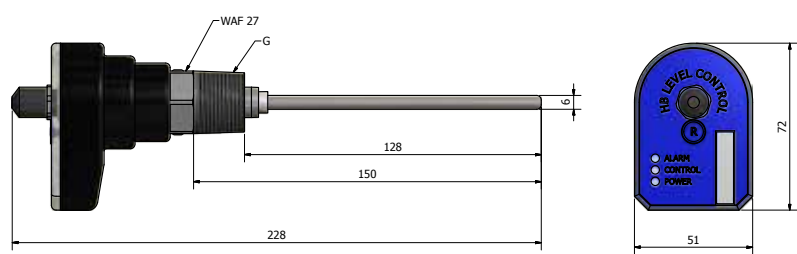
3 = Blue, DO, Alarm, PNP/NPN, 1A

4 & 5 = not in use

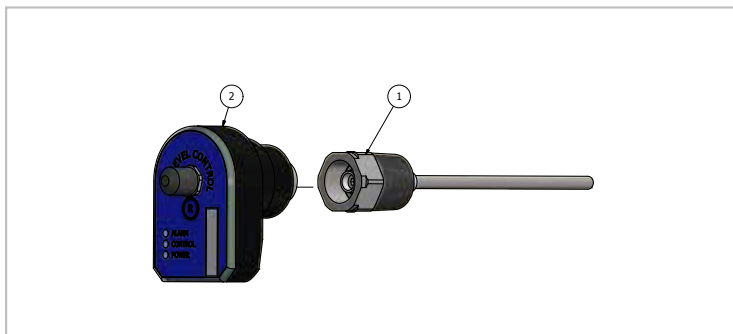
Ordering code

Output	Thread type	Ordering code
NC	3/4" NPT	HBLS-NC-1.3-2
NO	3/4" NPT	HBLS-NO-1.3-2
NC	3/4" BSPP	HBLS-NC-1.3-6
NO	3/4" BSPP	HBLS-NO-1.3-6

Mechanical dimensions



Spare parts



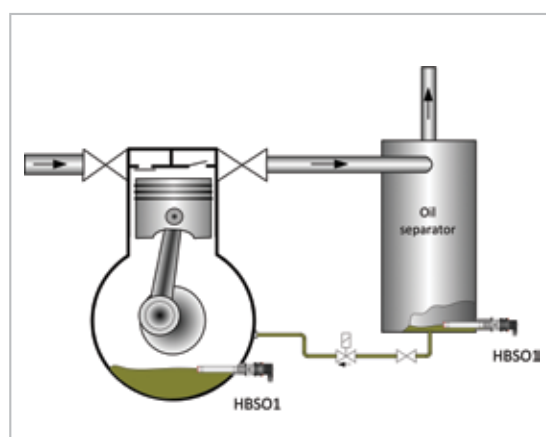
Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBLS-NC-EL
	Electronic part	PC-programmable	HBLS-NO-EL
2	Mechanical part	¾" NPT	HBLS-MEK-SSR/IP

Oil switch - 24 V AC/DC



Functional description

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.

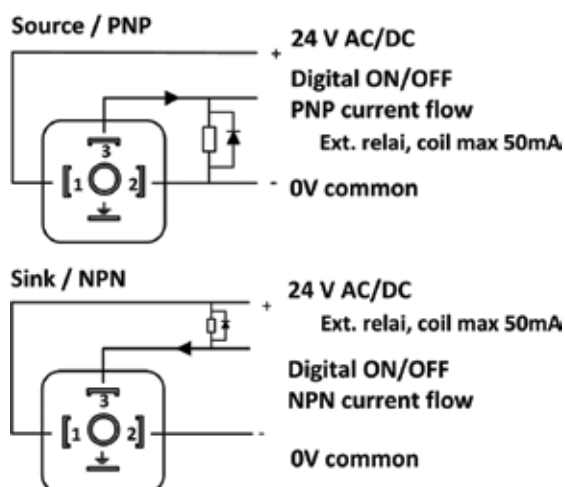


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	1/2" & 3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	192x52x40
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	4 x red	Max pressure	150 bar
Cable specification*		Protection degree	
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

NC: no signal when it is red

NO: signal when it is red

4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type	Ordering code
PNP / NO	1/2" NPT	HBSO1-PNP/NO-1
PNP / NC	1/2" NPT	HBSO1-PNP/NC-1
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2
PNP / NC	3/4" NPT	HBSO1-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO1-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO1-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO1-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO1-PNP/NC-6
PNP / NO	1 1/8" UNEF	HBSO1-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO1-PNP/NO-7
NPN / NO	1/2" NPT	HBSO1-NPN/NO-1
NPN / NC	1/2" NPT	HBSO1-NPN/NC-1
NPN / NO	3/4" NPT	HBSO1-NPN/NO-2
NPN / NC	3/4" NPT	HBSO1-NPN/NC-2
NPN / NO	1/2" BSPP	HBSO1-NPN/NO-5
NPN / NC	1/2" BSPP	HBSO1-NPN/NC-5
NPN / NO	3/4" BSPP	HBSO1-NPN/NO-6
NPN / NC	3/4" BSPP	HBSO1-NPN/NC-6
NPN / NO	1 1/8" UNEF	HBSO1-NPN/NO-7
NPN / NC	1 1/8" UNEF	HBSO1-NPN/NO-7
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2-HT
PNP/NO	1/2" BSPP	HBSO1-PNP/NO-5-HT
PNP/NO	3/4" BSPP	HBSO1-PNP/NO-6-HT

Output	Thread type	Ordering code
NPN/NO	3/4" NPT	HBSO1-NPN/NO-2-HT
NPN/NO	1/2" BSPP	HBSO1-NPN/NO-5-HT
NPN/NO	3/4" BSPP	HBSO1-NPN/NO-6-HT
PNP / NO	1/2" NPT	HBSO2-PNP/NO-1
PNP / NC	1/2" NPT	HBSO2-PNP/NC-1
PNP / NO	3/4" NPT	HBSO2-PNP/NO-2
PNP / NC	3/4" NPT	HBSO2-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO2-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO2-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO2-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO2-PNP/NC-6
PNP / NO	1 1/8" NEF	HBSO2-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO2-PNP/NO-7
NPN / NO	1/2" NPT	HBSO2-NPN/NO-1
NPN/NC	1/2" NPT	HBSO2-NPN/NC-1
NPN/NO	3/4" NPT	HBSO2-NPN/NO-2
NPN/NC	3/4" NPT	HBSO2-NPN/NC-2
NPN/NO	1/2" BSPP	HBSO2-NPN/NO-5
NPN/NC	1/2" BSPP	HBSO2-NPN/NC-5
NPN/NO	3/4" BSPP	HBSO2-NPN/NO-6
NPN/NC	3/4" BSPP	HBSO2-NPN/NC-6
NPN/NO	1 1/8" UNEF	HBSO2-NPN/NO-7
NPN/NC	1 1/8" UNEF	HBSO2-NPN/NO-7

Please specify the oil application by "1" for PEO, PAO & mineral oil and by "2" for PAG oil types.

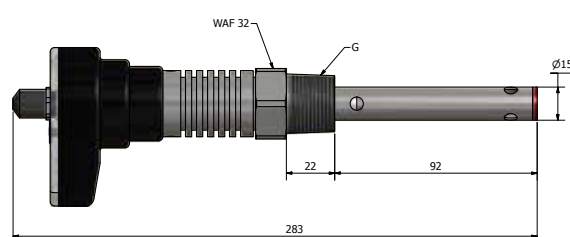
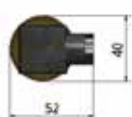
Mechanical dimensions



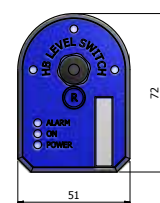
1/2" & 3/4"



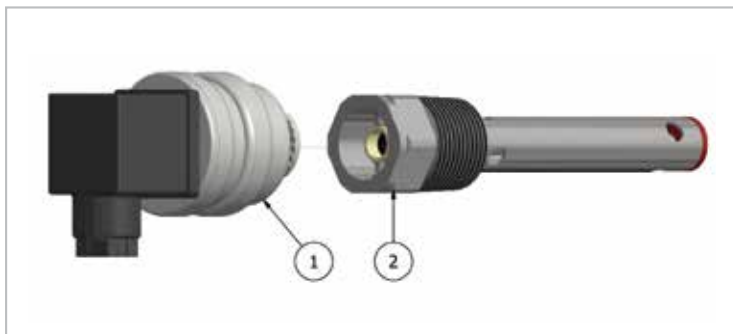
1 1/8" UNEF



HT version



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part - HBSO1	PNP/NO	HBSO1-EL/PNP/NO
		PNP/NC	HBSO1-EL/PNP/NC
		NPN/NO	HBSO1-EL/NPN/NO
		NPN/NC	HBSO1-EL/NPN/NC
	Electronic part - HBSO2	PNP/NO	HBSO2-EL/PNP/NO
		PNP/NC	HBSO2-EL/PNP/NC
		NPN/NO	HBSO2-EL/NPN/NO
		NPN/NC	HBSO2-EL/NPN/NC
2	Mechanical part	1/2" NPT	HBSO1-MEK-1
		3/4" NPT	HBSO1-MEK-2
		1/2" BSPP	HBSO1-MEK-5
		3/4" BSPP	HBSO1-MEK-6
		1 1/8" UNEF	HBSO1-MEK-7

Oil switch - 90...240 V AC

Split design which allows for easy installation and diagnosis. The electronic part can be easily disconnected by 2 screws.

Designed for the industrial refrigeration industry - max pressure 100 bar.

Proven sensor technology with solid state output contact function NO or NC.

Clear indication with LED when refrigerant is detected.

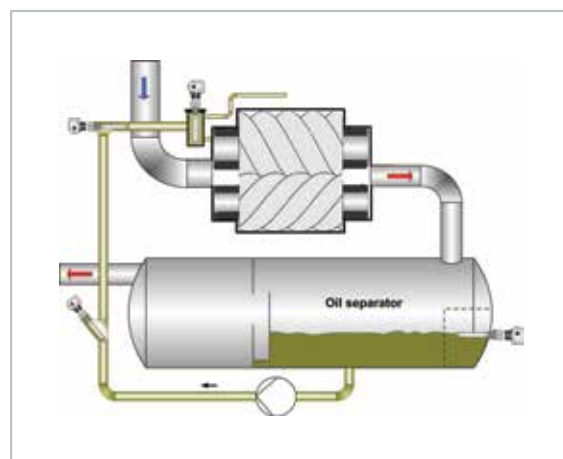
Universal power supply 90...240 V AC.

5 m cable included.



Functional description:

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.



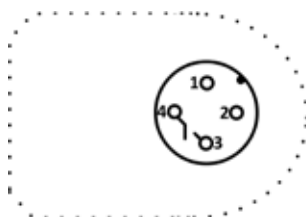
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.

Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	3 x green	Max pressure	150 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

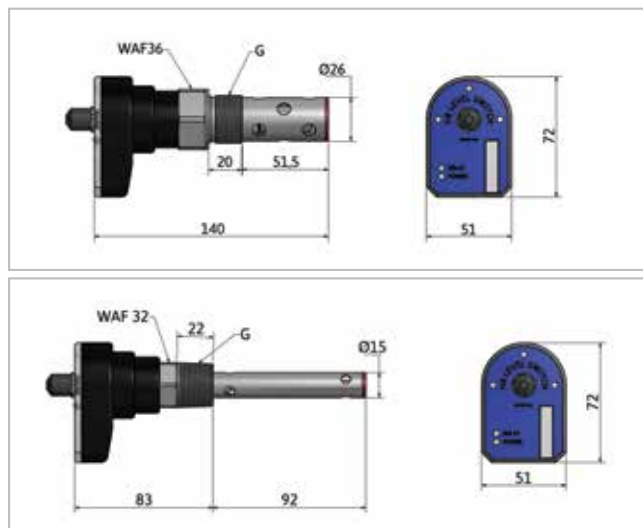
* For installation with heating element. Otherwise, the minimum temperature is – 30°C.

Electrical installation



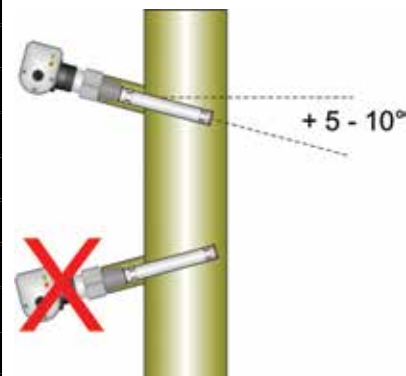
Supply: 90...240 V AC - 50/60 Hz
 1 = Brown: 90...240 V supply
 2 = White : 90...240 V supply
 3 = Blue: SSR output – max 240 V AC
 4 = Black: SSR output – max 240 V AC

Mechanical dimensions



Ordering code

Output	Thread type	Oil type	Temperature	Ordering code
NO	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-1
NC	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-1
NO	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-2
NC	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-2
NO	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-5
NC	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-5
NO	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-6
NC	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-6
NO	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-7
NC	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-7
NO	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-1
NC	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-1
NO	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-2
NC	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-2
NO	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-5
NC	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-5
NO	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-6
NC	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-6
NO	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NO-7
NC	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NC-7
NO	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-1-HT
NC	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-1-HT
NO	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-2-HT
NC	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-2-HT
NO	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-5-HT
NC	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-5-HT
NO	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-6-HT
NC	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-7-HT
NO	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-1-HT
NC	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-1-HT
NO	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-2-HT
NC	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-2-HT
NO	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-5-HT
NC	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-5-HT
NO	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-6-HT
NC	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NC-7-HT

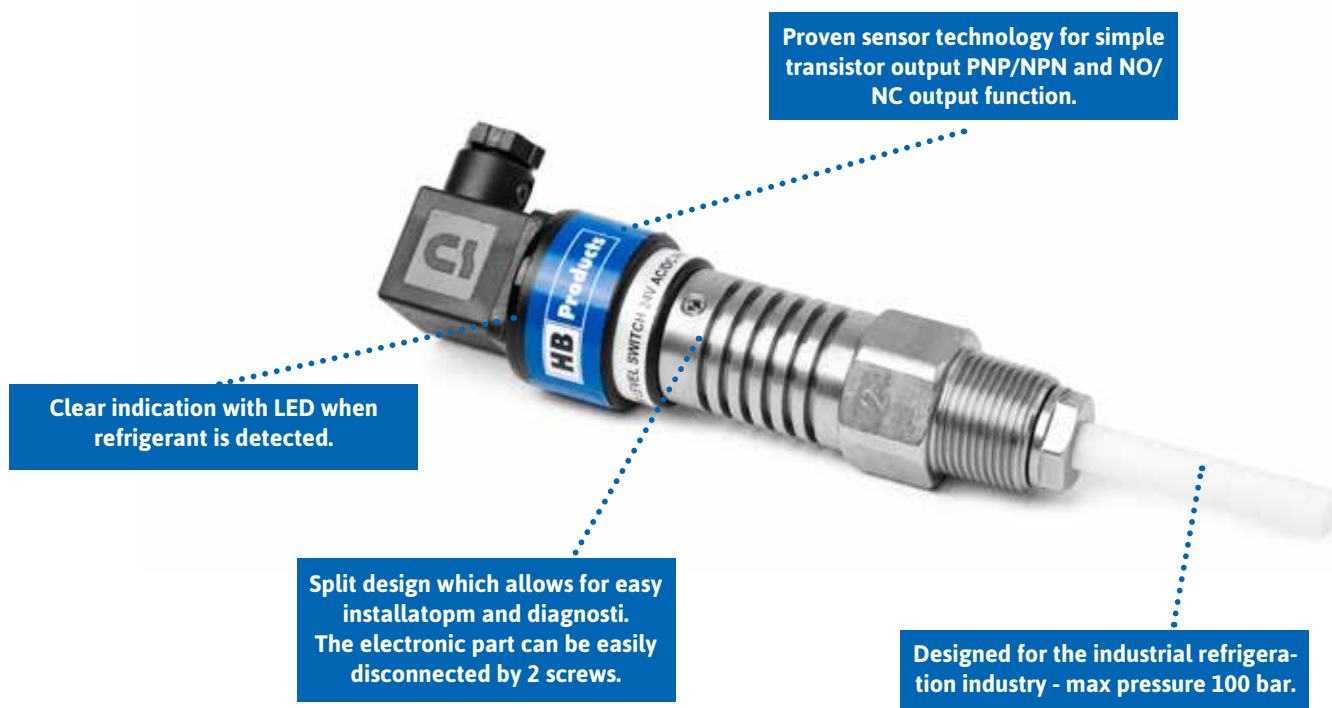


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part – HBSO1	NO	HBSO1-SSR-2/NO-EL
		NC	HBSO1-SSR-2/NC-EL
	Electronic part – HBSO1-High Temperature	NO	HBSO1-SSR-2/NO-HT-EL
		NC	HBSO1-SSR-2/NC-HT-EL
	Electronic part – HBSO2	NO	HBSO2-SSR-2/NO-HT-EL
		NC	HBSO2-SSR-2/NC-EL
	Electronic part – HBSO2- High Temperature	NO	HBSO2-SSR-2/NO-HT-EL
		NC	HBSO2-SSR-2/NC-HT-EL
2	Mechanical part	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		½" BSPP	HBSO1-MEK-5
		¾" BSPP	HBSO1-MEK-6
		1 1/8 UNEF	HBSO1-MEK-7
	Mechanical part – High Temperature	½" NPT	HBSO1-HT-MEK-1
		¾" NPT	HBSO1-HT-MEK-2
		½" BSPP	HBSO1-HT-MEK-5
		¾" BSPP	HBSO1-HT-MEK-6
		1 1/8 UNEF	HBSO1-HT-MEK-7

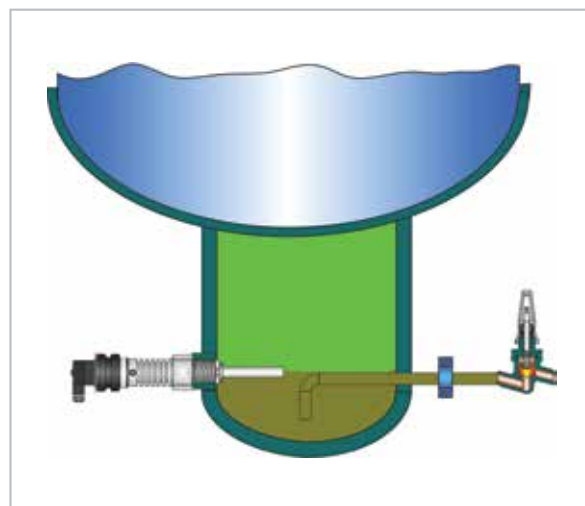
Phase change switch - 24 V AC/DC



Functional description

HBOR is a level switch designed for the detection of NH₃. When it is mounted in the oil pot, it will detect either NH₃ or oil depending on the level of oil. When the oil rises to the level switch, the HBOR will switch on! This is a warning for the operator to empty the pot of oil.

The LEDs on the switch will be active when oil is detected.

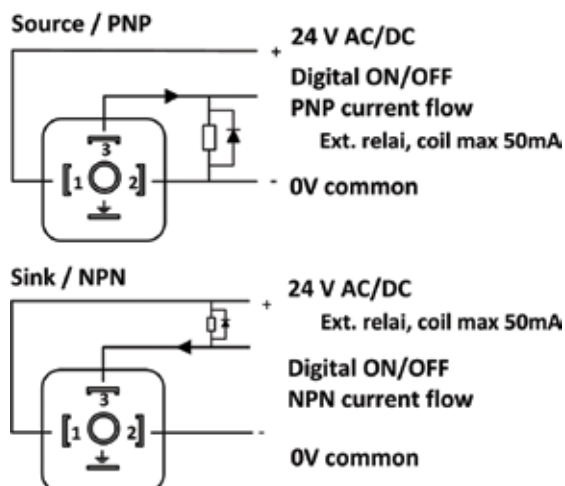


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	4 x red	Max pressure	100 bar
Cable specification*		Protection degree	IP65
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included.

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

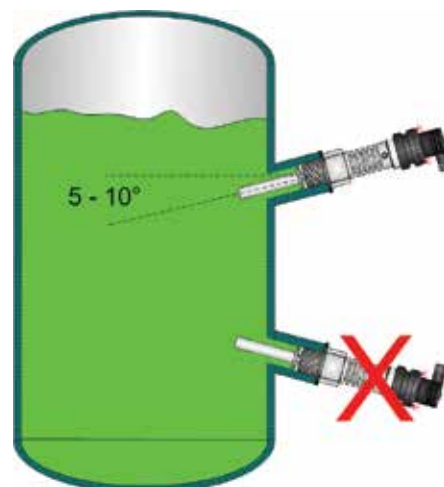
NC: no signal when it is red

NO: signal when it is red

4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type	Ordering code
PNP / NO	3/4" NPT	HBOR-PNP/NO-2
PNP / NC	3/4" NPT	HBOR-PNP/NC-2
PNP / NO	3/4" BSPP	HBOR-PNP/NO-6
PNP / NC	3/4" BSPP	HBOR-PNP/NC-6
NPN / NO	3/4" NPT	HBOR-NPN/NO-2
NPN / NC	3/4" NPT	HBOR-NPN/NC-2
NPN / NO	3/4" BSPP	HBOR-NPN/NO-6
NPN / NC	3/4" BSPP	HBOR-NPN/NC-6

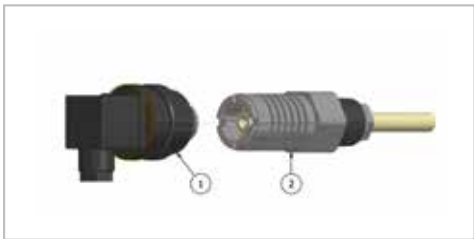


Mechanical dimensions



Thread to be sealed with conductive liquid sealing to ensure ground connection.

Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PNP/NO	HBOR-EL/PNP/NO
		PNP/NC	HBOR-EL/PNP/NC
		NPN/NO	HBOR-EL/NPN/NO
		NPN/NC	HBOR-EL/NPN/NC
2	Mechanical part	¾" NPT	HBSR-MEK-2
		¾" BSPP	HBSR-MEK-6

Phase change switch - 90...240 V AC

Split design which makes it easy to install and perform diagnostic on. The electronic part can be easily disconnected by 2 screws.

Designed for the industrial refrigeration industry - max pressure 100 bar.

Proven sensor technology with solid state output contact function NO or NC.

Clear indication with LED when refrigerant is detected.

5 m cable included.

Universal power supply 90...240 V AC.

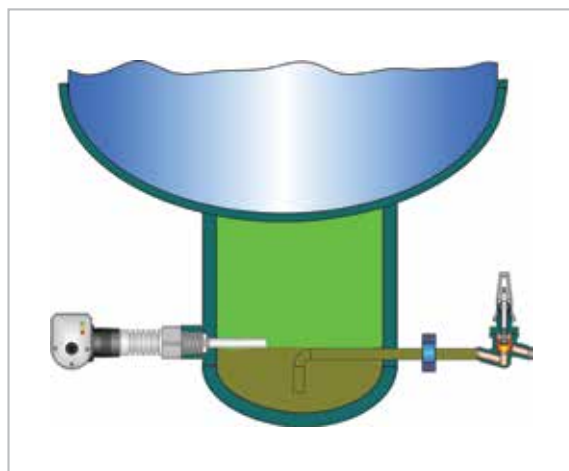


Functional description

HBOR is a level switch designed for the detection of NH₃. When it is mounted in the oil pot, it will detect either NH₃ or oil depending on the level of oil. When the oil rises to the level switch, the HBOR will switch on! This is a warning for the operator to empty the pot of oil.

The LEDs on the switch will be active when oil is detected.

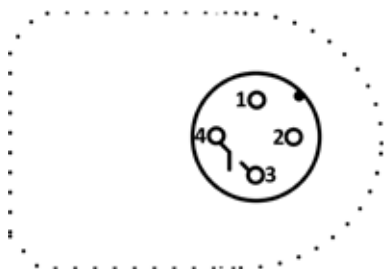
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.



Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	193x51x72
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

1 = Brown: 90...240 V supply

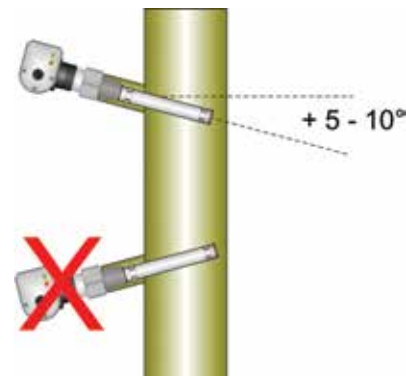
2 = White : 90...240 V supply

3 = Blue: SSR output – max 240 V AC

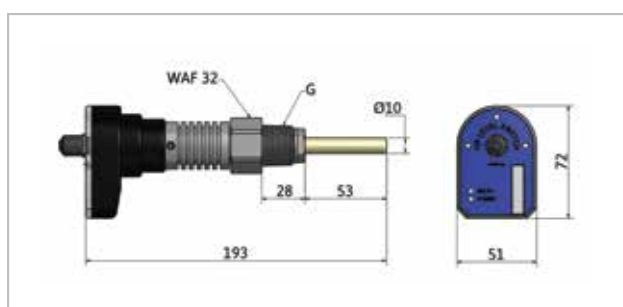
4 = Black: SSR output – max 240 V AC

Ordering code

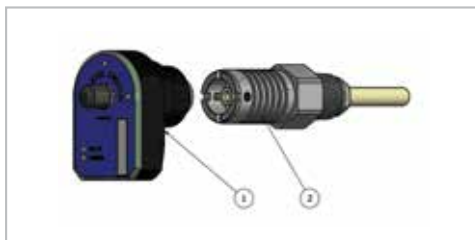
Output	Thread type	Ordering code
Solid state relay - NO	3/4" NPT	HBOR-SSR-2/NO-2
Solid state relay - NO	3/4" BSPP	HBOR-SSR-2/NO-6
Solid state relay - NC	3/4" NPT	HBOR-SSR-2/NC-2
Solid state relay - NC	3/4" BSPP	HBOR-SSR-2/NC-6



Mechanical dimensions

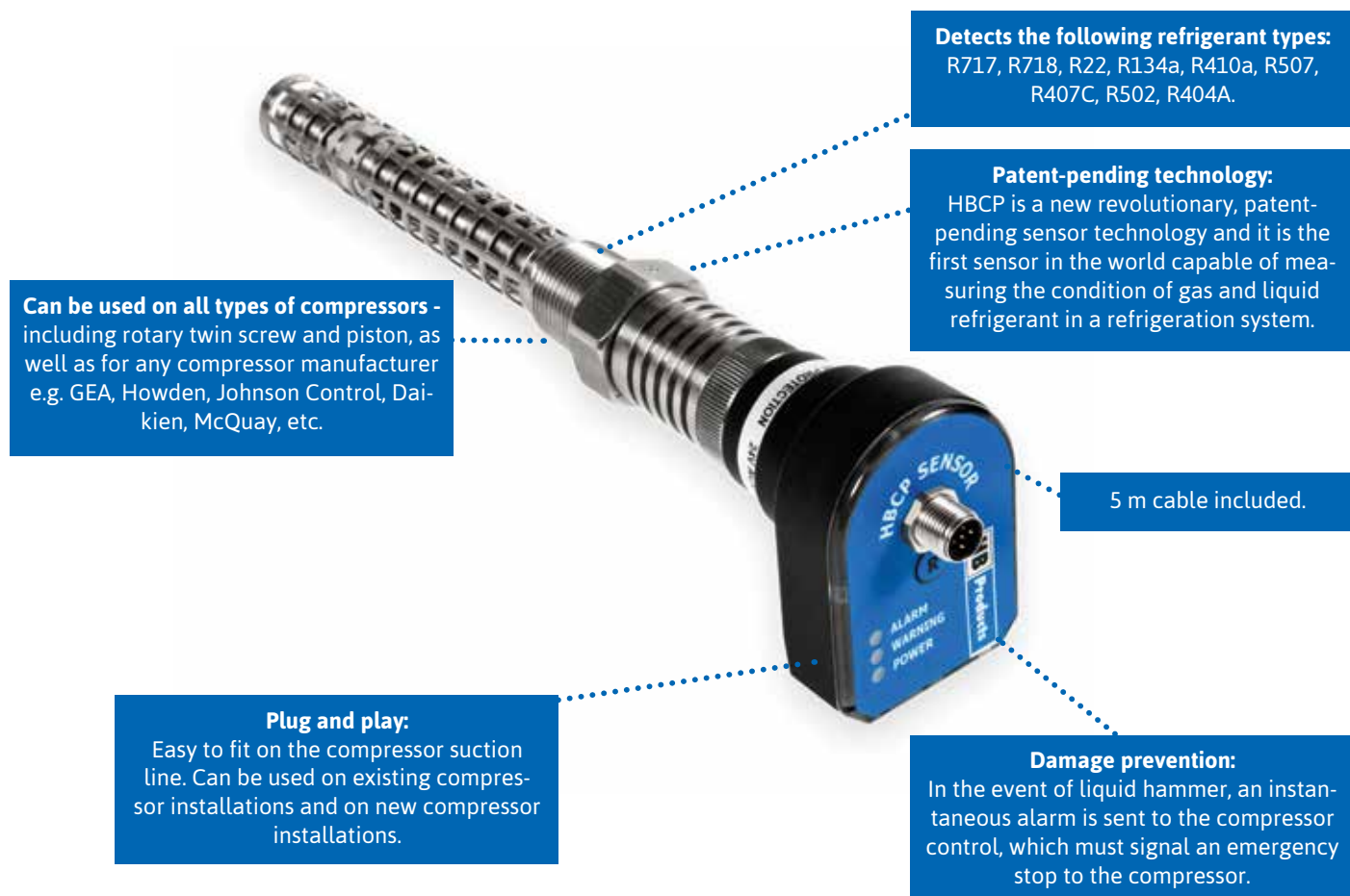


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	NO	HBOR-SSR-2/NO-EL
		NC	HBOR-SSR-2/NC-EL
2	Mechanical part	$\frac{3}{4}$ " NPT	HBSR-MEK-2
		$\frac{3}{4}$ " BSPP	HBSR-MEK-6

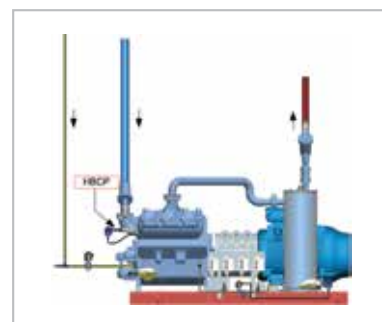
Compressor protection



Functional description

HBCP is a new revolutionary, patent-pending sensor technology and it is the first sensor in the world capable of measuring the condition of gas and liquid refrigerant in a refrigeration system. HBCP is used for detecting gas quality at the intake found on refrigeration compressors. The sensors thereby ensure that liquid refrigerant does not enter the compressor, causing damage to the moving parts.

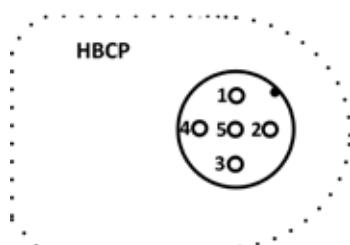
The sensor has a high sensitivity and even detects small liquid droplets before they become critical to the compressor. The sensor has a uniquely low reaction time, and thereby ensures that the compressor is not damaged. In the event of liquid hammer, an instantaneous alarm is sent to the compressor control, which must signal an emergency stop to the compressor. The sensor measures the total gas and liquid capacity, which is displayed in pF.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC	Thread connection	3/4" & 1" NPT / BSPP
Power/current consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	PNP-1 A	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	Alarm, warning & power	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8	Accessories	(to be ordered separate)
Cable resistance	500 Ω/Km	Configuration cable	HBxC-USB
Approvals		Splitterbox	HBxC-Splitbox
CE	EN 61000-2		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBCP software		

Electrical installation



Supply 24V AC/DC

1 = Brown +

2 = White -

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

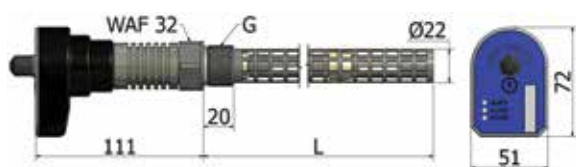


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

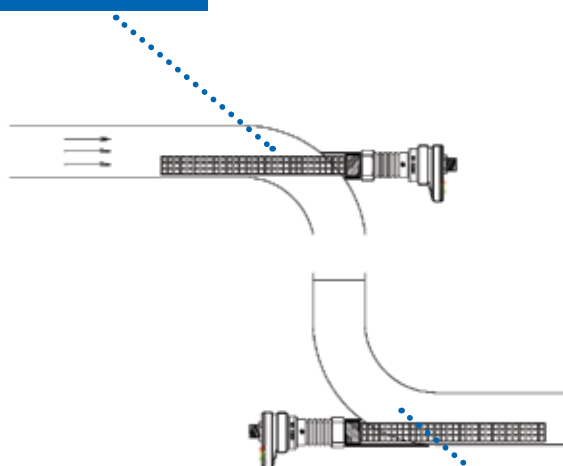
Pipe size (compressor line)	Length (L)	Connection	Ordering code
< 2"	150 mm	3/4" NPT	HBCP-1.5-2
< 2"	150 mm	3/4" BSPP	HBCP-1.5-6
> 2"	300 mm	1" NPT	HBCP-3-9
> 2"	300 mm	1" BSPP	HBCP-3-8

Mechanical dimensions



Installation guide lines

Countercurrent flow installation



Countercurrent flow installation

Tab "Edit configuration"

Configuration of sensor

Configuration of sensor parameters:

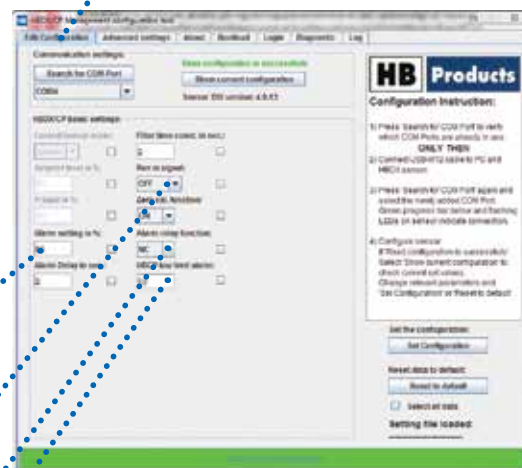
Delivered as a Plug & play solution.

Type of alarm output can be set – NO/NC.

Sensor can be activated or deactivated from external panel.

Sensitivity is factory set. In 99% of the cases it will not require to be set by the customer.

Setup	Factory settings	Configuration options
Alarm setting in %	50 %	0...100 %
Alarm delay	2 s	0...600 s
Filter time constant	2	0...100
Run in signal	OFF	ON / OFF
Zero cal. function	OFF	ON / OFF
Alarm relay function	NC	NC / NO
HBCP low limit alarm	20 %	0...100 %

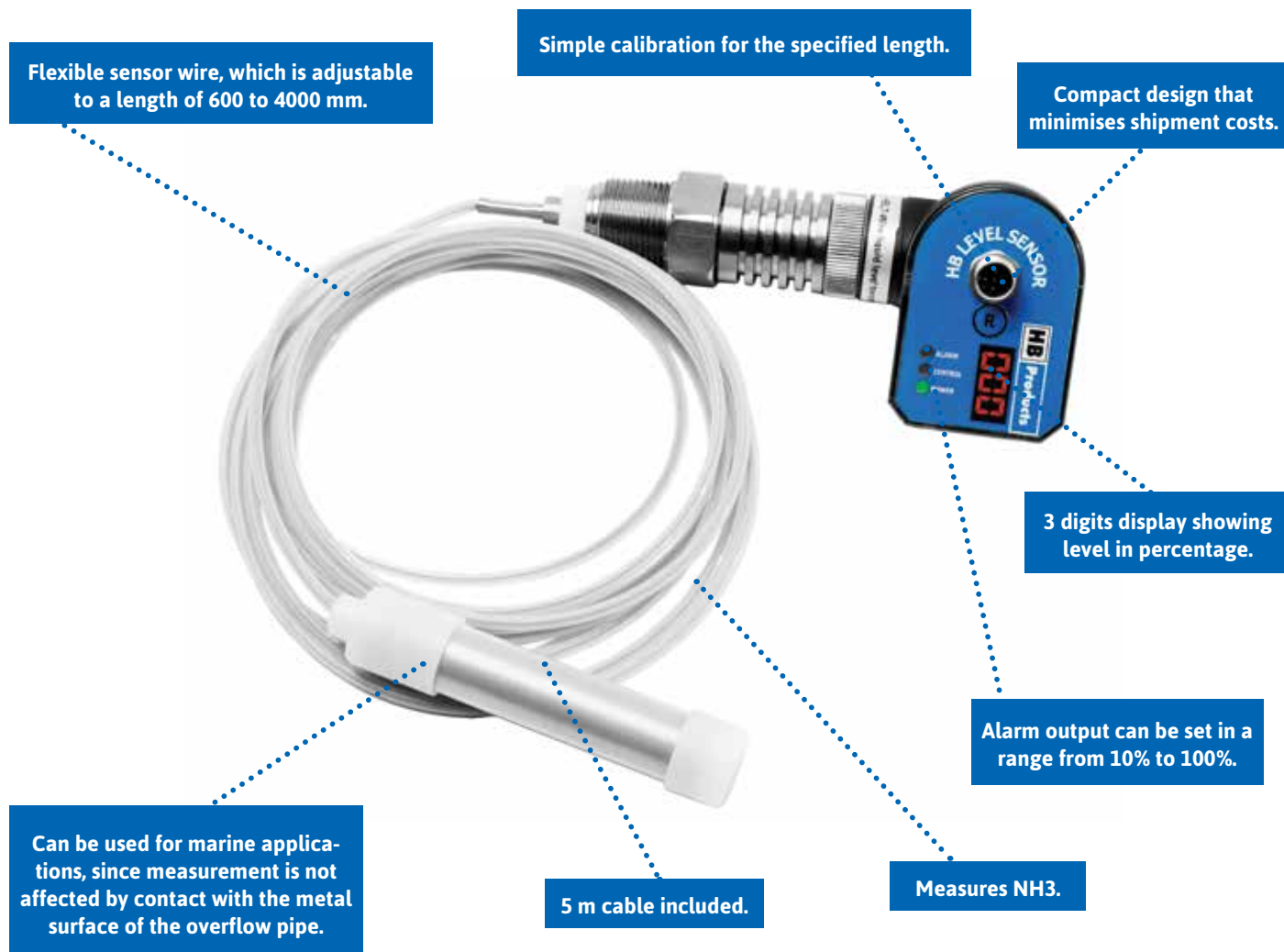


Spare parts



Position	Specification	Type	Ordering code
1	Electronic parts	PC-programmable	HBCP-EL
2	Mechanical parts	3/4" NPT	HBCP-2-MEK
		3/4" BSPP	HBCP-6-MEK
		1" NPT	HBCP-9-MEK
		1" BSPP	HBCP-8-MEK

NH3 level sensor



Functional description:

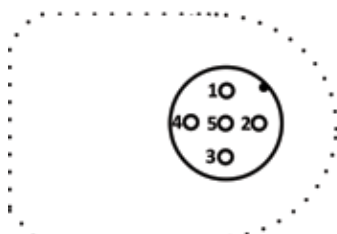
HBLT-wire is a capacitive sensor for level measurement of NH3 refrigerant in industrial refrigeration systems. The sensor has an output signal of 4-20 mA, which is proportional with 0 and 100%. Its output signal is 4 mA for an empty container and 20 mA for a full container. HBLT-wire can be adjusted in length to the current application. The sensor element consists of a 2mm steel wire as well as a Teflon tube. Both parts are provided with a length of 4 m and can be shortened with diagonal cutters or other pliers. HBLT-wire can be used in connection with the HBLT-C1 controller for controlling pumps, etc., or it can be configured to directly control a valve without the need for another controller.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature*	-50...+80°C
LED indication	3-digit display	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals		Cable adaptor	HBxC-M12/DIN
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool/HMI		
Tool to be used	HBLT-Wire software		

Electrical installation



- 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)



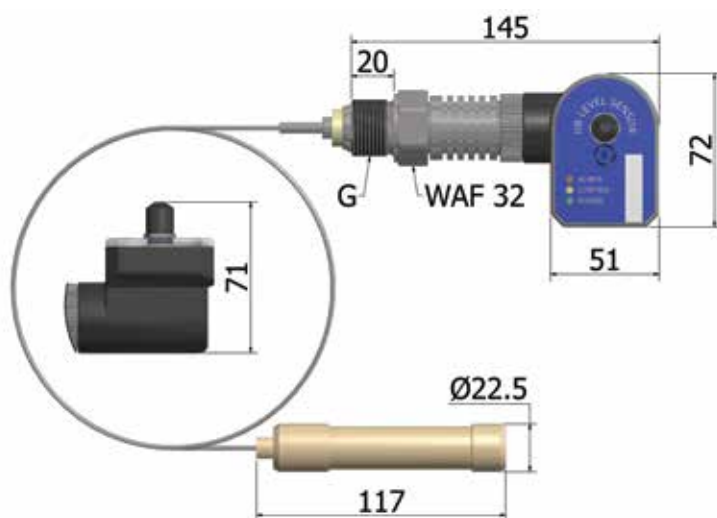
To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

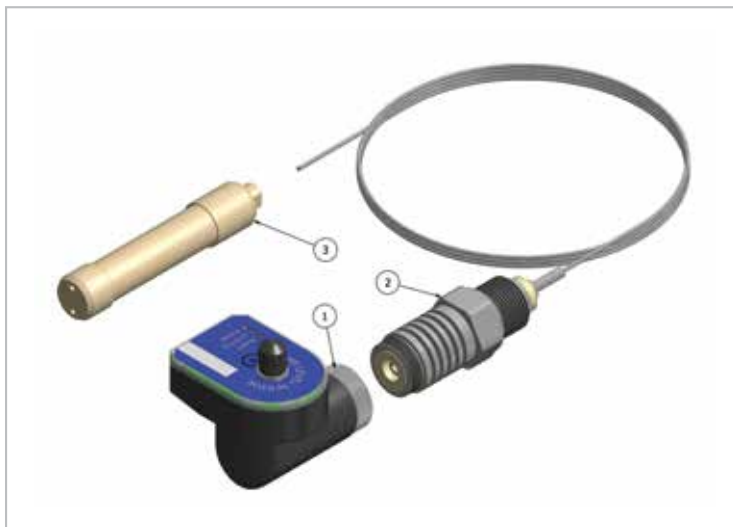
Thread type	Ordering code
3/4" NPT	HBLT-Wire-2
3/4" BSPP	HBLT-Wire-6

	Standpipe	DN32.....DN65
	Recommended pipe standard	DIN 10220
	Recommended bending	DIN 2615-1/Type 3
	Recommended TEE	DIN 2615-1
	Standpipe	DN65...DN100
	Recommended pipe standard	DIN 10220
	Recommended bending	DIN 2615-1/Type 3
	Sitepipe can be designed in smaller pipe e.g. o.5 x DN	
	If the sensor is installed in standpipe on front of plate heat exchanger the wire must be protected against splashing with a protection tube size DN25..DN32.	

Mechanical dimensions

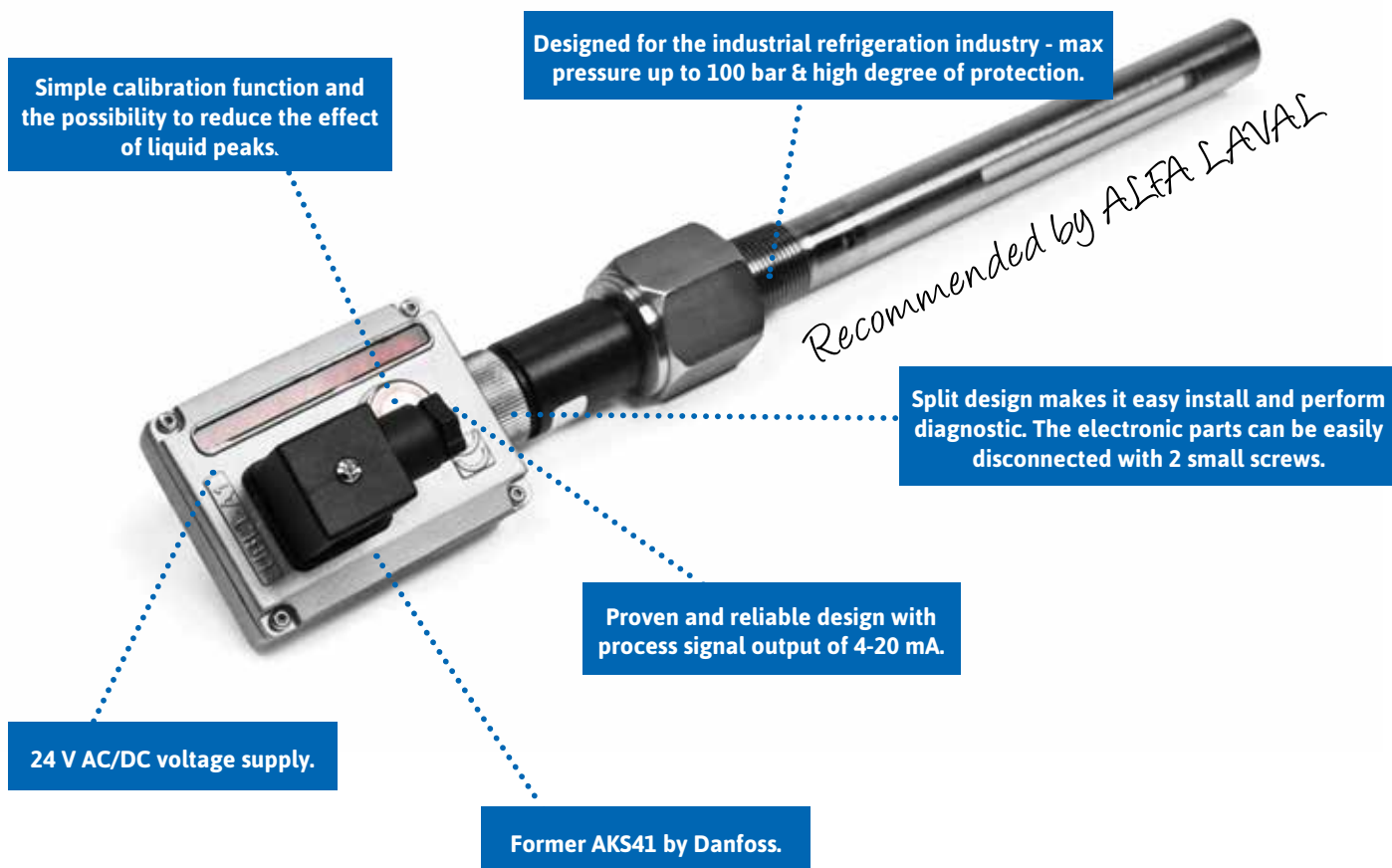


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBLT-Wire-EL
2	Mechanical parts	¾" NPT	HBLT-Wire-MEK-2
		¾" BSPP	HBLT-Wire-MEK-6
3	Wire plum	22.5x115	HBLT-Wire-PLUM

NH3 level sensor



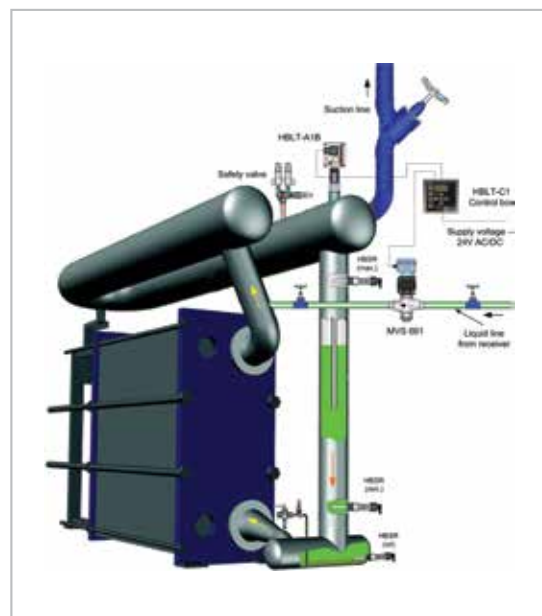
Functional description:

HBLT capacitive liquid level transmitters are used to measure liquid levels in refrigerant vessels.

The HBLT transmits an active 4-20 mA signal which is proportional to the liquid level.

4 mA when the transmitter does not register liquid and 20 mA when the entire transmitter is surrounded by liquid

The 4-20 mA signal from HBLT can be used in conjunction with a controller e.g HBLT-C1 to control the liquid level.



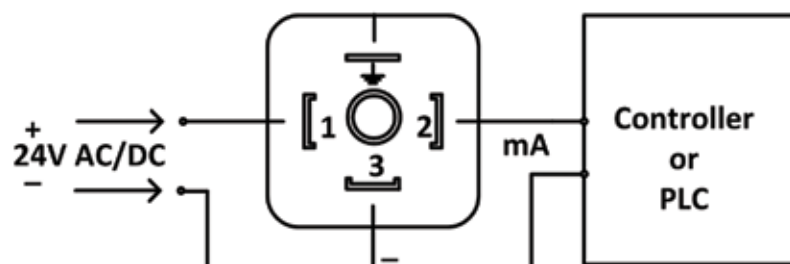
Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT & 1" BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	NA	Refrigerant temperature	-50...+80°C
LED indication	Bargraph (option)	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification*		Vibrations	IEC 68-2-6 (4g)
Cable size	3 x 0.34 mm ²	Accessories	
Cable glands	PG7 / M8	(to be ordered separate)	
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	Push bottom		

* Cable not included.

Electrical installation

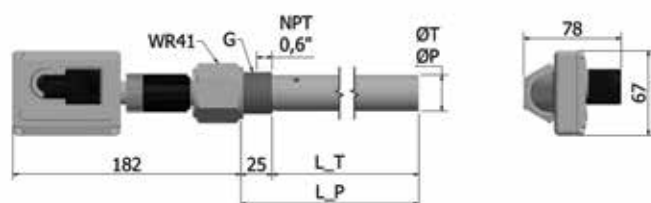
Alternative (-) supply — 7



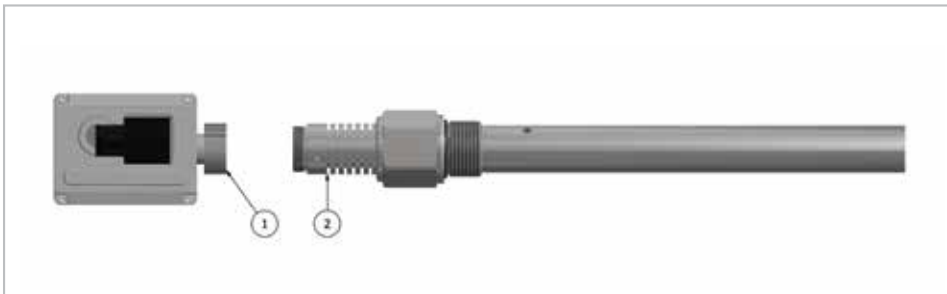
Ordering code

Length / thread (G)	Ordering code with out Bargraph	Ordering code with Bargraph
280 mm / 1" BSPP	HBLT-A1-2.8	HBLT-A1B-2.8
500 mm / 1" BSPP	HBLT-A1-5	HBLT-A1B-5
800 mm / 1" BSPP	HBLT-A1-8	HBLT-A1B-8
1000 mm / 1" BSPP	HBLT-A1-10	HBLT-A1B-10
1200 mm / 1" BSPP	HBLT-A1-12	HBLT-A1B-12
1500 mm / 1" BSPP	HBLT-A1-15	HBLT-A1B-15
1700 mm / 1" BSPP	HBLT-A1-17	HBLT-A1B-17
2200 mm / 1" BSPP	HBLT-A1-22	HBLT-A1B-22
3000 mm / 1" BSPP	HBLT-A1-30	HBLT-A1B-30
6" / 3/4 NPT	HBLT-A1-6U	HBLT-A1B-6U
8" / 3/4 NPT	HBLT-A1-8U	HBLT-A1B-8U
12" / 3/4 NPT	HBLT-A1-12U	HBLT-A1B-12U
15.3" / 3/4 NPT	HBLT-A1-15.3U	HBLT-A1B-15.3U
19.2" / 3/4 NPT	HBLT-A1-19.2U	HBLT-A1B-19.2U
23.1" / 3/4 NPT	HBLT-A1-23.1U	HBLT-A1B-23.1U
30" / 3/4 NPT	HBLT-A1-30U	HBLT-A1B-30U
35" / 3/4 NPT	HBLT-A1-35U	HBLT-A1B-35U
45" / 3/4 NPT	HBLT-A1-45U	HBLT-A1B-45U
55" / 3/4 NPT	HBLT-A1-55U	HBLT-A1B-55U
65" / 3/4 NPT	HBLT-A1-65U	HBLT-A1B-65U
85" / 3/4 NPT	HBLT-A1-85U	HBLT-A1B-85U
105" / 3/4 NPT	HBLT-A1-105U	HBLT-A1B-105U
120" / 3/4 NPT	HBLT-A1-120U	HBLT-A1B-120U

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	Programmable without bargraph	HBLT-A1-EL
		Programmable with bargraph	HBLT-A1B-EL
2	Mechanical parts	For 280 mm length	HBLT-MEK-2.8
		For 500 mm length	HBLT-MEK-5
		For 800 mm length	HBLT-MEK-8
		For 1000 mm length	HBLT-MEK-10
		For 1200 mm length	HBLT-MEK-12
		For 1500 mm length	HBLT-MEK-15
		For 1700 mm length	HBLT-MEK-17
		For 2200 mm length	HBLT-MEK-22
		For 3000 mm length	HBLT-MEK-30
		For 6" length	HBLT-MEK-6U
		For 8" length	HBLT-MEK-8U
		For 12" length	HBLT-MEK-12U
		For 15.3" length	HBLT-MEK-15.3U
		For 19.2" length	HBLT-MEK-19.2U
		For 23.1" length	HBLT-MEK-23.1U
		For 30" length	HBLT-MEK-30U
		For 35" length	HBLT-MEK-35U
		For 45" length	HBLT-MEK-45U
		For 55" length	HBLT-MEK-55U
		For 65" length	HBLT-MEK-65U
		For 85" length	HBLT-MEK-85U
		For 105" length	HBLT-MEK-105U
		For 120" length	HBLT-MEK-120U

Intelligent “Float level regulation”

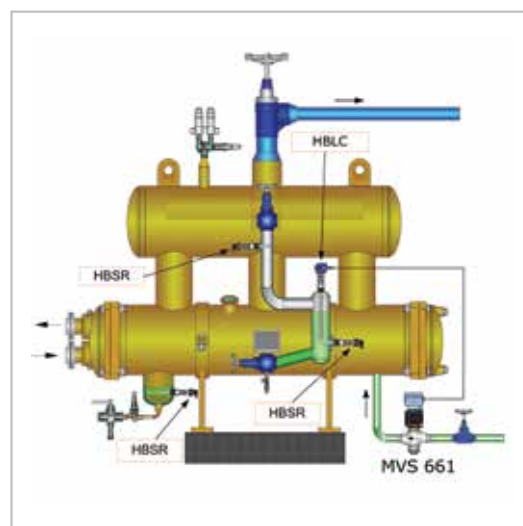


Functional description:

HBLC is an intelligent sensor with a built-in microprocessor. It is designed to control refrigerant levels in both low pressure and high pressure systems. It emits a 4-20 mA signal, which is proportional to the sensor's set range of measurement. Apart from the 4-20 mA signal, the sensor also has a built-in controller.

The controller can be set-up with all the parameters necessary for controlling a modulating motor valve or stepper motor.

The sensor can be delivered with a cable for direct supply to and control of motor valve or stepper motor valve.



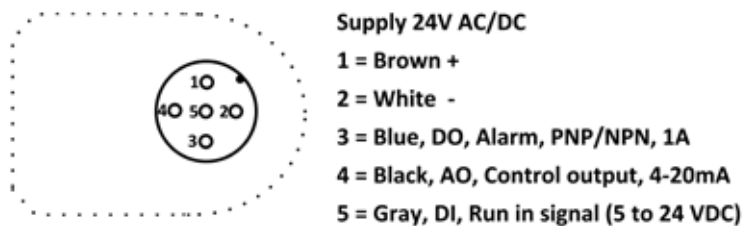
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	25 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Power, control, alarm	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Configuration cable	HBxC-USB
Approvals		Splitterbox	HBxC-splitbox
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBLC software		

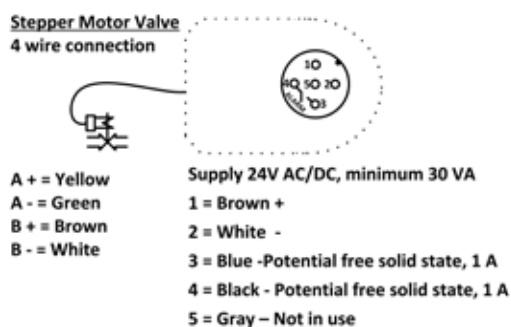
Technical data - valve regulation

Valve control (Modulating valve)		Valve control (Stepper motor)	
Signal to valve	4-20 mA	Stepper motor steps	25-5000 steps
Valve regulation	P-regulation	Stepper motor speed	2-40 m/s
Cable specification (valve control)		Stepper motor phase current	0-750 mA
Length	3 m (118")	Stepper motor holding current	0-250 mA
Cable size	3 x 0.75 mm ²		
Cable glands	PG7 / M8		

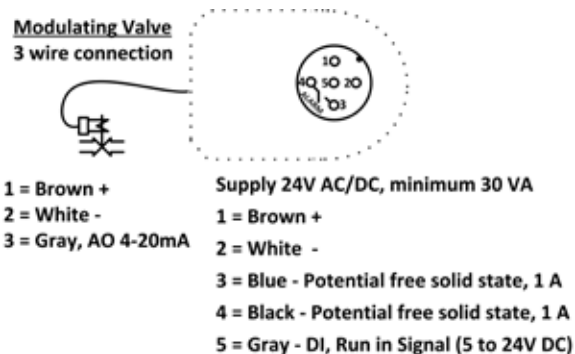
Electrical installation



HBLC with control of modulating valve with power supply cable (HBLC-xxx).



HBLC with direct control of stepper motor valve (HBLC/C/S-xxx)



HBLC/C with cable to direct control of modulating valve (HBLC/C-xxx)



To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

Refrigerant	Length (L) / Thread	Motor type	Cable to valve	Ordering code
NH3	314 mm / 3/4" NPT	Modulating	No	HBLC-NH3-3.1-2
NH3	314 mm / 3/4" BSP	Modulating	No	HBLC-NH3-3.1-6
NH3	314 mm / 3/4" NPT	Modulating	Yes	HBLC/C-NH3-3.1-2
NH3	314 mm / 3/4" BSP	Modulating	Yes	HBLC/C-NH3-3.1-6
NH3	314 mm / 3/4" NPT	Stepper	Yes	HBLC/S-NH3-3.1-2
NH3	314 mm / 3/4" BSP	Stepper	Yes	HBLC/S-NH3-3.1-6

Accessories - Siemens valves MVS661



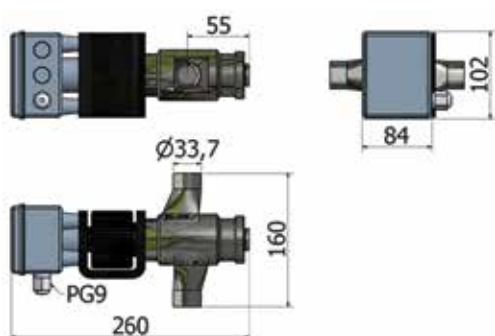
Technical data: MVS661

MVS661 is a modulating valve for the connection to the refrigerant level control sensor type HBLC. It can be used for all refrigerants and has a fast reaction time.

The modulating valve require only supply and connection from the HBLC.

- High precision and precise regulation
- Precise positioning
- Feedback signal to central panel about valve positioning
- Fast reaction time
- Proven and reliable design

Mechanical dimensions



Technical data

Power connection		Mechanical specifications	
Loop from HBLC controller	4-20 mA	PN class	PN50 - EN 1333
Connection	3 x Ø20.5 mm	Max. pressure	50 bar
Terminals	Screw terminals max 4 mm ²	Refrigerant temperature	-40...+120°C
Signal output		Mounting	Horizontal or vertical
Positioning	4-20 mA	Weight	5, 17 kg
Load	500 ohm	Protection degree	IP65 - EN 60529
Reaction time	1 s	Pipe connection	Ø33.7/22.4
Approvals		Materials	
EMC	EN61000-6-2/3	Material - liquid parts	Steel / CrNi steel
Protection degree	Class III - EN 60730	Material - sealing	PTFE/CR
UL standard	UL 873		
CSA standard	C22.2 No. 24		

Ordering code

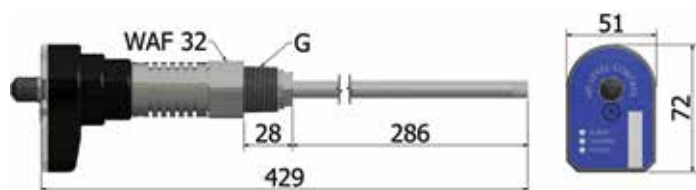
Part number	Kvs [m3/h]	QoE [kW]
MVS661.25-016N	0.16	95
MVS661.25-0.4N	0.40	245
MVS661.25-1.0N	1.00	610
MVS661.25-2.5N	2.50	1530
MVS661.25-6.3N	6.30	3850

QoE = Refrigeration capacity in expansion applications.

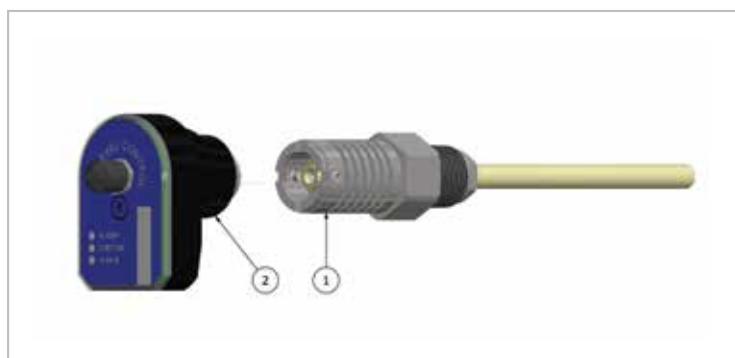
Float regulator cross reference list for Siemens valve types:

Producer	Regulator	Weight	Required installation size	Valve ordering code
Th-Witt	HR1	13	300x390x640 mm	MVS661.25-0.16N
Th-Witt	HR2	23	325x450x880 mm	MVS661.25-1.0N
Th-Witt	HR3	46	432.5x530x1040 mm	MVS661.25-2.5N
Th-Witt	HR4	114	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	WP2HR	26	250x475x960 mm	MVS661.25-1.0N
Th-Witt	WP3HR	61	345x640x1045 mm	MVS661.25-2.5N
Th-Witt	HS31/HS34	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS32/HS35	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS33/HS36	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS41/HS44	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS42/HS45	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS43/HS46	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS51/HS54	118	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	HS53/HS56	118	919x526x1265 mm	MVS661.25-6.3N
Hansen	HT100	NA	191x537x191 mm	MVS661.25-0.16N
Hansen	HT200	NA	321x632x321 mm	MVS661.25-1.0N
Hansen	HT300	NA	375x876x375 mm	MVS661.25-2.5N
Danfoss	HFI 040	41	309x702x219 mm	MVS661.25-1.0N
Danfoss	HFI 050	41	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 060	41	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 070	41	309x702x219 mm	MVS661.25-6.3N

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	¾" NPT / 314 mm/NH3	HBLC-NH3-3.1-2-MEK
		¾" BSPP / 314 mm/NH3	HBLC-NH3-3.1-6-MEK
2	Electronic parts	Without cable	HBLC-EL
		With cable	HBLC/C-EL
		With cable - stepper motor	HBLC/S-EL

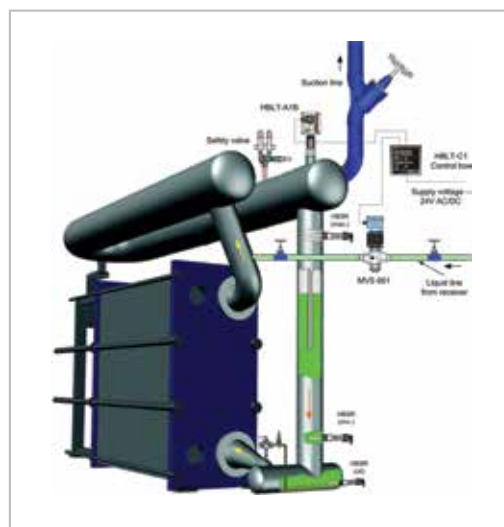
Level controller



Functional description:

HBLT-C1 is designed for level control in vessels in industrial refrigeration systems. It can be used in connection with the HBLT-A1 and HBLT-Wire analogue level sensor or other similar sensors with a 4-20 mA output signal. To be used in:

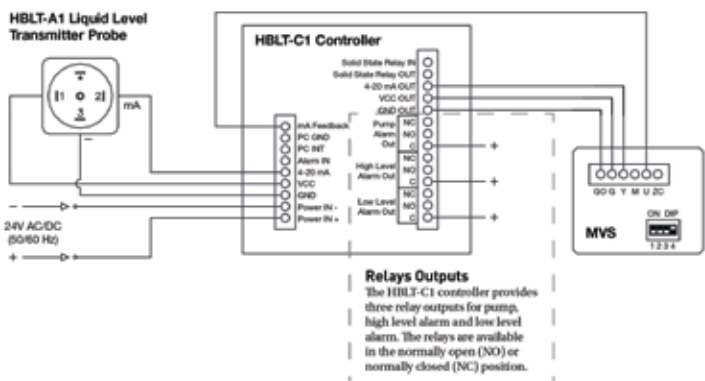
- Pump vessels
- Separators
- Intercoolers
- Economisers
- Condensators
- Receivers



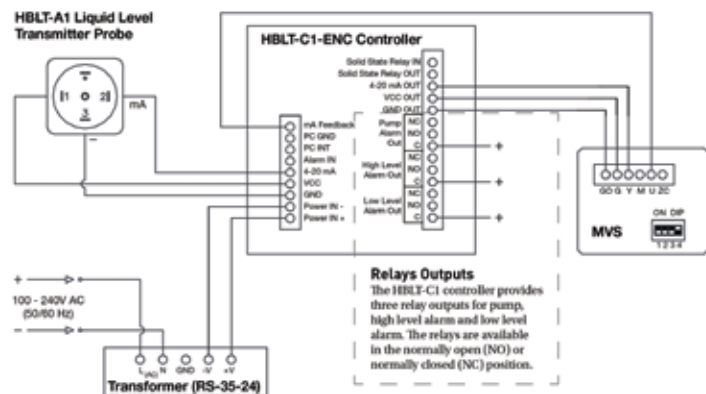
Technical data

	HBLT-C1	HBLT-C1-ENC
Supply		
Voltage	24 V AC/DC \pm 10 %	100..240 V AC
Frequency	50/60 Hz	50/60 Hz
Current draw	Max 40 mA	Max 1.5 A
Connection	Screw terminal	Screw terminal
Wire size	< 2.5 mm ²	< 2.5 mm ²
Installation conditions:		
Surrounding temperature	-20...+70°C	-20...+70°C
Protection class	IP45	IP65
Relative humidity	20...80 %	20...80 %
Approvals:		
EMC Emission	EN61000-3-2	EN61000-3-2
EMC Immunity	EN61000-4-2	EN61000-4-2
GOST R	No 0903044	
Mechanical specifications:		
Mounting	In front of panel	On wall
External measurement	96x96x94 mm (BxHxD)	205x220x140 mm (BxHxD)
Cut-out measurement	92.8x92.8 mm	N.A.
Material	Plastic	Plastic
Weight	0.2 kg	1.4 kg
Display:		
Digit's display	3 digits, red	3 digits, red
Alarm indication	LED (green og red)	LED (green og red)
Programming	From front	From front
Updatting	1 time each second	1 time each second
Valve position indication	5 x LED (yellow)	5 x LED (yellow)
Input:		
Analogue input - sensor	4-20 mA	4-20 mA
Analogue input – valve feedback	4-20 mA	4-20 mA
Alarm – max level	Relay – 5...25 V DC	Relay – 5...25 V DC
Output:		
Analogue output	4-20 mA	4-20 mA
Load	3A/24 VDC	3A/24 VDC
Relay output	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A
Solid state output	NC/NO-1A-24V AC/VDC	NC/NO-1A-24V AC/VDC

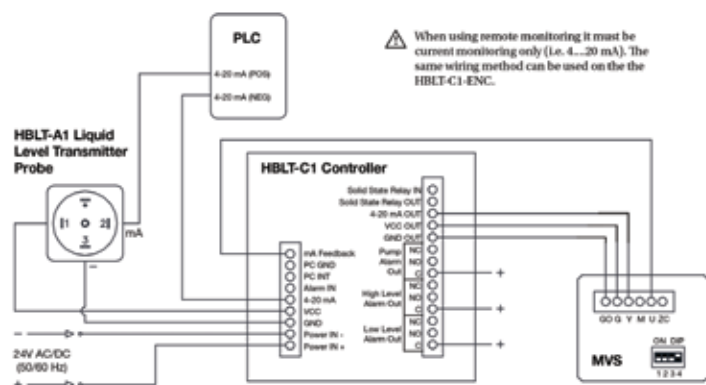
Electrical installations



Wiring Diagram: HBLT-C1 Controller



Wiring Diagram: HBLT-C1-ENC Controller with Enclosure



Wiring Diagram: HBLT-C1/HBLT-C1-ENC Controller with Remote Monitoring

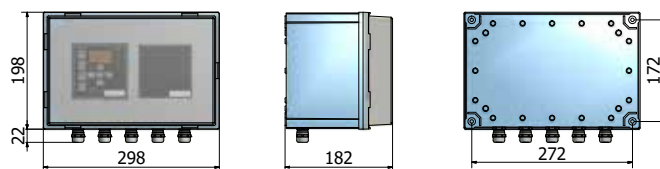
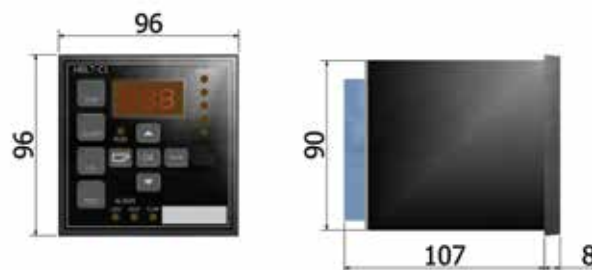
PC GND & PC INT: Has no function in this controller.

Solid state relay IN & Solid state relay OUT: Should only be used when AKVA valve is used.

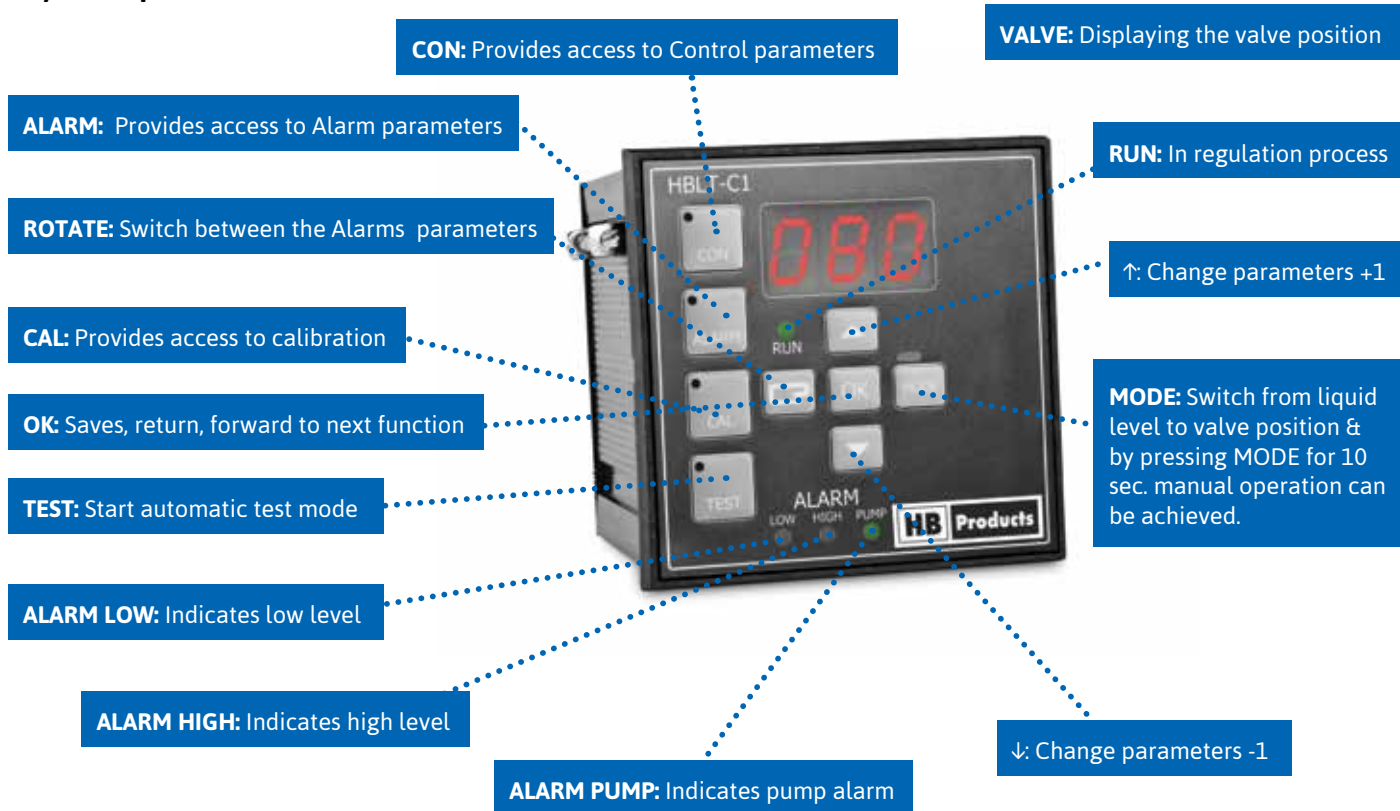
Ordering code

House design	Ordering code
Controller - 24 V AC/DC power supply	HBLT-C1
Controller built in a cabinet and mounted with 100/240 V power supply	HBLT-C1-ENC

Mechanical dimensions



Key description



Operation menu:

Control Parameters	Alarm Parameters	Calibration Menu	Manual Operation
Setpoint	Low alarm	Min calibration	Manuel setting
P-band	Hysteresis low alarm	Max calibration	
Level LP/HP	High alarm		
Start- up Ramp	Hysteresis high alarm		
Valve damping	Pump alarm		
AKVA settings	Hysteresis pump alarm		

Change to next parameter:

OK: Saves , return, forward to next function

Change parameters

↓: Change parameters +1
↑: Change parameters -1

Manual operation:

MODE – press in 10 sec and set the required level at start up. Press any button to leave manual operation.

Calibration:

Detailed information on calibration function is available in the Instruction Manual.

Pressure sensor

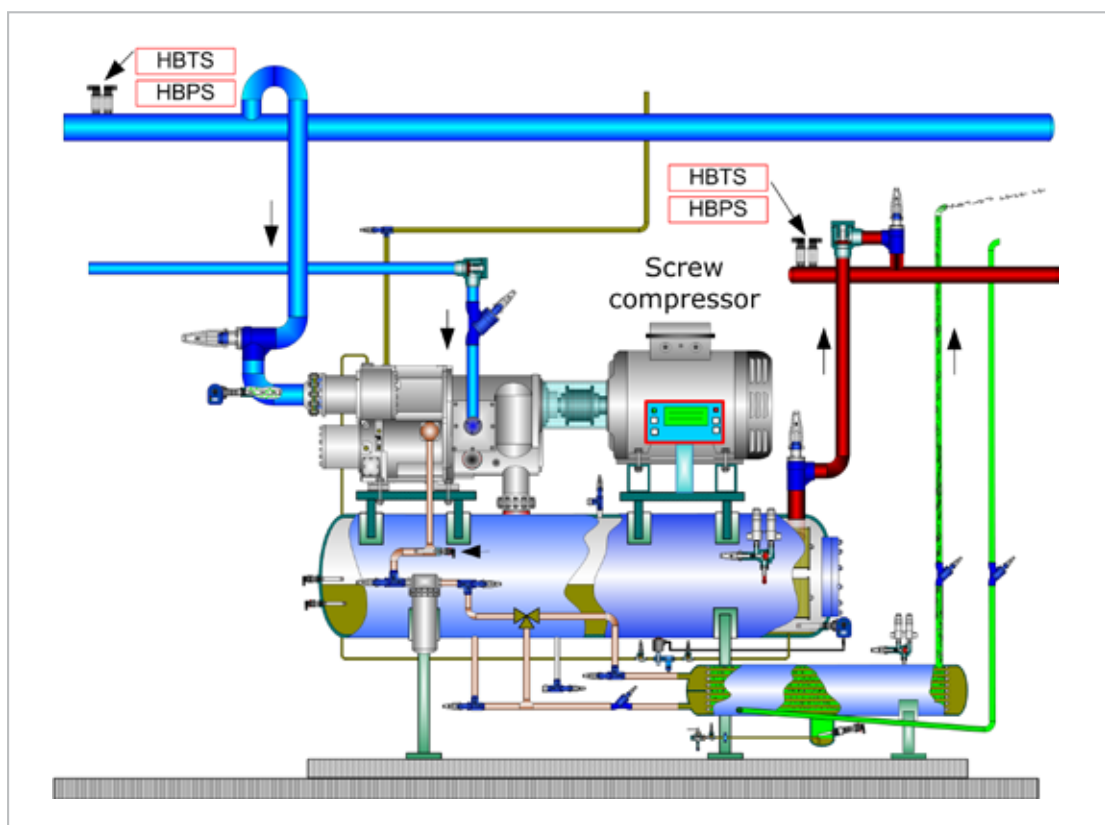


Functional description:

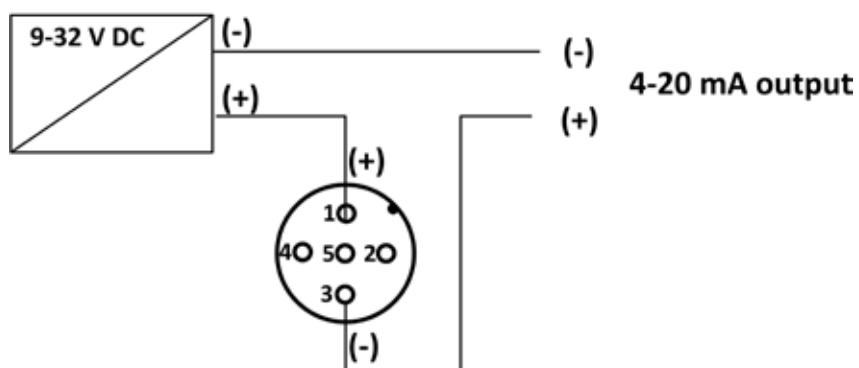
HBPS is a pressure sensor that is specially developed for the refrigeration industry. The sensor has a stainless membrane, and the housing is also made of stainless steel. It has a quick reaction time of < 1 s, and it is accessible in 2 pressure ranges of -1...25 bar and -1...200 bar.

Technical data

Power supply		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	G 1/4" - Form E
Power supply	9...32 V DC	Material – liquid parts	AISI 304
Analogue output	4...20 mA	Material – electronic parts	AISI 304
Pin surface treatment	Gold		
Connection	2-wire		
Environmental conditions		Approvals	
Ambient temperature	-40...+105°C	EMC	EN 61000-2
Refrigerant temperature	-40...+125°C	Accessories	
Max pressure	-1...25 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



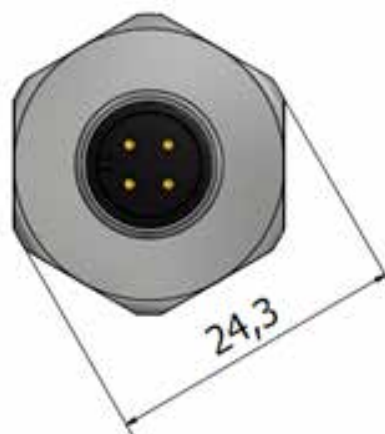
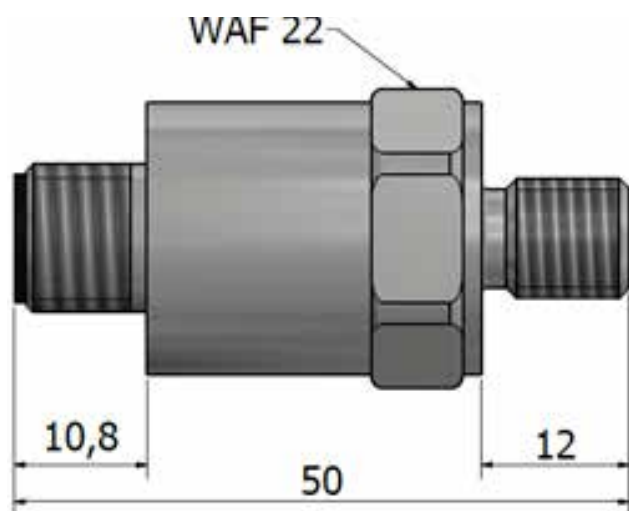
Electrical installations



Ordering code

Pressure range	Thread type	Ordering code
-1...25 bar	1/4" G - Form E	HBPS-25-1/4

Mechanical dimensions



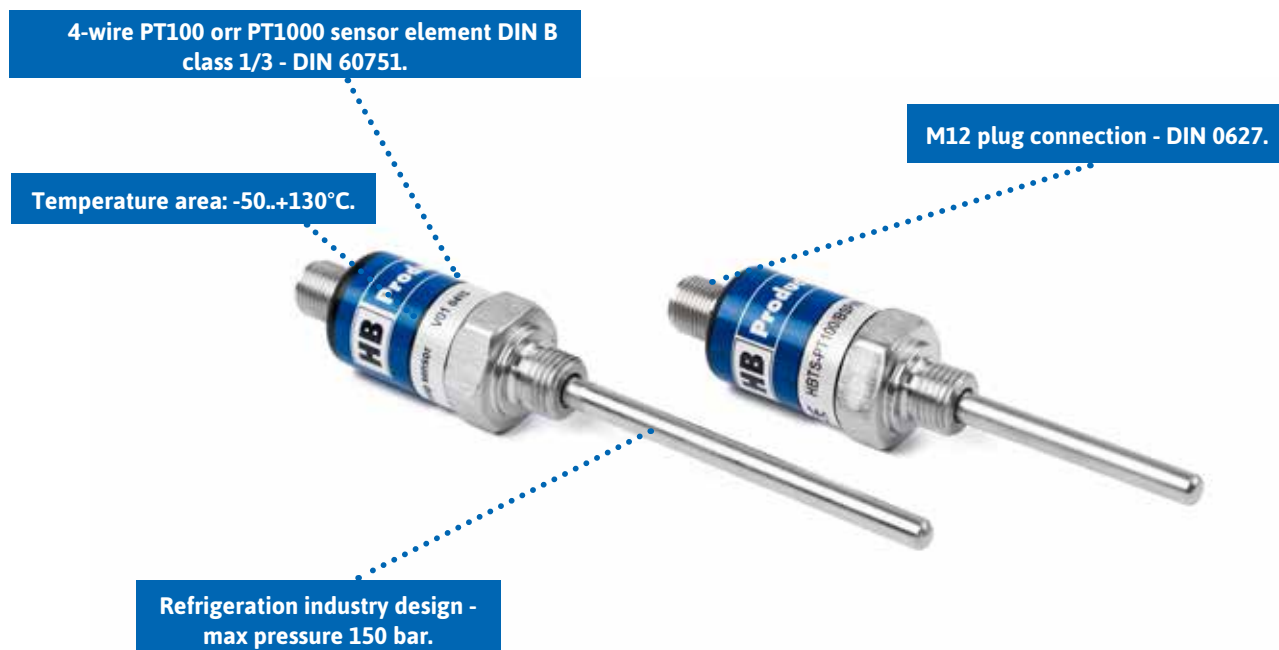


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Temperature sensor

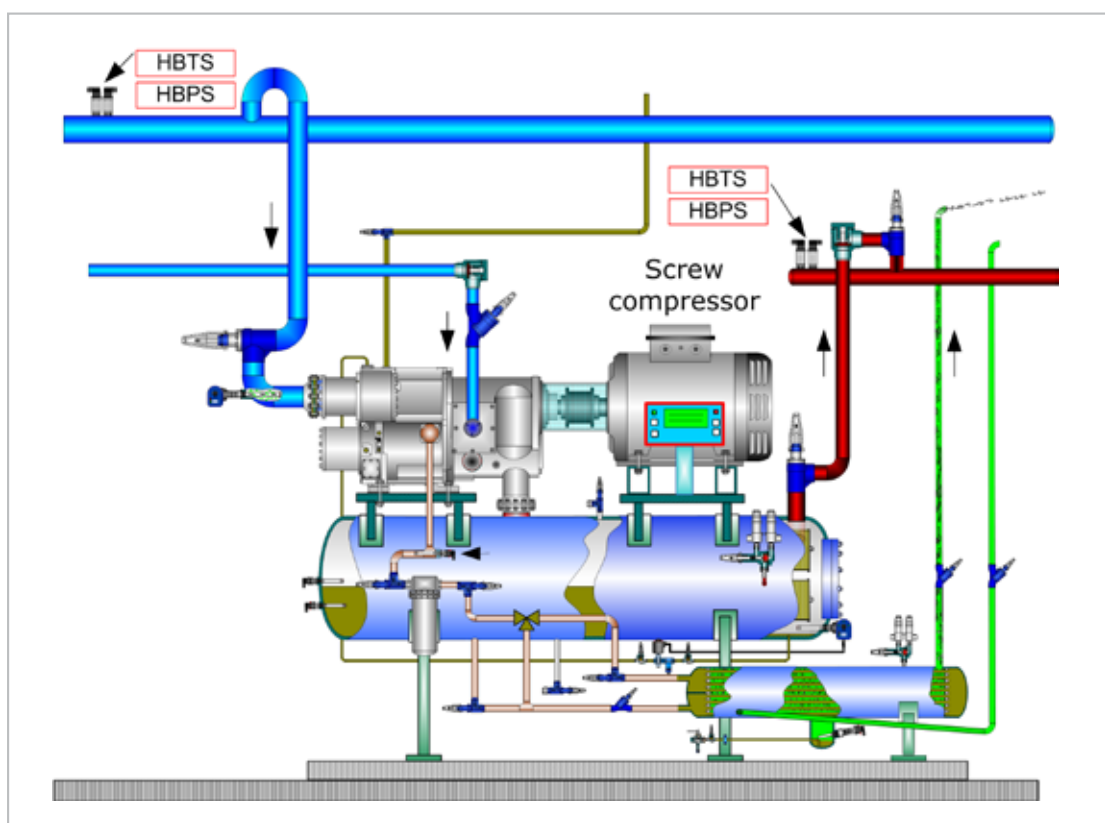


Functional description:

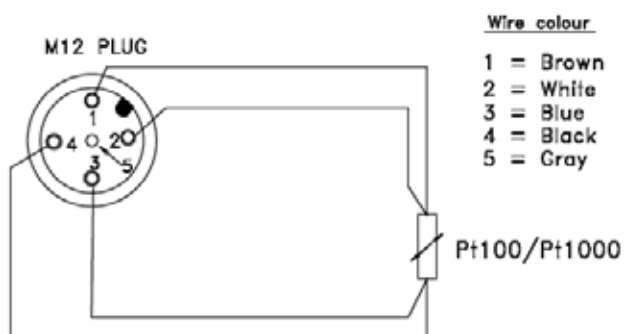
HBTS is a temperature sensor in accordance with DIN 60751, and it is available in two variants, PT100 and PT1000 – DIN B – class 3. The sensor is designed for the refrigeration industry where servicing of the electronics can be carried out without emptying the system of refrigerant. The sensor is delivered with a 60 & 90 mm sensor element length and a 6 mm sensor diameter.

Technical data

Electrical specifications		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	1/4" NPT or BSPP
Sensor element	PT100 / PT1000	Material – liquid parts	AISI 304
Sensor class	DIN B - KL 1/3	Material – electronic parts	Plast
Sensor design	4 wire	Sensor element	Ø6 - 60 / 90 mm
Envirnomental conditions		Approvals	
Ambient temperature	-30...+85°C	EMC	EN 61000-2
Refrigerant temperature	-50...+130°C	Accessories	
Max pressure	150 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



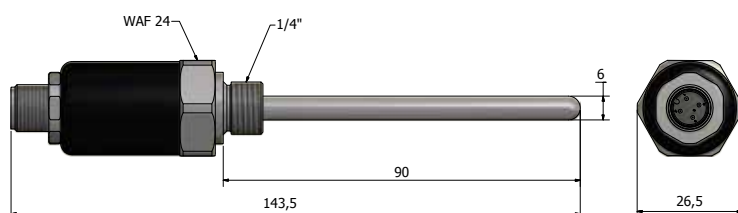
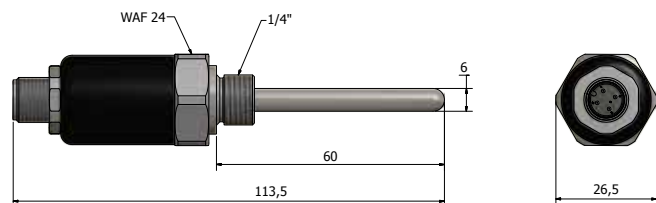
Electrical installations



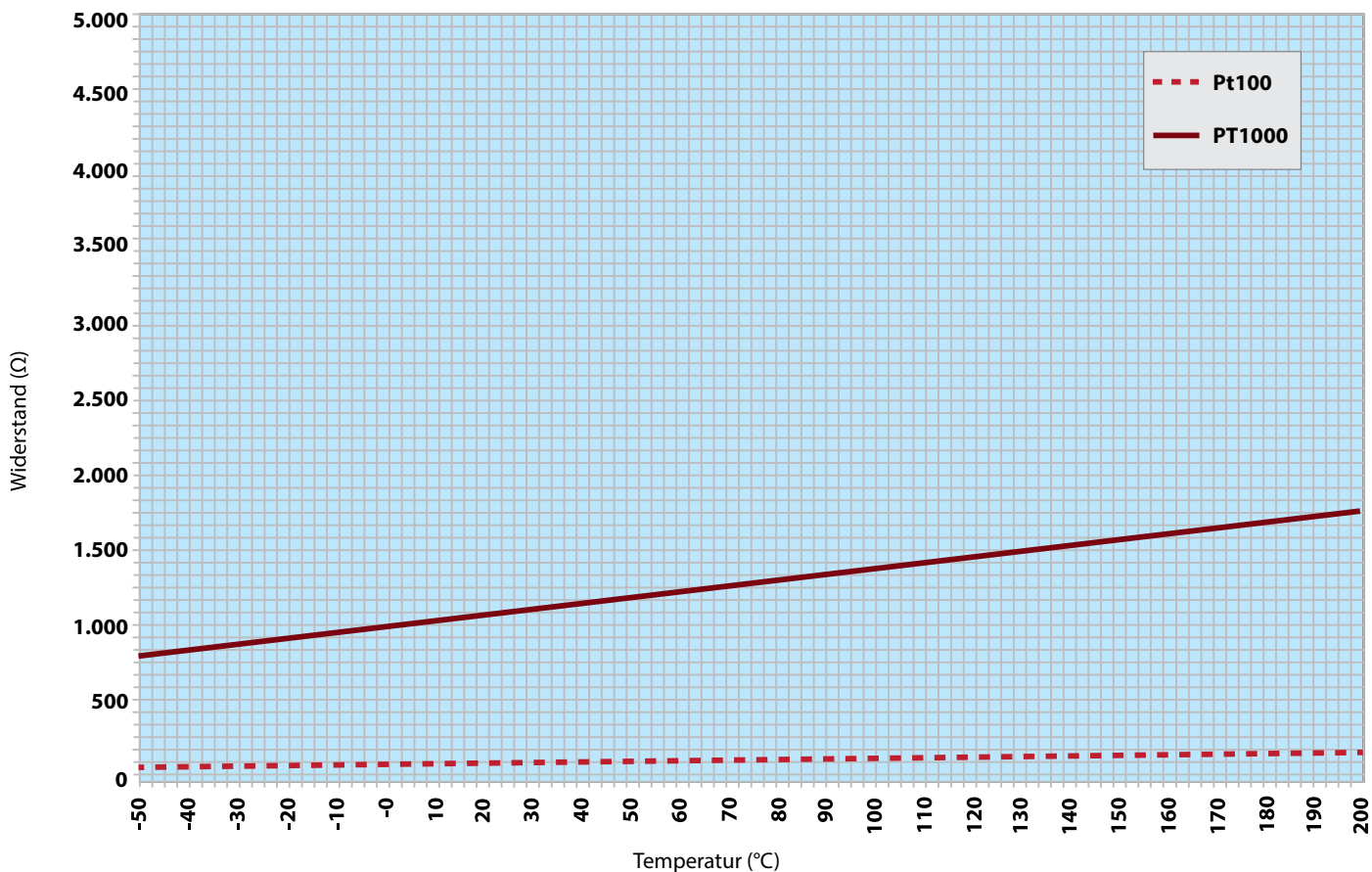
Ordering code

Sensor type	Sensor length	Thread type	Ordering code
PT100	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT100	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT100	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT100	90 mm	1/4" BSPP	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" BSPP	HBTS-PT100/NPT/90

Mechanical dimensions



Temperature area - PT100/PT1000

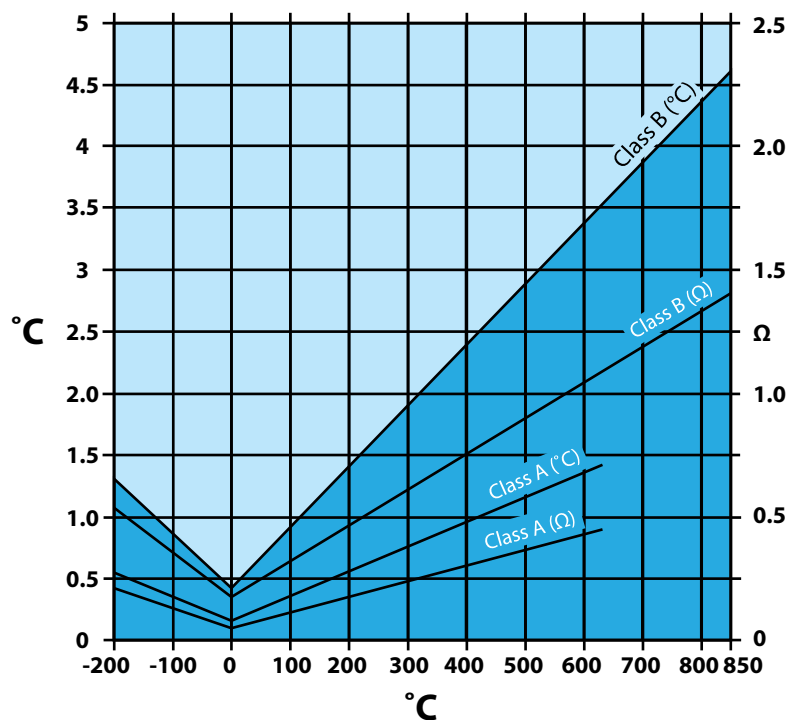


Tolerances for Ω thermometers

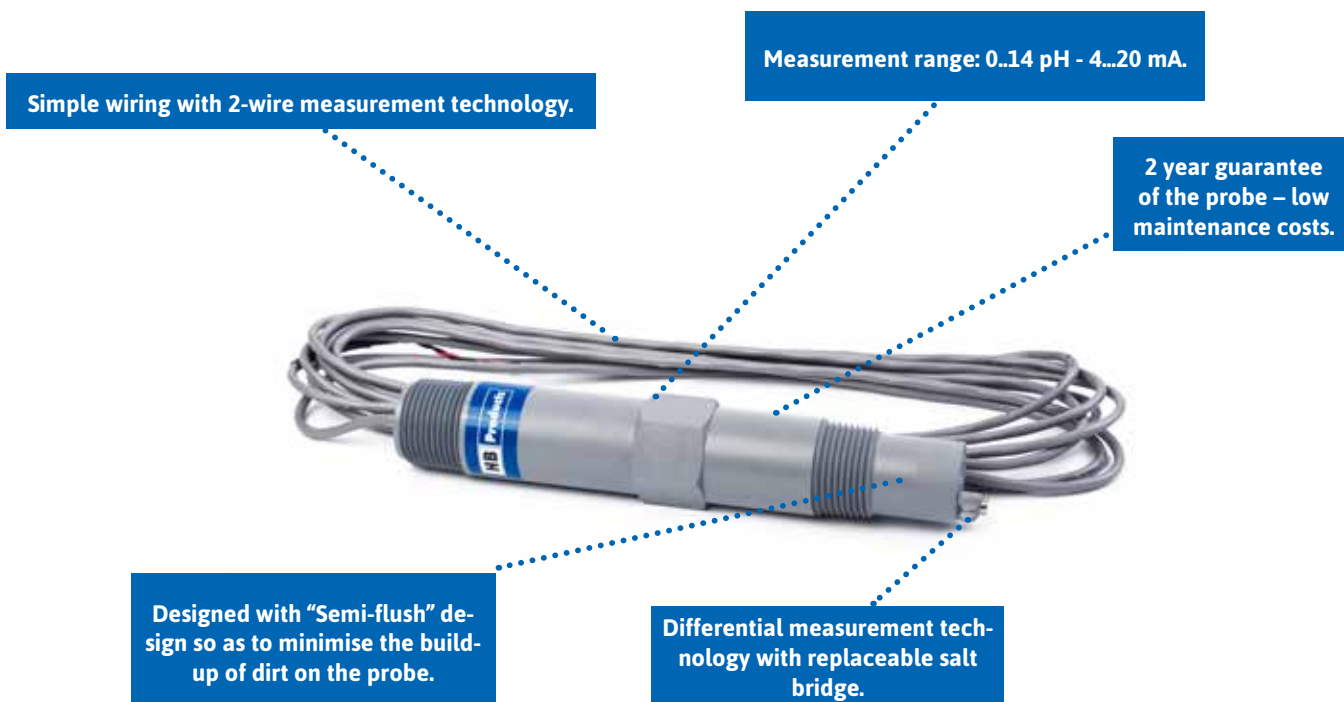
Tolerance values as a function of temperature
for 100 Ω thermometers

Tolerances for Ω thermometers

temp °C	class A ±°C ±Ω	class B ±°C ±Ω
-200	0.55 0.24	1.3 0.56
-100	0.33 0.14	0.8 0.32
0	0.15 0.06	0.3 0.12
100	0.35 0.13	0.80 0.30
200	0.55 0.20	1.3 0.48
300	0.75 0.27	1.8 0.64
400	0.95 0.33	2.3 0.79
500	1.15 0.38	2.8 0.93
600	1.35 0.43	3.3 1.06
700	- -	3.8 1.17
800	- -	4.3 1.28
850	- -	4.6 1.34



NH₃/Brine leakage sensor

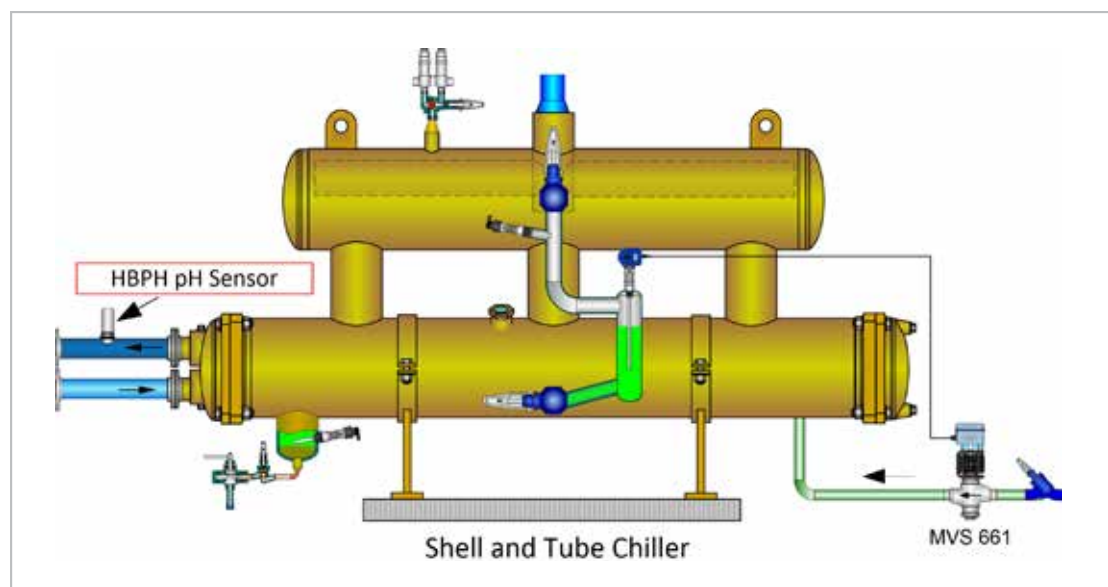


Functional description:

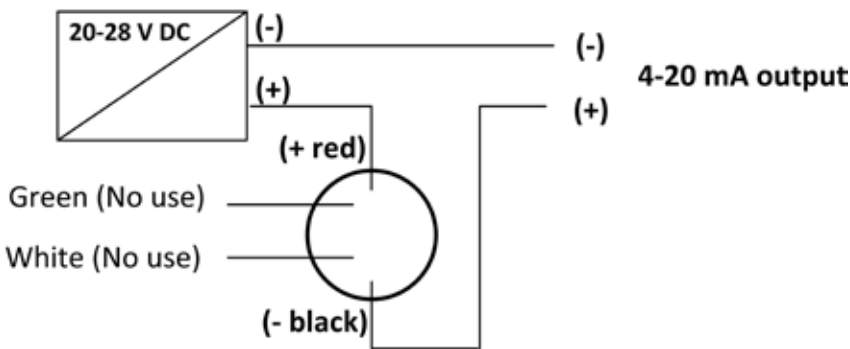
HBPH is a pH sensor designed for the extreme requirements of industrial refrigeration. It is used to measure the pH value of brine in case of an ammonia leak in a heat exchanger. Brine has a pH value of 7, and even for small leaks, the pH will rise to 9-10. The sensor is designed with differential measurement technology that ensures a minimum lifetime of 2 years for the sensor element.

Technical data

Electrical specifications		Mechanical specifications	
Cable (shielded)	4.6 m	Thread connection	1" NPT
Power supply	20...28 V DC	Material	CPVC, Kynar, Glass & EPDM
Analogue output	4...20 mA	Approvals	
Connection	2-wire	EMC test	EN 61000-2
Max load	450 ohm		
Max cable length	Depends on cable size		
Environmental conditions		Accessories	
Ambient temperature	-10...+50°C	Calibration liquid - pH 4	ph4-500ml
Measurement area	0... 14 pH	Calibration liquid - pH 7	ph7-500ml
Liquid temperature	-10...+95°C	Calibration liquid - pH 10	ph10-500ml
Max pressure	6.9 / 2.8 bar (+65/+95°C)		
Protection degree	IP65		
Max liquid speed	3 m/s		
Vibrations	IEC 68-2-6 (4g)		



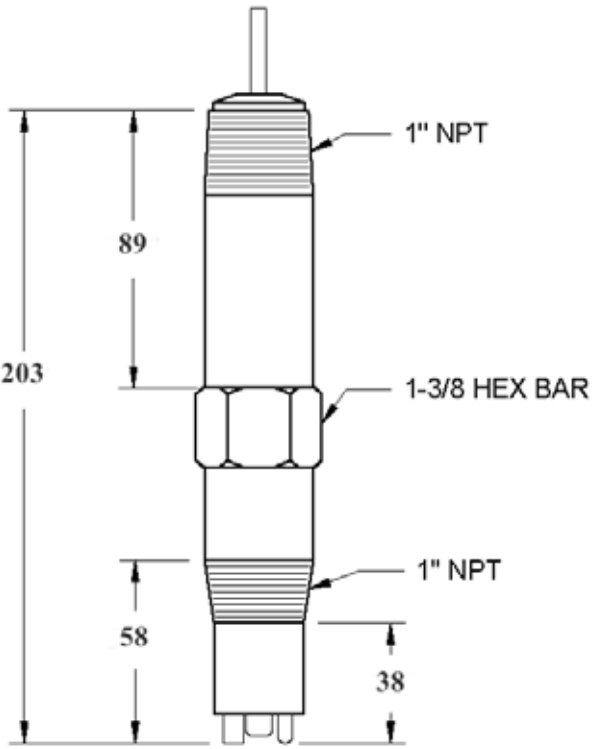
Electrical installations



Ordering code

Pressure range	Thread type	Ordering code
-1...25 bar	1/4" G - Form E	HBPS-25-1/4

Mechanical dimensions



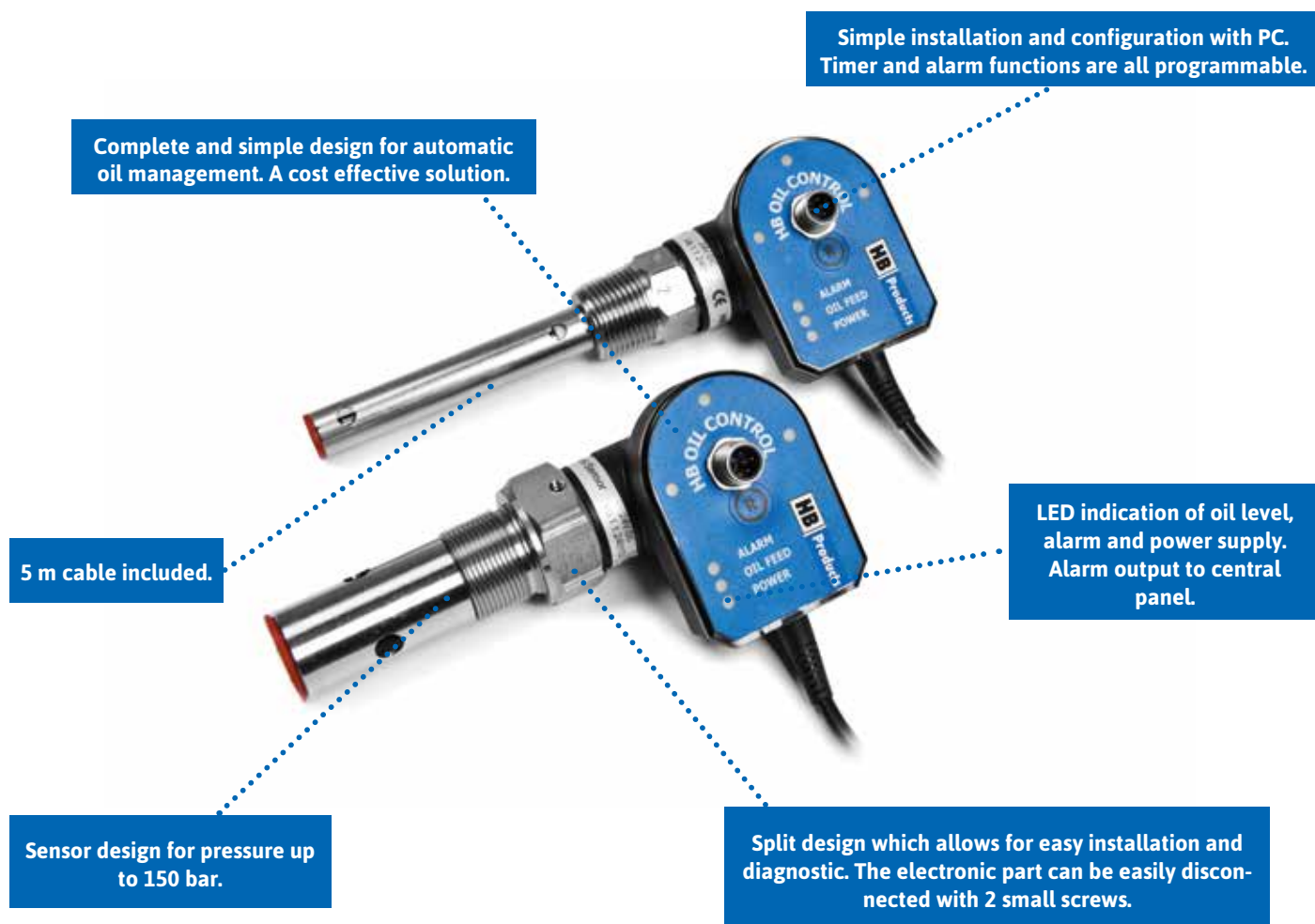


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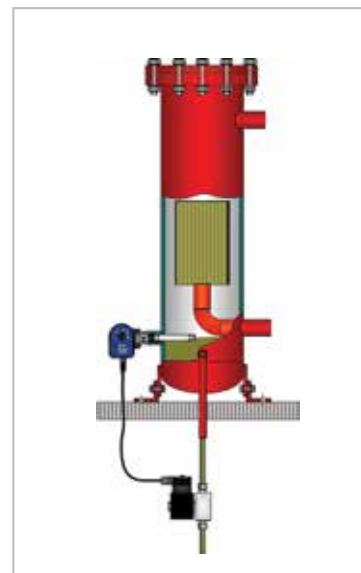
Oil level controller / Management



Functional description:

HBOC is an intelligent sensor with a built-in microprocessor. It is designed to detect and control oil levels in oil separators and compressors.

Apart from the sensor function, it also has a built-in controller. The controller can be setup with all the parameters that are necessary to directly regulate a solenoid valve for oil level control.



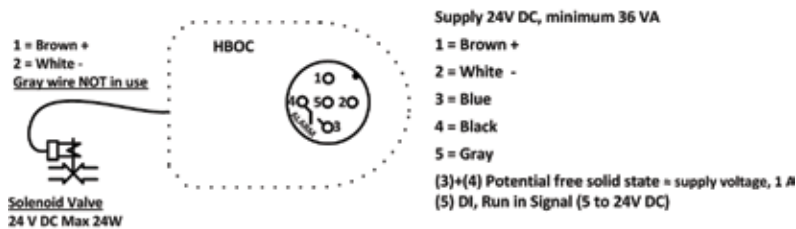
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V DC + 10%	Thread connection	See ordering code
Power consumption	<20mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
On/Off	Time	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	100 bar
Max. load	24 W	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Compressor adaptor	HBS/ADAP/FLANGE/UNI
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Technical data - valve regulation

Valve control	
Signal to valve	ON/OFF
Valve regulation	Time-regulation
Cable specification (valve control)	
Length	3 m (118")
Cable size	3 x 0.75 mm ²
Cable glands	PG7 / M8

Electrical installation



Ordering code

House design	Thread type	Ordering code
Angle	1/2" NPT	HBOC/C-1
Angle	3/4" NPT	HBOC/C-2
Angle	1 1/8 UNEF	HBOC/C-7

To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Accessories - solenoid valve - V100



Technical data: V100

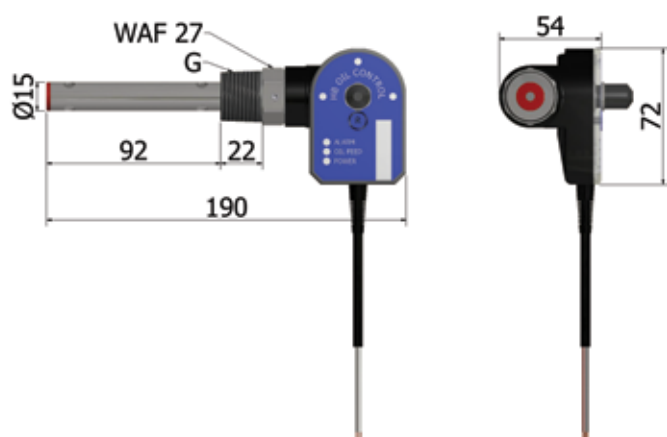
V100 is designed for connection to HBOC in compressor and oil-separator installations. The solenoid valve is controlled directly from the HBOC controller. V100 has a design pressure up to 100 bar.

- Direct control from the HBOC sensor control in NH3 applications
- House produced in stainless steel - AISI316
- Fast reaction time
- Reliable design

Installations conditions		Mechanical specifications	
Ambient temperature	-40...+80 °C	Thread size	G 1/4" - ISO 228/1
Max. pressure	100 bar	Material - housing	AISI316
Liquid	Oil	Material - sealing	PTFE
Max. viscosity	25 cSt	Outside dimension	52x74x53 mm
Flow		Weight	200 g
Theoretical flow	1.5 l/min	Valve design	Direct / NC
Connection		Ordering code	
Plug type*	DIN 43650	100 bar	V100 / 24VDC
Energy consumption - V100	14 W		

* Plug included

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		1 1/8 UNEF	HBSO1-MEK-7
2	Electronic part	PC-programmable	HBOC/C-EL

Oil Pot Controller

Complete and simple design for automatic oil management in oil pots.

Simple installation and configuration with PC. Timer and alarm functions are all programmable.

Sensor design for pressure up to 150 bar.

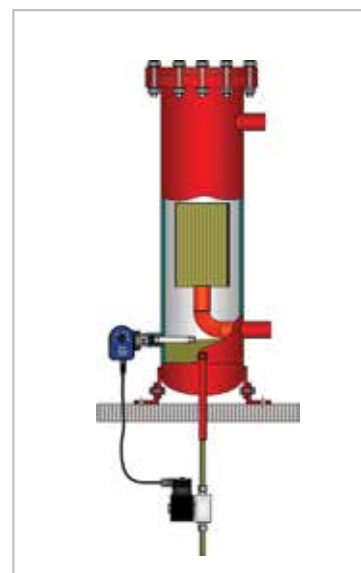
LED indication of oil level, alarm and power supply. Alarm output to central panel.

5 m cable included.

Split design which allows for easy installation and diagnostic. The electronic part can be easily disconnected with 2 small screws.

Functional description:

HBOR is a level sensor with a built-in controller for controlling the oil return from the oil collection points in industrial cooling systems. The sensor is installed in the oil pot at the level where automatic emptying should take place. When the sensor no longer detects NH₃, it automatically opens the solenoid valves so that hot gas is fed over an ejector. The ejector forms a vacuum so that the oil pot is automatically emptied. The oil emptying function is set with a PC tool.



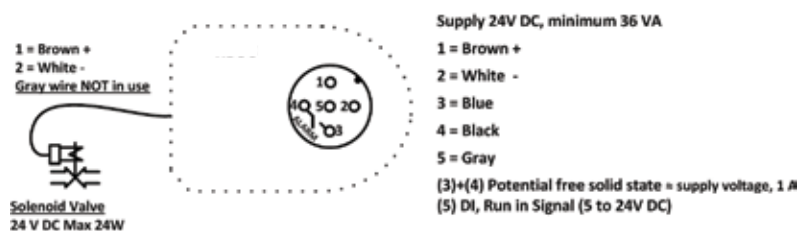
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V DC + 10%	Thread connection	See ordering code
Power consumption	<20mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
On/Off	Time	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	100 bar
Max. load	24 W	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	
Cable glands	PG7 / M8	Compressor adaptor	HBS/ADAP/FLANGE/UNI
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals			
CE	EN 6100-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBOC software		

Technical data - valve regulation

Valve control (Modulating valve)	
Signal to valve	ON/OFF
Valve regulation	Time-regulation
Cable specification (valve control)	
Length	3 m (118")
Cable size	3 x 0.75 mm ²
Cable glands	PG7 / M8

Electrical installation



Ordering code

House design	Thread type	Ordering code
Angle	1/2" NPT	HBOR/C-1
Angle	3/4" NPT	HBOR/C-2
Angle	1 1/8 UNEF	HBOR/C-7

To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Accessories - solenoid valve - V100



Technical data: V100

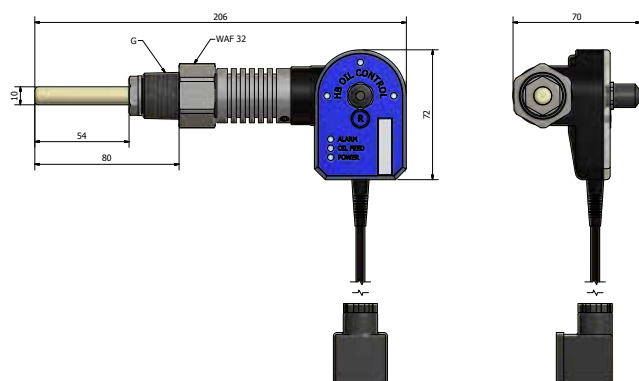
V100 is designed for connection to HBOC in compressor and oil-separator installations. The solenoid valve is controlled directly from the HBOC controller. V100 has a design pressure up to 100 bar.

- Direct control from the HBOC sensor control in NH3 applications
- House produced in stainless steel - AISI316
- Fast reaction time
- Reliable design

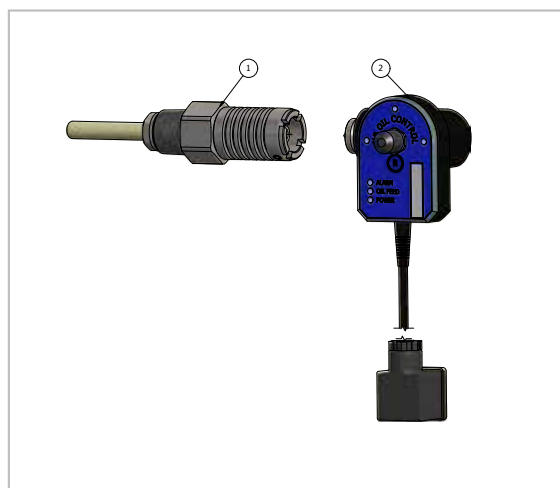
Installations conditions		Mechanical specifications	
Ambient temperature	-40...+80 °C	Thread size	G 1/4" - ISO 228/1
Max. pressure	100 bar	Material - housing	AISI316
Liquid	Oil	Material - sealing	PTFE
Max. viscosity	25 cSt	Outside dimension	52x74x53 mm
Flow		Weight	200 g
Theoretical flow	1.5 l/min	Valve design	Direct / NC
Connection		Ordering code	
Plug type*	DIN 43650	100 bar	V100 / 24VDC
Energy consumption - V100	14 W		

* Plug included

Mechanical dimensions

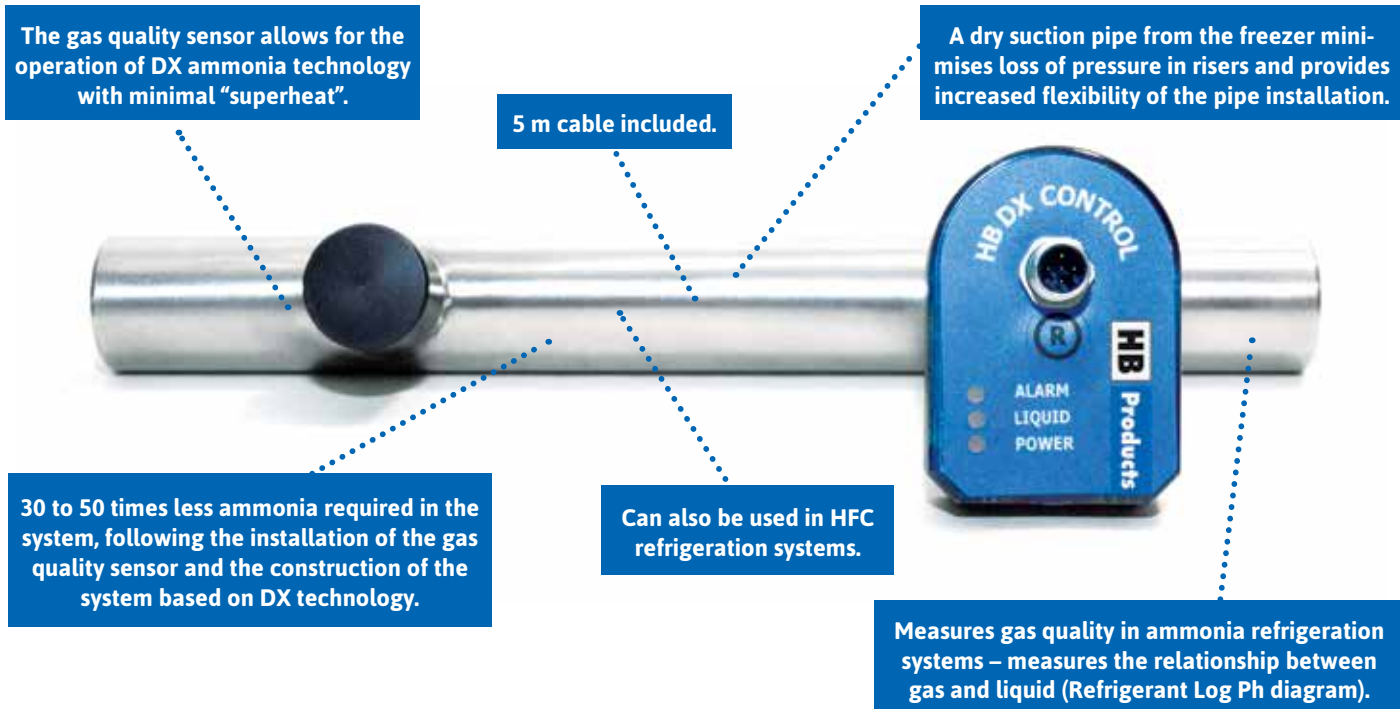


Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	1/2" NPT	HBSO1-MEK-1
		3/4" NPT	HBSO1-MEK-2
		1 1/8 UNEF	HBSO1-MEK-7
2	Electronic part	PC-programmable	HBOR/C-EL

Gas quality sensor / DX controller



Functional description:

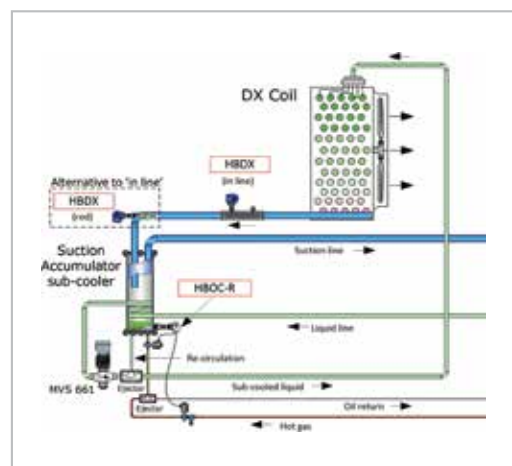
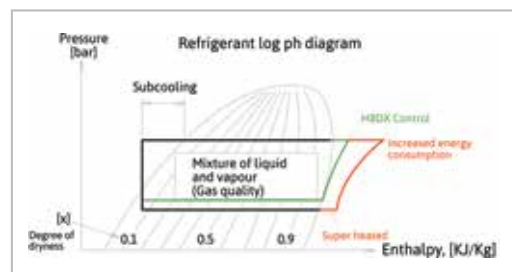
HBDX is a new revolutionary, patent-pending sensor technology, and it is thus the first sensor in the world capable of measuring the relationship between gas and liquid in a refrigeration system. The sensor measures the degree of dryness, "X", of the gas in the gas pipes, and the value is converted into a 4-20 mA analogue signal corresponding to "X".

The sensor is available in two variants, "Rod Style" for installation in a pipe elbow and "In-line" for welding into the suction pipe.

The sensor offers very precise measurements and provides instant read-outs of the gas quality, making it useable in most evaporators (plate, pipe, and air evaporators).

The sensor's microprocessor also functions as a controller, enabling the direct control of a modulating motor valve, thereby bypassing the external controller or the PLC. The controller can be set up with all the parameters that are necessary for regulating a modulating motor valve or a stepper motor valve. The sensor is available with a cable for direct supply to and control of the motor valve, or as a sensor where the signal is sent to the external controller/PLC.

The sensor cannot measure actual overheating, but with proper installation and system design, overheating can be reduced or eliminated, thus leading to substantial energy savings.



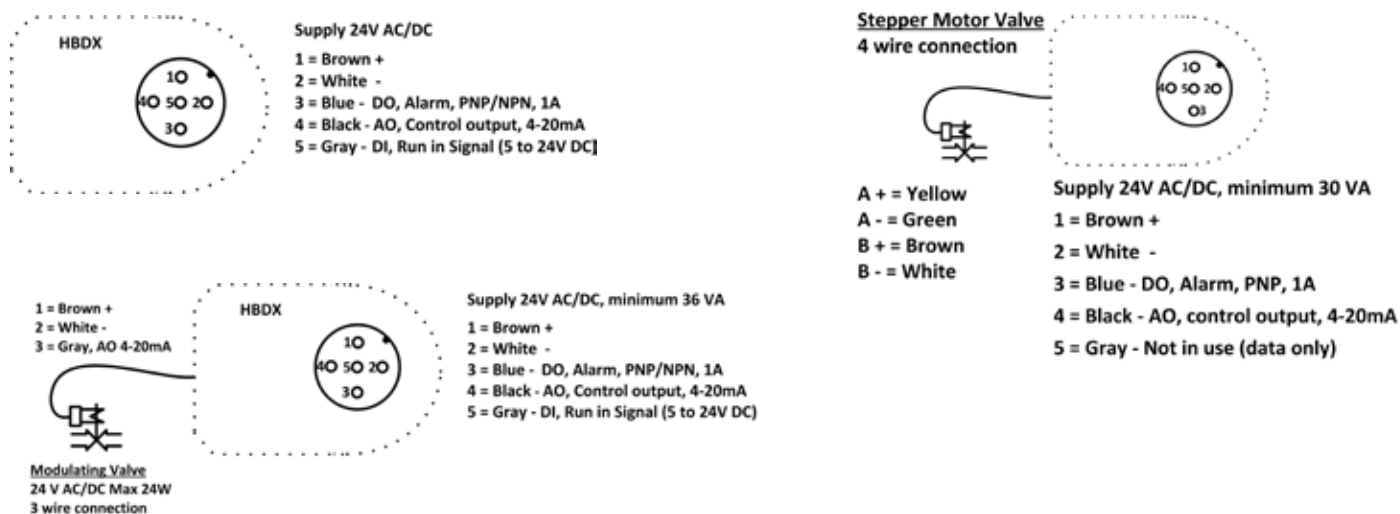
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Alarm, control, power	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-splitbox
Approvals			
CE	EN 6100-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBDX software		

Technical data - valve regulation

Valve control (Modulating valve)		Valve control (Stepper motor)	
Signal to valve	4-20 mA	Stepper motor steps	25-5000 steps
Valve regulation	P-regulation	Stepper motor speed	2-40 m/s
Cable specification (valve control)		Stepper motor phase current	0-750 mA
Length	3 m (118")	Stepper motor holding current	0-250 mA
Cable size	3 x 0.75 mm ²		
Cable glands	PG7 / M8		

Electrical installation

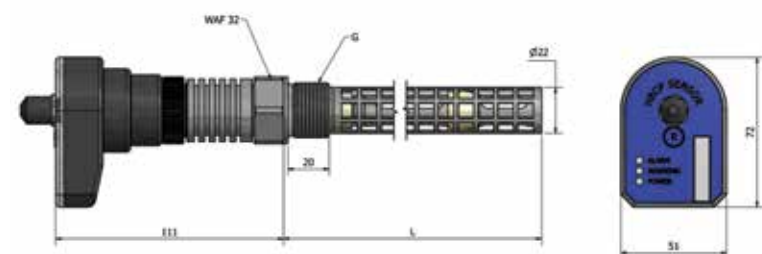


Ordering code

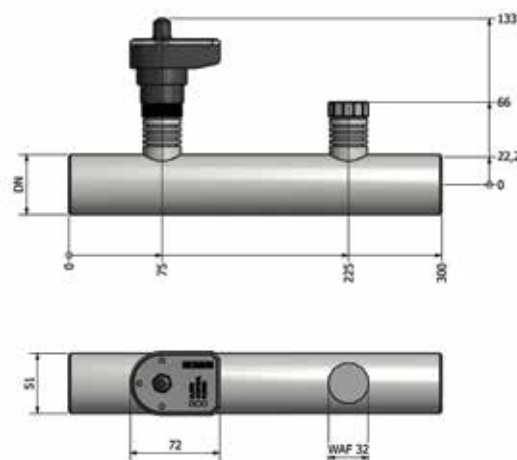
Design	Length (L)	Motor type	Cable to valve	Connection	Ordering code
Rod	195 mm	Modulating	No	3/4" NPT	HBDX-R-1.5-2
Rod	195 mm	Modulating	No	3/4" BSPP	HBDX-R-1.5-6
Rod	300 mm	Modulating	No	1" NPT	HBDX-R-3-9
Rod	300 mm	Modulating	No	1" BSPP	HBDX-R-3-8
In-line	300 mm	Modulating	No	DN25	HBDX-IN-DN25
In-line	300 mm	Modulating	No	DN40	HBDX-IN-DN40
In-line	300 mm	Modulating	No	DN50	HBDX-IN-DN50
Rod	195 mm	Modulating	Yes	3/4" NPT	HBDX/C-R-1.5-2
Rod	150 mm	Modulating	Yes	3/4" BSPP	HBDX/C-R-1.5-6
Rod	300 mm	Modulating	Yes	1" NPT	HBDX/C-R-3-9
Rod	300 mm	Modulating	Yes	1" BSPP	HBDX/C-R-3-8
In-line	300 mm	Modulating	Yes	DN25	HBDX/C-IN-DN25
In-line	300 mm	Modulating	Yes	DN40	HBDX/C-IN-DN40
In-line	300 mm	Modulating	Yes	DN50	HBDX/C-IN-DN50
Rod	195 mm	Stepper	Yes	3/4" NPT	HBDX/S-R-1.5-2
Rod	195 mm	Stepper	Yes	3/4" BSPP	HBDX/S-R-1.5-6
Rod	300 mm	Stepper	Yes	1" NPT	HBDX/S-R-3-9
Rod	300 mm	Stepper	Yes	1" BSPP	HBDX/S-R-3-8
In-line	300 mm	Stepper	Yes	DN25	HBDX/S-IN-DN25
In-line	300 mm	Stepper	Yes	DN40	HBDX/S-IN-DN40
In-line	300 mm	Stepper	Yes	DN50	HBDX/S-IN-DN50

In case of pipe dimensions bigger than DN50 we recommend the Rod-style.

Mechanical dimensions

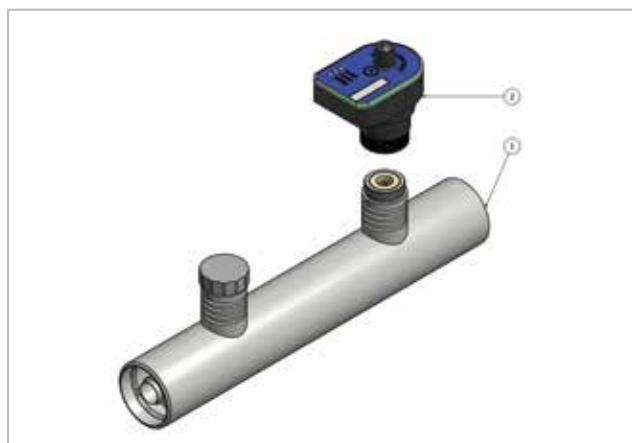


Rod-style (HBDX-R)



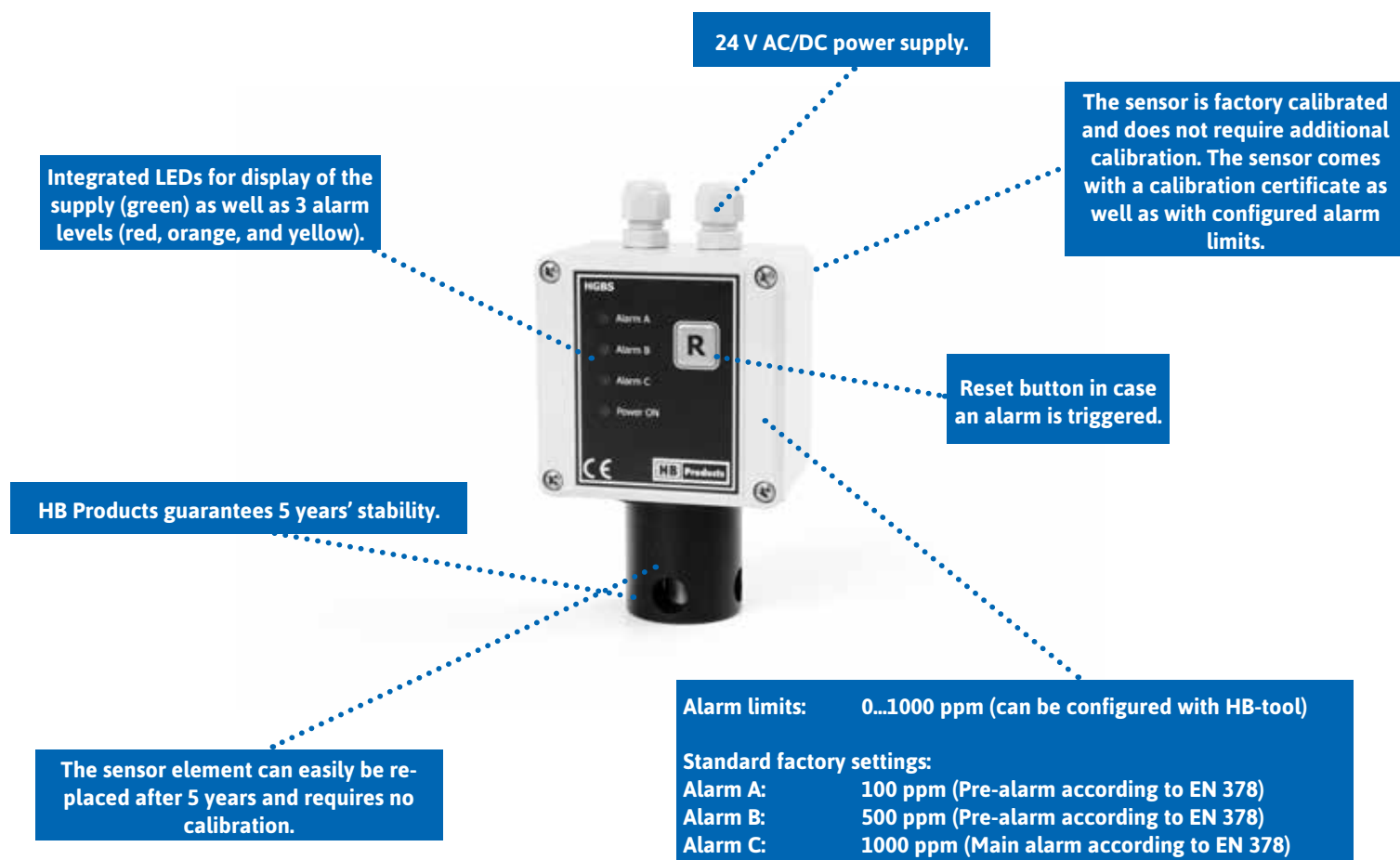
In-line (HBDX-IN)

Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	¾" NPT – 195 mm	HBDX-MEK-2-2
		¾" BSPP – 195 mm	HBDX-MEK-2-6
		1" NPT – 300 mm	HBDX-MEK-3-9
		1" BSPP – 300 mm	HBDX-MEK-3-8
		DN25	HBDX-MEK-DN25
		DN40	HBDX-MEK-DN40
		DN50	HBDX-MEK-DN50
2	Electronic part	PC-programmable	HBDX-EL
		PC-programmable with cable for direct valve control	HBDX/C-EL
		PC-programmable with cable for direct valve control	HBDX/S-EL

NH3 Gas leakage sensor



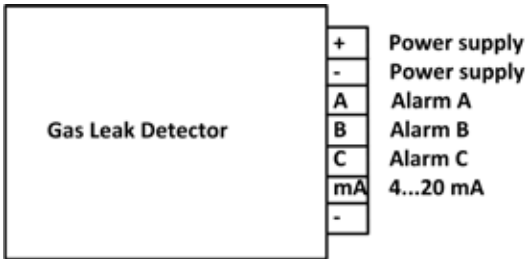
Functional description:

HBGS fulfils the requirements for gas leakage measurement in accordance with F-GAS regulation EU/517/2014. HBGS detects NH3 (R717) in a range of 0... 1000 ppm. It is an independent unit that must be supplied with 24 V AC/DC. It has 3 built-in digital alarm outputs and 1 analogue 4... 20 mA output. The sensor can be set up using a PC with the HB Configuration Tool.

Technical data

Electrical connection		Mechanical specifications	
Connection	Terminals for cables	Cabinet size	82x59x126mm
Screwed cable connection	2 x M12	Material	Plast
Power supply	24 V DC	Mounting	On wall
Analog output	4...20 MA		
Max load:	500 ohm		
Digital output - relay:	3 x SPDT, 1A		
Digital output - light/horn:	1 x SPDT, 0,8A		
Installation conditions		Approvals	
Ambient temperature:	-10...+50°C	EMC Emission	EN 61000-3-2
Protection degree	IP20	EMC Immunity	EN 61000-4-2
Vibrations	IEC 68-2-6 (4g)		

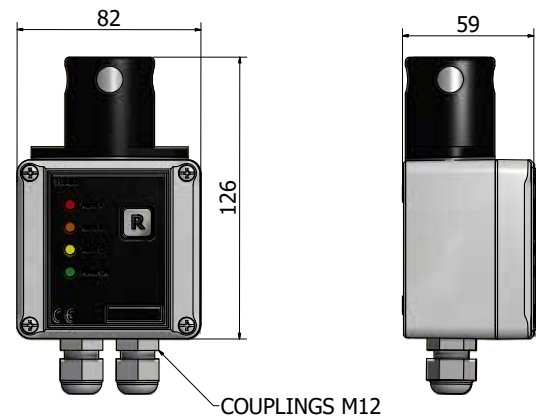
Electrical installations



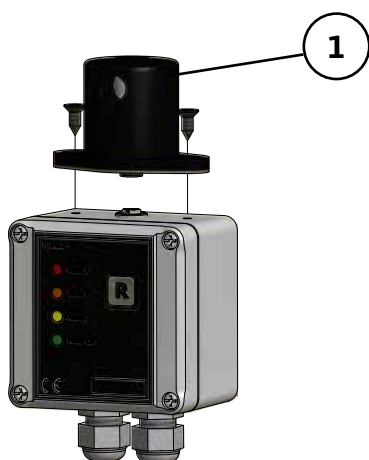
Ordering code

House design	Measuring area	Ordering code
Front	0... 1000 ppm	HBGS-NH3

Mechanical dimensions

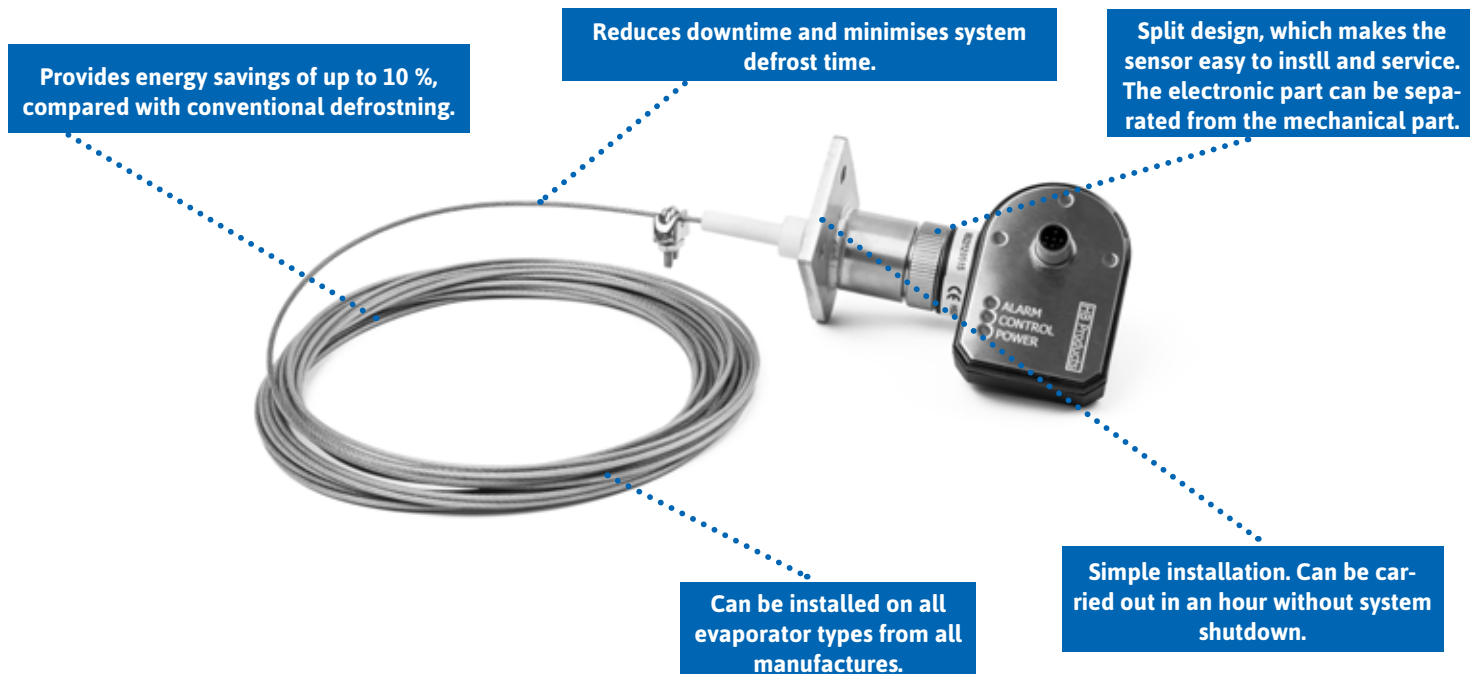


Spare parts



Position	Specification	Type	Ordering code
1	Sensor head	0-1000 ppm	HBGS-NH3-S

Defrost sensor



Functional description:

HBDF is a simple solution for energy-optimal automatic defrosting of evaporators. It results in energy savings of approximately 10%, thus quickly recouping its cost. The sensor measures the thickness of ice deposits between the fins and sends a 4..20mA signal to the system's PLC. The 4 mA signal is emitted when the evaporator is free of ice. The defrost point is set according to the evaporator type and the amount of moisture, and it is determined based on a visual assessment of the ice deposits on the evaporator.

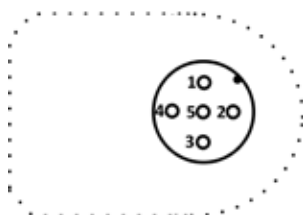
The sensor can be installed in less than one hour, on both new and old evaporators. It can be installed when the system is in operation, and therefore, system shutdown is not necessary. The electronic part is mounted on the evaporator's frame using 2 screws. The mechanical part consists of a thin Teflon-coated wire, which is installed between the fins of the evaporator. HBDF is available in 3 variants, with a 10m, 20m, and 30m wire respectively.

After installation, the sensor is calibrated/configured to the evaporator it is mounted on. This is done using a PC-based software tool, which can be downloaded via this link.

Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Flange connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature*	-50...+80°C
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Splitterbox	HBxC-Splitbox
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Electrical installation



- 1 = Brown [Supply + 24 V AC/DC]
- 2 = White [Supply – 24 V AC/DC]
- 3 = Blue [not in use]
- 4 = Black [AO, analogue output 4-20 mA]
- 5 = Gray [DI, Calibration Signal (5 to 24V DC)]

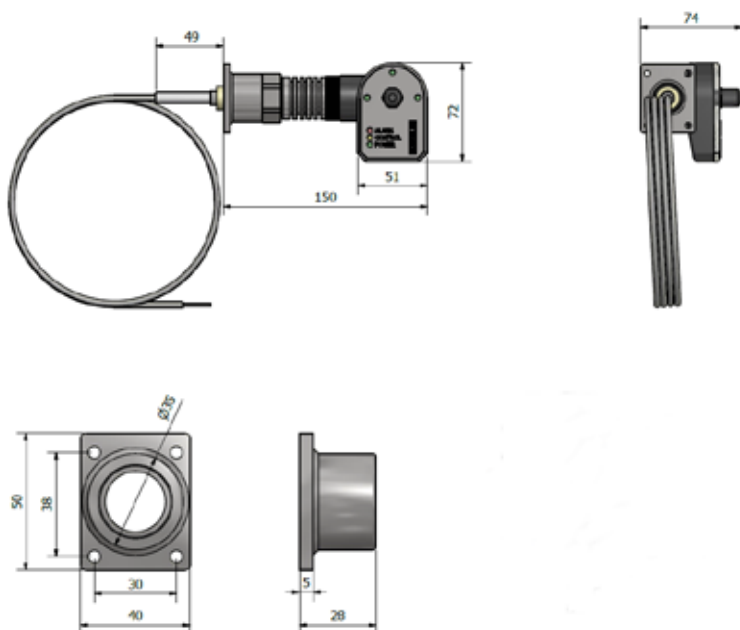


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

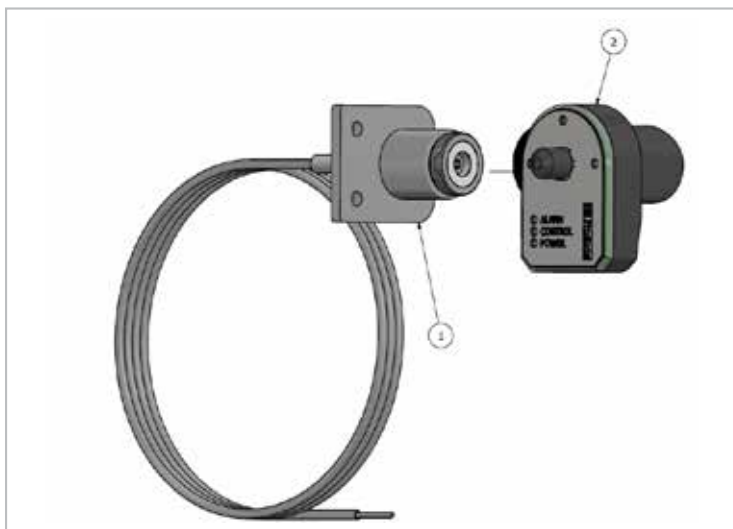
Ordering code

Wire length	Ordering code
10 m	HBDF-10M
20 m	HBDF-20M
30 m	HBDF-30M

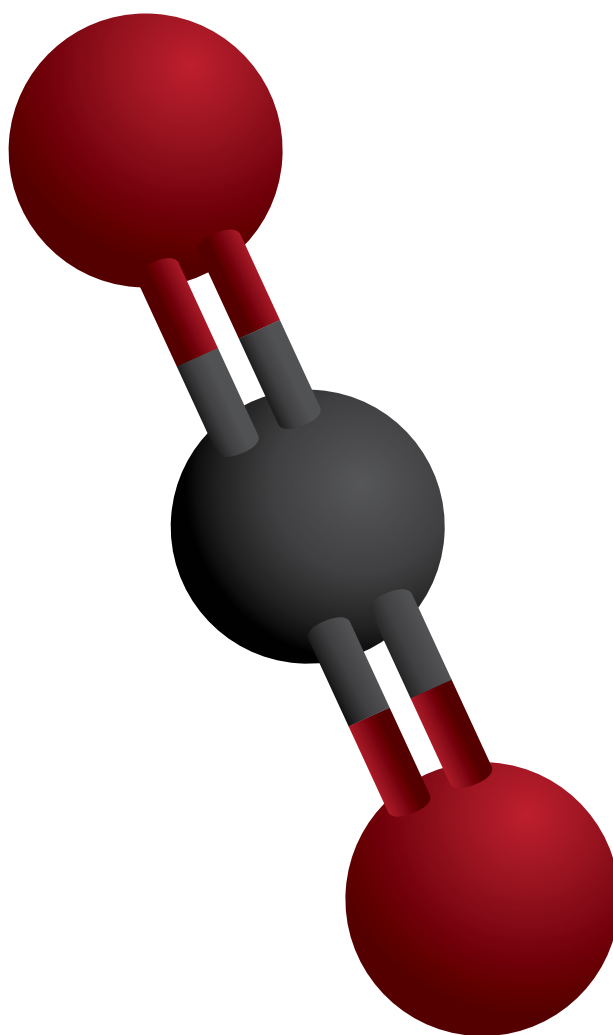
Mechanical dimensions



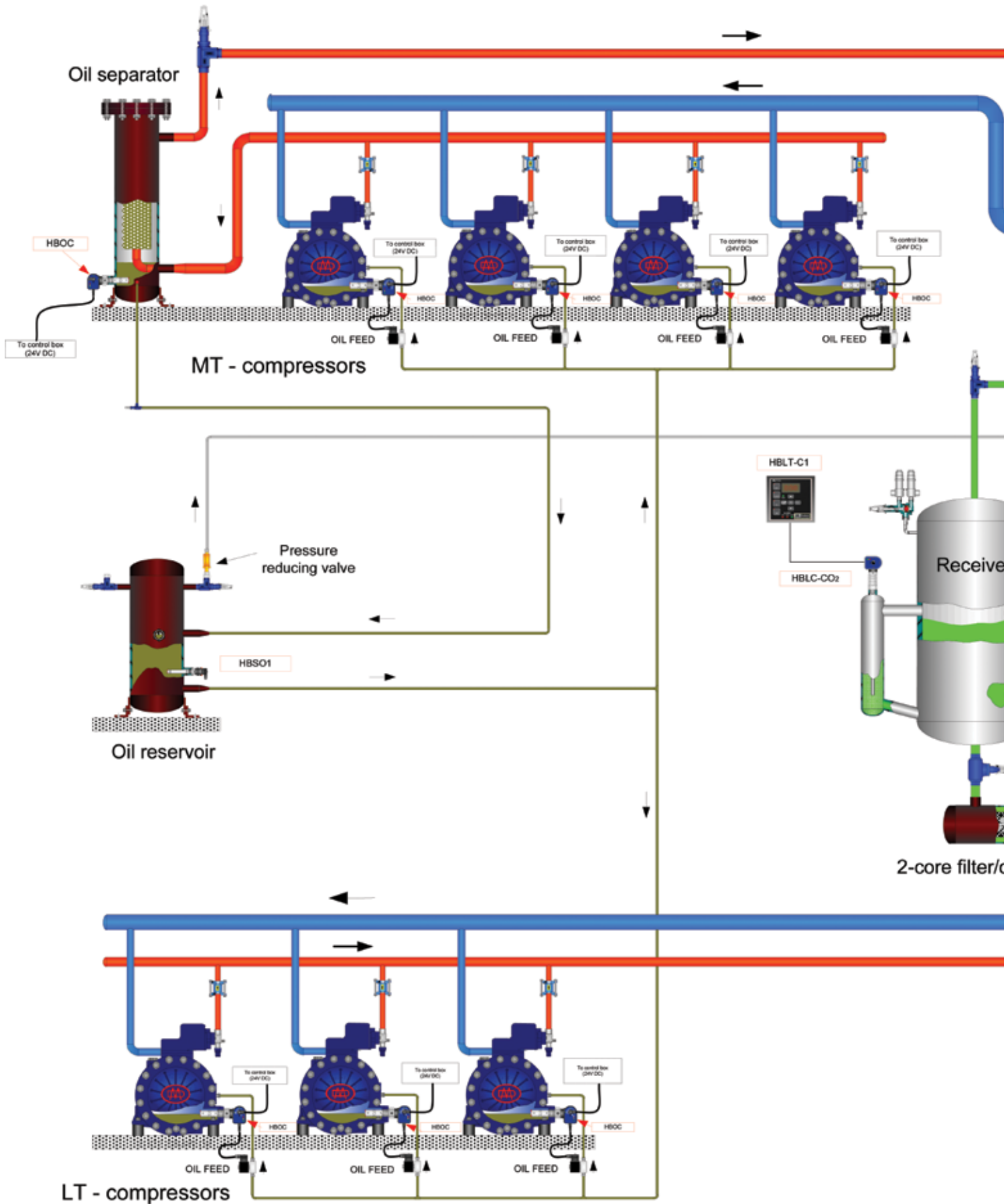
Spare parts



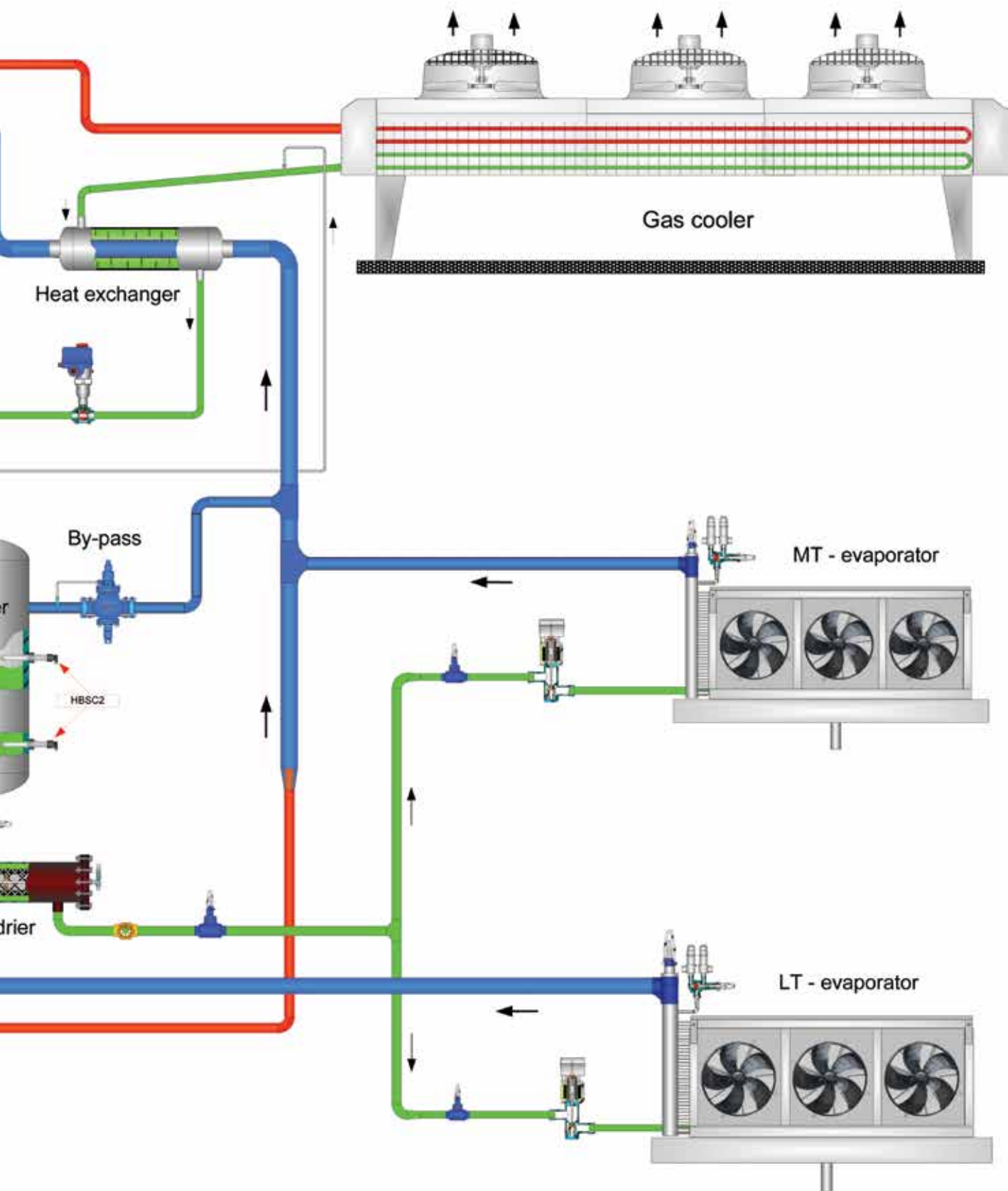
Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBDF-EL
2	Mechanical parts	10m	HBDF-10M-MEK
		20m	HBDF-20M-MEK
		30m	HBDF-30M-MEK



Two-stage transcritical



al CO₂ plant - principle



Switches, sensor and controls for CO₂ refrigeration installations

ON/OFF switches

CO₂ liquid

Function: CO₂ liquid switch

Application: Level switch in tanks

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: PNP/NPN – 1A



Page 122

Function: CO₂ liquid switch

Application: Level switch in tanks

Temperature: -30...+80°C

Supply: 90...240 V AC

Output: Solid state relay



Page 124

Function: CO₂ liquid switch

Application: Level switch in flow freezers

Temperature: -60...+80°C

Supply: 24 V DC

Output: Solid state relay



Page 128

Oil

Function: Oil switch

Application: Compressor crankcases, oil collectors/tanks & oil separators.

Temperature: -30...+80/120°C

Supply: 24 V AC/DC

Output: PNP/NPN – 1A



Page 132

Function: Oil switch

Applications: Compressor crankcases, oil collectors/tanks & oil separators.

Temperature: -30...+80/120°C

Supply: 90...240 V AC

Output: Solid state relay



Page 136

Sensor and controls

CO₂ liquid

Function: CO₂ level sensor

Applications: Level measurement in standpipes

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA/PNP – 1A



Page 110

Function: Intelligent "Float level regulation"

Applications: Float regulation in e.g. chillers

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA



Page 114

Function: Level controller

Applications: Level control on e.g. pump separators

Temperature: -30...+80°C

Supply: 24 V AC/DC / 100-240 V AC

Output: 4...20 mA / 3x solid state relay - 3/5 A



Page 120

Function: Pressure sensor

Applications: Pressure measurement in refrigeration systems

Temperature: 40...+125°C

Supply: 9...32 V DC

Output: 4...20 mA



Page 120

Function: Temperature sensor

Applications: Temperature measurement in refrigeration systems

Temperature: -50...+130°C

Output: PT100 / PT1000



Page 120

oil

Function: Oil level controller

Applications: Oil separator, oil tanks, oil purgers or compressors

Temperature: -30...+80°C

Supply: 24 V DC

Output: Solid state relay – 1A



Page 124

Ice

Function: Ice thickness sensor

Applications: Evaporator - Defrost on demand.

Temperature: -60...+80°C

Supply: 24 V DC

Output: 4...20 mA



Page 124

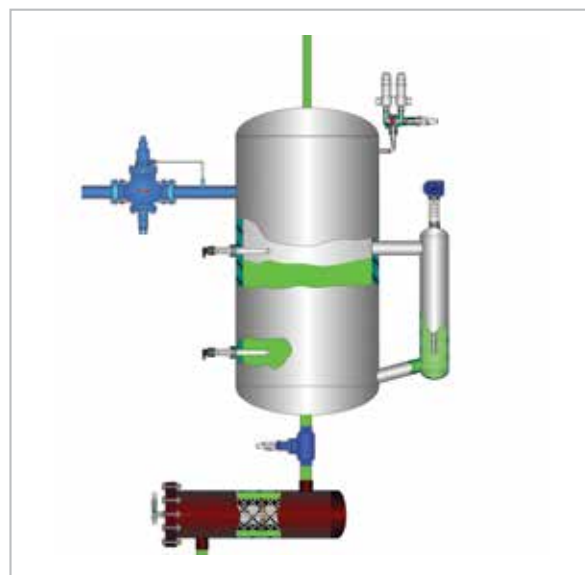
CO₂ liquid switch - 24 V AC/DC



Functional description:

HBSC2 is a level switch for detecting liquid CO₂ in refrigeration systems. Typically, it is installed in/on the receiver, but it is also suited for installation in other locations where a level indication is needed. The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle as well as its special construction allows it to withstand high pressure and low refrigerant temperatures.

The sensor is suited for use on transcritical CO₂ refrigeration systems.

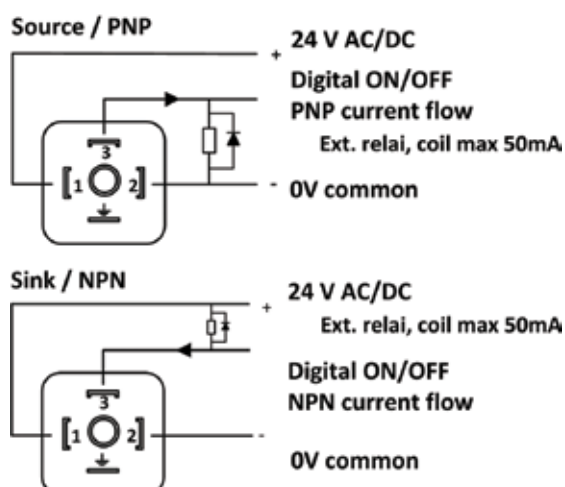


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	4 x red	Max pressure	150 bar
Cable specification		Protection degree	
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

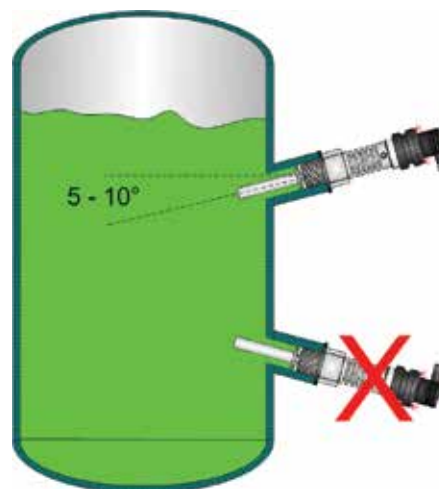
NC: no signal when it is red

NO: signal when it is red

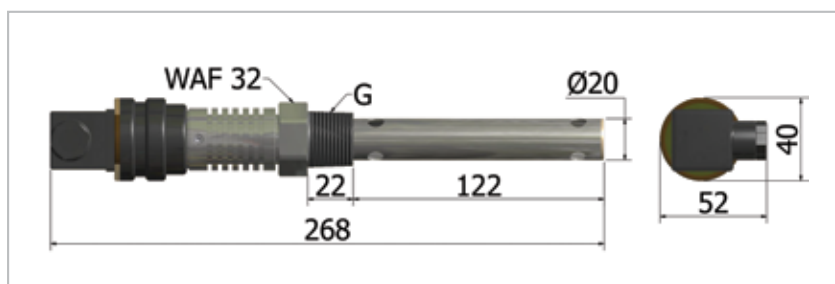
4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

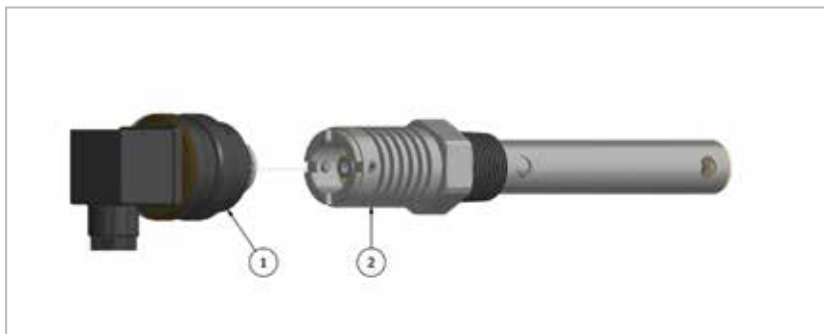
Output	Thread type	Ordering code
PNP / NO	3/4" NPT	HBSC2-PNP/NO-2
PNP / NC	3/4" NPT	HBSC2-PNP/NC-2
PNP / NO	3/4" BSPP	HBSC2-PNP/NO-6
PNP / NC	3/4" BSPP	HBSC2-PNP/NC-6
NPN / NO	3/4" NPT	HBSC2-NPN/NO-2
NPN / NC	3/4" NPT	HBSC2-NPN/NC-2
NPN / NO	3/4" BSPP	HBSC2-NPN/NO-6
NPN / NC	3/4" BSPP	HBSC2-NPN/NC-6



Mechanical dimensions

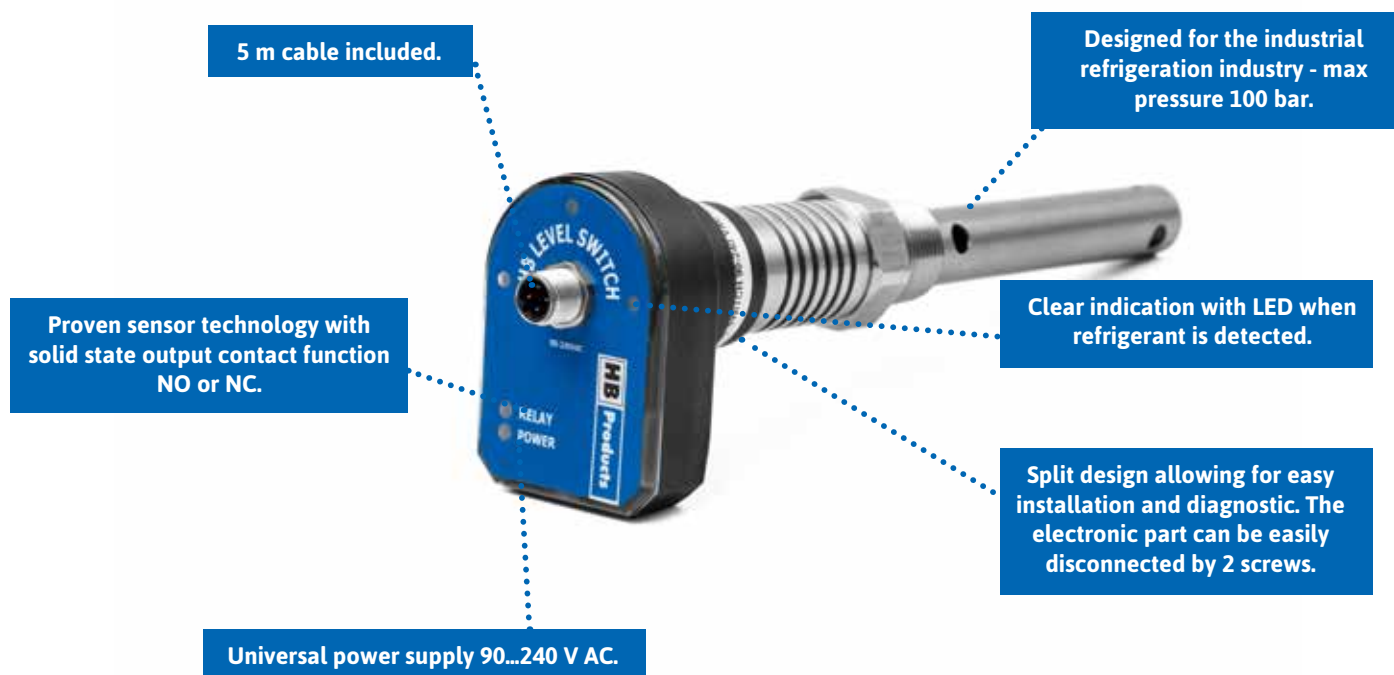


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PNP/NO	HBSC2-EL/PNP/NO
		PNP/NC	HBSC2-EL/PNP/NC
		NPN/NO	HBSC2-EL/NPN/NO
		NPN/NC	HBSC2-EL/NPN/NC
2	Mechanical part	¾" NPT	HBSC2-MEK-2
		¾" BSPP	HBSC2-MEK-6

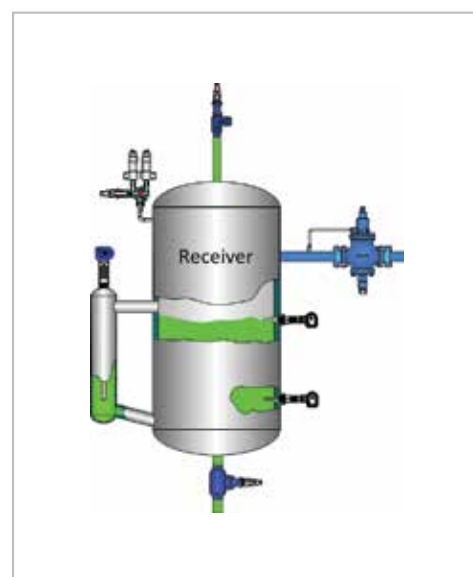
CO₂ liquid switch - 90...240 V AC



Functional description:

HBSC2 is a level switch for detecting liquid CO₂ in refrigeration systems. Typically, it is installed in/on the receiver, but it is also suited for installation in other locations where a level indication is needed. The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle as well as its special construction allows it to withstand high pressure and low refrigerant temperatures. The sensor is suited for use on transcritical CO₂ refrigeration systems.

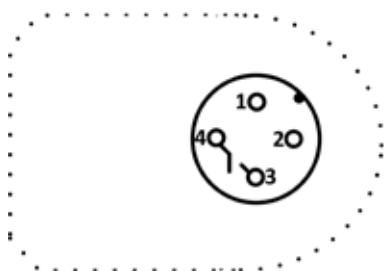
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.



Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	150 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

1 = Brown: 90...240 V supply

2 = White : 90...240 V supply

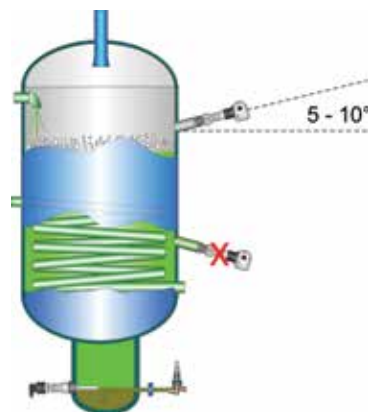
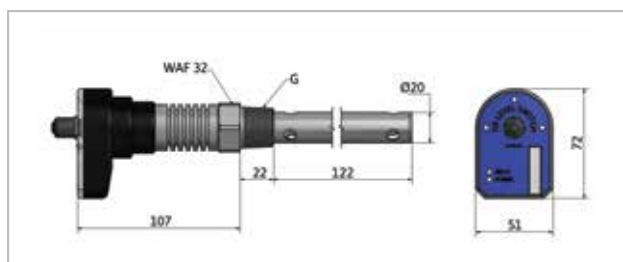
3 = Blue: SSR output – max 240 V AC

4 = Black: SSR output – max 240 V AC

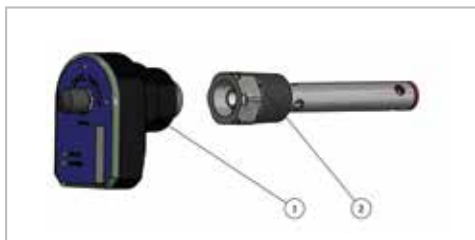
Ordering code

Output	Thread type	Ordering code
Solid state relay - NO	3/4" NPT	HBSC2-SSR-2/NO-2
Solid state relay - NO	3/4" BSPP	HBSC2-SSR-2/NO-6
Solid state relay - NC	3/4" NPT	HBSC2-SSR-2/NC-2
Solid state relay - NC	3/4" BSPP	HBSC2-SSR-2/NC-6

Mechanical dimensions

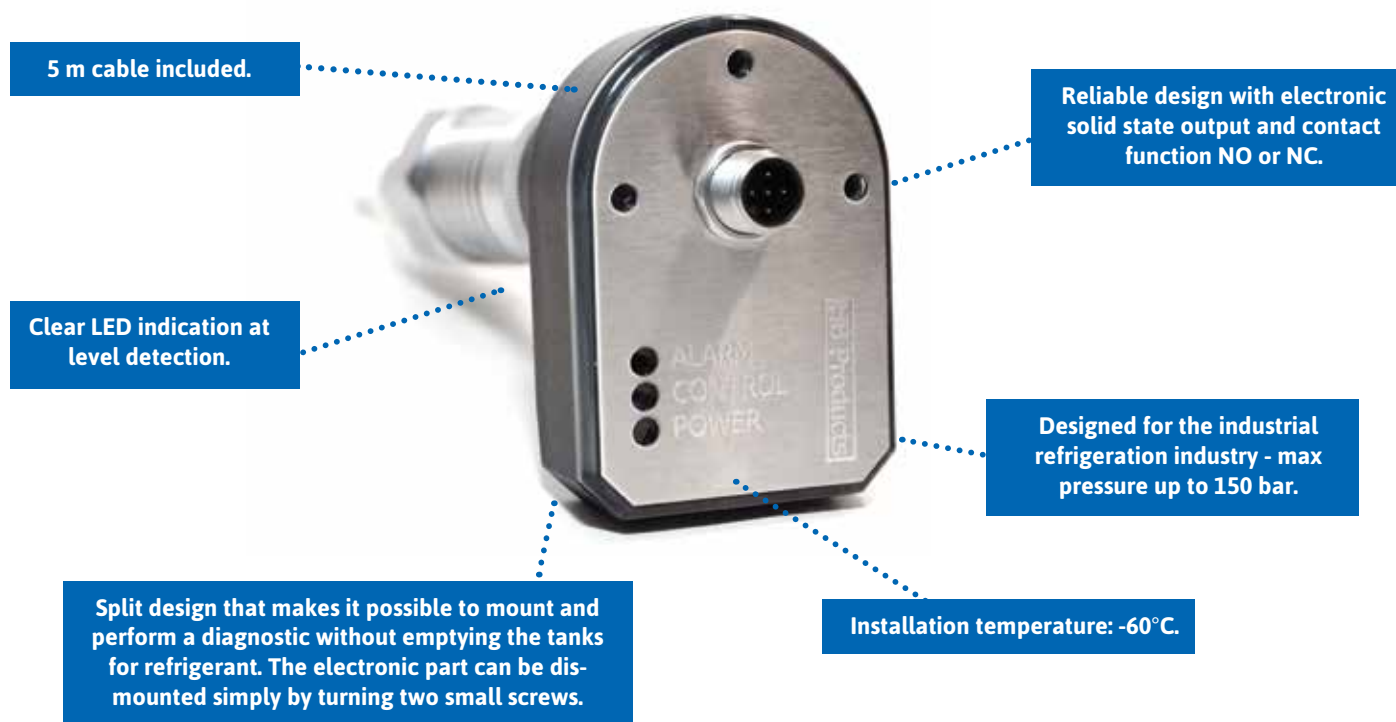


Spare parts



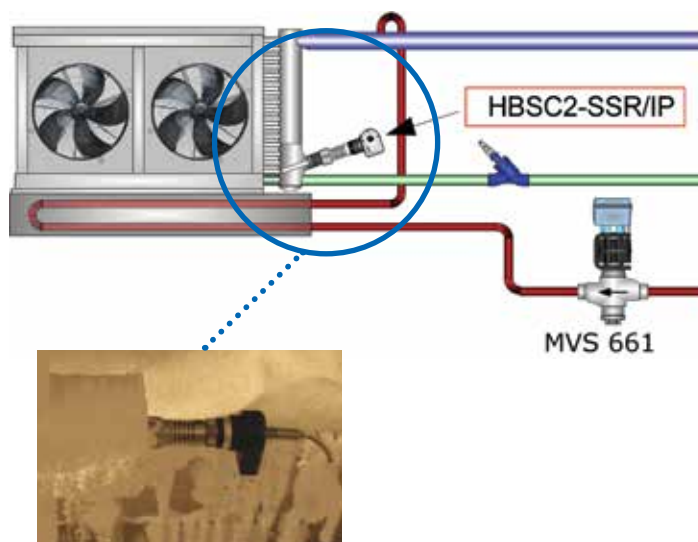
Position	Specification	Type	Ordering code
1	Electronic part	NO	HBSC2-SSR-2/NO-EL
		NC	HBSC2-SSR-2/NC-EL
2	Mechanical part	¾" NPT	HBSC2-MEK-2
		¾" BSPP	HBSC2-MEK-6

Ice proof switch



Functional description

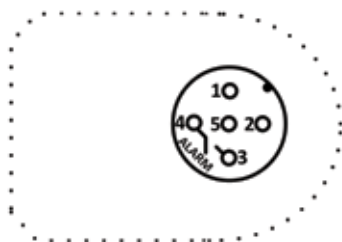
HBSC2-SSR-2/IP is a level switch for detecting liquid in refrigeration systems. Typically, it is installed in/on the receiver, but it is also suited for installation in other locations where a level indication is required. The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle as well as its special construction allows it to withstand high pressure and low refrigerant temperatures.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V DC	Thread connection	3/4" NPT
Power/current consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	SSR- 1A / 24 V AC/DC	Ambient temperature	-60...+50°C
Output function	NC or NO	Refrigerant temperature	-60...+80°C
LED indication	3 x green	Max pressure	150 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5m - 3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply 24V DC

1 = Brown +

2 = White -

3 = Blue - Potential free solid state, 1 A

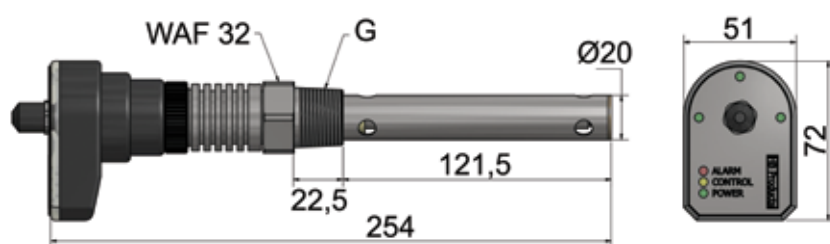
4 = Black - Potential free solid state, 1 A

5 = Gray Not in use (data only)

Ordering code

Output	Thread type	Ordering code
NC / NO - programmable	3/4" NPT	HBSC2-SSR-2/IP-2

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBSC2-SSR-2/IP-EL
1	Mechanical part	3/4" NPT	HBSC2-MEK-SSR/IP

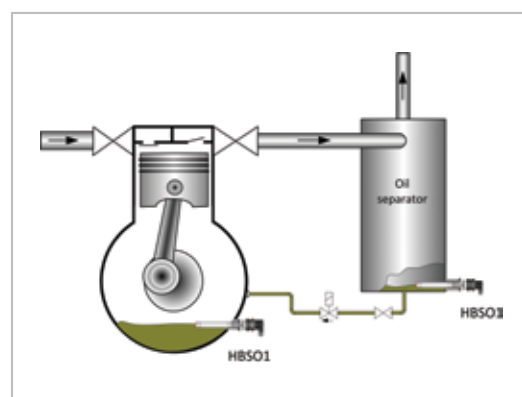
Oil switch - 24 V AC/DC



Functional description:

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.

The sensor is suited for use on transcritical CO₂ refrigeration systems.

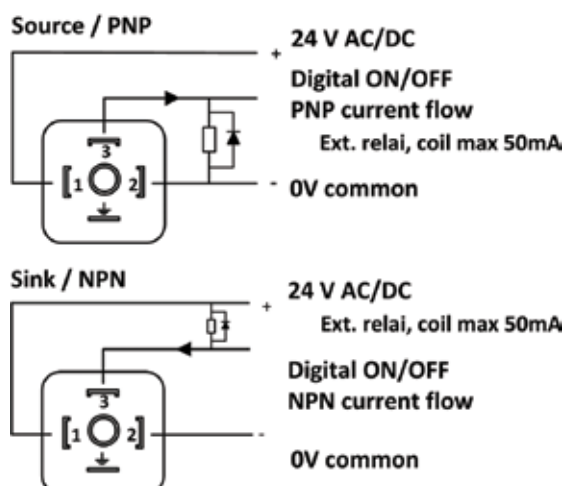


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	4 x red	Max pressure	150 bar
Cable specification*		Protection degree	
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

NC: no signal when it is red

NO: signal when it is red

4 x LED for always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type	Ordering code
PNP / NO	1/2" NPT	HBSO1-PNP/NO-1
PNP / NC	1/2" NPT	HBSO1-PNP/NC-1
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2
PNP / NC	3/4" NPT	HBSO1-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO1-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO1-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO1-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO1-PNP/NC-6
PNP / NO	1 1/8" UNEF	HBSO1-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO1-PNP/NO-7
NPN / NO	1/2" NPT	HBSO1-NPN/NO-1
NPN / NC	1/2" NPT	HBSO1-NPN/NC-1
NPN / NO	3/4" NPT	HBSO1-NPN/NO-2
NPN / NC	3/4" NPT	HBSO1-NPN/NC-2
NPN / NO	1/2" BSPP	HBSO1-NPN/NO-5
NPN / NC	1/2" BSPP	HBSO1-NPN/NC-5
NPN / NO	3/4" BSPP	HBSO1-NPN/NO-6
NPN / NC	3/4" BSPP	HBSO1-NPN/NC-6
NPN / NO	1 1/8" UNEF	HBSO1-NPN/NO-7
NPN / NC	1 1/8" UNEF	HBSO1-NPN/NO-7
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2-HT
PNP/NO	1/2" BSPP	HBSO1-PNP/NO-5-HT
PNP/NO	3/4" BSPP	HBSO1-PNP/NO-6-HT

Output	Thread type	Ordering code
NPN/NO	3/4" NPT	HBSO1-NPN/NO-2-HT
NPN/NO	1/2" BSPP	HBSO1-NPN/NO-5-HT
NPN/NO	3/4" BSPP	HBSO1-NPN/NO-6-HT
PNP / NO	1/2" NPT	HBSO2-PNP/NO-1
PNP / NC	1/2" NPT	HBSO2-PNP/NC-1
PNP / NO	3/4" NPT	HBSO2-PNP/NO-2
PNP / NC	3/4" NPT	HBSO2-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO2-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO2-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO2-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO2-PNP/NC-6
PNP / NO	1 1/8" NEF	HBSO2-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO2-PNP/NO-7
NPN / NO	1/2" NPT	HBSO2-NPN/NO-1
NPN/NC	1/2" NPT	HBSO2-NPN/NC-1
NPN/NO	3/4" NPT	HBSO2-NPN/NO-2
NPN/NC	3/4" NPT	HBSO2-NPN/NC-2
NPN/NO	1/2" BSPP	HBSO2-NPN/NO-5
NPN/NC	1/2" BSPP	HBSO2-NPN/NC-5
NPN/NO	3/4" BSPP	HBSO2-NPN/NO-6
NPN/NC	3/4" BSPP	HBSO2-NPN/NC-6
NPN/NO	1 1/8" UNEF	HBSO2-NPN/NO-7
NPN/NC	1 1/8" UNEF	HBSO2-NPN/NO-7

Please specify the oil application by "1" for PEO, PAO & mineral oil and by "2" for PAG oil types.

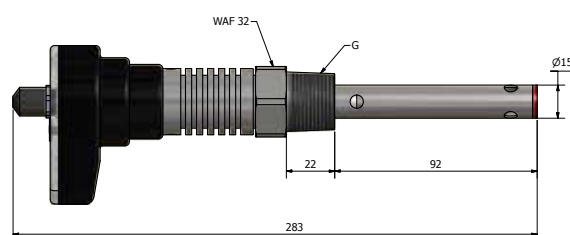
Mechanical dimensions



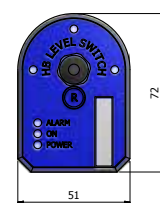
1/2" & 3/4"



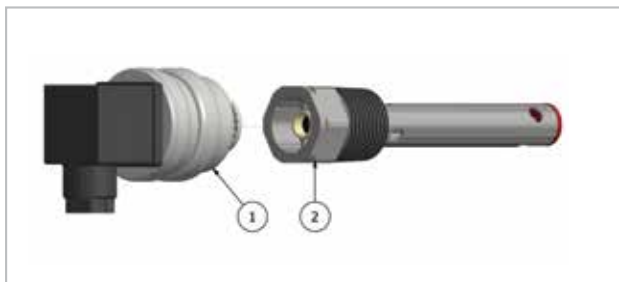
1 1/8" UNEF



HT version

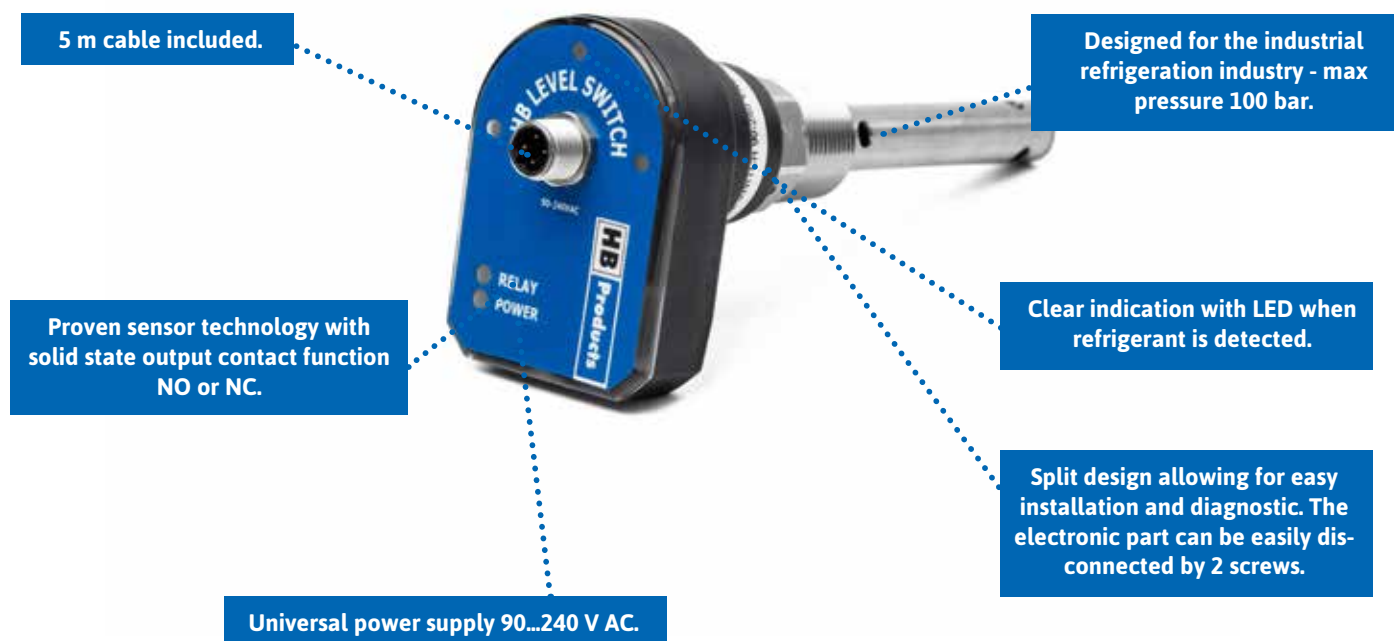


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part - HBSO1	PNP/NO	HBSO1-EL/PNP/NO
		PNP/NC	HBSO1-EL/PNP/NC
		NPN/NO	HBSO1-EL/NPN/NO
		NPN/NC	HBSO1-EL/NPN/NC
	Electronic part - HBSO2	PNP/NO	HBSO2-EL/PNP/NO
		PNP/NC	HBSO2-EL/PNP/NC
		NPN/NO	HBSO2-EL/NPN/NO
		NPN/NC	HBSO2-EL/NPN/NC
2	Mechanical part	1/2" NPT	HBSO1-MEK-1
		3/4" NPT	HBSO1-MEK-2
		1/2" BSPP	HBSO1-MEK-5
		3/4" BSPP	HBSO1-MEK-6
		1 1/8" UNEF	HBSO1-MEK-7

Oil switch - 90...240 V AC

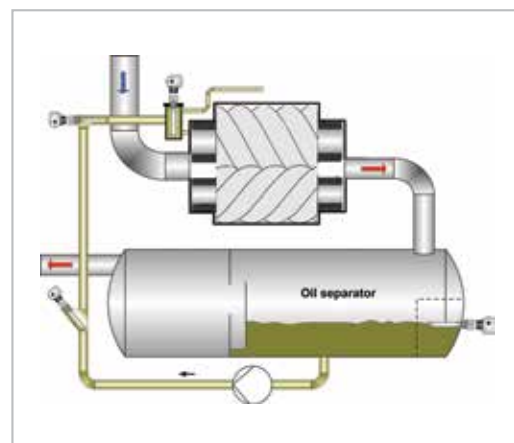


Functional description:

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.

The sensor is suited for use on transcritical CO₂ refrigeration systems.

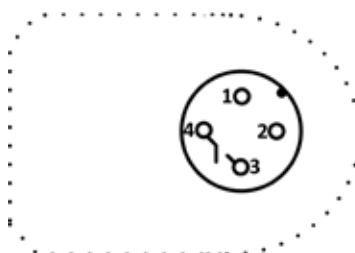
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.



Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	150 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

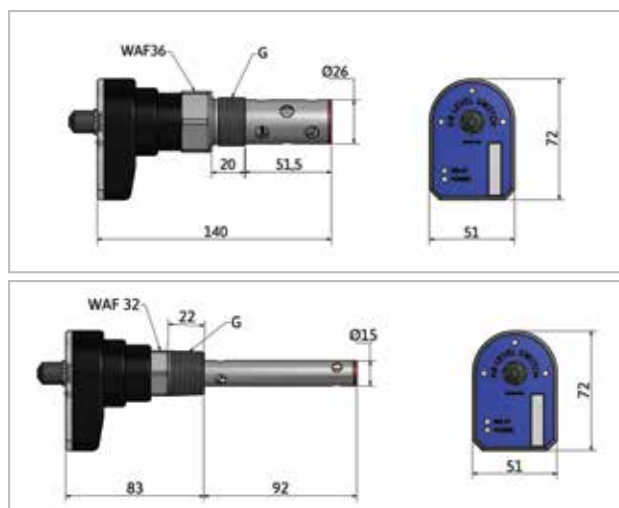
1 = Brown: 90...240 V supply

2 = White : 90...240 V supply

3 = Blue: SSR output – max 240 V AC

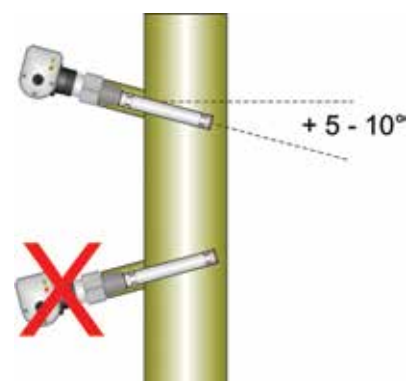
4 = Black: SSR output – max 240 V AC

Mechanical dimensions



Ordering code

Output	Thread type	Oil type	Temperature	Ordering code
NO	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-1
NC	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-1
NO	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-2
NC	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-2
NO	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-5
NC	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-5
NO	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-6
NC	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-6
NO	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-7
NC	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-7
NO	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-1
NC	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-1
NO	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-2
NC	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-2
NO	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-5
NC	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-5
NO	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-6
NC	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-6
NO	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NO-7
NC	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NC-7
NO	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-1-HT
NC	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-1-HT
NO	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-2-HT
NC	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-2-HT
NO	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-5-HT
NC	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-5-HT
NO	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-6-HT
NC	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-7-HT
NO	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-1-HT
NC	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-1-HT
NO	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-2-HT
NC	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-2-HT
NO	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-5-HT
NC	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-5-HT
NO	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-6-HT
NC	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NC-7-HT

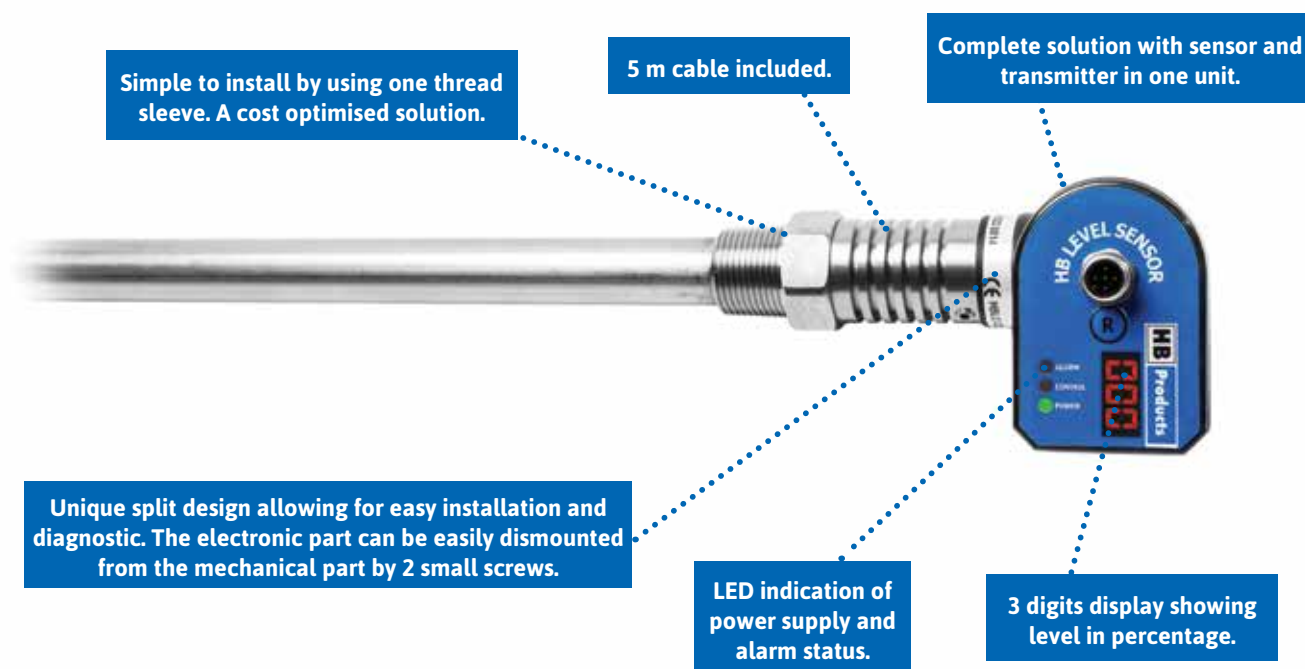


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part – HBSO1	NO	HBSO1-SSR-2/NO-EL
		NC	HBSO1-SSR-2/NC-EL
	Electronic part – HBSO1-High temperature	NO	HBSO1-SSR-2/NO-HT-EL
		NC	HBSO1-SSR-2/NC-HT-EL
	Electronic part – HBSO2	NO	HBSO2-SSR-2/NO-EL
		NC	HBSO2-SSR-2/NC-EL
	Electronic part – HBSO2- High temperature	NO	HBSO2-SSR-2/NO-HT-EL
		NC	HBSO2-SSR-2/NC-HT-EL
2	Mechanical part	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		½" BSPP	HBSO1-MEK-5
		¾" BSPP	HBSO1-MEK-6
		1 1/8 UNEF	HBSO1-MEK-7
	Mechanical part – High temperature	½" NPT	HBSO1-HT-MEK-1
		¾" NPT	HBSO1-HT-MEK-2
		½" BSPP	HBSO1-HT-MEK-5
		¾" BSPP	HBSO1-HT-MEK-6
		1 1/8 UNEF	HBSO1-HT-MEK-7

CO₂ level sensor

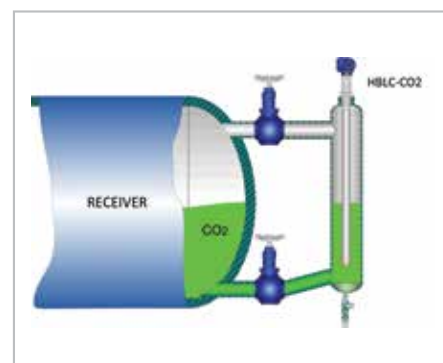


Functional description:

HBLC-CO₂ is designed for the measurement of CO₂ refrigerant levels in chillers, evaporators and condensers.

The sensor detects the refrigerant and transmits the signal to an analog 4-20 mA signal.

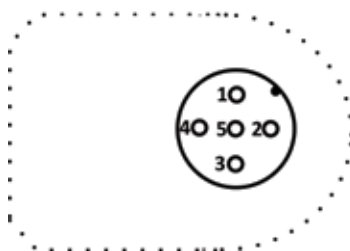
The sensor has been pre-calibrated to CO₂. It can however be calibrated to other refrigerants.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	3 digits display	Max pressure	150 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Configuration cable	HBxC-USB
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBLC software		

Electrical installation



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)

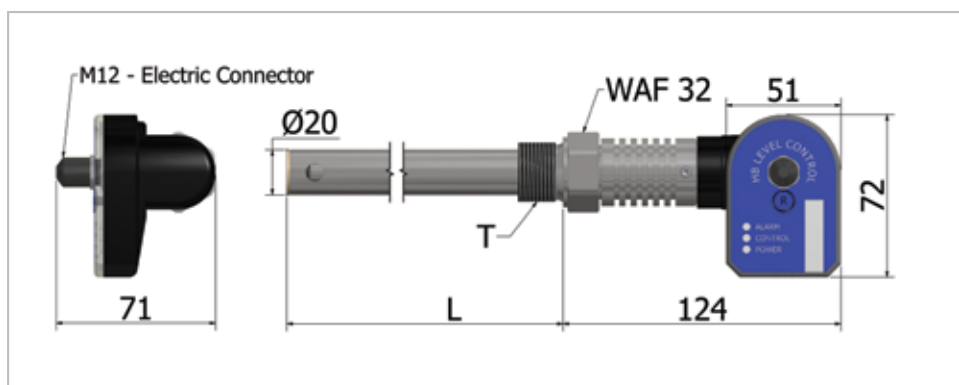


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

Sensor length (L)	Thread type	Ordering code
300 mm	3/4" BSPP	HBLC-CO2-3-6
500 mm	3/4" BSPP	HBLC-CO2-5-6
800 mm	3/4" BSPP	HBLC-CO2-8-6
1000 mm	3/4" BSPP	HBLC-CO2-10-6
1200 mm	3/4" BSPP	HBLC-CO2-12-6
1400 mm	3/4" BSPP	HBLC-CO2-14-6
1700 mm	3/4" BSPP	HBLC-CO2-17-6
2500 mm	3/4" BSPP	HBLC-CO2-25-6
300 mm	3/4" NPT	HBLC-CO2-3-2
500 mm	3/4" NPT	HBLC-CO2-5-2
800 mm	3/4" NPT	HBLC-CO2-8-2
1000 mm	3/4" NPT	HBLC-CO2-10-2
1200 mm	3/4" NPT	HBLC-CO2-12-2
1400 mm	3/4" NPT	HBLC-CO2-14-2
1700 mm	3/4" NPT	HBLC-CO2-17-2
2500 mm	3/4" NPT	HBLC-CO2-25-2

Mechanical dimensions



Spare parts



Position	Description	Specification	Part number
1	Mechanical parts	3/4" NPT - 300 mm	HBLC-CO2-3-2-MEK
		3/4" NPT - 500 mm	HBLC-CO2-5-2-MEK
		3/4" NPT - 800 mm	HBLC-CO2-8-2-MEK
		3/4" NPT - 1000 mm	HBLC-CO2-10-2-MEK
		3/4" NPT - 1200 mm	HBLC-CO2-12-2-MEK
		3/4" NPT - 1400 mm	HBLC-CO2-14-2-MEK
		3/4" NPT - 1700 mm	HBLC-CO2-17-2-MEK
		3/4" NPT - 2500 mm	HBLC-CO2-25-2-MEK
		3/4" BSPP - 300 mm	HBLC-CO2-3-6-MEK
		3/4" BSPP - 500 mm	HBLC-CO2-5-6-MEK
		3/4" BSPP - 800 mm	HBLC-CO2-8-6-MEK
		3/4" BSPP - 1000 mm	HBLC-CO2-10-6-MEK
		3/4" BSPP - 1200 mm	HBLC-CO2-12-6-MEK
		3/4" BSPP - 1400 mm	HBLC-CO2-14-6-MEK
		3/4" BSPP - 1700 mm	HBLC-CO2-17-6-MEK
		3/4" BSPP - 2500 mm	HBLC-CO2-25-6-MEK
1	Electronic part	PC-programmable	HBLC-CO2-EL-LED

Intelligent “Float level regulation”



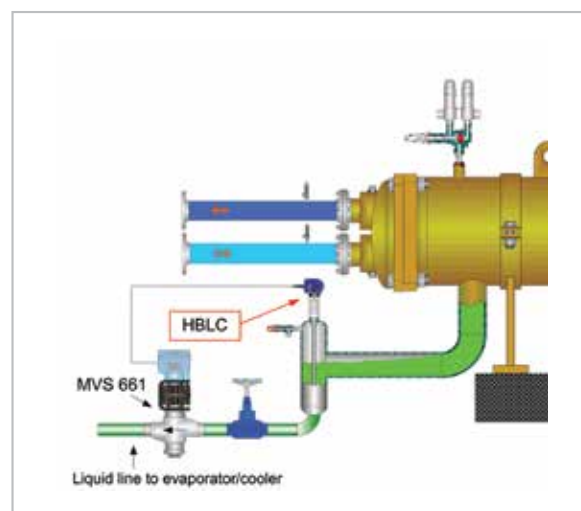
Functional description:

HBLC is an intelligent sensor with a built-in microprocessor. It is designed to control refrigerant levels in both low pressure and high pressure systems. It emits a 4-20 mA signal, which is proportional to the sensor's set range of measurement.

Apart from the 4-20 mA signal, the sensor also has a built-in controller.

The controller can be setup with all the parameters necessary for controlling a modulating motor valve or stepper motor.

The sensor can be delivered with a cable for direct supply to and control of a motor valve or stepper motor valve.



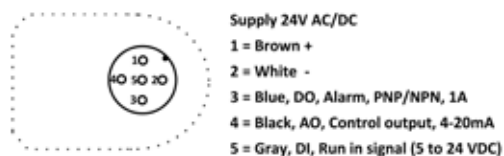
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	25 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Alarm, control, power	Max pressure	150 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-splitbox
Approvals			
CE	EN 6100-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBLC software		

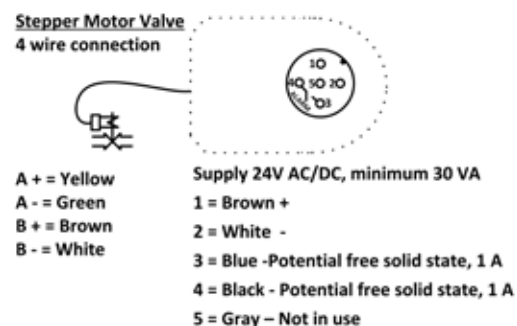
Technical data - valve regulation

Valve control (Modulating valve)		Valve control (Stepper motor)	
Signal to valve	4-20 mA	Stepper motor steps	25-5000 steps
Valve regulation	P-regulation	Stepper motor speed	2-40 m/s
Cable specification (valve control)		Stepper motor phase current	0-750 mA
Length	3 m (118")	Stepper motor holding current	0-250 mA
Cable size	3 x 0.75 mm ²		
Cable glands	PG7 / M8		

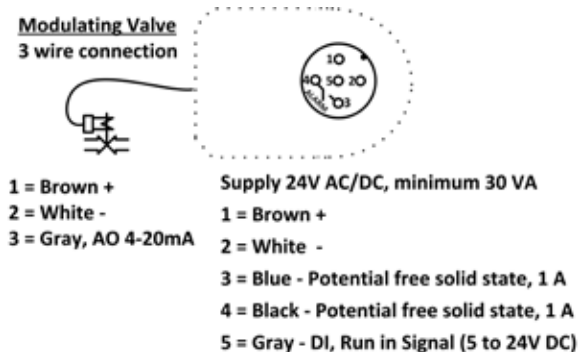
Electrical installation



HBLC with control of modulating valve with power supply cable (HBLC-xxx).



HBLC with direct control of stepper motor valve (HBLC/C/S-xxx)



HBLC/C with cable to direct control of modulating valve (HBLC/C-xxx)



To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

Refrigerant	Length (L) / Thread	Motor type	Cable to valve	Ordering code
CO2/HFC	314 mm / 3/4" NPT	Modulating	No	HBLC-CO2/HFC-3.1-2
CO2/HFC	314 mm / 3/4" BSPP	Modulating	No	HBLC-CO2/HFC-3.1-6
CO2/HFC	314 mm / 3/4" NPT	Modulating	Yes	HBLC/C-CO2/HFC-3.1-2
CO2/HFC	314 mm / 3/4" BSPP	Modulating	Yes	HBLC/C-CO2/HFC-3.1-6
CO2/HFC	314 mm / 3/4" NPT	Stepper	Yes	HBLC/S-CO2/HFC-3.1-2
CO2/HFC	314 mm / 3/4" BSPP	Stepper	Yes	HBLC/S-CO2/HFC-3.1-6

Accessories - Siemens valves MVS661

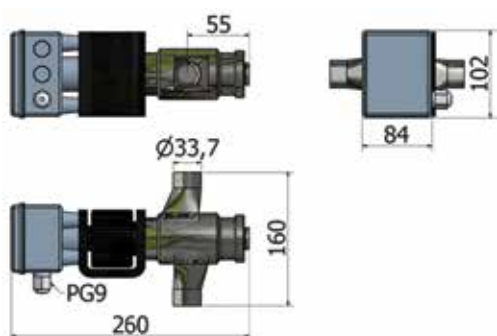


Technical data: MVS661

MVS661 is a modulating valve for the connection to the refrigerant level control sensor type HBLC. It can be used for all refrigerants and has a fast reaction time. The modulating valve require only supply and connection from the HBLC.

- High precision and precise regulation
- Precise positioning
- Feedback signal to central panel about valve positioning
- Fast reaction time
- Proven and reliable design

Mechanical dimensions



Technical data

Power connection		Mechanical specifications	
Loop from HBLC controller	4-20 mA	PN class	PN50 - EN 1333
Connection	3 x Ø20.5 mm	Max. pressure	50 bar
Terminals	Screw terminals max 4 mm ²	Refrigerant temperature	-40...+120°C
Signal output		Mounting	Horizontal or vertical
Positioning	4-20 mA	Weight	5, 17 kg
Load	500 ohm	Protection degree	IP65 - EN 60529
Reaction time	1 s	Pipe connection	Ø33.7/22.4
Approvals		Materials	
EMC	EN61000-6-2/3	Material - liquid parts	Steel / CrNi steel
Protection degree	Class III - EN 60730	Material - sealing	PTFE/CR
UL standard	UL 873		
CSA standard	C22.2 No. 24		

Ordering code

Part number	Kvs [m3/h]	QoE [kW]
MVS661.25-016N	0.16	95
MVS661.25-0.4N	0.40	245
MVS661.25-1.0N	1.00	610
MVS661.25-2.5N	2.50	1530
MVS661.25-6.3N	6.30	3850

QoE = Refrigeration capacity in expansion applications.

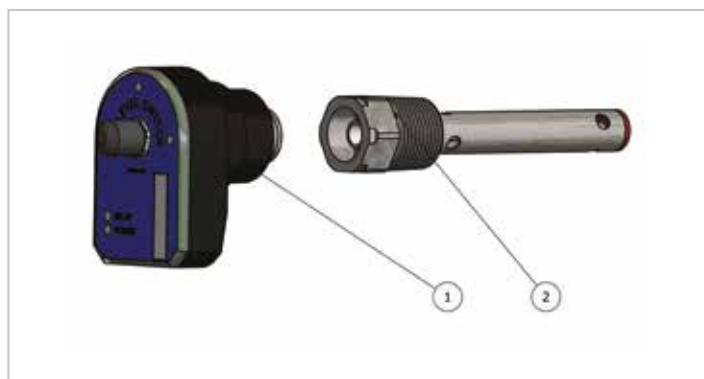
Float regulator cross reference list for Siemens valve types:

Producer	Regulator	Weight	Required installation size	Valve ordering code
Th-Witt	HR1	13 kg	300x390x640 mm	MVS661.25-0.16N
Th-Witt	HR2	23 kg	325x450x880 mm	MVS661.25-1.0N
Th-Witt	HR3	46 kg	432.5x530x1040 mm	MVS661.25-2.5N
Th-Witt	HR4	114 kg	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	WP2HR	26 kg	250x475x960 mm	MVS661.25-1.0N
Th-Witt	WP3HR	61 kg	345x640x1045 mm	MVS661.25-2.5N
Th-Witt	HS31/HS34	49 kg	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS32/HS35	49 kg	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS33/HS36	49 kg	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS41/HS44	94 kg	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS42/HS45	94 kg	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS43/HS46	94 kg	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS51/HS54	118 kg	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	HS53/HS56	118 kg	919x526x1265 mm	MVS661.25-6.3N
Hansen	HT100	NA	191x537x191 mm	MVS661.25-0.16N
Hansen	HT200	NA	321x632x321 mm	MVS661.25-1.0N
Hansen	HT300	NA	375x876x375 mm	MVS661.25-2.5N
Danfoss	HFI 040	41 kg	309x702x219 mm	MVS661.25-1.0N
Danfoss	HFI 050	41 kg	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 060	41 kg	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 070	41 kg	309x702x219 mm	MVS661.25-6.3N

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	¾" NPT / 314 mm/NH3	HBLC-CO2/HFC-3.1-2-MEK
		¾" BSPP / 314 mm/NH3	HBLC-CO2/HFC-3.1-6-MEK
2	Electronic parts	PC-programmable	HBLC-CO2/HFC-EL

Level controller



Functional description:

HBLT-C1 is designed for level control in vessels in industrial refrigeration systems. It can be used in connection with the HBLC-CO₂ analogue level sensor or other similar sensors with a 4-20 mA output signal. To be used in:

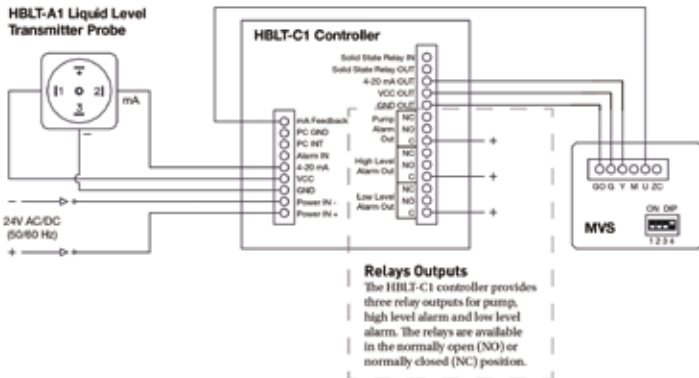
- Pump vessels
- Separators
- Intercoolers
- Economisers
- Condensators
- Receivers



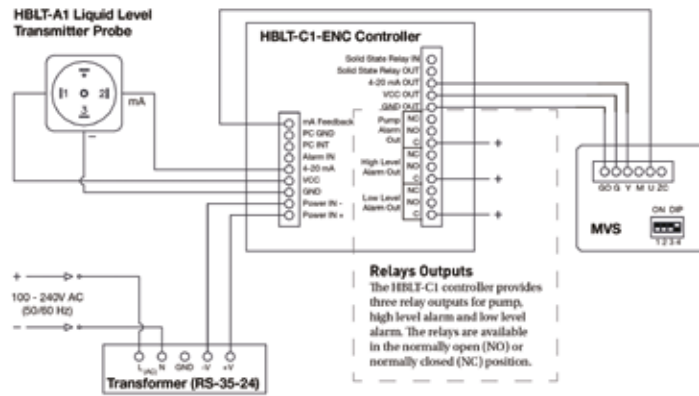
Technical data

	HBLT-C1	HBLT-C1-ENC
Supply		
Voltage	24 V AC/DC \pm 10 %	100..240 V AC
Frequency	50/60 Hz	50/60 Hz
Current draw	Max 40 mA	Max 1.5 A
Connection	Screw terminal	Screw terminal
Wire size	< 2.5 mm ²	< 2.5 mm ²
Installation conditions :		
Surrounding temperature	-20...+70°C	-20...+70°C
Protection class	IP45	IP65
Relative humidity	20...80 %	20...80 %
Approvals:		
EMC Emission	EN61000-3-2	EN61000-3-2
EMC Immunity	EN61000-4-2	EN61000-4-2
GOST R	No 0903044	
Mechanical specifications:		
Mounting	In front of panel	On wall
External measurement	96x96x94 mm (BxHxD)	205x220x140 mm (BxHxD)
Cut-out measurement	92.8x92.8 mm	N.A.
Material	Plastic	Plastic
Weight	0.2 kg	1.4 kg
Display:		
Digit's display	3 digits, red	3 digits, red
Alarm indication	LED (green og red)	LED (green og red)
Programming	From front	From front
Updating	1 time each second	1 time each second
Valve position indication	5 x LED (yellow)	5 x LED (yellow)
Input:		
Analogue input - sensor	4-20 mA	4-20 mA
Analogue input – valve feedback	4-20 mA	4-20 mA
Alarm – max level	Relay – 5...25 V DC	Relay – 5...25 V DC
Output:		
Analogue output	4-20 mA	4-20 mA
Load	3A/24 VDC	3A/24 VDC
Relay output	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A
Solid state output	NC/NO-1A-24V AC/VDC	NC/NO-1A-24V AC/VDC

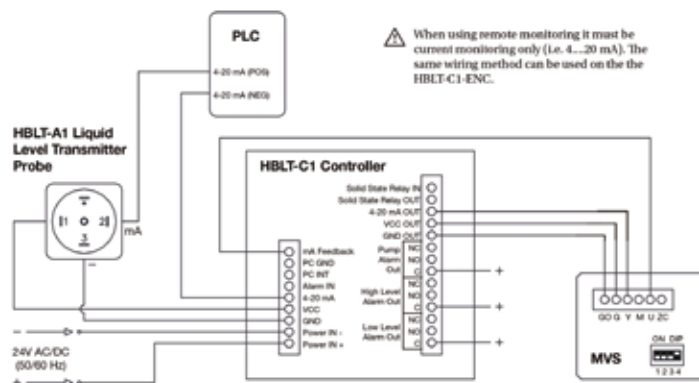
Electrical installations



Wiring Diagram: HBLT-C1 Controller



Wiring Diagram: HBLT-C1-ENC Controller with Enclosure



Wiring Diagram: HBLT-C1/HBLT-C1-ENC Controller with Remote Monitoring

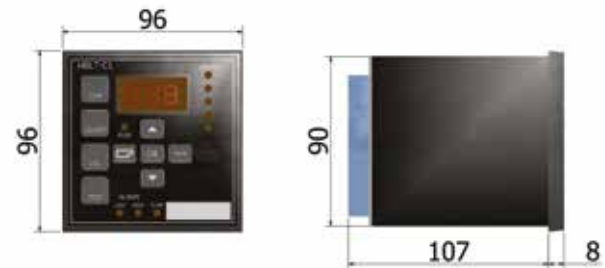
PC GND & PC INT: Has no function in this controller.

Solid state relay IN & Solid state relay OUT: Should only be used when AKVA valve is used.

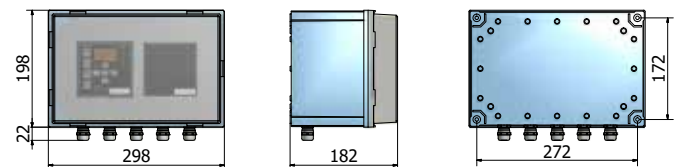
Ordering code

House design	Ordering code
Controller - 24 V AC/DC power supply	HBLT-C1
Controller built in a cabinet and mounted with 100/240 V power supply	HBLT-C1-ENC

Mechanical dimensions

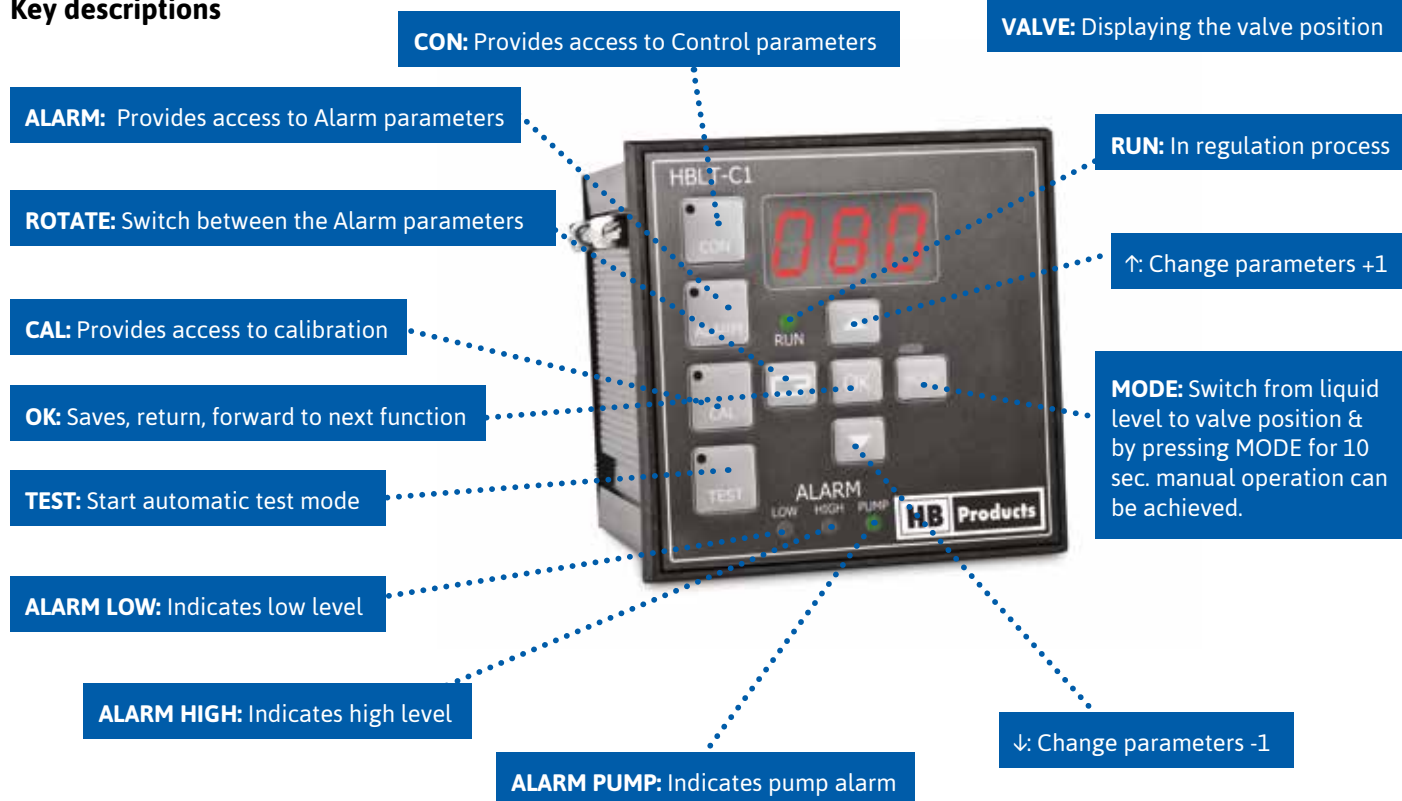


HBLT-C1



HBLT-C1-ENC

Key descriptions



Operation menu:

Control Parameters	Alarm Parameters	Calibration Menu	Manual Operation
Setpoint	Low alarm	Min calibration	Max calibration
P-band	Hysteresis low alarm		
Level LP/HP	High alarm		
Start- up Ramp	Hysteresis high alarm		
Valve damping	Pump alarm		
AKVA settings	Hysteresis pump alarm		

Change to next parameter:

OK: Saves , return, forward to next function

Change parameters

↓: Change parameters +1
↑: Change parameters -1

Manual operation:

MODE – press in 10 sec and set the required level at start up. Press any button to leave manual operation.

Calibration:

Detailed information's on calibration function are available in Instruction manual.

Pressure sensor

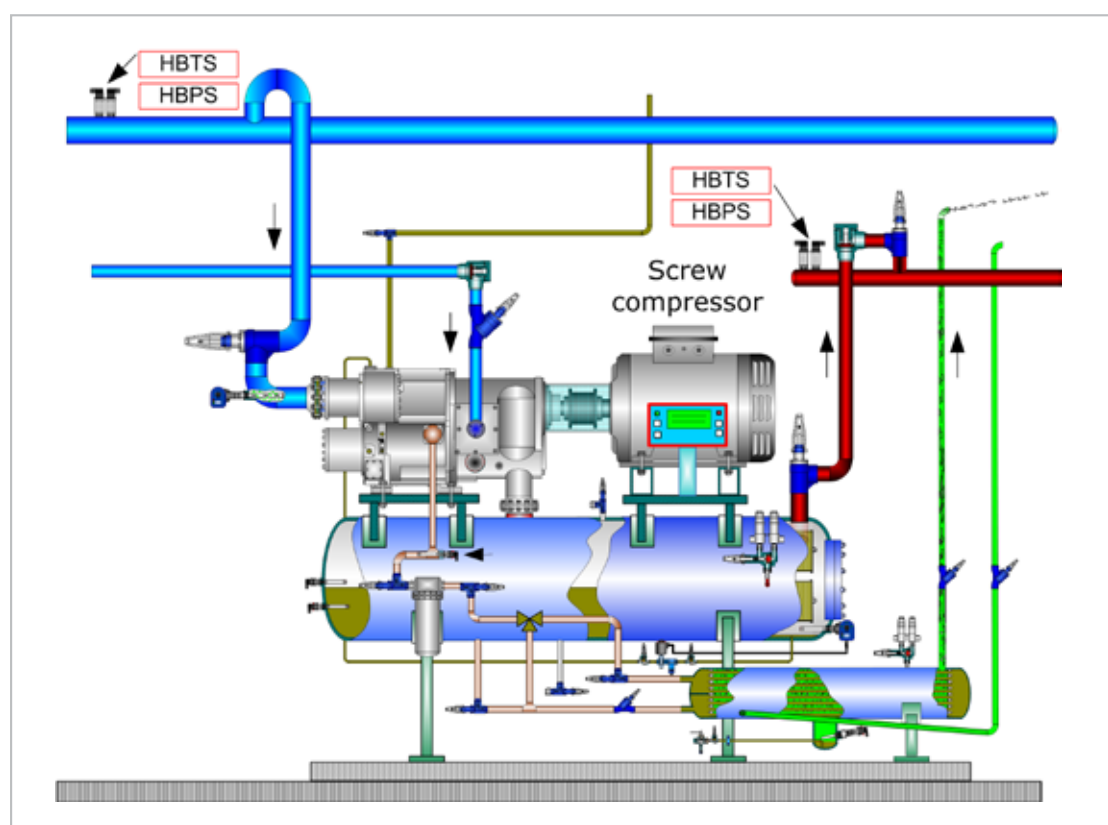


Functional description:

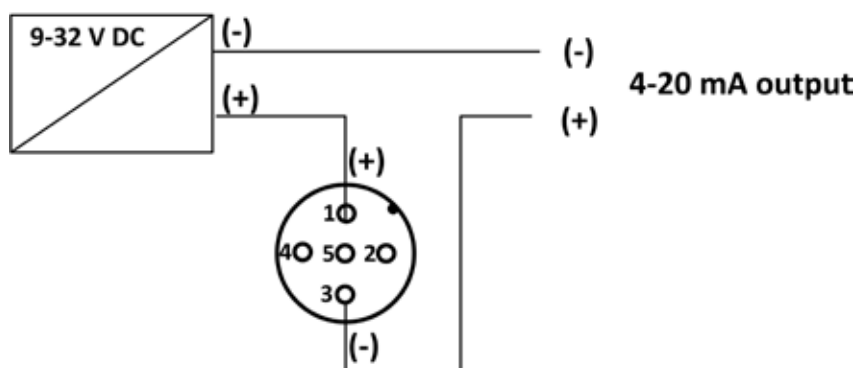
HBPS is a pressure sensor that is specially developed for the refrigeration industry. The sensor has a stainless membrane, and the housing is also made of stainless steel. It has a quick reaction time of < 1 s, and it is accessible in 2 pressure ranges of -1...25 bar and -1...200 bar.

Technical data

Power supply		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	G 1/4" - Form E
Power supply	9...32 V DC	Material – liquid parts	AISI 304
Analogue output	4...20 mA	Material – electronic parts	AISI 304
Pin surface treatment	Gold		
Connection	2-wire		
Environmental conditions		Approvals	
Ambient temperature	-40...+105°C	EMC	EN 61000-2
Refrigerant temperature	-40...+125°C	Accessories	
Max pressure	-1...25 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



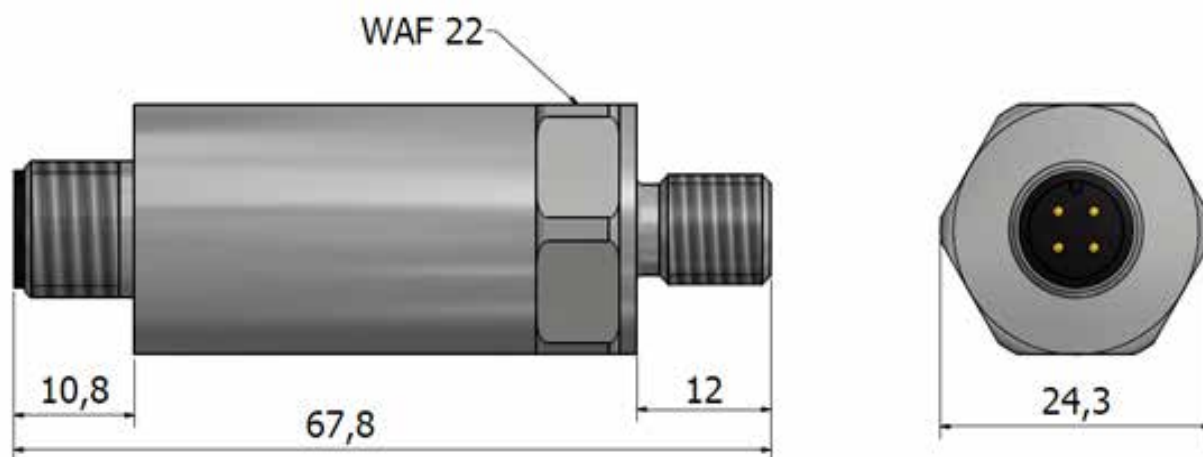
Electrical installations



Ordering code

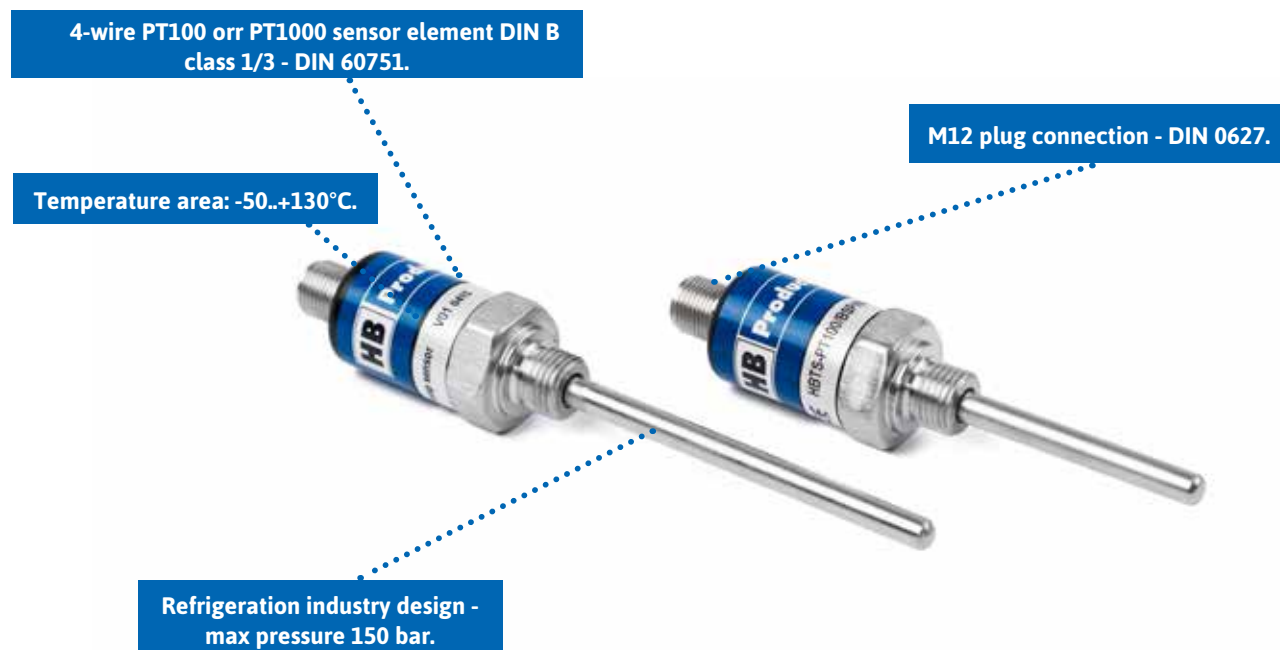
Pressure range	Thread type	Ordering code
-1...200 bar	1/4" G - Form E	HBPS-200-1/4

Mechanical dimensions





Temperature sensor

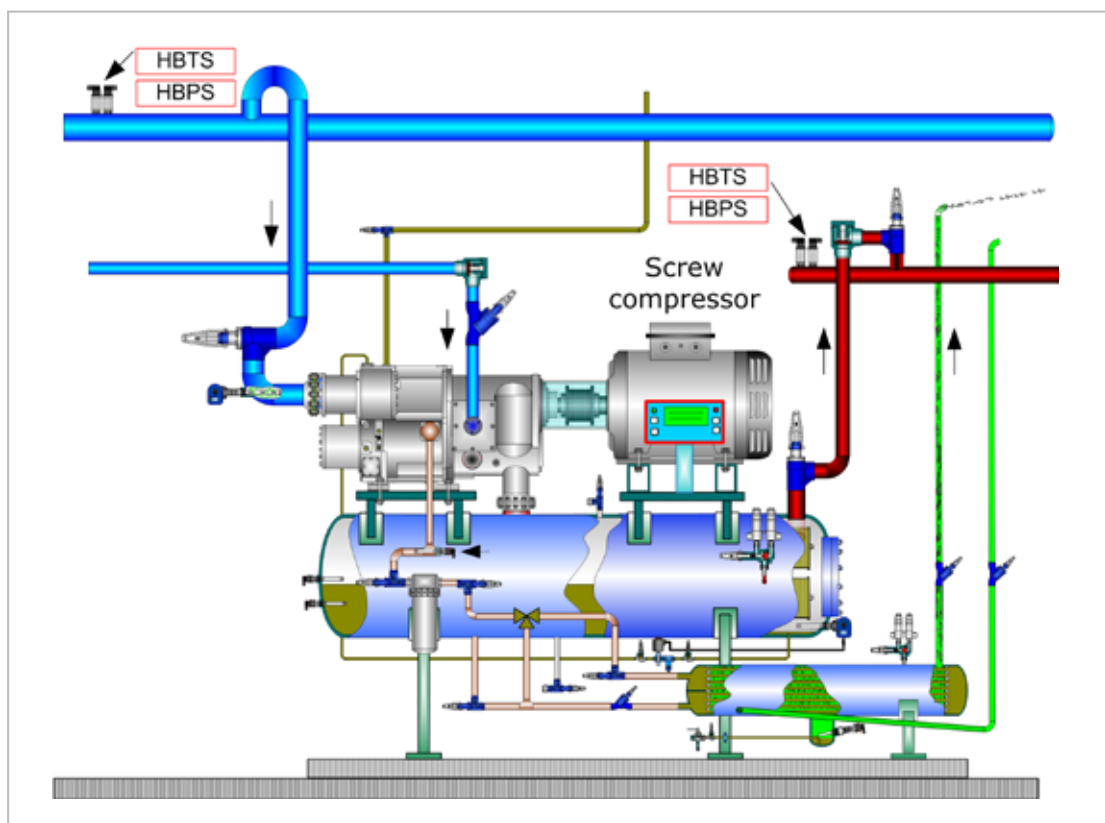


Functional description:

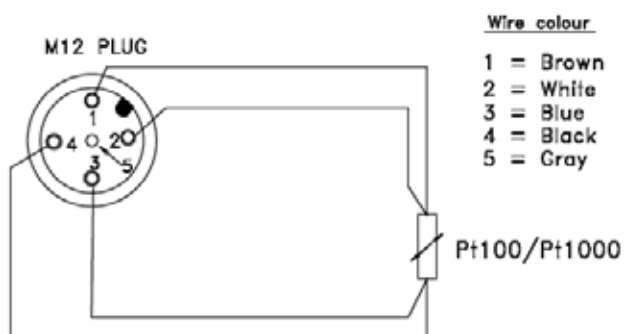
HBTS is a temperature sensor in accordance with DIN 60751, and it is available in two variants, PT100 and PT1000 – DIN B – class 3. The sensor is designed for the refrigeration industry where servicing of the electronics can be carried out without emptying the system of refrigerant. The sensor is delivered with a 60 & 90 mm sensor element length and a 6 mm sensor diameter.

Technical data

Electrical specifications		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	1/4" NPT or BSPP
Sensor element	PT100 / PT1000	Material – liquid parts	AISI 304
Sensor class	DIN B - KL 1/3	Material – electronic parts	Plast
Sensor design	4 wire	Sensor element	Ø6 - 60 / 90 mm
Environmental conditions		Approvals	
Ambient temperature	-30...+85°C	EMC	EN 61000-2
Refrigerant temperature	-50...+130°C	Accessories	
Max pressure	150 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



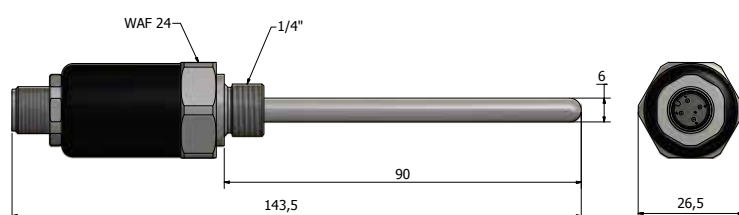
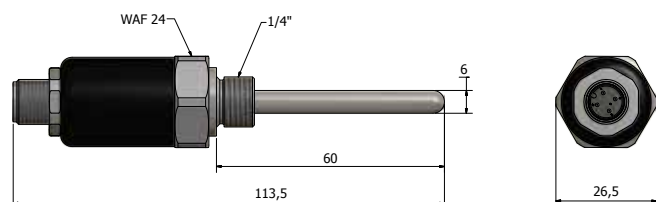
Electrical installations



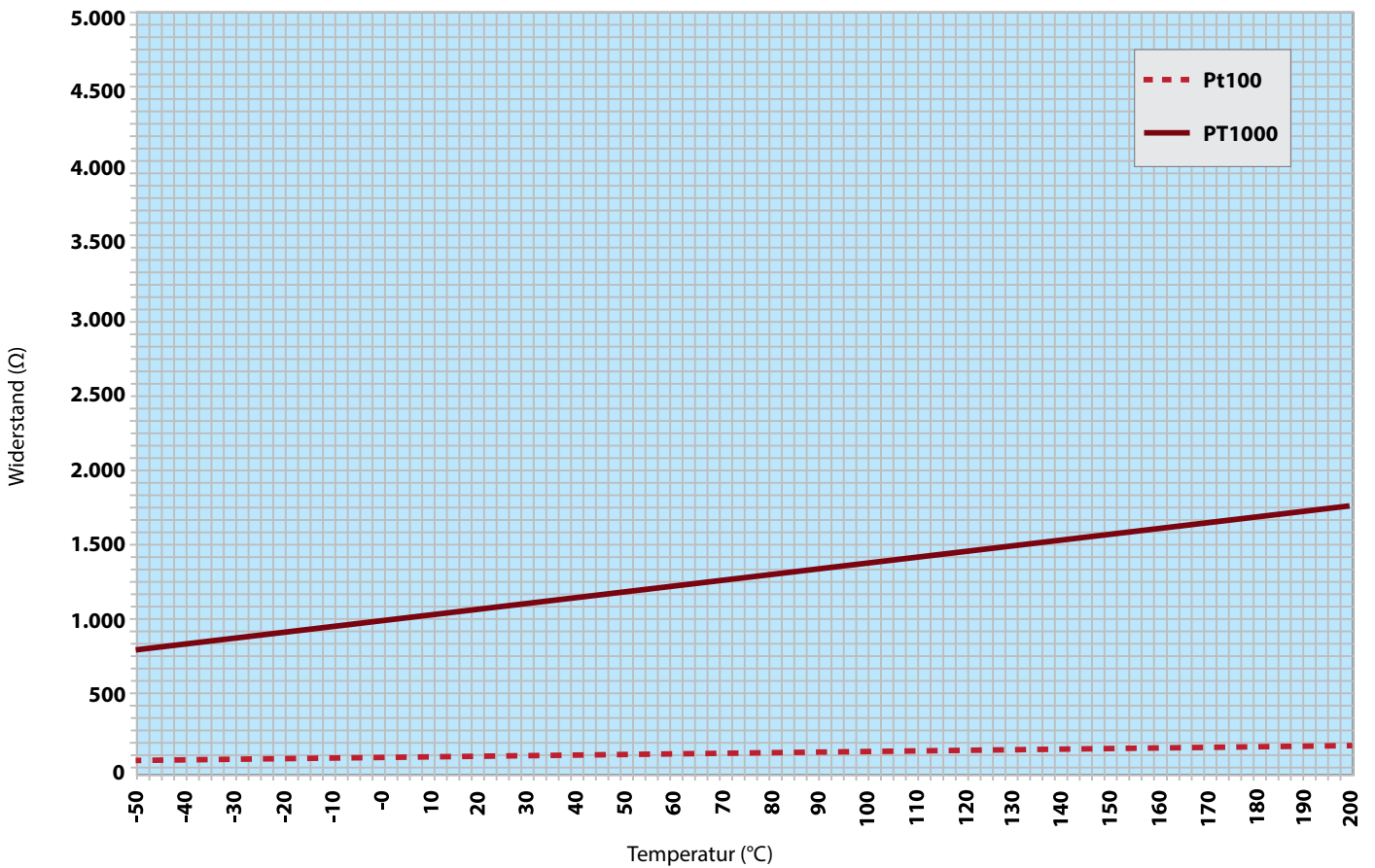
Ordering code

Sensor type	Sensor length	Thread type	Ordering code
PT100	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT100	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT100	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT100	90 mm	1/4" BSPP	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" BSPP	HBTS-PT100/NPT/90

Mechanical dimensions



Temperature area - PT100/PT1000

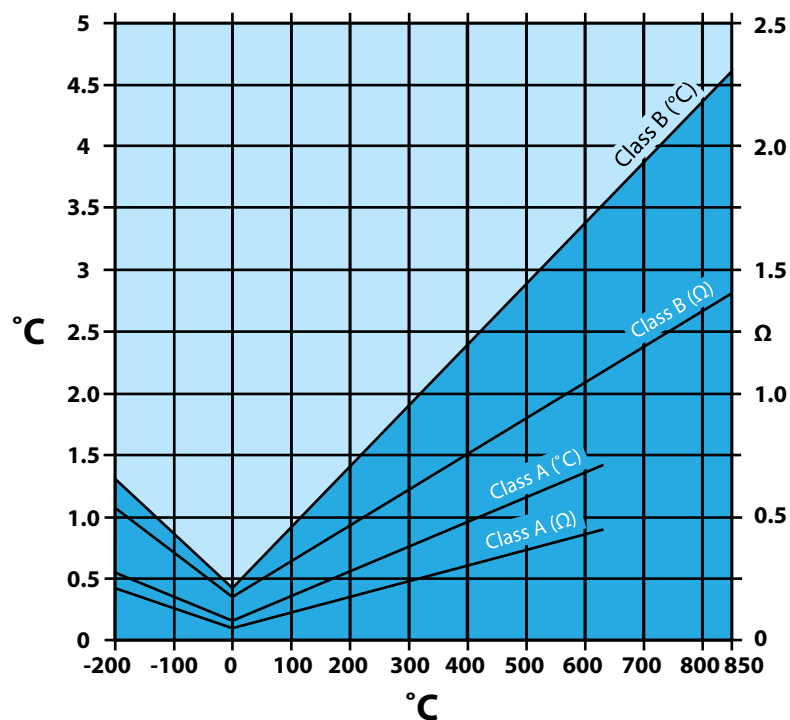


Tolerances for Ω thermometers

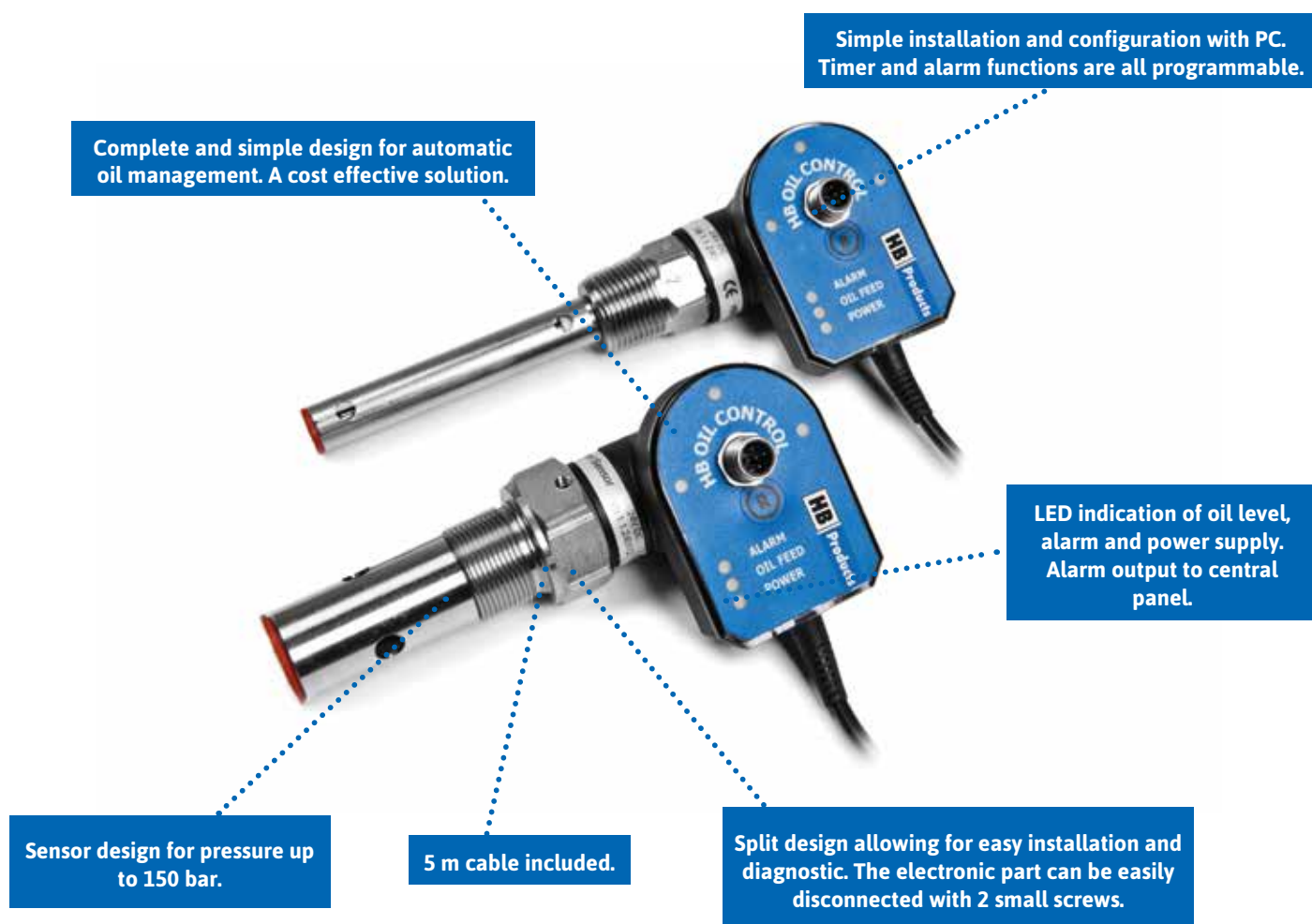
Tolerance values as a function of temperature
for 100 Ω thermometers

Tolerances for Ω thermometers

temp °C	class A ±°C ±Ω	class B ±°C ±Ω
-200	0.55 0.24	1.3 0.56
-100	0.33 0.14	0.8 0.32
0	0.15 0.06	0.3 0.12
100	0.35 0.13	0.80 0.30
200	0.55 0.20	1.3 0.48
300	0.75 0.27	1.8 0.64
400	0.95 0.33	2.3 0.79
500	1.15 0.38	2.8 0.93
600	1.35 0.43	3.3 1.06
700	- -	3.8 1.17
800	- -	4.3 1.28
850	- -	4.6 1.34



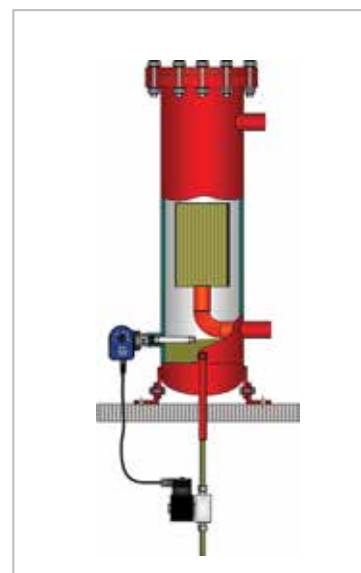
Oil level controller / Management



Functional descriptions:

HBOC is an intelligent sensor with a built-in microprocessor. It is designed to detect and control oil levels in oil separators and compressors.

Apart from the sensor function, it also has a built-in controller. The controller can be setup with all the parameters that are necessary to directly regulate a solenoid valve for oil level control.



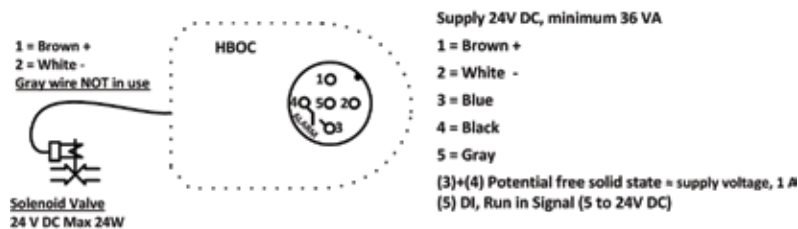
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V DC + 10%	Thread connection	See ordering code
Power consumption	20mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
On/Off	Time	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Power, control, alarm	Max pressure	150 bar
Max. load	24 W	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Compressor adaptor	HBS/ADAP/FLANGE/UNI
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Technical data - valve regulation

Valve control	
Signal to valve	ON/OFF
Valve regulation	Time-regulation
Cable specification (valve control)	
Length	3 m (118")
Cable size	3 x 0.75 mm ²
Cable glands	PG7 / M8

Electrical installation



Ordering code

House design	Thread type	Ordering code
Angle	1/2" NPT	HBOC/-1
Angle	3/4" NPT	HBOC/-2
Angle	1 1/8 UNEF	HBOC/-7

To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Accessories



Technical data: V150

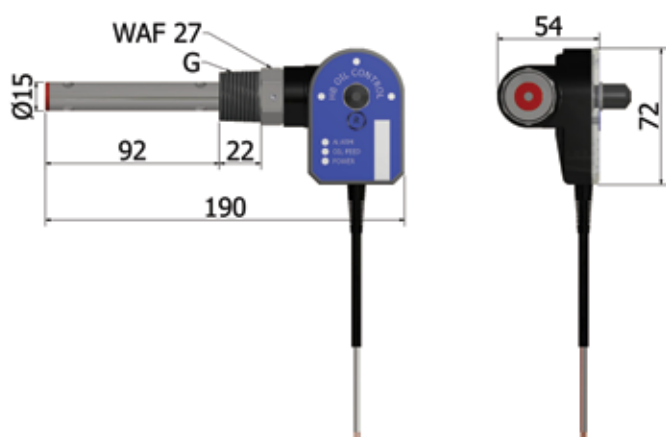
V150 is designed for connection to HBOC in compressor and oil-separator installations. The solenoid valve is controlled directly from the HBOC controller. V150 has a design pressure up to 100 bar.

- Direct control from the HBOC sensor control in CO₂ applications
- House produced in brass
- Fast reaction time
- Reliable design

Installations conditions		Mechanical specifications	
Ambient temperature	-10...+100 °C	Thread size	G 1/8" - ISO 228/1
Max. pressure	150 bar	Material - housing	Brass
Liquid	Oil	Material - sealing	PTFE
Max. viscosity	21 cSt	Outside dimension	24,4x54,5x30 mm
Flow		Weight	200 g
Theoretical flow	0,25 l/min	Valve design	Direct / NC
Connection		Ordering code	
Plug type*	ISO 4400 - 4 pins	150 bar	Solenoid - V150-CO2
Energy consumption - V150	6 W		

* Plug included

Mechanical dimensions

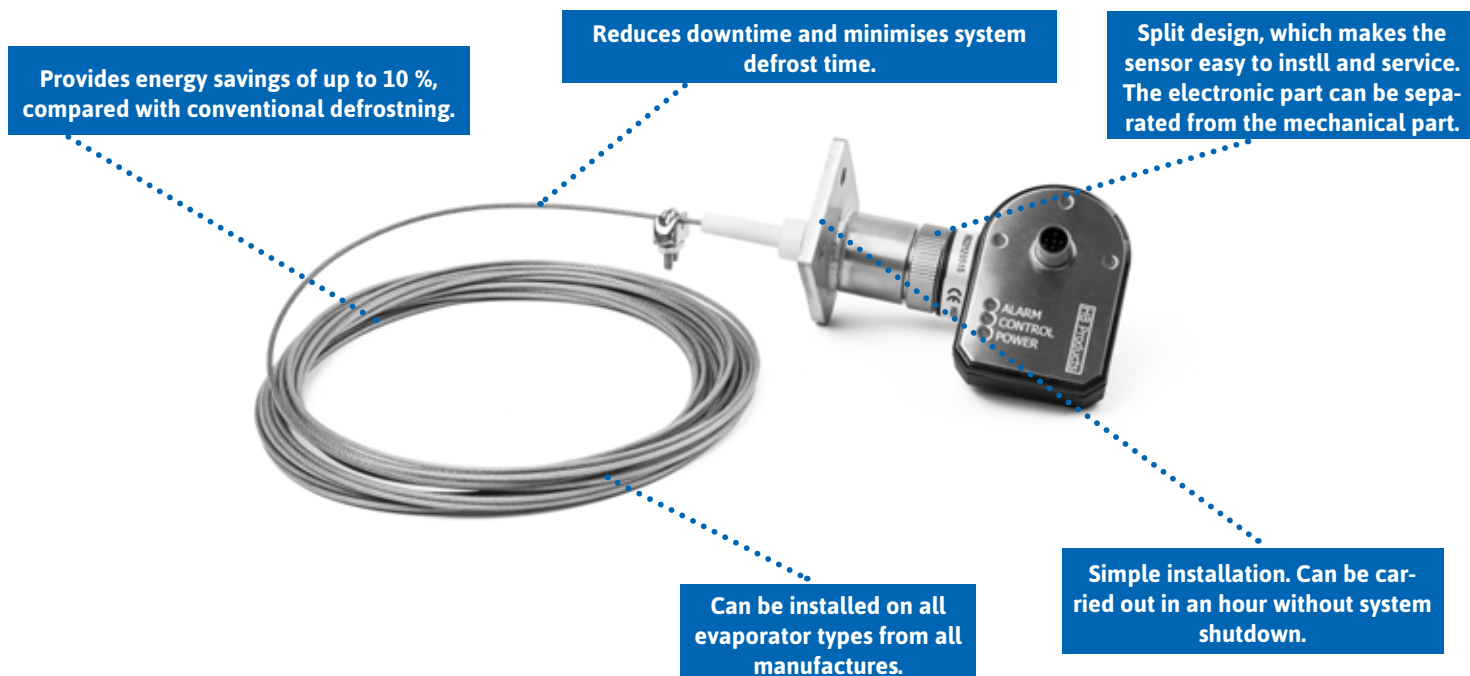


Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		1 1/8 UNEF	HBSO1-MEK-7
2	Electronic part	PC-programmable	HBOC/C-EL

Defrost sensor



Functional description:

HBDF is a simple solution for energy-optimal automatic defrosting of evaporators. It results in energy savings of approximately 10%, thus quickly recouping its cost. The sensor measures the thickness of ice deposits between the fins and sends a 4..20mA signal to the system's PLC. The 4 mA signal is emitted when the evaporator is free of ice. The defrost point is set according to the evaporator type and the amount of moisture, and it is determined based on a visual assessment of the ice deposits on the evaporator.

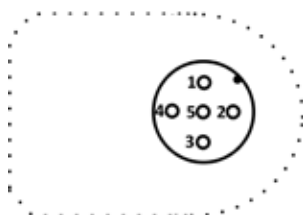
The sensor can be installed in less than one hour, on both new and old evaporators. It can be installed when the system is in operation, and therefore, system shutdown is not necessary. The electronic part is mounted on the evaporator's frame using 2 screws. The mechanical part consists of a thin Teflon-coated wire, which is installed between the fins of the evaporator. HBDF is available in 3 variants, with a 10m, 20m, and 30m wire respectively.

After installation, the sensor is calibrated/configured to the evaporator it is mounted on. This is done using a PC-based software tool, which can be downloaded via this link.

Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Flange connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature*	-50...+80°C
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Splitterbox	HBxC-Splitbox
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Electrical installation



- 1 = Brown [Supply + 24 V AC/DC]
- 2 = White [Supply – 24 V AC/DC]
- 3 = Blue [not in use]
- 4 = Black [AO, analogue output 4-20 mA]
- 5 = Gray [DI, Calibration Signal (5 to 24V DC)]

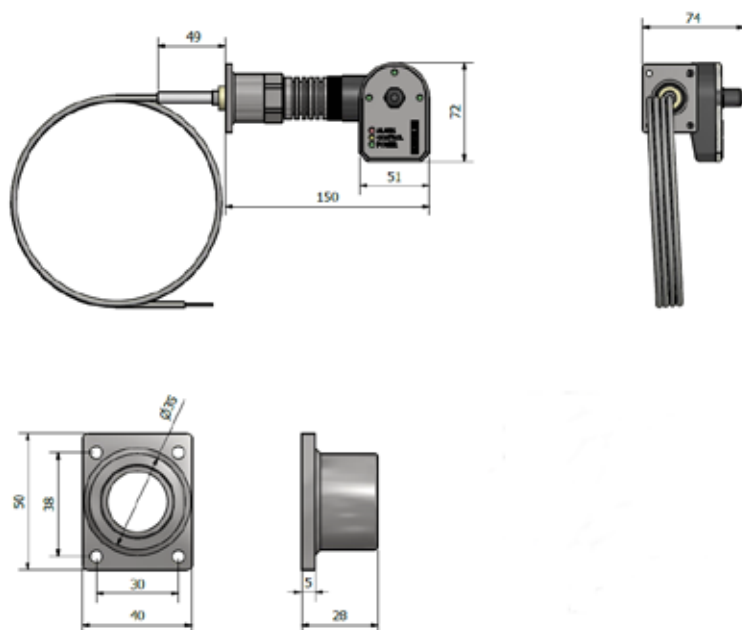


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

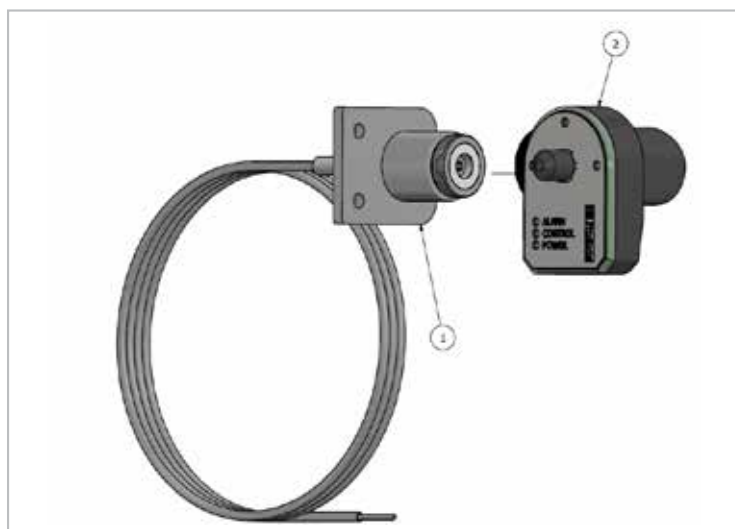
Ordering code

Wire length	Ordering code
10 m	HBDF-10M
20 m	HBDF-20M
30 m	HBDF-30M

Mechanical dimensions



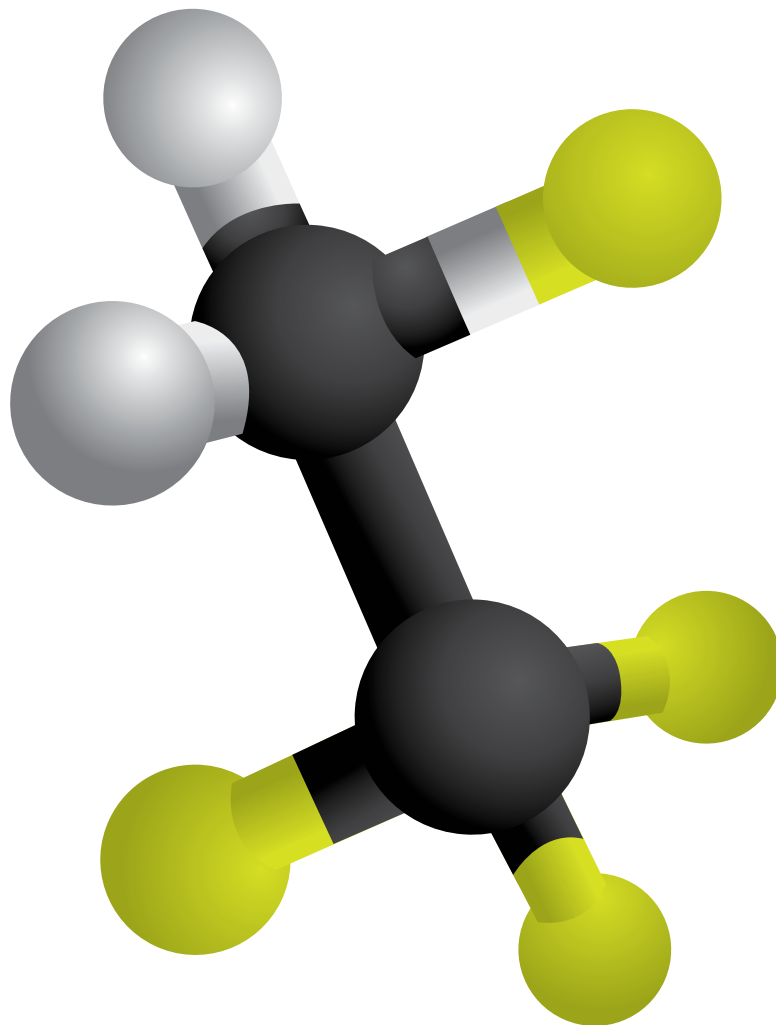
Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBDF-EL
2	Mechanical parts	10m	HBDF-10M-MEK
		20m	HBDF-20M-MEK
		30m	HBDF-30M-MEK



HFC



Switches, sensor and controls for HFC industrial refrigeration installations

ON/OFF switches

HFC liquid

Function: HFC liquid switch

Application: Level switch in tanks

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: PNP/NPN – 1A



Page 176

Function: HFC liquid switch

Application: Level switch in tanks

Temperature: -30...+80°C

Supply: 90...240 V AC

Output: Solid state relay – 1A



Page 180

Function: HFC liquid switch

Application: Level switch in flow freezers

Temperature: -60...+80°C

Supply: 24 V DC

Output: Solid state relay



Page 184

HFC GAS

Function: HFC gas switch

Application: Compressor protection sensor

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: PNP/NPN – 1A



Page 188

Oil

Function: Oil switch

Application: Compressor crankcases, oil collectors/tanks & oil separators.

Temperature: -30...+80/120°C

Supply: 24 V AC/DC

Output: PNP/NPN – 1A



Page 192

Function: Oil switch

Applications: Compressor crankcases, oil collectors/tanks & oil separators.

Temperature: -30...+80/120°C

Supply: 90...240 V AC

Output: Solid state relay



Page 196

Sensor and controls

HFC liquid

Function: HFC level sensor

Applications: Level measurement in standpipes

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA / PNP-1A



Page 200

Function: HFC level sensor

Applications: Level measurement in standpipes

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA



Page 204

Function: Intelligent "Float level regulation"

Applications: Float regulation in e.g. chillers

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA / PNP-1A



Page 208

Function: Level controller

Applications: Level control on e.g. pump separators

Temperature: -30...+80°C

Supply: 24 V AC/DC / 100-240 V AC

Output: 4...20 mA / 3x solid state relay - 3/5A



Page 214

Function: Pressure sensor

Applications: Pressure measurement in refrigeration systems

Temperature: 40...+125°C

Supply: 9...32 V DC

Output: 4...20 mA



Page 218

Function: Temperature sensor

Applications: Temperature measurement in refrigeration systems

Temperature: -50...+130°C

Output: PT100 / PT1000



Page 222

Oil

Function: Oil level controller

Applications: Oil separator, oil tanks, oil purgers or compressors

Temperature: -30...+80°C

Supply: 24 V DC

Output: Solid state relay



Page 226

Gas

Function: Gas quality sensor/controller

Applications: Gas quality measurement

Temperature: -30...+80°C

Supply: 24 V AC/DC

Output: 4...20 mA / PNP-1A



Page 230

Ice

Function: Ice thickness sensor

Applications: Evaporator - Defrost on demand.

Temperature: -60...+80°C

Supply: 24 V DC

Output: 4...20 mA



Page 234

HFC Refrigerant switch - 24 V AC/DC

Clear indication with LED when refrigerant is detected.

24 V AC/VC voltage supply.

Designed for the industrial refrigeration industry - max pressure 100 bar.

Proven sensor technology for simple transistor output PNP/NPN and NO/NC output function.

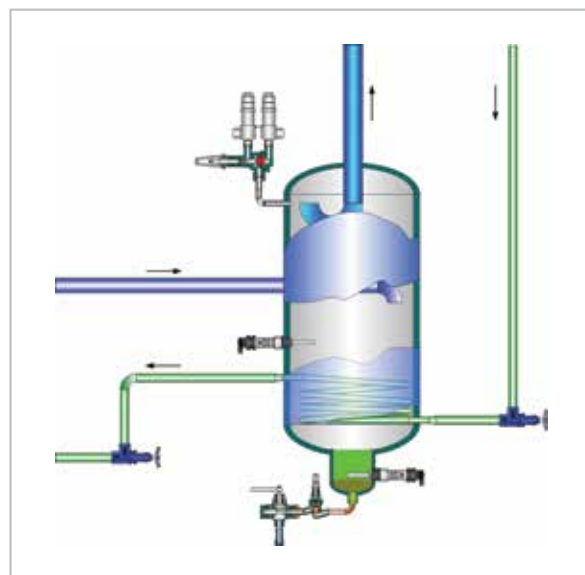
Split design which allows for easy installation and diagnosis. The electronic part can be easily disconnected by 2 screws.

Functional description

HBSR is a level switch for the detection of HFC refrigerants.

Typically it is installed in/on the refrigerant vessels, pump separators, economisers or heat exchanger.

The sensor is specially built to resist high pressure and low temperatures.



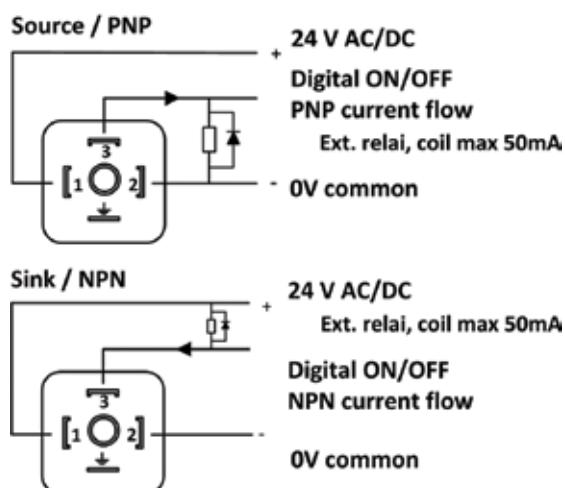
Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C**
LED indication	4 x red	Max pressure	100 bar
Cable specification*		Protection degree	
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included.

** Max temperature specified for R134a. For R410a, R507 and R22 the max temperature is +40 °.

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

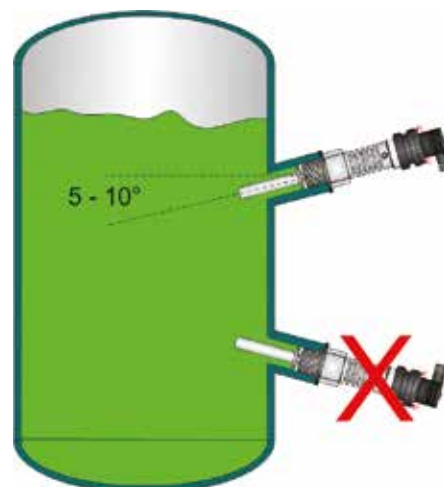
NC: no signal when it is red

NO: signal when it is red

4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type	Ordering code
PNP / NO	3/4" NPT	HBSR-HFC-PNP/NO-2
PNP / NC	3/4" NPT	HBSR-HFC-PNP/NC-2
PNP / NO	3/4" BSPP	HBSR-HFC-PNP/NO-6
PNP / NC	3/4" BSPP	HBSR-HFC-PNP/NC-6
NPN / NO	3/4" NPT	HBSR-HFC-NPN/NO-2
NPN / NC	3/4" NPT	HBSR-HFC-NPN/NC-2
NPN / NO	3/4" BSPP	HBSR-HFC-NPN/NO-6
NPN / NC	3/4" BSPP	HBSR-HFC-NPN/NC-6

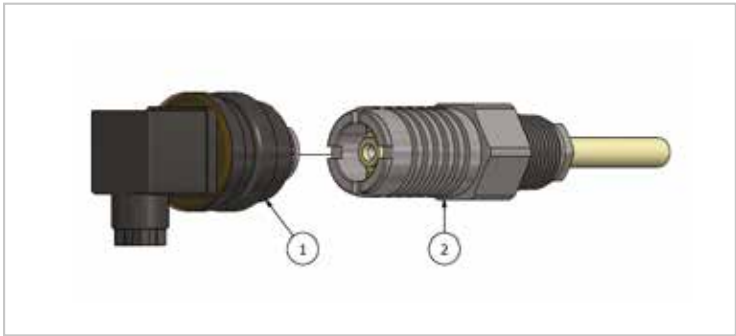


Mechanical dimensions



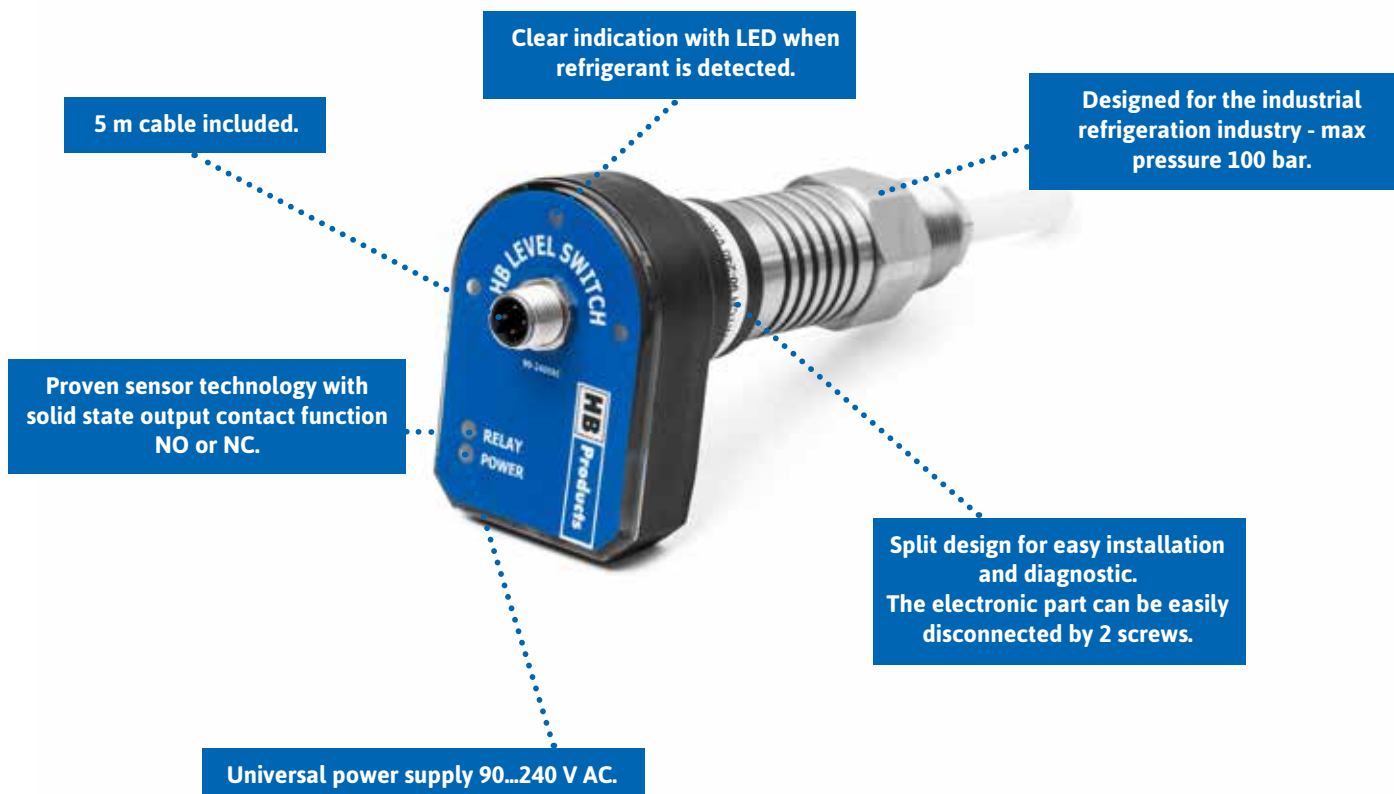
Thread to be sealed with conductive liquid sealing to ensure ground connection.

Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PNP/NO	HBSR-HFC-EL/PNP/NO
		PNP/NC	HBSR-HFC-EL/PNP/NC
		NPN/NO	HBSR-HFC-EL/NPN/NO
		NPN/NC	HBSR-HFC-EL/NPN/NC
2	Mechanical part	¾" NPT	HBSR-MEK-2
		¾" BSPP	HBSR-MEK-6

HFC Refrigerant switch - 90...240 V AC



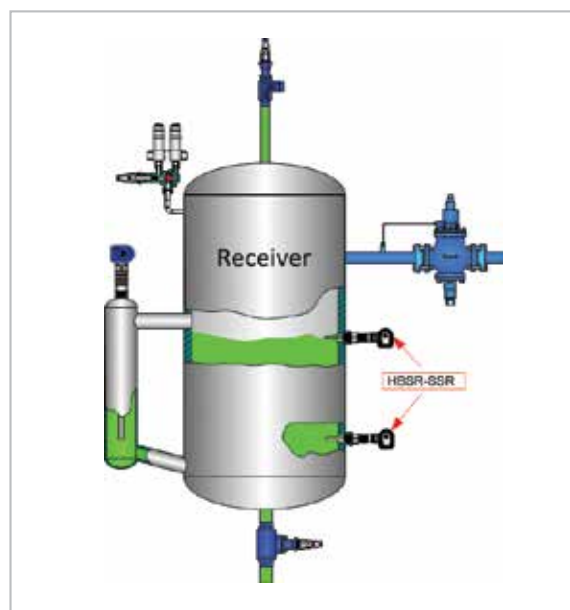
Functional description

HBSR is a level switch for the detection of HFC refrigerants.

Typically it is installed in/on the refrigerant vessels, pump separators, economisers or heat exchanger.

The sensor is specially built to resist high pressure and low temperatures.

The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.

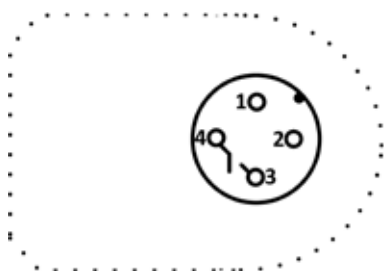


Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C*
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

* Max temperature specified for R134a. For R410a, R507 and R22 the max temperature is +40 °.

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

1 = Brown: 90...240 V supply

2 = White : 90...240 V supply

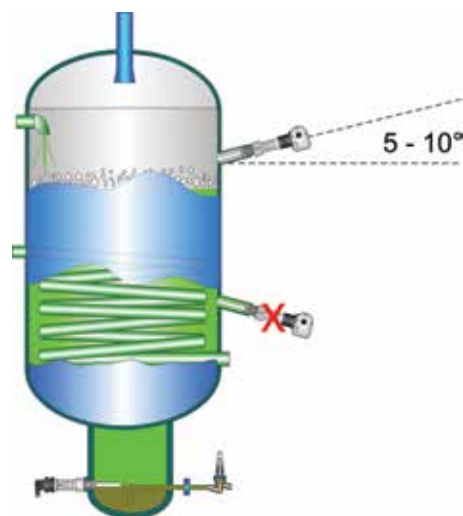
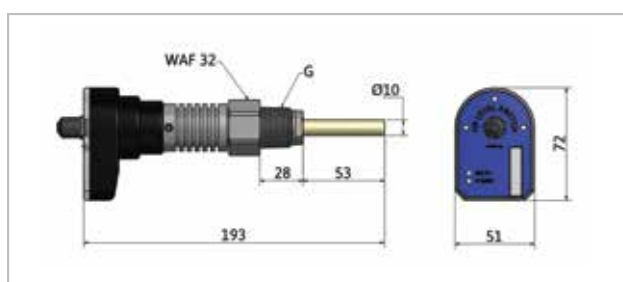
3 = Blue: SSR output – max 240 V AC

4 = Black: SSR output – max 240 V AC

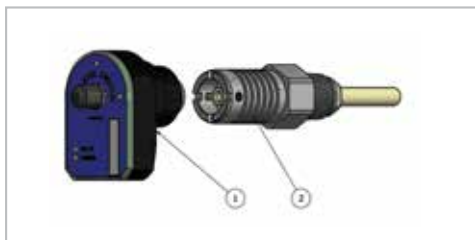
Ordering code

Output	Thread type	Ordering code
Solid state relay - NO	3/4" NPT	HBSR-HFC-SSR-2/NO-2
Solid state relay - NO	3/4" BSPP	HBSR-HFC-SSR-2/NO-6
Solid state relay - NC	3/4" NPT	HBSR-HFC-SSR-2/NC-2
Solid state relay - NC	3/4" BSPP	HBSR-HFC-SSR-2/NC-6

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	NO	HBSR-HFC-SSR-2/NO-EL
		NC	HBSR-HFC-SSR-2/NC-EL
2	Mechanical part	3/4" NPT	HBSR-MEK-2
		3/4" BSPP	HBSR-MEK-6

Ice proof switch

Split design that makes it possible to mount and perform a diagnostic without emptying the tanks for refrigerant. The electronic part can be dismounted simply by turning two small screws.

Reliable design with electronic solid state output and contact function NO or NC.

Clear LED indication at level detection.

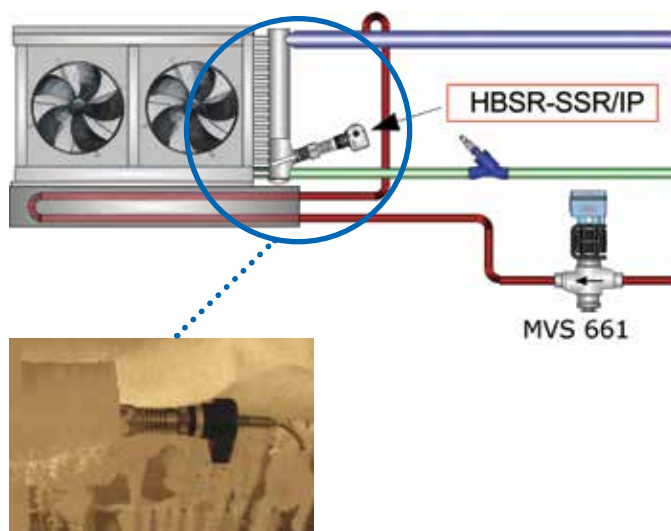
Designed for the industrial refrigeration industry - max pressure up to 100 bar.

5 m cable included.

Installation temperature: -60°C.

Functional description

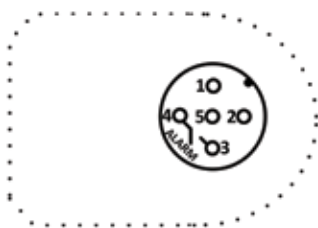
HBSR-SSR-1/IP is a level switch for detecting liquid in refrigeration systems. Typically, it is installed in/on the receiver, but it is also suited for installation in other locations where a level indication is required. The sensor's measurement principle makes it unique for these purposes, since the properties of the measurement principle as well as its special construction allows it to withstand high pressure and low refrigerant temperatures.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V DC	Thread connection	3/4" NPT
Power/current consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	210x52x40
Output		Environmental conditions	
Output type	PNP-1 A	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-60...+80°C
LED indication	3 x green	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply 24V DC

1 = Brown +

2 = White -

3 = Blue - Potential free solid state, 1 A

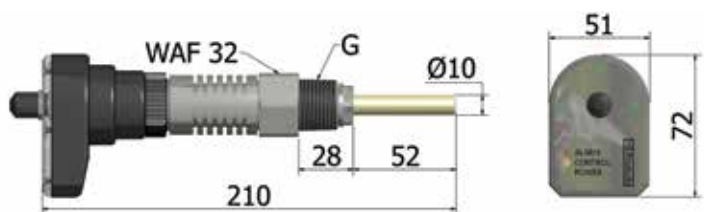
4 = Black - Potential free solid state, 1 A

5 = Gray Not in use (data only)

Ordering code

Output	Thread type	Ordering code
NC / NO - programmable	3/4" NPT	HBSR-SSR-1/IP

Mechanical dimensions

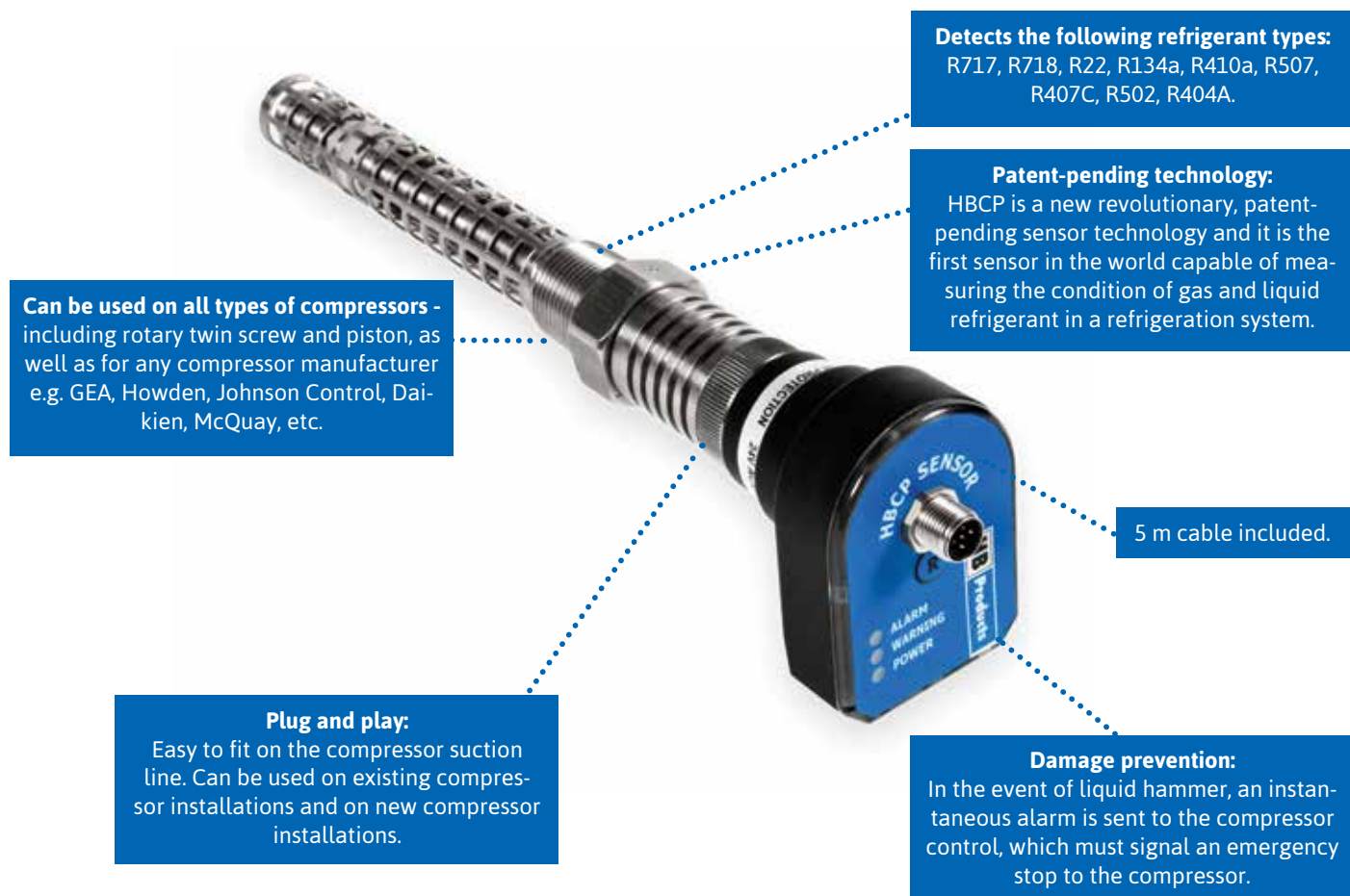


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBSR-SSR-1/IP-EL
1	Mechanical part	¾" NPT	HBLC-R-IP-MEK

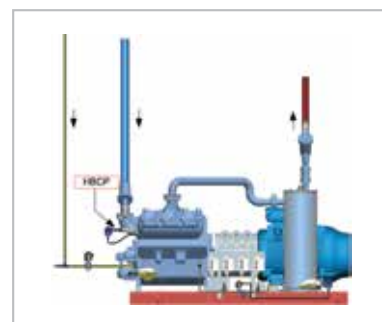
Compressor protection



Functional description

HBCP is a new revolutionary, patent-pending sensor technology and it is the first sensor in the world capable of measuring the condition of gas and liquid refrigerant in a refrigeration system. HBCP is used for detecting gas quality at the intake found on refrigeration compressors. The sensors thereby ensure that liquid refrigerant does not enter the compressor, causing damage to the moving parts.

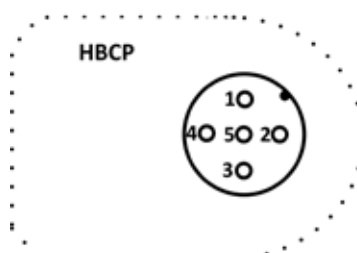
The sensor has a high sensitivity and even detects small liquid droplets before they become critical to the compressor. The sensor has a uniquely low reaction time, and thereby ensures that the compressor is not damaged. In the event of liquid hammer, an instantaneous alarm is sent to the compressor control, which must signal an emergency stop to the compressor. The sensor measures the total gas and liquid capacity, which is displayed in pF.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC	Thread connection	3/4" NPT / BSPP
Power/current consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	PNP-1 A	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature*	-50...+80°C
LED indication	Alarm, warning, power	Max pressure	100 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance**	500 Ω/Km		
Approvals			
CE	EN 61000-2		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBCP software		

Electrical installation



Supply 24V AC/DC

1 = Brown +

2 = White -

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

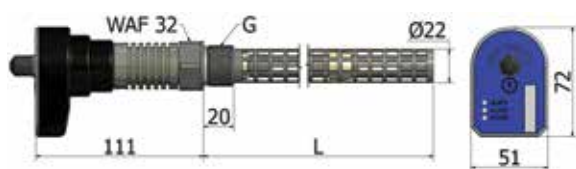


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

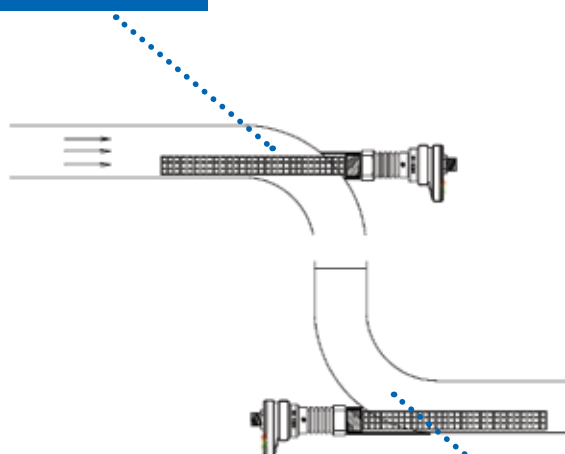
Pipe size (compressor line)	Length (L)	Connection	Ordering code
< 2"	150 mm	3/4" NPT	HBCP-1.5-2
< 2"	150 mm	3/4" BSPP	HBCP-1.5-6
> 2"	300 mm	1" NPT	HBCP-3-9
> 2"	300 mm	1" BSPP	HBCP-3-8

Mechanical dimensions



Installation guide lines

Countercurrent flow installation



Countercurrent flow installation

Tab "Edit configuration"

Configuration of sensor

Configuration of sensor parameters:

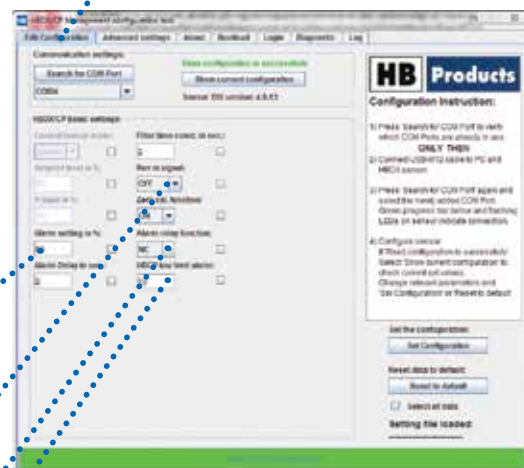
Delivered as a Plug & play solution.

Type of alarm output can be set – NO/NC.

Sensor can be activated or deactivated from external panel.

Sensitivity is factory set. In 99% of the cases it will not require to be set by the customer.

Setup	Factory settings	Configuration options
Alarm setting in %	50 %	0...100 %
Alarm delay	2 s	0...600 s
Filter time constant	2	0...100
Run in signal	OFF	ON / OFF
Zero cal. function	OFF	ON / OFF
Alarm relay function	NC	NC / NO
HBCP low limit alarm	20 %	0...100 %

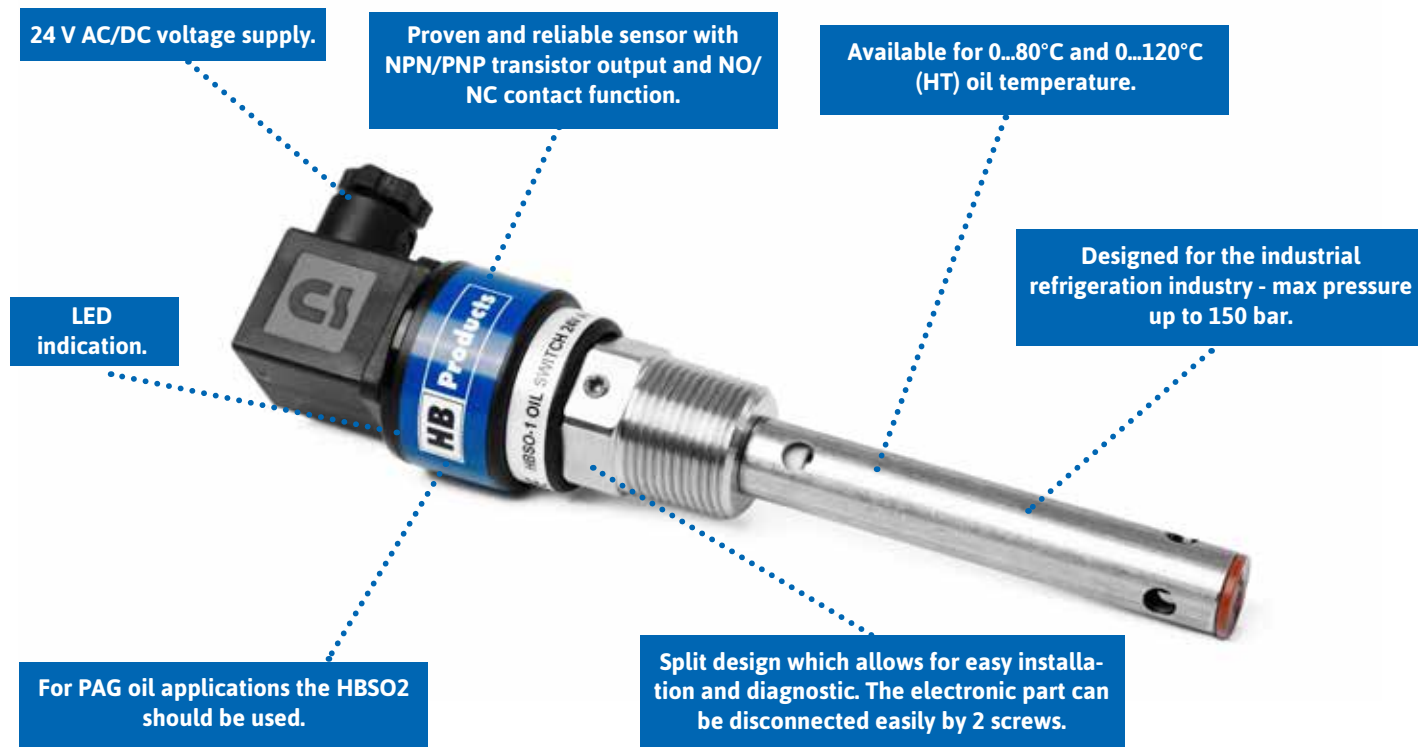


Spare parts



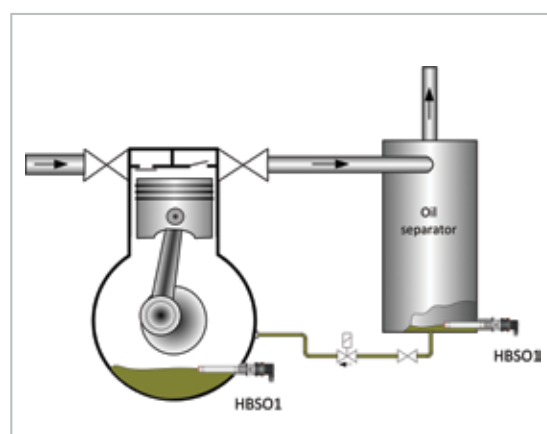
Position	Specification	Type	Ordering code
1	Electronic parts	PC-programmable	HBCP-EL
2	Mechanical parts	3/4" NPT	HBCP-2-MEK
		3/4" BSPP	HBCP-6-MEK
		1" NPT	HBCP-9-MEK
		1" BSPP	HBCP-8-MEK

Oil switch - 24 V AC/DC



Functional description:

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.

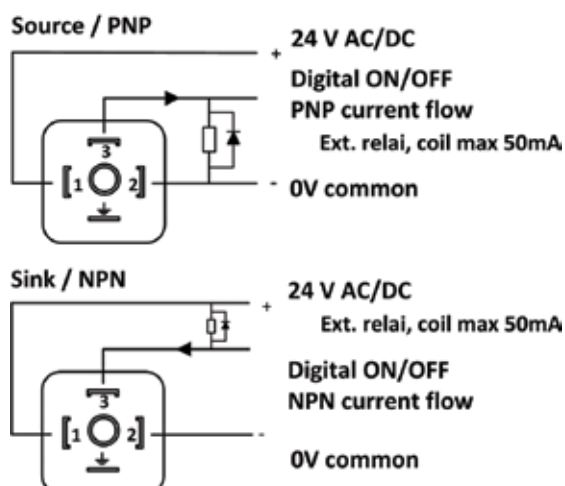


Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT / BSPP
Power/current consumption	< 10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Output type	PNP or NPN - 50 mA	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	4 x red	Max pressure	150 bar
Cable specification*		Protection degree	IP65
Cable size	3 x 0.34 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		

* Cable not included.

Electrical installation



Sensor relay specifications:

- A) Voltage: 24 V,
- B) Max coil resistant: 475 ohm
- C) Coil effect: 1.2 W

Example on relay types:

- SCHRACK type MT221024
- OMRON type G22A-432A

Function of charge output on pin 3 & 4

NC: no signal when it is red

NO: signal when it is red

4 x LED are always activated when approximately half of the sensor is covered or immersed in ammonia

Ordering code

Output	Thread type	Ordering code
PNP / NO	1/2" NPT	HBSO1-PNP/NO-1
PNP / NC	1/2" NPT	HBSO1-PNP/NC-1
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2
PNP / NC	3/4" NPT	HBSO1-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO1-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO1-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO1-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO1-PNP/NC-6
PNP / NO	1 1/8" UNEF	HBSO1-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO1-PNP/NO-7
NPN / NO	1/2" NPT	HBSO1-NPN/NO-1
NPN / NC	1/2" NPT	HBSO1-NPN/NC-1
NPN / NO	3/4" NPT	HBSO1-NPN/NO-2
NPN / NC	3/4" NPT	HBSO1-NPN/NC-2
NPN / NO	1/2" BSPP	HBSO1-NPN/NO-5
NPN / NC	1/2" BSPP	HBSO1-NPN/NC-5
NPN / NO	3/4" BSPP	HBSO1-NPN/NO-6
NPN / NC	3/4" BSPP	HBSO1-NPN/NC-6
NPN / NO	1 1/8" UNEF	HBSO1-NPN/NO-7
NPN / NC	1 1/8" UNEF	HBSO1-NPN/NO-7
PNP / NO	3/4" NPT	HBSO1-PNP/NO-2-HT
PNP/NO	1/2" BSPP	HBSO1-PNP/NO-5-HT
PNP/NO	3/4" BSPP	HBSO1-PNP/NO-6-HT

Output	Thread type	Ordering code
NPN/NO	3/4" NPT	HBSO1-NPN/NO-2-HT
NPN/NO	1/2" BSPP	HBSO1-NPN/NO-5-HT
NPN/NO	3/4" BSPP	HBSO1-NPN/NO-6-HT
PNP / NO	1/2" NPT	HBSO2-PNP/NO-1
PNP / NC	1/2" NPT	HBSO2-PNP/NC-1
PNP / NO	3/4" NPT	HBSO2-PNP/NO-2
PNP / NC	3/4" NPT	HBSO2-PNP/NC-2
PNP / NO	1/2" BSPP	HBSO2-PNP/NO-5
PNP / NC	1/2" BSPP	HBSO2-PNP/NC-5
PNP / NO	3/4" BSPP	HBSO2-PNP/NO-6
PNP / NC	3/4" BSPP	HBSO2-PNP/NC-6
PNP / NO	1 1/8" NEF	HBSO2-PNP/NO-7
PNP / NC	1 1/8" UNEF	HBSO2-PNP/NO-7
NPN / NO	1/2" NPT	HBSO2-NPN/NO-1
NPN/NC	1/2" NPT	HBSO2-NPN/NC-1
NPN/NO	3/4" NPT	HBSO2-NPN/NO-2
NPN/NC	3/4" NPT	HBSO2-NPN/NC-2
NPN/NO	1/2" BSPP	HBSO2-NPN/NO-5
NPN/NC	1/2" BSPP	HBSO2-NPN/NC-5
NPN/NO	3/4" BSPP	HBSO2-NPN/NO-6
NPN/NC	3/4" BSPP	HBSO2-NPN/NC-6
NPN/NO	1 1/8" UNEF	HBSO2-NPN/NO-7
NPN/NC	1 1/8" UNEF	HBSO2-NPN/NO-7

Please specify the oil application by "1" for PEO, PAO & mineral oil and by "2" for PAG oil types.

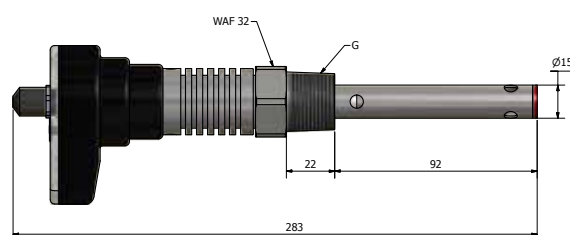
Mechanical dimensions



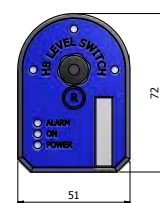
1/2" & 3/4"



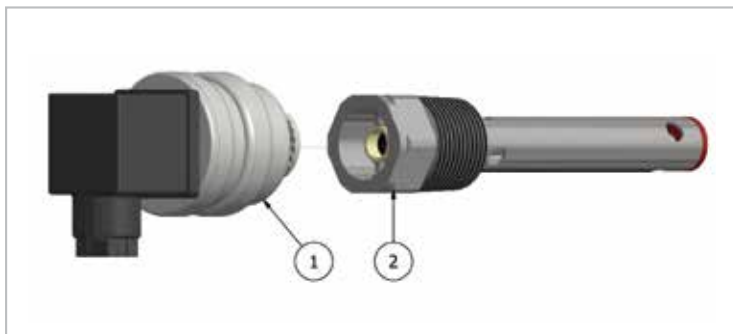
1 1/8" UNEF



HT version



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part - HBSO1	PNP/NO	HBSO1-EL/PNP/NO
		PNP/NC	HBSO1-EL/PNP/NC
		NPN/NO	HBSO1-EL/NPN/NO
		NPN/NC	HBSO1-EL/NPN/NC
	Electronic part - HBSO2	PNP/NO	HBSO2-EL/PNP/NO
		PNP/NC	HBSO2-EL/PNP/NC
		NPN/NO	HBSO2-EL/NPN/NO
		NPN/NC	HBSO2-EL/NPN/NC
2	Mechanical part	1/2" NPT	HBSO1-MEK-1
		3/4" NPT	HBSO1-MEK-2
		1/2" BSPP	HBSO1-MEK-5
		3/4" BSPP	HBSO1-MEK-6
		1 1/8" UNEF	HBSO1-MEK-7

Oil switch - 90...240 V AC

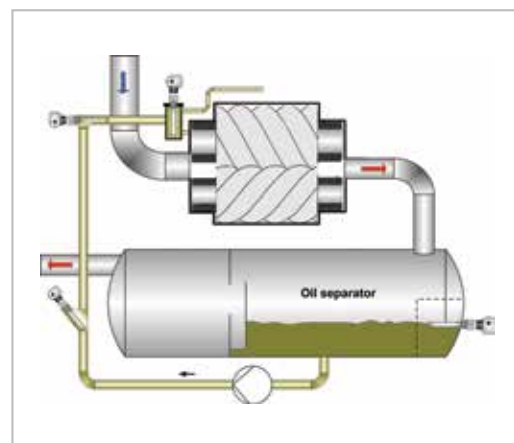


Functional description:

HBSO1 (PAO, PEO & mineral oil) and HBSO2 (PAG oil) is a level switch for detecting common 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.

The sensor is suited for use on transcritical CO₂ refrigeration systems.

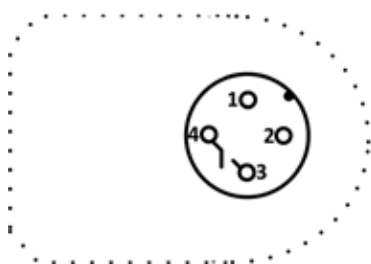
The switch has a built-in local power supply for direct use on net supply 90...240 V AC. A solid state relay can also operate a valve directly.



Technical data

Power supply		Mechanical specifications	
Voltage	90...240 V AC	Thread connection	3/4" NPT / BSPP
Power/current consumption	10 mA	Material – liquid parts	AISI 304 / PTFE
Max power/current consumption	50 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Output type	Solid state relay - 40 W	Ambient temperature	-30...+50°C
Output function	NC or NO	Refrigerant temperature	-50...+80°C
LED indication	3 x green	Max pressure	150 bar
Cable specification (power supply)		Protection degree	IP65
Cable size	5 m - 3 x 0.25 mm ²	Vibrations	IEC 68-2-6 (4g)
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		

Electrical installation



Supply: 90...240 V AC - 50/60 Hz

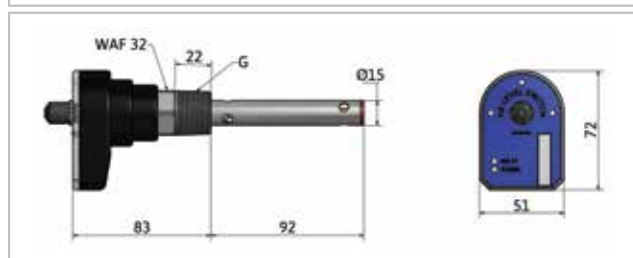
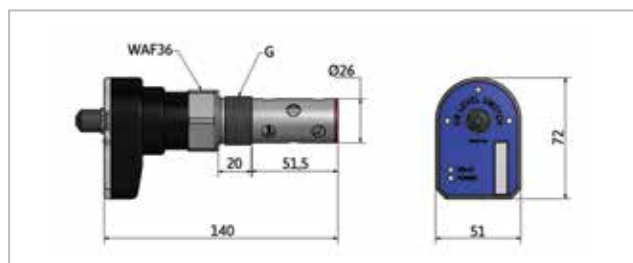
1 = Brown: 90...240 V supply

2 = White : 90...240 V supply

3 = Blue: SSR output – max 240 V AC

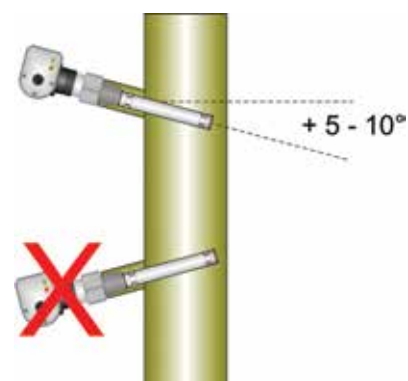
4 = Black: SSR output – max 240 V AC

Mechanical dimensions



Ordering code

Output	Thread type	Oil type	Temperature	Ordering code
NO	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-1
NC	½" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-1
NO	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-2
NC	¾" NPT	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-2
NO	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-5
NC	½" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-5
NO	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-6
NC	¾" BSPP	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-6
NO	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NO-7
NC	1 1/8" UNEF	PAO, PEO, mineral	0...80 °C	HBSO1-SSR-2/NC-7
NO	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-1
NC	½" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-1
NO	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NO-2
NC	¾" NPT	PAG	0...80 °C	HBSO2-SSR-2/NC-2
NO	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-5
NC	½" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-5
NO	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NO-6
NC	¾" BSPP	PAG	0...80 °C	HBSO2-SSR-2/NC-6
NO	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NO-7
NC	1 1/8" UNEF	PAG	0...80 °C	HBSO2-SSR-2/NC-7
NO	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-1-HT
NC	½" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-1-HT
NO	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-2-HT
NC	¾" NPT	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-2-HT
NO	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-5-HT
NC	½" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-5-HT
NO	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-6-HT
NC	¾" BSPP	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAO, PEO, mineral	0...120 °C	HBSO1-SSR-2/NC-7-HT
NO	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-1-HT
NC	½" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-1-HT
NO	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NO-2-HT
NC	¾" NPT	PAG	0...120 °C	HBSO2-SSR-2/NC-2-HT
NO	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-5-HT
NC	½" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-5-HT
NO	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NO-6-HT
NC	¾" BSPP	PAG	0...120 °C	HBSO2-SSR-2/NC-6-HT
NO	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NO-7-HT
NC	1 1/8" UNEF	PAG	0...120 °C	HBSO2-SSR-2/NC-7-HT

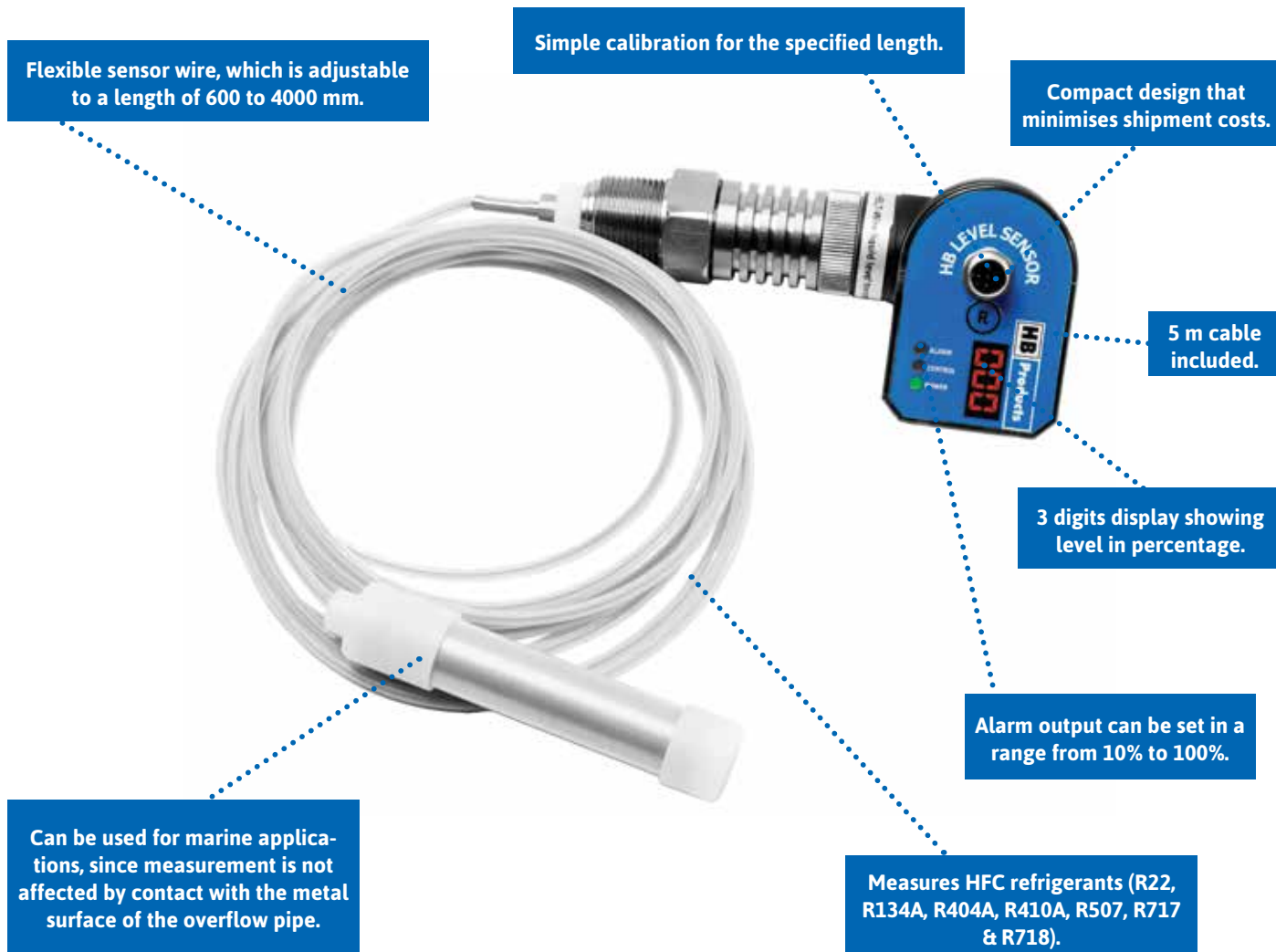


Spare parts



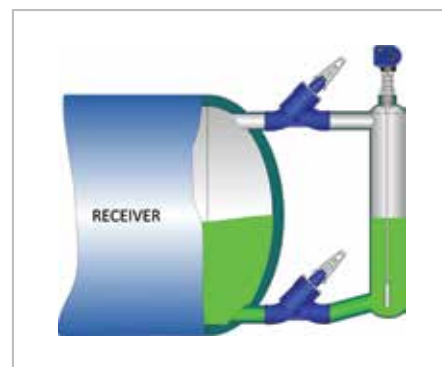
Position	Specification	Type	Ordering code
1	Electronic part – HBSO1	NO	HBSO1-SSR-2/NO-EL
		NC	HBSO1-SSR-2/NC-EL
	Electronic part – HBSO1-High temperature	NO	HBSO1-SSR-2/NO-HT-EL
		NC	HBSO1-SSR-2/NC-HT-EL
	Electronic part – HBSO2	NO	HBSO2-SSR-2/NO-EL
		NC	HBSO2-SSR-2/NC-EL
	Electronic part – HBSO2- High temperature	NO	HBSO2-SSR-2/NO-HT-EL
		NC	HBSO2-SSR-2/NC-HT-EL
2	Mechanical part	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		½" BSPP	HBSO1-MEK-5
		¾" BSPP	HBSO1-MEK-6
		1 1/8 UNEF	HBSO1-MEK-7
	Mechanical part – High temperature	½" NPT	HBSO1-HT-MEK-1
		¾" NPT	HBSO1-HT-MEK-2
		½" BSPP	HBSO1-HT-MEK-5
		¾" BSPP	HBSO1-HT-MEK-6
		1 1/8 UNEF	HBSO1-HT-MEK-7

HFC level sensor



Functional description:

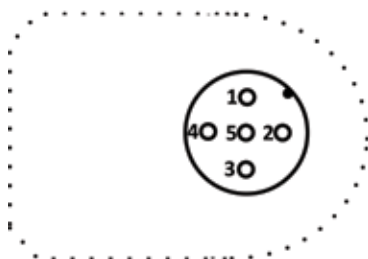
HBLT-wire is a capacitive sensor for level measurement of HFC refrigerant in industrial refrigeration systems. The sensor has an output signal of 4-20 mA, which is proportional with 0 and 100%. Its output signal is 4 mA for an empty container and 20 mA for a full container. HBLT-wire can be adjusted in length to the current application. The sensor element consists of a 2mm steel wire as well as a Teflon tube. Both parts are provided with a length of 4 m and can be shortened with diagonal cutters or other pliers. HBLT-wire can be used in connection with the HBLT-C1 controller for controlling pumps, etc., or it can be configured to directly control a valve without the need for another controller.



Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	3 digits display	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals		Adaptor cable	HBxC-M12/DIN
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBLT-Wire software		

Electrical installation



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)



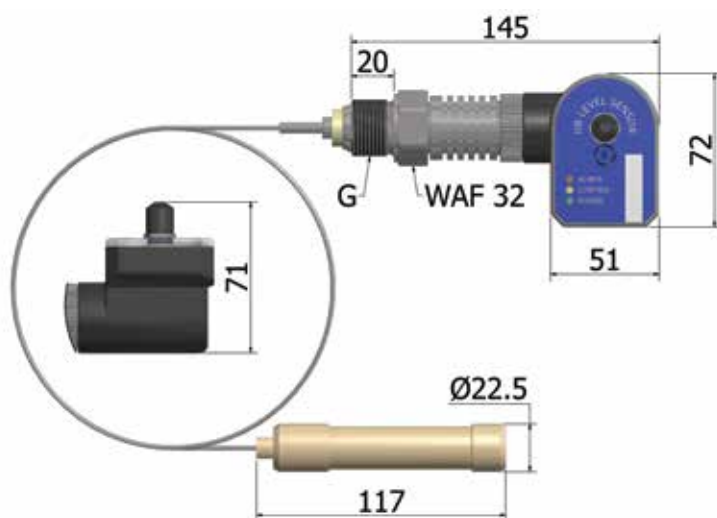
To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

Thread type	Ordering code
3/4" NPT	HBLT-Wire-2
3/4" BSPP	HBLT-Wire-6

	Standpipe	DN32.....DN65
	Recommended pipe standard	DIN 10220
	Recommended bending	DIN 2615-1/Type 3
	Recommended TEE	DIN 2615-1
	Standpipe	DN65...DN100
	Recommended pipe standard	DIN 10220
	Recommended bending	DIN 2615-1/Type 3
	Sitepipe can be designed in smaller pipe e.g. o.5 x DN	
	<p>If the sensor is installed in standpipe on front of plate heat exchanger the wire must be protected against splashing with a protection tube size DN25..DN32.</p>	

Mechanical dimensions

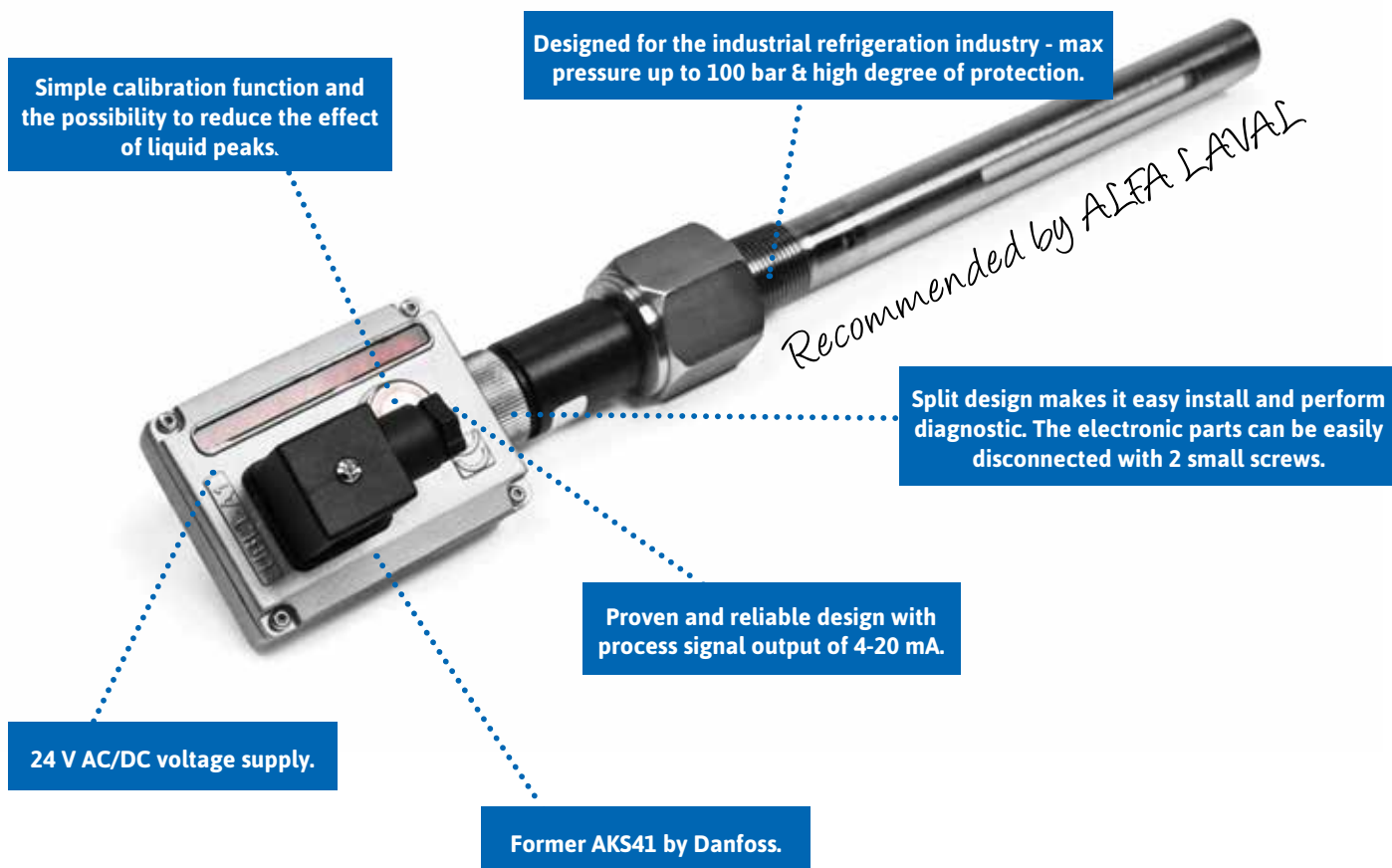


Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBLT-Wire-EL
2	Mechanical parts	¾" NPT	HBLT-Wire-MEK-2
		¾" BSPP	HBLT-Wire-MEK-6
3	Wire plum	22.5x115	HBLT-Wire-PLUM

HFC level sensor



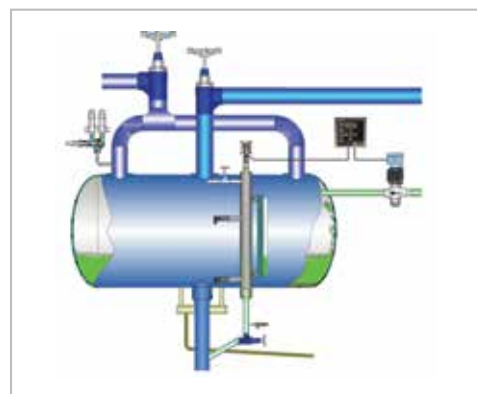
Functional description:

HBLT capacitive liquid level transmitters are used to measure liquid levels in refrigerant vessels.

The HBLT transmits an active 4-20 mA signal which is proportional to the liquid level.

4 mA when the transmitter does not register liquid and 20 mA when the entire transmitter is surrounded by liquid

The 4-20 mA signal from HBLT can be used in conjunction with a controller e.g HBLT-C1 to control the liquid level.



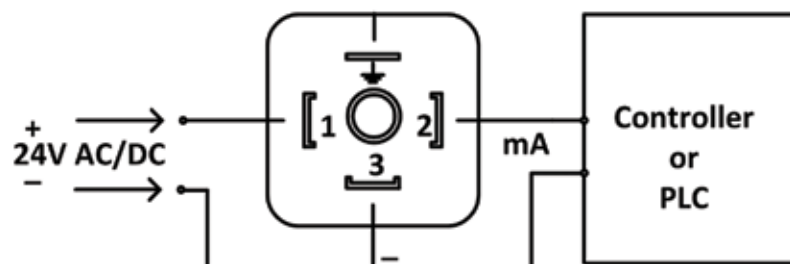
Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	<20mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	DIN 43650 - 4 pins	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	NA	Refrigerant temperature	-50...+80°C
LED indication	Bargraph (option)	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification*		Vibrations	
Cable size	3 x 0.34 mm ²		
Cable glands	PG7 / M8		
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 6100-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	Push bottom		

* Cable not included.

Electrical installation

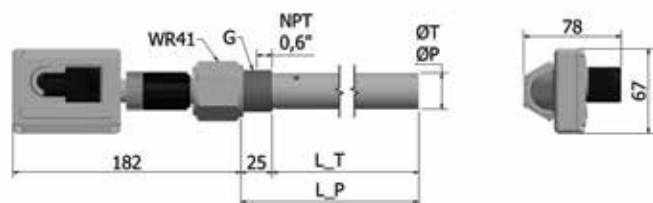
Alternative (-) supply – 7



Ordering code

Length / thread	Ordering code with out bargraph	Ordering code with bargraph
280 mm / 1" BSPP	HBLT-A1-2.8	HBLT-A1B-2.8
500 mm / 1" BSPP	HBLT-A1-5	HBLT-A1B-5
800 mm / 1" BSPP	HBLT-A1-8	HBLT-A1B-8
1000 mm / 1" BSPP	HBLT-A1-10	HBLT-A1B-10
1200 mm / 1" BSPP	HBLT-A1-12	HBLT-A1B-12
1500 mm / 1" BSPP	HBLT-A1-15	HBLT-A1B-15
1700 mm / 1" BSPP	HBLT-A1-17	HBLT-A1B-17
2200 mm / 1" BSPP	HBLT-A1-22	HBLT-A1B-22
3000 mm / 1" BSPP	HBLT-A1-30	HBLT-A1B-30
6" / 3/4 NPT	HBLT-A1-6U	HBLT-A1B-6U
8" / 3/4 NPT	HBLT-A1-8U	HBLT-A1B-8U
12" / 3/4 NPT	HBLT-A1-12U	HBLT-A1B-12U
15.3" / 3/4 NPT	HBLT-A1-15.3U	HBLT-A1B-15.3U
19.2" / 3/4 NPT	HBLT-A1-19.2U	HBLT-A1B-19.2U
23.1" / 3/4 NPT	HBLT-A1-23.1U	HBLT-A1B-23.1U
30" / 3/4 NPT	HBLT-A1-30U	HBLT-A1B-30U
35" / 3/4 NPT	HBLT-A1-35U	HBLT-A1B-35U
45" / 3/4 NPT	HBLT-A1-45U	HBLT-A1B-45U
55" / 3/4 NPT	HBLT-A1-55U	HBLT-A1B-55U
65" / 3/4 NPT	HBLT-A1-65U	HBLT-A1B-65U
85" / 3/4 NPT	HBLT-A1-85U	HBLT-A1B-85U
105" / 3/4 NPT	HBLT-A1-105U	HBLT-A1B-105U
120" / 3/4 NPT	HBLT-A1-120U	HBLT-A1B-120U

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	Programmable without bargraph	HBLT-A1-EL
		Programmable with bargraph	HBLT-A1B-EL
2	Mechanical parts	For 280 mm length	HBLT-MEK-2.8
		For 500 mm length	HBLT-MEK-5
		For 800 mm length	HBLT-MEK-8
		For 1000 mm length	HBLT-MEK-10
		For 1200 mm length	HBLT-MEK-12
		For 1500 mm length	HBLT-MEK-15
		For 1700 mm length	HBLT-MEK-17
		For 2200 mm length	HBLT-MEK-22
		For 3000 mm length	HBLT-MEK-30
		For 6" length	HBLT-MEK-6U
		For 8" length	HBLT-MEK-8U
		For 12" length	HBLT-MEK-12U
		For 15.3" length	HBLT-MEK-15.3U
		For 19.2" length	HBLT-MEK-19.2U
		For 23.1" length	HBLT-MEK-23.1U
		For 30" length	HBLT-MEK-30U
		For 35" length	HBLT-MEK-35U
		For 45" length	HBLT-MEK-45U
		For 55" length	HBLT-MEK-55U
		For 65" length	HBLT-MEK-65U
		For 85" length	HBLT-MEK-85U
		For 105" length	HBLT-MEK-105U
		For 120" length	HBLT-MEK-120U

Intelligent “Float level regulation”

Stand alone solution together with modulating valve.
Flexible and cost effective alternative to float regulators.

The sensor can control modulating valve,
pilot valves or stepper motor valve.

For modulating valves from Siemens,
Parker, Danfoss and Hansen.

Simple installation and configuration
with PC. The regulation loop, timer
and alarm are all programmable.

5 m cable included.

For stepper motor valves
from Carel, Parker, Danfoss
and Emmerson.

Split design which allows for easy installation and
diagnostic. The electronic part can be easily dis-
connected by 2 screws.

LED indication of power supply, alarm
and regulation status. Further an alarm
status can be given to central panel.

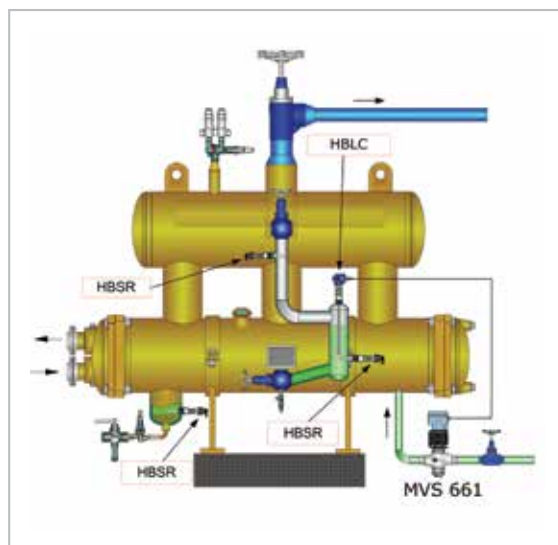
Functional description:

HBLC is an intelligent sensor with a built-in microproces-
sor. It is designed to control refrigerant levels in both low
pressure and high pressure systems. It emits a 4-20 mA
signal, which is proportional to the sensor's set range of
measurement.

Apart from the 4-20 mA signal, the sensor also has a built-
in controller.

The controller can be set-up with all the parameters nec-
essary for controlling a modulating motor valve or step-
per motor.

The sensor can be delivered with a cable for direct supply
to and control of motor valve or stepper motor valve.



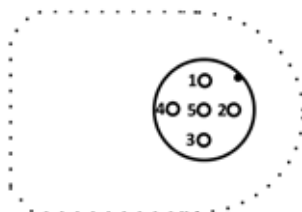
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	25 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Alarm, control, power	Max pressure	150 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-splitbox
Approvals			
CE	EN 6100-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HBLC software		

Technical data - valve regulation

Valve control (Modulating valve)		Valve control (Stepper motor)	
Signal to valve	4-20 mA	Stepper motor steps	25-5000 steps
Valve regulation	P-regulation	Stepper motor speed	2-40 m/s
Cable specification (valve control)		Stepper motor phase current	0-750 mA
Length	3 m (118")	Stepper motor holding current	0-250 mA
Cable size	3 x 0.75 mm ²		
Cable glands	PG7 / M8		

Electrical installation

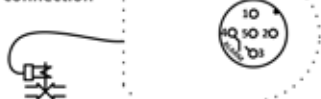


Supply 24V AC/DC

- 1 = Brown +
- 2 = White -
- 3 = Blue, DO, Alarm, PNP/NPN, 1A
- 4 = Black, AO, Control output, 4-20mA
- 5 = Gray, DI, Run in signal (5 to 24 VDC)

HBLC with control of modulating valve with power supply cable (HBLC-xxx).

Stepper Motor Valve 4 wire connection



- A+ = Yellow
- A- = Green
- B+ = Brown
- B- = White

Supply 24V AC/DC, minimum 30 VA

- 1 = Brown +
- 2 = White -
- 3 = Blue - Potential free solid state, 1 A
- 4 = Black - Potential free solid state, 1 A
- 5 = Gray - Not in use

HBLC with direct control of stepper motor valve (HBLC/C/S-xxx)

Modulating Valve 3 wire connection



- 1 = Brown +
- 2 = White -
- 3 = Gray, AO 4-20mA

Supply 24V AC/DC, minimum 30 VA

- 1 = Brown +
- 2 = White -
- 3 = Blue - Potential free solid state, 1 A
- 4 = Black - Potential free solid state, 1 A
- 5 = Gray - DI, Run in Signal (5 to 24V DC)

HBLC/C with cable to direct control of modulating valve (HBLC/C-xxx)



To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Ordering code

Refrigerant	Length (L) / Thread	Motor type	Cable to valve	Ordering code
HFC	314 mm / 3/4" NPT	Modulating	No	HBLC-CO2/HFC-3.1-2
HFC	314 mm / 3/4" BSP	Modulating	No	HBLC-CO2/HFC-3.1-6
HFC	314 mm / 3/4" NPT	Modulating	Yes	HBLC/C-CO2/HFC-3.1-2
HFC	314 mm / 3/4" BSP	Modulating	Yes	HBLC/C-CO2/HFC-3.1-6
HFC	314 mm / 3/4" NPT	Stepper	Yes	HBLC/S-CO2/HFC-3.1-2
HFC	314 mm / 3/4" BSP	Stepper	Yes	HBLC/S-CO2/HFC-3.1-6

Accessories - Siemens valves MVL661



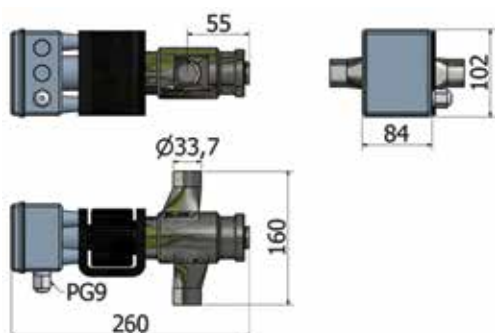
Technical data: MVL661

MVL661 is a modulating valve for the connection to the refrigerant level control sensor type HBLC. It can be used for all refrigerants and has a fast reaction time.

The modulating valve requires only supply and connection from the HBLC.

- High precision and precise regulation
- Precise positioning
- Feedback signal to central panel about valve positioning
- Fast reaction time
- Proven and reliable design

Mechanical dimensions



Technical data

Power connection		Mechanical specifications	
Loop from HBLC controller	4-20 mA	PN class	PN50 - EN 1333
Connection	3 x Ø20.5 mm	Max. pressure	50 bar
Terminals	Screw terminals max 4 mm ²	Refrigerant temperature	-40...+120°C
Signal output		Mounting	Horizontal or vertical
Positioning	4-20 mA	Weight	5, 17 kg
Load	500 ohm	Protection degree	IP65 - EN 60529
Reaction time	1 s	Pipe connection	Ø33.7/22.4
Approvals		Materials	
EMC	EN61000-6-2/3	Material - liquid parts	Steel / CrNi steel
Protection degree	Class III - EN 60730	Material - sealing	PTFE/CR
UL standard	UL 873		
CSA standard	C22.2 No. 24		

Ordering code

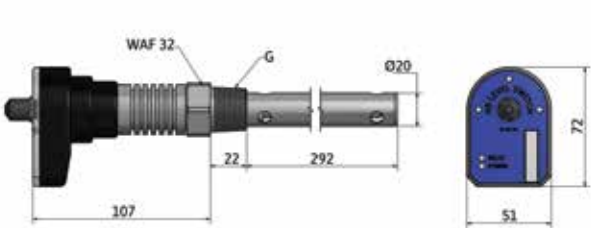
Part number	Kvs [m3/h]	QoE [kW]
MVS661.25-016N	0.16	95
MVS661.25-0.4N	0.40	245
MVS661.25-1.0N	1.00	610
MVS661.25-2.5N	2.50	1530
MVS661.25-6.3N	6.30	3850

QoE = Refrigeration capacity in expansion applications.

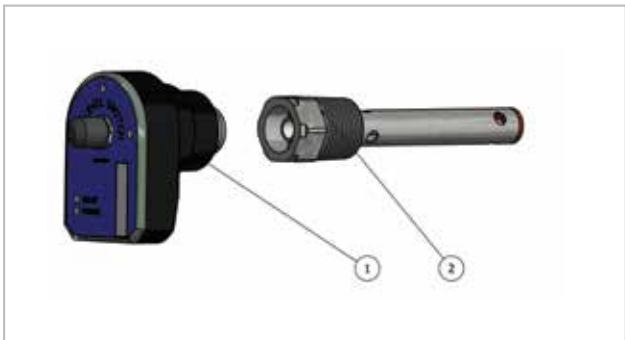
Float regulator cross reference list for Siemens valve types:

Producer	Regulator	Weight	Required installation size	Valve ordering code
Th-Witt	HR1	13	300x390x640 mm	MVS661.25-0.16N
Th-Witt	HR2	23	325x450x880 mm	MVS661.25-1.0N
Th-Witt	HR3	46	432.5x530x1040 mm	MVS661.25-2.5N
Th-Witt	HR4	114	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	WP2HR	26	250x475x960 mm	MVS661.25-1.0N
Th-Witt	WP3HR	61	345x640x1045 mm	MVS661.25-2.5N
Th-Witt	HS31/HS34	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS32/HS35	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS33/HS36	49	290x480x1055 mm	MVS661.25-2.5N
Th-Witt	HS41/HS44	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS42/HS45	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS43/HS46	94	400x683x1175 mm	MVS661.25-6.3N
Th-Witt	HS51/HS54	118	919x526x1265 mm	MVS661.25-6.3N
Th-Witt	HS53/HS56	118	919x526x1265 mm	MVS661.25-6.3N
Hansen	HT100	NA	191x537x191 mm	MVS661.25-0.16N
Hansen	HT200	NA	321x632x321 mm	MVS661.25-1.0N
Hansen	HT300	NA	375x876x375 mm	MVS661.25-2.5N
Danfoss	HFI 040	41	309x702x219 mm	MVS661.25-1.0N
Danfoss	HFI 050	41	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 060	41	309x702x219 mm	MVS661.25-2.5N
Danfoss	HFI 070	41	309x702x219 mm	MVS661.25-6.3N

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	¾" NPT / 314 mm/NH3	HBLC-CO2/HFC-3.1-2-MEK
		¾" BSPP / 314 mm/NH3	HBLC-CO2/HFC-3.1-6-MEK
2	Electronic parts	Without cable	HBLC-EL
		With cable	HBLC/C-EL
		With cable - stepper motor	HBLC/S-EL

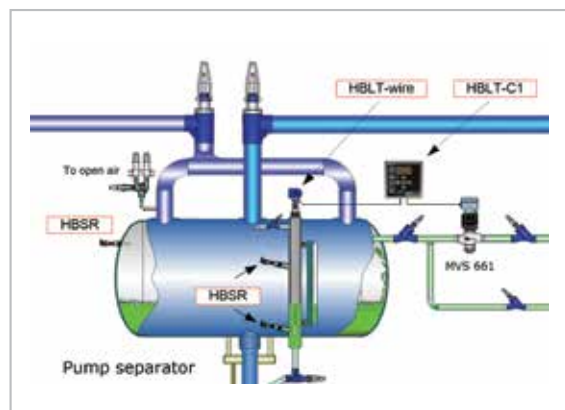
Level controller



Functional description:

HBLT-C1 is designed for level control in vessels in industrial refrigeration systems. It can be used in connection with the HBLT-A1 and HBLT-Wire analogue level sensor or other similar sensors with a 4-20 mA output signal. To be used in:

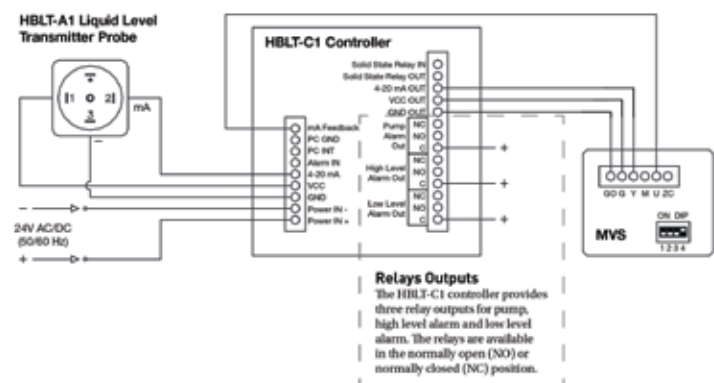
- Pump vessels
- Separators
- Intercoolers
- Economisers
- Condensators
- Receivers



Technical data

	HBLT-C1	HBLT-C1-ENC
Supply		
Voltage	24 V AC/DC \pm 10 %	100..240 V AC
Frequency	50/60 Hz	50/60 Hz
Current draw	Max 40 mA	Max 1.5 A
Connection	Screw terminal	Screw terminal
Wire size	< 2.5 mm ²	< 2.5 mm ²
Installation conditions:		
Surrounding temperature	-20...+70°C	-20...+70°C
Protection class	IP45	IP65
Relative humidity	20...80 %	20...80 %
Approvals:		
EMC Emission	EN61000-3-2	EN61000-3-2
EMC Immunity	EN61000-4-2	EN61000-4-2
GOST R	No 0903044	
Mechanical specifications:		
Mounting	In front of panel	On wall
External measurement	96x96x94 mm (BxHxD)	205x220x140 mm (BxHxD)
Cut-out measurement	92.8x92.8 mm	N.A.
Material	Plastic	Plastic
Weight	0.2 kg	1.4 kg
Display:		
Digit's display	3 digits, red	3 digits, red
Alarm indication	LED (green og red)	LED (green og red)
Programming	From front	From front
Updatting	1 time each second	1 time each second
Valve position indication	5 x LED (yellow)	5 x LED (yellow)
Input:		
Analogue input - sensor	4-20 mA	4-20 mA
Analogue input – valve feedback	4-20 mA	4-20 mA
Alarm – max level	Relay – 5...25 V DC	Relay – 5...25 V DC
Output:		
Analogue output	4-20 mA	4-20 mA
Load	3A/24 VDC	3A/24 VDC
Relay output	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A	@24V AC/VDC: 3 x 3A @110 V AC: 3 x 5A @220 V AC: 3 x 5A
Solid state output	NC/NO-1A-24V AC/VDC	NC/NO-1A-24V AC/VDC

Electrical installations



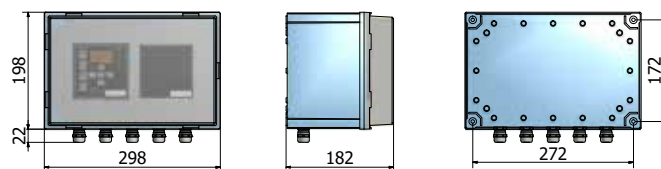
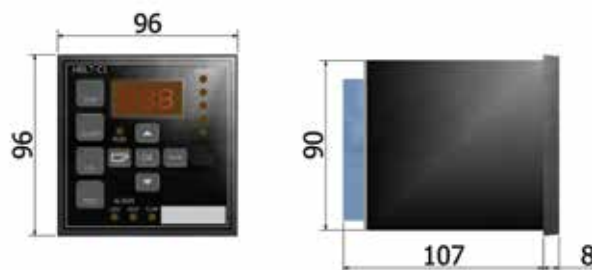
PC GND & PC INT: Has no function in this controller.

Solid state relay IN & Solid state relay OUT: Should only be used when AKVA valve is used.

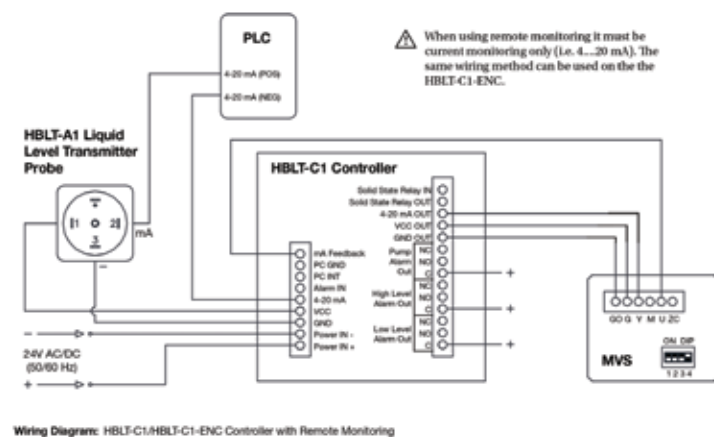
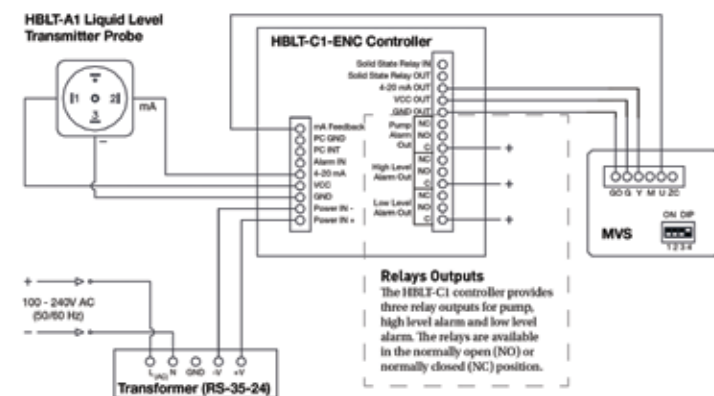
Ordering code

House design	Ordering code
Controller - 24 V AC/DC power supply	HBLT-C1
Controller built in a cabinet and mounted with 100/240 V power supply	HBLT-C1-ENC

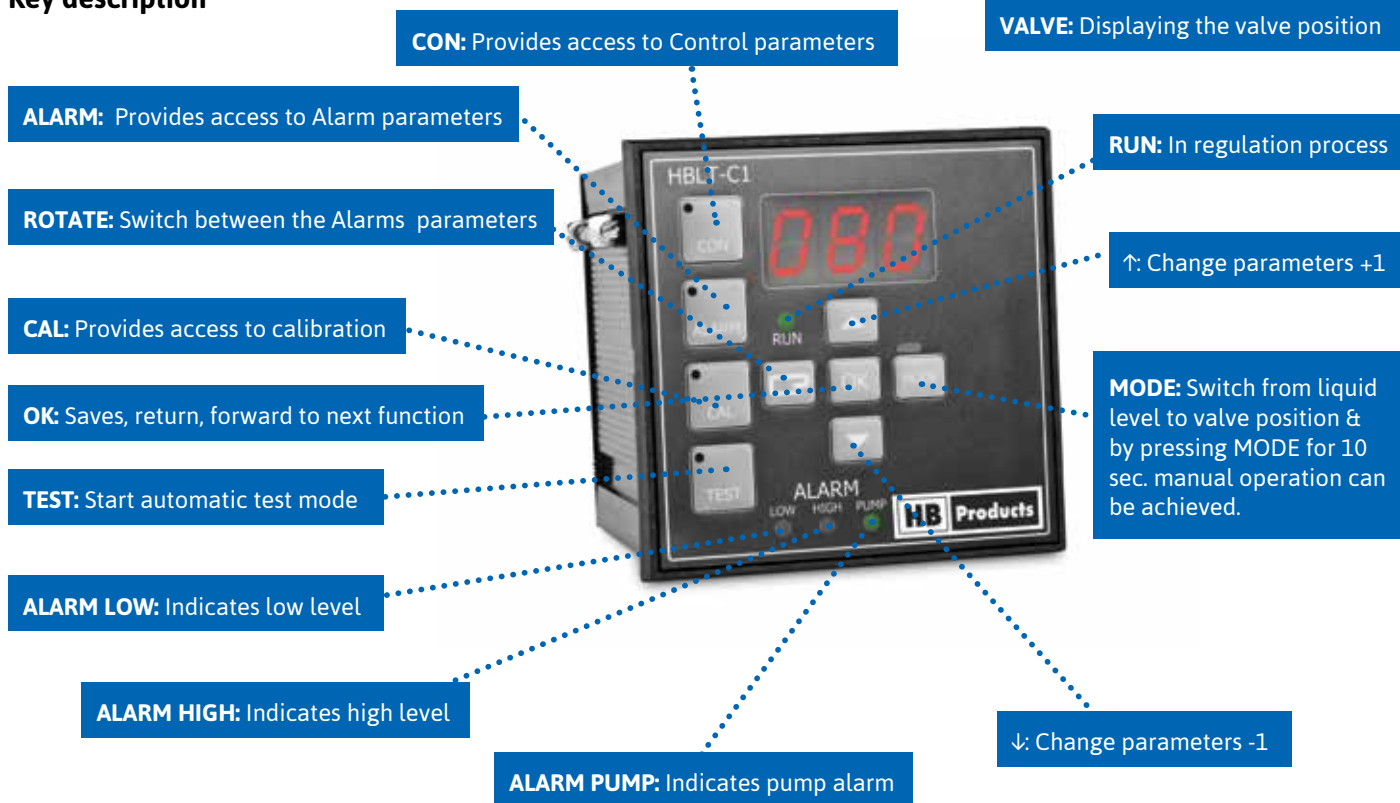
Mechanical dimensions



Wiring Diagram: HBLT-C1 Controller



Key description



Operation menu:

Control Parameters	Alarm Parameters	Calibration Menu	Manual Operation
CON	ALARM	CAL	MODE
Setpoint	Low alarm	Min calibration	Max calibration
040	040	000	000
P-band	Hysteresis low alarm		
P30	040		
Level LP/HP	High alarm		
LP	040		
Start- up Ramp	Hysteresis high alarm		
005	040		
Valve damping	Pump alarm		
005	040		
AKVA settings	Hysteresis pump alarm		
006	040		

Change to next parameter:
OK: Saves , return, forward to next function

Change parameters
↓: Change parameters +1
↑: Change parameters -1

Manual operation:
MODE – press in 10 sec and set the required level at start up. Press any button to leave manual operation.

Calibration:
Detailed information on calibration function is available in the Instruction Manual.

Pressure sensor

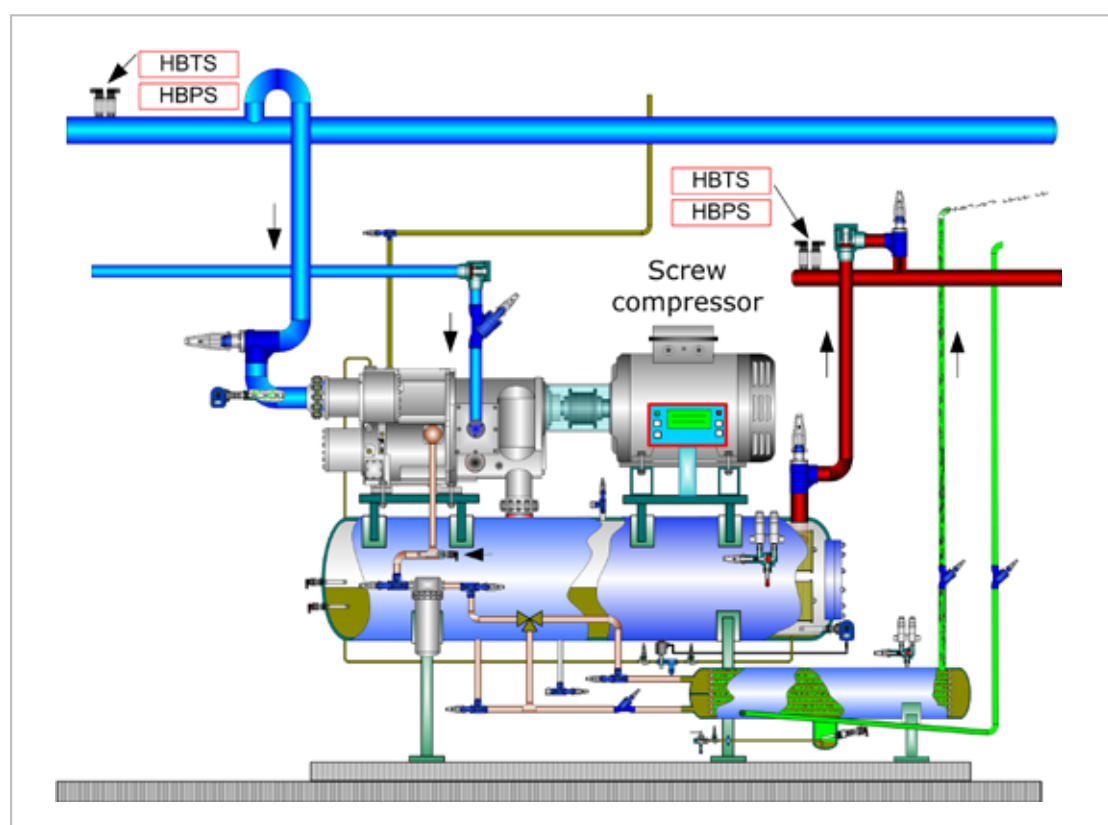


Functional description:

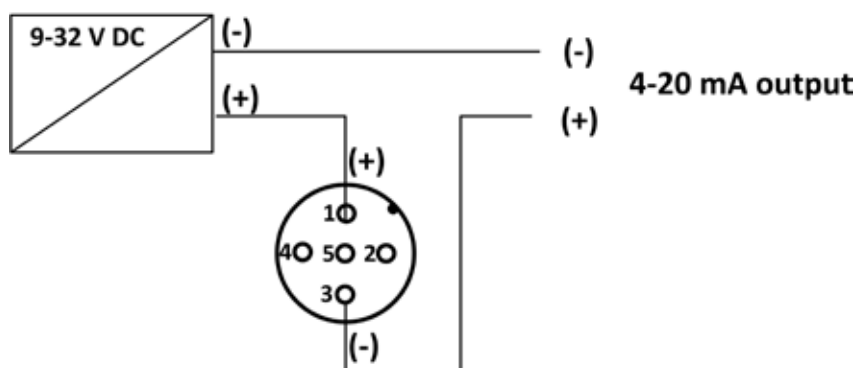
HBPS is a pressure sensor that is specially developed for the refrigeration industry. The sensor has a stainless membrane, and the housing is also made of stainless steel. It has a quick reaction time of < 1 s, and it is accessible in 2 pressure ranges of -1...25 bar and -1...200 bar.

Technical data

Power supply		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	G 1/4" - Form E
Power supply	9...32 V DC	Material – liquid parts	AISI 304
Analogue output	4...20 mA	Material – electronic parts	AISI 304
Pin surface treatment	Gold		
Connection	2-wire		
Environmental conditions		Approvals	
Ambient temperature	-40...+105°C	EMC	EN 61000-2
Refrigerant temperature	-40...+125°C	Accessories	
Max pressure	-1...25 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



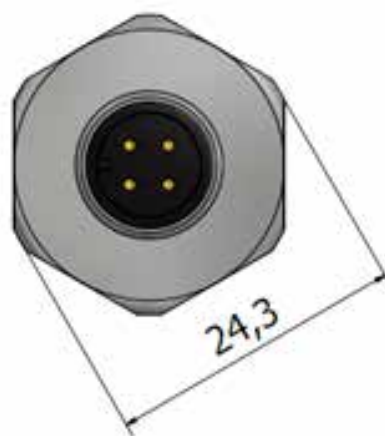
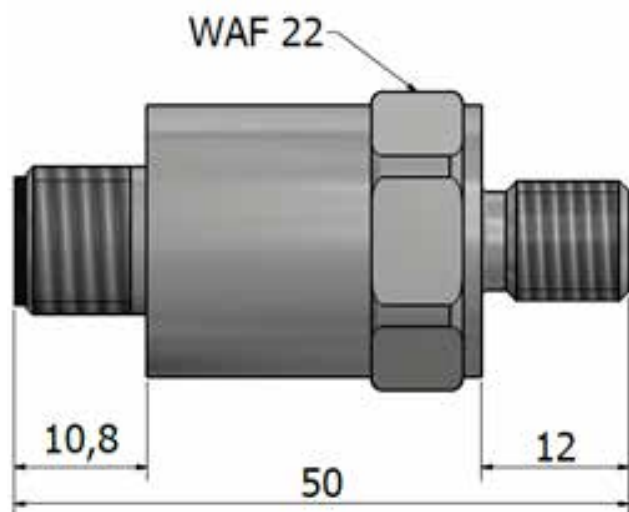
Electrical installations



Ordering code

Pressure range	Thread type	Ordering code
-1...25 bar	1/4" G - Form E	HBPS-25-1/4

Mechanical dimensions



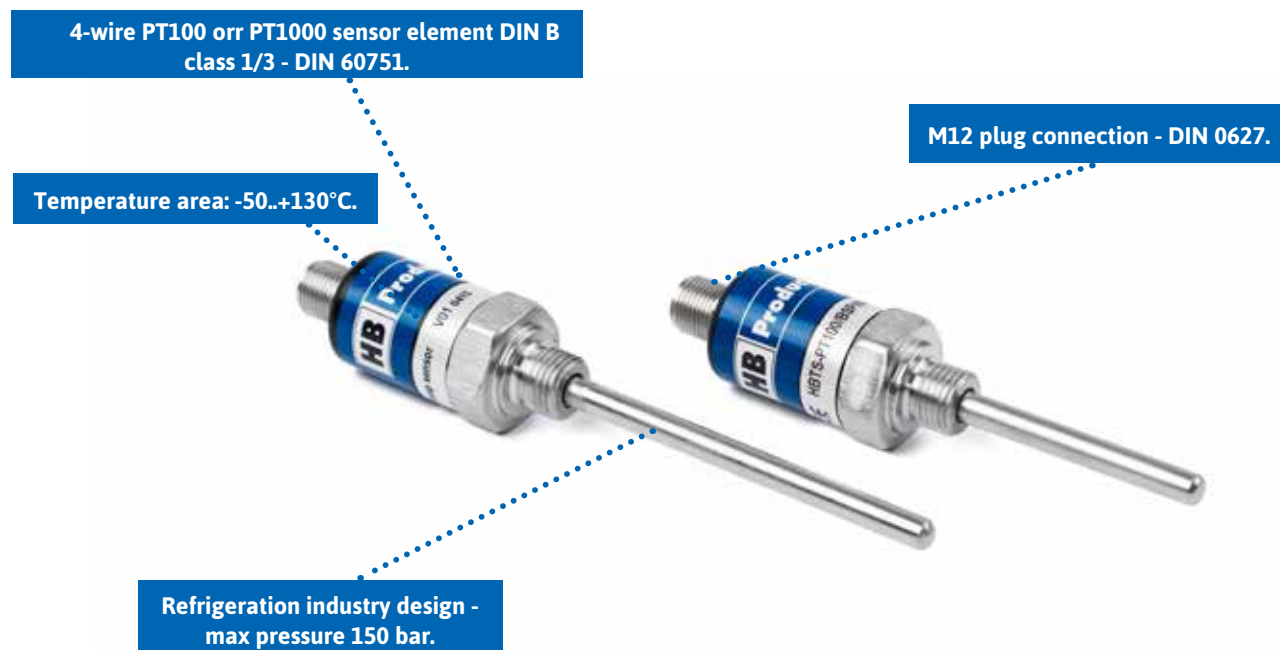


Products

WE INCREASE
UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY



Temperature sensor

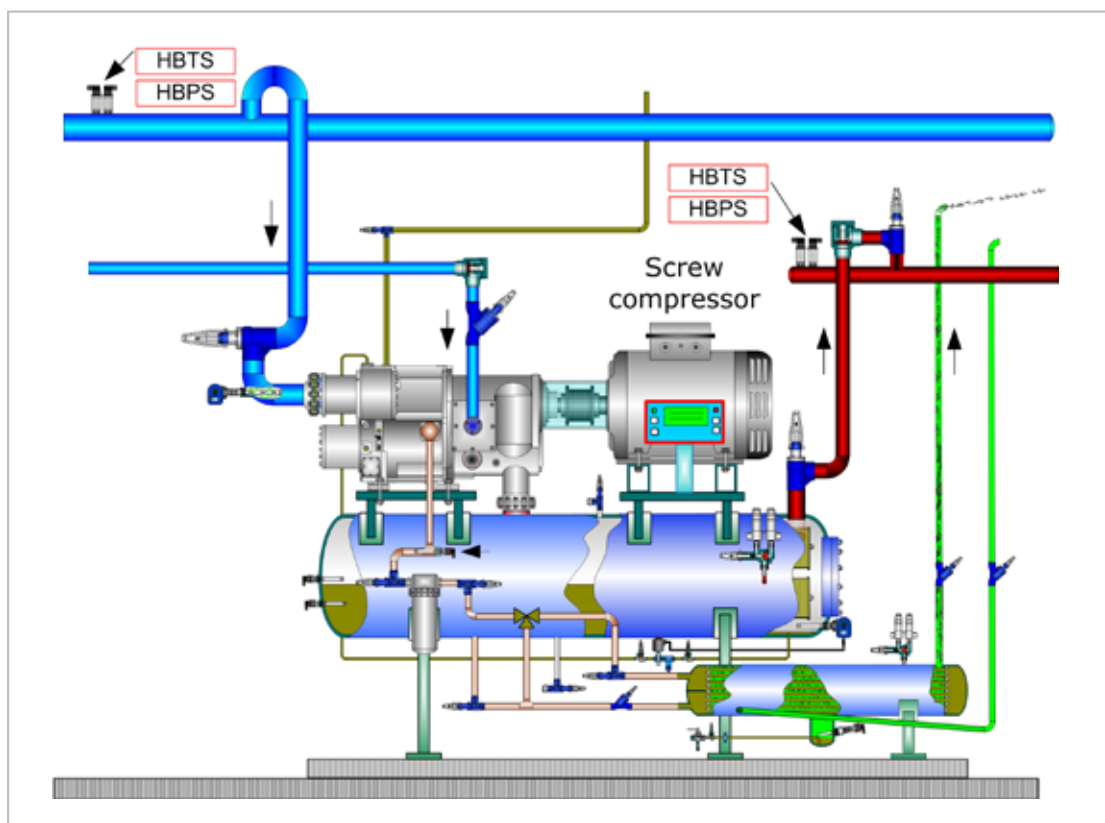


Functional description:

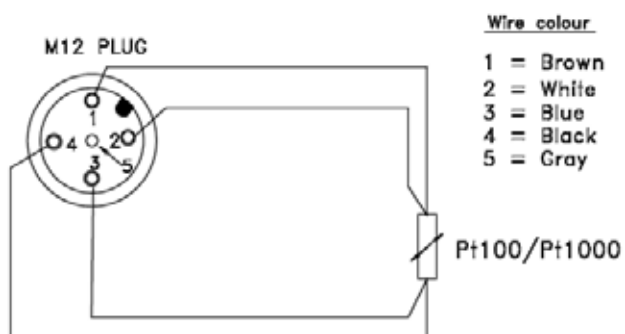
HBTS is a temperature sensor in accordance with DIN 60751, and it is available in two variants, PT100 and PT1000 – DIN B – class 3. The sensor is designed for the refrigeration industry where servicing of the electronics can be carried out without emptying the system of refrigerant. The sensor is delivered with a 60 & 90 mm sensor element length and a 6 mm sensor diameter.

Technical data

Electrical specifications		Mechanical specifications	
Plug	M12-DIN 0627	Thread connection	1/4" NPT or BSPP
Sensor element	PT100 / PT1000	Material – liquid parts	AISI 304
Sensor class	DIN B - KL 1/3	Material – electronic parts	Plast
Sensor design	4 wire	Sensor element	Ø6 - 60 / 90 mm
EnvirnomentaI conditions		Approvals	
Ambient temperature	-30...+85°C	EMC	EN 61000-2
Refrigerant temperature	-50...+130°C	Accessories	
Max pressure	150 bar	Cable-5m	HBxC/M12-5
Protection degree	IP67		
Vibrations	IEC 68-2-6 (4g)		



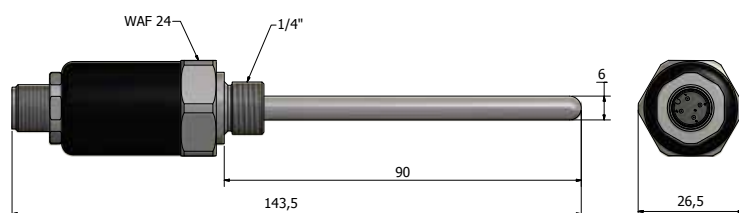
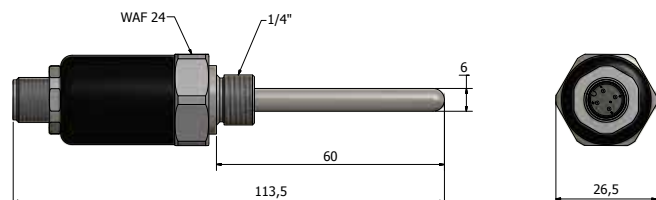
Electrical installations



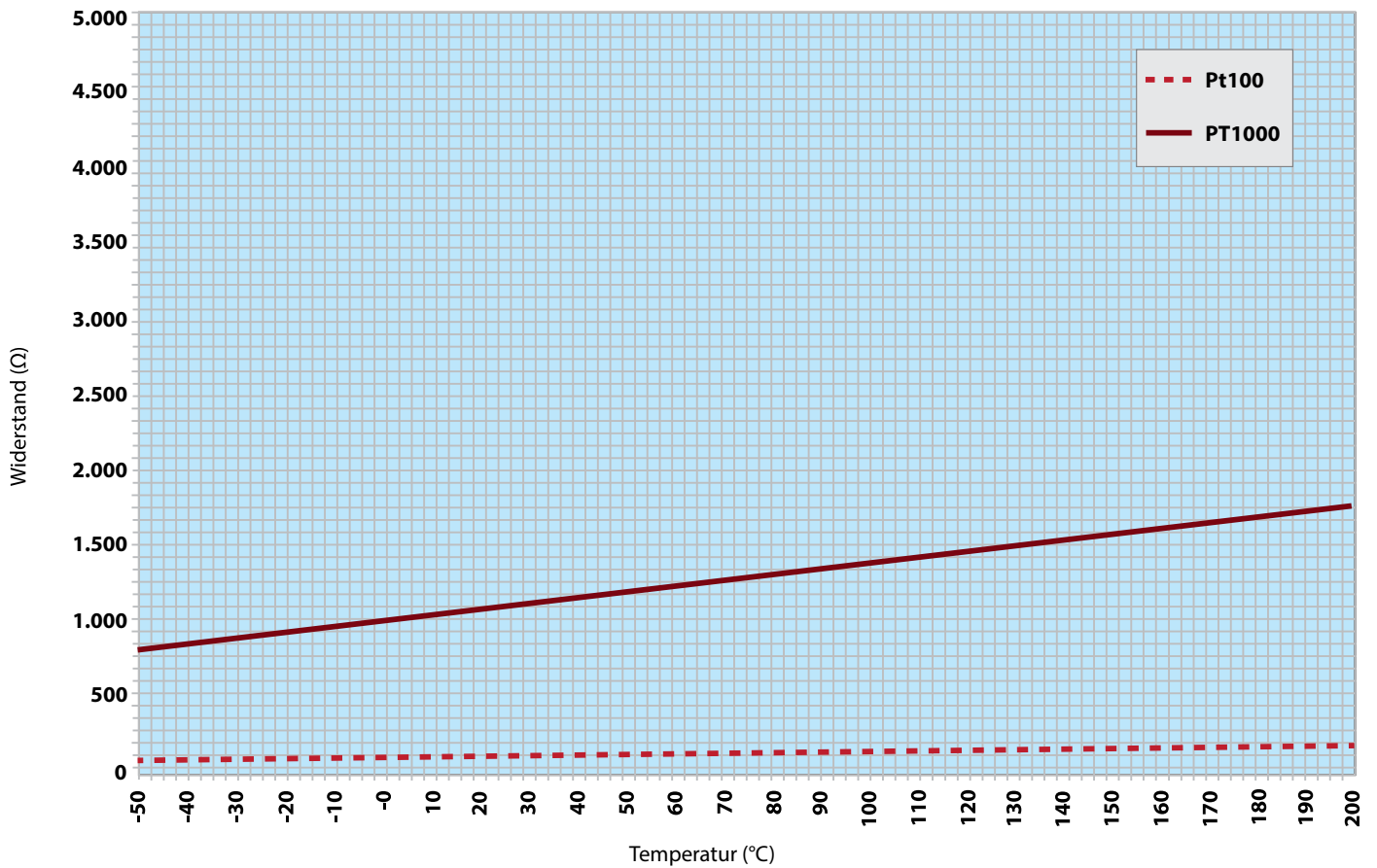
Ordering code

Sensor type	Sensor length	Thread type	Ordering code
PT100	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT100	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT100	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT100	90 mm	1/4" BSPP	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" NPT	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" NPT	HBTS-PT100/NPT/90
PT1000	60 mm	1/4" BSPP	HBTS-PT100/NPT/60
PT1000	90 mm	1/4" BSPP	HBTS-PT100/NPT/90

Mechanical dimensions



Temperature area - PT100/PT1000

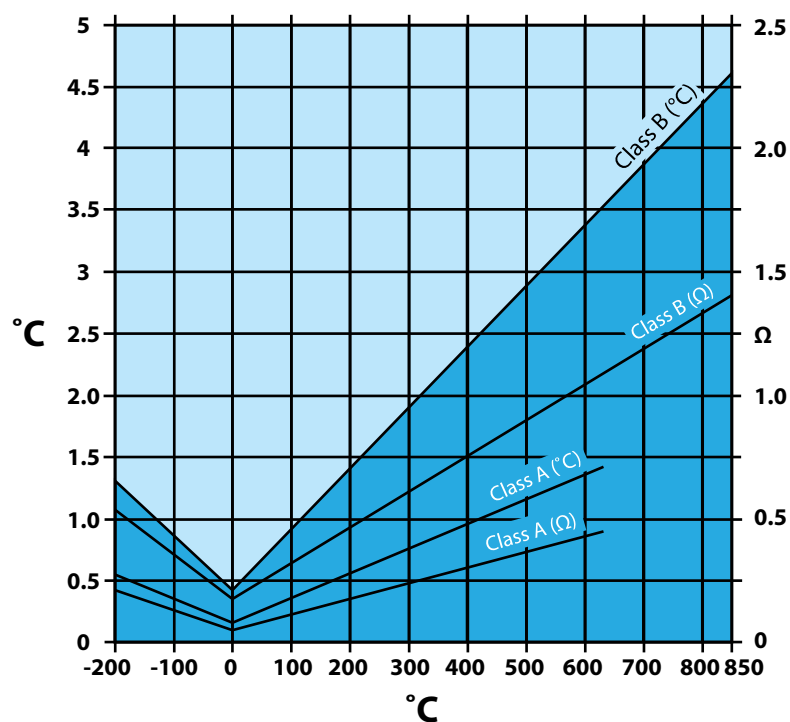


Tolerances for Ω thermometers

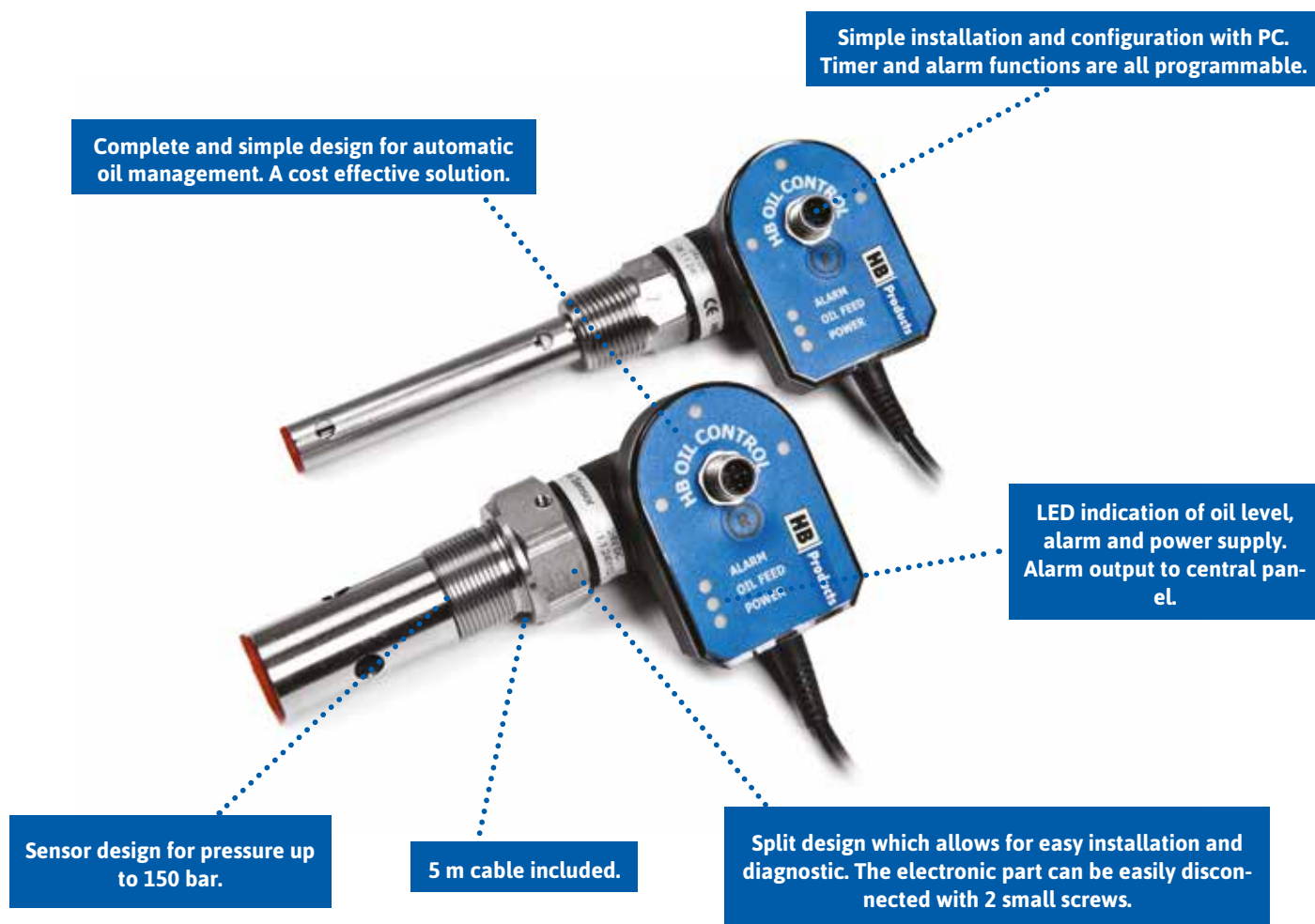
Tolerance values as a function of temperature
for 100 Ω thermometers

Tolerances for Ω thermometers

temp °C	class A ±°C ±Ω	class B ±°C ±Ω
-200	0.55 0.24	1.3 0.56
-100	0.33 0.14	0.8 0.32
0	0.15 0.06	0.3 0.12
100	0.35 0.13	0.80 0.30
200	0.55 0.20	1.3 0.48
300	0.75 0.27	1.8 0.64
400	0.95 0.33	2.3 0.79
500	1.15 0.38	2.8 0.93
600	1.35 0.43	3.3 1.06
700	- -	3.8 1.17
800	- -	4.3 1.28
850	- -	4.6 1.34



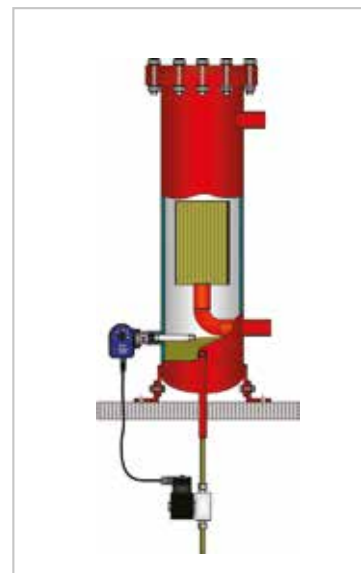
Oil level controller / Management



Functional description:

HBOC is an intelligent sensor with a built-in microprocessor. It is designed to detect and control oil levels in oil separators and compressors.

Apart from the sensor function, it also has a built-in controller. The controller can be setup with all the parameters that are necessary to directly regulate a solenoid valve for oil level control.



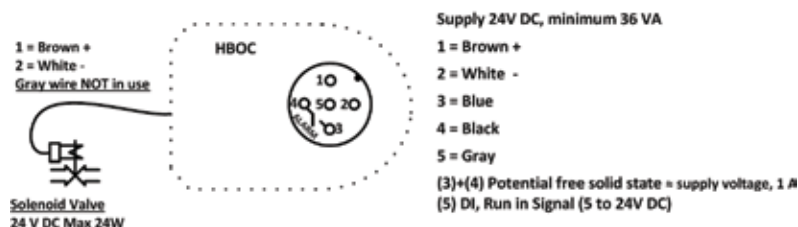
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24V DC + 10%	Thread connection	See ordering code
Power consumption	20 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
On / Off	Time	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Alarm, control, power	Max pressure	100 bar
Max. load	24 W	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Compressor adaptor	HBS/ADAP/FLANGE/UNI
Cable resistance	500 Ω/Km	Splitterbox	HBxC-Splitbox
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Technical data - valve regulation

Valve control	
Signal to valve	ON/OFF
Valve regulation	Time-regulation
Cable specification (valve control)	
Length	3 m (118")
Cable size	3 x 0.75 mm ²
Cable glands	PG7 / M8

Electrical installation



Ordering code

House design	Thread type	Ordering code
Angle	1/2" NPT	HBOC/C-1
Angle	3/4" NPT	HBOC/C-2
Angle	1 1/8 UNEF	HBOC/C-7

To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

Accessories



Technical data: V100

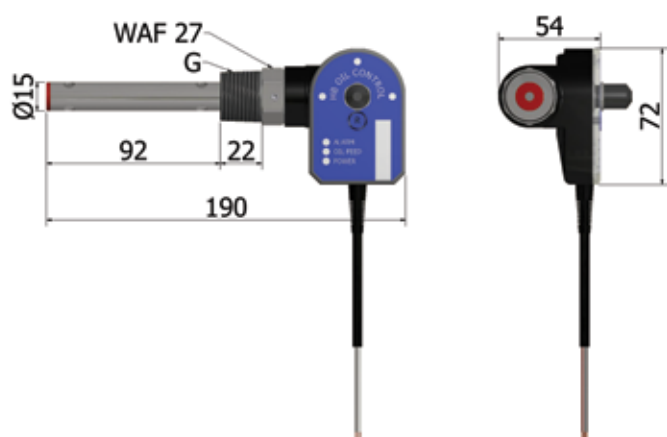
V100 is designed for connection to HBOC in compressor and oil-separator installations. The solenoid valve is controlled directly from the HBOC controller. V100 has a design pressure up to 100 bar.

- Direct control from the HBOC sensor control in NH3 applications
- House produced in stainless steel - AISI316
- Fast reaction time
- Reliable design

Installations conditions		Mechanical specifications	
Ambient temperature	-40...+80 °C	Thread size	G 1/4" - ISO 228/1
Max. pressure	100 bar	Material - housing	AISI316
Liquid	Oil	Material - sealing	PTFE
Max. viscosity	25 cSt	Outside dimension	52x74x53 mm
Flow		Weight	200 g
Theoretical flow	1.5 l/min	Valve design	Direct / NC
Connection		Ordering code	
Plug type*	DIN 43650	100 bar	V100 / 24VDC
Energy consumption - V100	14 W		

* Plug included

Mechanical dimensions

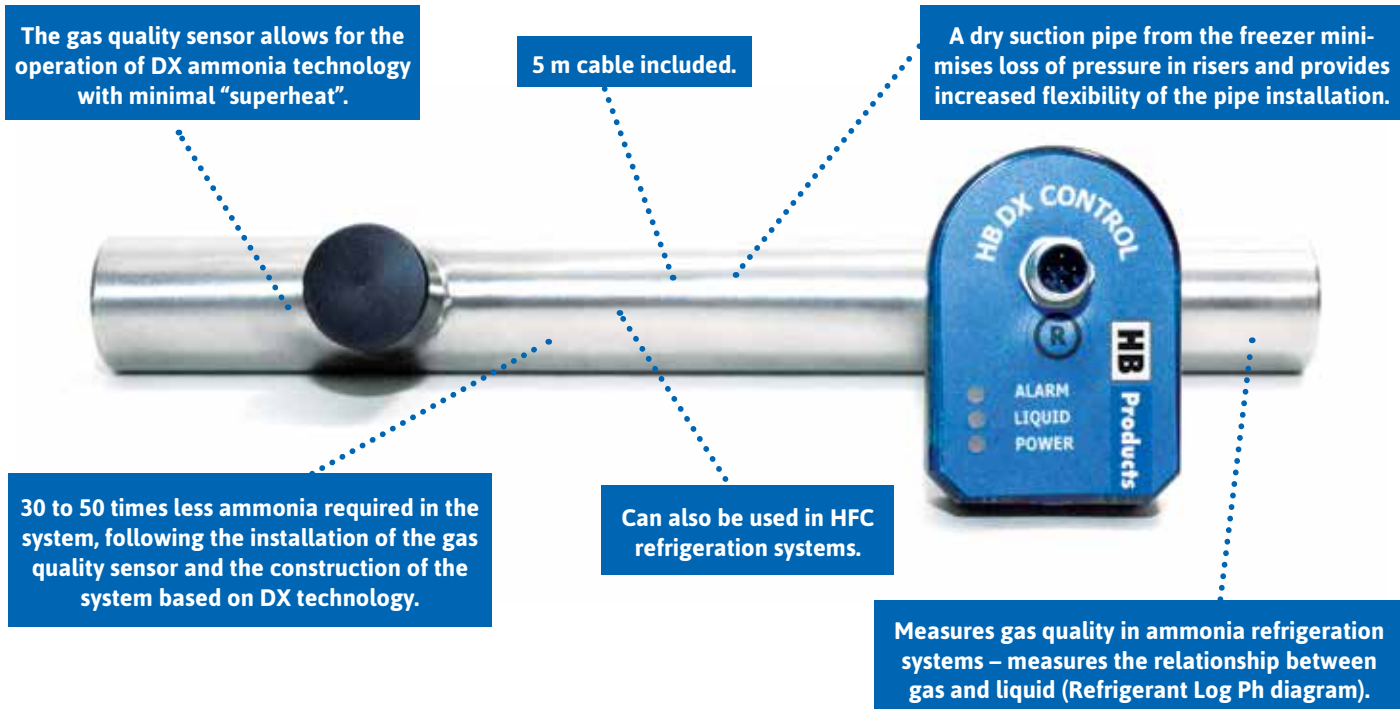


Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	½" NPT	HBSO1-MEK-1
		¾" NPT	HBSO1-MEK-2
		½" BSPP	HBSO1-MEK-5
		¾" BSPP	HBSO1-MEK-6
		1 1/8 UNEF	HBSO1-MEK-7
2	Electronic part	PC-programmable	HBOC/C-EL

Gas quality sensor / DX controller



Functional description:

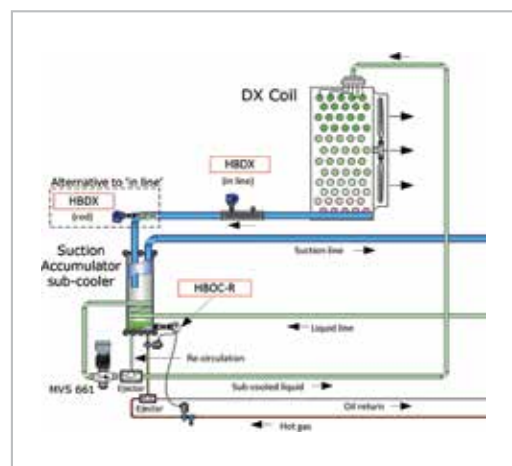
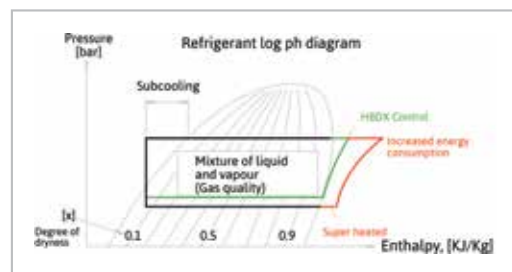
HBDX is a new revolutionary, patent-pending sensor technology, and it is thus the first sensor in the world capable of measuring the relationship between gas and liquid in a refrigeration system. The sensor measures the degree of dryness, "X", of the gas in the gas pipes, and the value is converted into a 4-20 mA analogue signal corresponding to "X".

The sensor is available in two variants, "Rod Style" for installation in a pipe elbow and "In-line" for welding into the suction pipe.

The sensor offers very precise measurements and provides instant read-outs of the gas quality, making it useable in most evaporators (plate, pipe, and air evaporators).

The sensor's microprocessor also functions as a controller, enabling the direct control of a modulating motor valve, thereby bypassing the external controller or the PLC. The controller can be set up with all the parameters that are necessary for regulating a modulating motor valve or a stepper motor valve. The sensor is available with a cable for direct supply to and control of the motor valve, or as a sensor where the signal is sent to the external controller/PLC.

The sensor cannot measure actual overheating, but with proper installation and system design, overheating can be reduced or eliminated, thus leading to substantial energy savings.



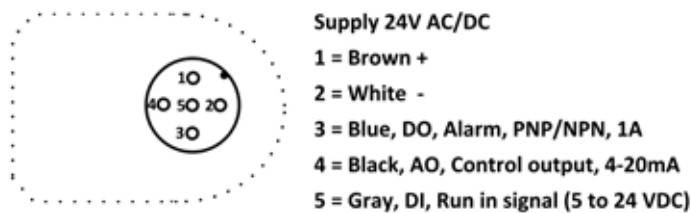
Technical data - sensor

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Thread connection	3/4" NPT/BSPP
Power consumption	400 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	600 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature	-50...+80°C
LED indication	Alarm, control, power	Max pressure	100 bar
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Adapter - 3/4" NPT / 1" BSPP	HBS/ADAP/8/2
Cable resistance	500 Ω/Km	Splitterbox	HBxC-splitbox
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

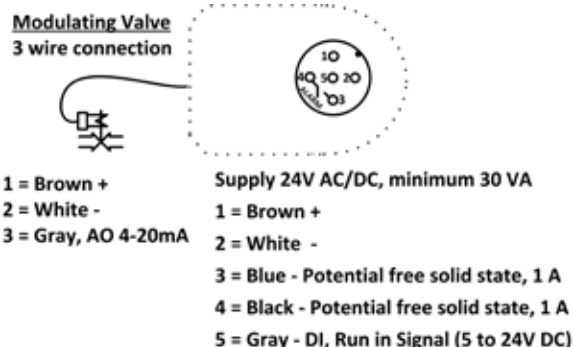
Technical data - valve regulation

Valve control (Modulating valve)		Valve control (Stepper motor)	
Signal to valve	4-20 mA	Stepper motor steps	25-5000 steps
Valve regulation	P-regulation	Stepper motor speed	2-40 m/s
Cable specification (valve control)		Stepper motor phase current	0-750 mA
Length	3 m (118")	Stepper motor holding current	0-250 mA
Cable size	3 x 0.75 mm ²		
Cable glands	PG7 / M8		

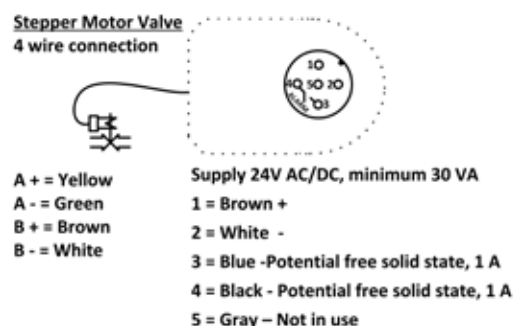
Electrical installation



HBDX with control of modulating valve with power supply cable (HBDX-xxx).



HBDX/C with cable to direct control of modulating valve (HBDX/C-xxx)



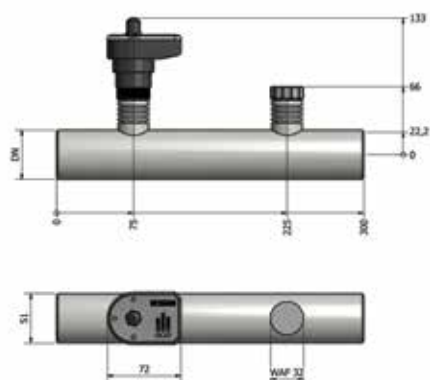
HBDX with direct control of stepper motor valve (HBDX/S-xxx)

Ordering code

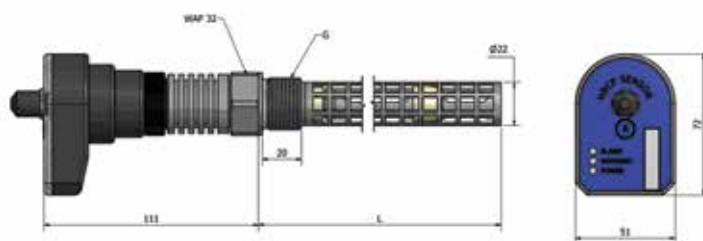
Design	Length (L)	Motor type	Cable to valve	Connection	Ordering code
Rod	195 mm	Modulating	No	3/4" NPT	HBDX-R-1.5-2
Rod	195 mm	Modulating	No	3/4" BSPP	HBDX-R-1.5-6
Rod	300 mm	Modulating	No	1" NPT	HBDX-R-3-9
Rod	300 mm	Modulating	No	1" BSPP	HBDX-R-3-8
In-line	300 mm	Modulating	No	DN25	HBDX-IN-DN25
In-line	300 mm	Modulating	No	DN40	HBDX-IN-DN40
In-line	300 mm	Modulating	No	DN50	HBDX-IN-DN50
Rod	195 mm	Modulating	Yes	3/4" NPT	HBDX/C-R-1.5-2
Rod	195 mm	Modulating	Yes	3/4" BSPP	HBDX/C-R-1.5-6
Rod	300 mm	Modulating	Yes	1" NPT	HBDX/C-R-3-9
Rod	300 mm	Modulating	Yes	1" BSPP	HBDX/C-R-3-8
In-line	300 mm	Modulating	Yes	DN25	HBDX/C-IN-DN25
In-line	300 mm	Modulating	Yes	DN40	HBDX/C-IN-DN40
In-line	300 mm	Modulating	Yes	DN50	HBDX/C-IN-DN50
Rod	195 mm	Stepper	Yes	3/4" NPT	HBDX/S-R-1.5-2
Rod	195 mm	Stepper	Yes	3/4" BSPP	HBDX/S-R-1.5-6
Rod	300 mm	Stepper	Yes	1" NPT	HBDX/S-R-3-9
Rod	300 mm	Stepper	Yes	1" BSPP	HBDX/S-R-3-8
In-line	300 mm	Stepper	Yes	DN25	HBDX/S-IN-DN25
In-line	300 mm	Stepper	Yes	DN40	HBDX/S-IN-DN40
In-line	300 mm	Stepper	Yes	DN50	HBDX/S-IN-DN50

In case of pipe dimensions bigger than DN50 we recommend the Rod-style.

Mechanical dimensions

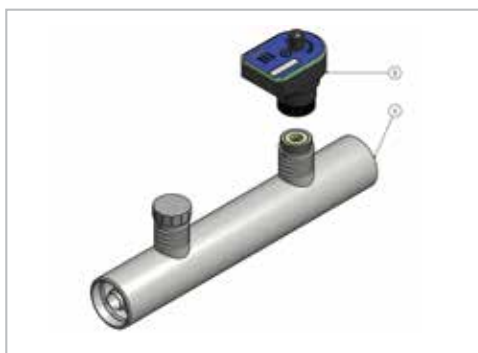


In-line (HBDX-IN)



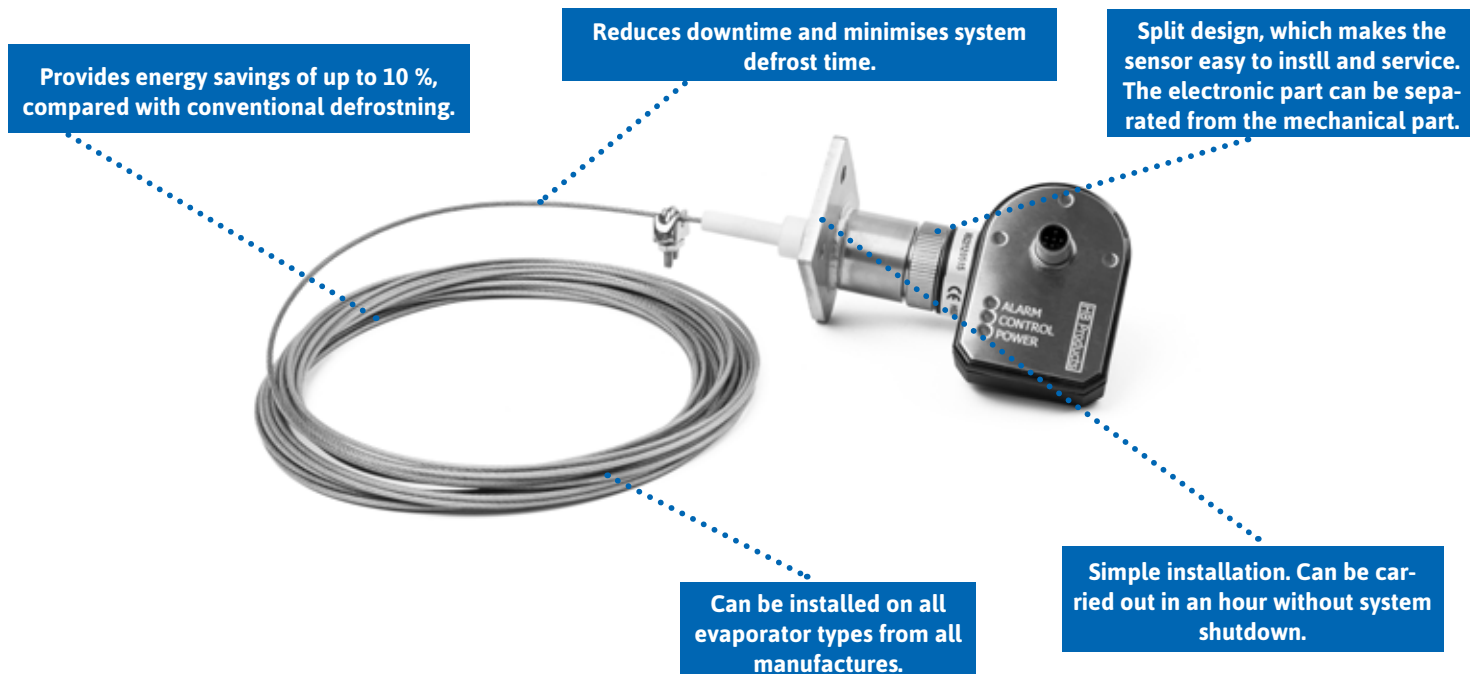
Rod-style (HBDX-R)

Spare parts



Position	Specification	Type	Ordering code
1	Mechanical parts	¾" NPT – 195 mm	HBDX-MEK-2-2
		¾" BSPP – 195 mm	HBDX-MEK-2-6
		1" NPT – 300 mm	HBDX-MEK-3-9
		1" BSPP – 300 mm	HBDX-MEK-3-8
		DN25	HBDX-MEK-DN25
		DN40	HBDX-MEK-DN40
		DN50	HBDX-MEK-DN50
2	Electronic part	PC-programmable	HBDX-EL
		PC-programmable with cable for direct valve control	HBDX/C-EL
		PC-programmable with cable for direct valve control	HBDX/S-EL

Defrost sensor



Functional description:

HBDF is a simple solution for energy-optimal automatic defrosting of evaporators. It results in energy savings of approximately 10%, thus quickly recouping its cost. The sensor measures the thickness of ice deposits between the fins and sends a 4..20mA signal to the system's PLC. The 4 mA signal is emitted when the evaporator is free of ice. The defrost point is set according to the evaporator type and the amount of moisture, and it is determined based on a visual assessment of the ice deposits on the evaporator.

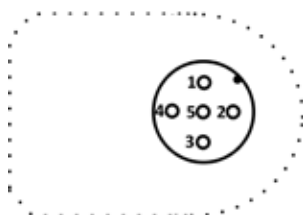
The sensor can be installed in less than one hour, on both new and old evaporators. It can be installed when the system is in operation, and therefore, system shutdown is not necessary. The electronic part is mounted on the evaporator's frame using 2 screws. The mechanical part consists of a thin Teflon-coated wire, which is installed between the fins of the evaporator. HBDF is available in 3 variants, with a 10m, 20m, and 30m wire respectively.

After installation, the sensor is calibrated/configured to the evaporator it is mounted on. This is done using a PC-based software tool, which can be downloaded via this link.

Technical data

Power supply		Mechanical specifications	
Voltage	24 V AC/DC + 10%	Flange connection	3/4" NPT/BSPP
Power consumption	30 mA	Material – liquid parts	AISI 304 / PTFE
Max power consumption	60 mA	Material – electronic parts	Nylon 6 (PA)
Plug connection	M12 - DIN 0627	Dimensions	See drawing
Output		Environmental conditions	
Analogue output	4-20 mA	Ambient temperature	-30...+50°C
Alarm output	PNP, 1 A	Refrigerant temperature*	-50...+80°C
Max. possible resistance	500 ohm	Protection degree	IP65
Cable specification (power supply)		Vibrations	IEC 68-2-6 (4g)
Cable size	5 m - 3 x 0.25 mm ²	Accessories	(to be ordered separate)
Cable glands	PG7 / M8	Splitterbox	HBxC-Splitbox
Cable resistance	500 Ω/Km		
Approvals			
CE	EN 61000-2		
GOST-R	No 0903044		
Configuration			
Type of configuration	PC tool		
Tool to be used	HB software		

Electrical installation



- 1 = Brown [Supply + 24 V AC/DC]
- 2 = White [Supply – 24 V AC/DC]
- 3 = Blue [not in use]
- 4 = Black [AO, analogue output 4-20 mA]
- 5 = Gray [DI, Calibration Signal (5 to 24V DC)]

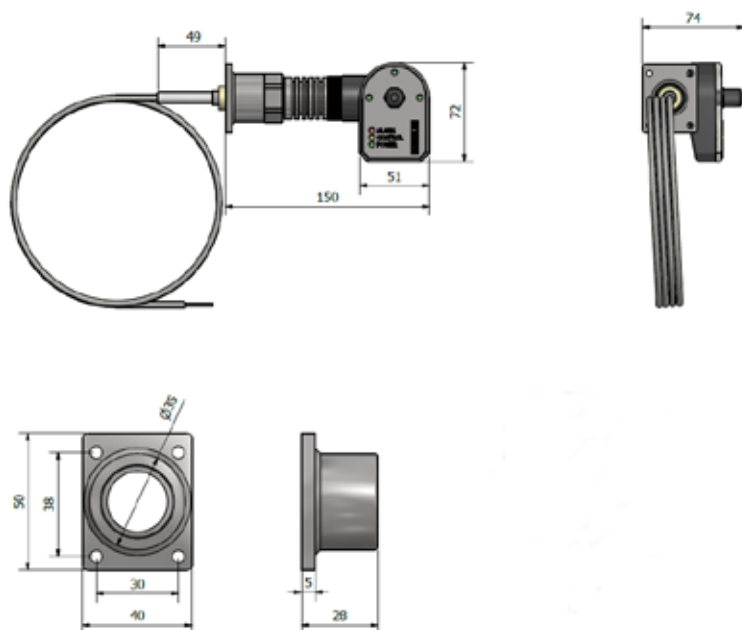


To have the sensor online and to configure it at same time requires a splitter box (HBxC-Splitbox)

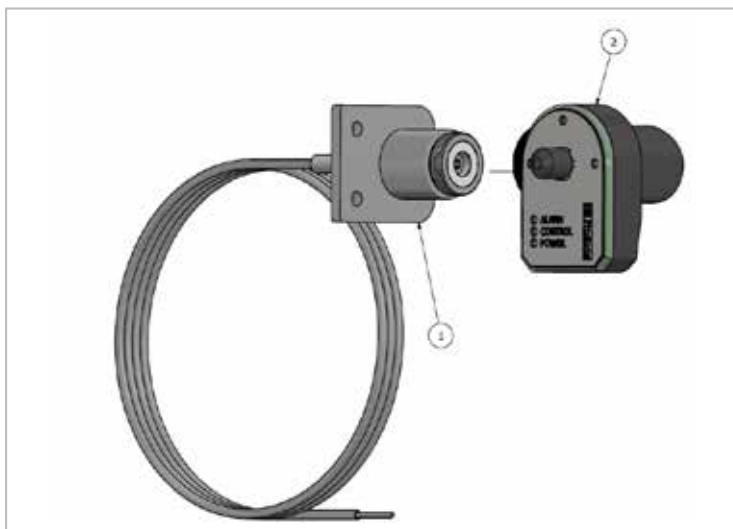
Ordering code

Wire length	Ordering code
10 m	HBDF-10M
20 m	HBDF-20M
30 m	HBDF-30M

Mechanical dimensions



Spare parts



Position	Specification	Type	Ordering code
1	Electronic part	PC-programmable	HBDF-EL
2	Mechanical parts	10m	HBDF-10M-MEK
		20m	HBDF-20M-MEK
		30m	HBDF-30M-MEK

Sensor outputs:

The output on a sensor from HB Products can be:

Digital outputs (DO):

- 3-wire - Transistor high -PNP (Sourcing) or transistor low - NPN (Sinking)
- 3/4-wire - Solid-state relay

The transistor outputs are available with an NO or NC contact function. The solid-state relay has an NC or NO contact function or programmable NC/NO contact function.

Analogue outputs (AO):

- 3-wire analogue output (AO) – 4...20 mA

Digital outputs (DO) – 3/4-wire sensors:

The sensors have separate connections for power supply and load. Either the transistor or solid-state can act as the output. The transistor output needs a relay or a PLC digital input to operate. The solid-state relay is a standalone solution that can operate a valve directly.

As the solid-state operated switch is able to handle a valve directly, it is logical that the price will be higher. If the sensor with a transistor output should be able to handle a valve, a relay must be added in the price comparison.

Specifications for the outputs:

Type	Sensors	Current load	Potential-free
Transistor output	HBSR, HBSO & HBSC2	50 mA	No
Solid-state output	HBSR-SSR-1/IP	1 A	Yes
Transistor output	HBLC	1 A	No
Solid-state output	HBLC/C (cable version)	1 A	Yes

Potential-free: A circuit that is separated from the control signal in order to have 100% EMC free signal. The benefit of a potential-free signal is that it is a standalone contact where both DC and AC power can be connected at a voltage range of 24...240 V.

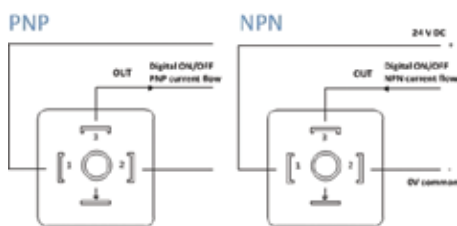
Transistor outputs:

The transistor output is available in PNP (Sourcing) or NPN (Sinking). The type that should be used depends on the type of PLC or relay used. PNP is traditionally found in Europe and NPN is traditionally used in USA and ASIA, however both types can be found worldwide.

PNP is an acronym of positive-negative-positive and NPN is an acronym of negative-positive-negative.

In general, Sinking (NPN) and Sourcing (PNP) are terms that define the control of direct current flow in a load. They are only pertinent with DC components and should not be associated with an AC control structure. Devices like relay outputs, reed switches, etc. are typically not affected since they are not dependent on current direction (unless they have devices sensitive to internal polarity, like LEDs or unidirectional spike suppressors).

In short the differences between the types are:



1) PNP (Sourcing) are outputs that “source” or “push” current through the load. This means that the common connection to the load is the 0 VDC (-DC) line. Sourcing output modules require the load to be energised by a current that flows from +24 VDC (+DC), through the PNP Output switch device, through the load, and to the 0 VDC (-DC) line.

2) NPN (Sinking) are outputs that “sink” or “pull” current through the load. In this case, the common connection to the load is the 24 VDC (+DC) line. Sinking output modules require the load to be energised by a current that flows from +24VDC (+DC), through the load, through the NPN Output switch device, and to the 0 VDC (-DC) line.

Please note that PLC manufacturers tend to mix the definitions, so it is recommendable to select the type of sensor based on the diagram and not the definition they are using.

Solid-state relays (SSR):

A solid-state relay is an ON-OFF control device in which the load current is conducted by one or more semiconductors - e.g. a power transistor, an SCR, or a TRIAC. The solid state can have either an NO or NC contact function. It is a programmable function that can be changed using the HB software tool.

Contact function NO or NC:

For the 3-wire sensors, the contact function can either be NO (Normally Open) or NC (Normally Closed). This specifies the contact function’s position in a dry condition. Therefore, an NO contact function has a deactivated contact when the sensor is dry and an NC contact function has an activated contact when the sensor is dry.

This is simple and logical for most people, but when using a HBSR switch for oil phase separation it gets a bit trickier. The HBSR detects ammonia and does not detect oil. By using it in an oil pot, it “detects” oil in the “dry” condition. So the required output must be selected based on the wet condition in order to have the same logic as for other switches.

The reaction time for the sensor is very close to 0 ms and the hysteresis is approx. 1 mm. Since high fluctuations may very often occur in both of the refrigerant and the oil, the PLC should be programmed with a time constant before the PLC reacts. We recommend the following time constant:

Liquid	Time response
Oil in crankcase compressors:	>1 s
Oil in filters	>5 s
Oil in tanks	>10 s
NH3 in tanks	>20 s
HFC in tanks:	>20 s
CO2 in tanks:	>30 s

Analogue outputs (AO):

For industrial process control instruments, analogue 4...20 mA current loop is commonly used. The 4 mA represents the lowest end of the range and 20 mA represents the highest. The key advantage of the current loop is that the accuracy of the signal is not affected by a voltage drop in the interconnecting wiring. Even if there is significant electrical resistance in the line, the current transmitter will maintain the proper current, up to its maximum voltage capability.

Depending on the source of current for the loop, devices may be classified as active (supplying power) or passive (relying on loop power). All sensors from HB Products with a 4...20 mA signal output are 3-wire sensors. The three wires are: +24 VDC, 0 VDC (common for both input and output), and output.

Sensors are factory calibrated with an output corresponding to the sensor probe length. Therefore, at the bottom of the sensor (0 mm) the output signal is 4 mA, and at the top of the sensor’s measurement range, it is 20 mA. E.g. for a probe of 800 mm length, the 4 mA is at 0 and the 20 mA is at 800 mm.

If a smaller range of measurement is required, it is possible to calibrate the sensor to show 20 mA at 400 mm. This calibration functionality is available in both the sensor and the controllers provided by HB Products.

The 4...20 mA is typically not shown in any display, but the percentage corresponding to it is 4...20 mA: 0...100%.

Control output as P-regulation:

The 4...20 mA can be used to show the actual signal in a display, for example in %. The signal output from the sensor is linear to the level in the tank and does not control any process. The 4...20mA signal can also be used for maintaining a constant level, such as a float regulator. In this case, the sensor output is connected to a controller that converts the signal to a valve open/close signal. The sensor signal is converted in the controller by a standard P-regulation process.

The P-regulation operates from a selected "Set-point" [%], where the set point is automatically maintained by signals from the sensor. If the refrigerant level is lower than the set point, the valve opens, and if the tank is empty, the valve opens fully. The closing function operates in the opposite way. A P-band defines the stiffness on the operation curve. A P-regulation normally operates within a P-band range of 30 to 60 %.

HB Products produces both sensors with built-in controllers and standalone controllers. We have defined these as decentralised controllers (sensor with built-in controller, e.g. HBLC) and centralised controllers (separate sensor and controller e.g. HBLT-C1). The decentralised solution is a cost-optimal solution and has fewer possibilities than the standalone controller. The standalone controller has separate alarm outputs for pumps etc.

In a P-regulator, only the P-band can be set. The choice of a suitable P-band is determined by two opposing requirements. In order to minimise the deviation of the regulation, a small P-band should be selected. This only requires a small change to the liquid level, so that the regulator changes the output signal to a suitable level. However, there is a limit to how much the P-band can be decreased.

If the P-band is too small, a sudden change in liquid level can result in a wide opening of the liquid valve so that the liquid level rises above the desired level. Since there are always time delays in the system, it takes a certain time before the level sensor/probe detects this change, so that the liquid inflow can be reduced. Due to the time delay, the liquid level once again has time to drop below the desired level, before the level sensor/probe reacts and increases the liquid inflow again. The liquid level will therefore fluctuate around the desired value a few times before becoming stable.

If the P-band is reduced further, the liquid level will never stabilise and we would have an unstable system. The P-band where the fluctuations begin is called the critical P-band.

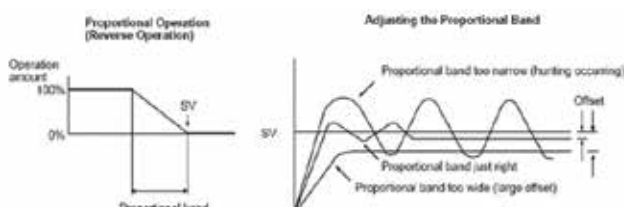
Instead, if the P-band is increased, you would have good stability but also a greater regulation deviation and a slower effect. Fig. 1. shows how the liquid level varies at different P-band settings for a certain change in load.

The P-band setting will thus be a compromise between stability and a small/large error in regulation.

In general, concerning control/regulation of liquid level in a refrigeration system, it is important that the regulation is steady/slow since you do not want the compressor capacity regulation to be unnecessarily affected; rather optimal/steady operational conditions than a constant liquid level, normally with a change in liquid level of +/-5.

Output signal is proportional to the input signal depending on the amplification (P-band):

- The P-regulator is load-dependent. It leads to a lasting deviation dependent on the load.
- An increase in the P-band leads to better stability and a greater error in regulation.
- A reduction of the P-band leads to worse stability and a smaller regulation error.
- For the regulation of liquid level in a refrigeration system, we recommend only using P-regulation.



Design recommendation – refrigerant switches:

The refrigerant switches can be mounted in both a horizontal and vertical position; however, the horizontal position in a tank is most common. Depending on the type, the sensor can be delivered with different kinds of thread types. The last number in the ordering code is normally the thread code. Below the thread type and the identical number in ordering code.

Number	Thread type	Comments
2	¾" NPT	National Pipe Taper
6	¾" BSPP	British Standard Pipe Taper (G)

The switch can either be mounted in a sleeve welded to the tank or another mechanical part that can resist the design pressure from the system. Please note that welding may only be carried out when the electronic part is dismounted from the mechanical part and the power is switched of, in case the sensor is mounted during welding.

The sensors are delivered without any sealing element. The thread should be sealed with liquid sealant.

Below you can find refrigerant switches available both as 24 V AC/DC versions and 240 V AC versions:

Refrigerant	Ordering code	Refrigerant Dielectric	Temperature range	Max pressure
R718 (ammonia)	HBSR	17	-30*...+80°C	100 bar
R718 (ammonia)	HBSR-SSR-1/IP	17	-60...+80°C	100 bar
R134a (HFC)	HBSR-HFC	9.24	-30*...+80°C	100 bar
R22 (HFC)	HBSR-HFC	6.35	-30*...+80°C	100 bar
R410a (HFC)	HBSR-HFC	7.78	-30*...+80°C	100 bar
R507 (HFC)	HBSR-HFC	6.97	-30*...+80°C	100 bar
R744 (CO2)	HBSC2	1.5	-30*...+80°C	150 bar

The main electronics on all switches are identical. However when a spare part is ordered, the sensor must be set up (calibrated) for the refrigerant being used.

Design recommendations – oil switches:

Number	Thread type	Comments	Comments
1	½" NPT	National Pipe Taper	Standard length
2	¾" NPT	National Pipe Taper	Standard length
5	½" BSPP	British Standard Pipe Taper (G)	Standard length
6	¾" BSPP	British Standard Pipe Taper (G)	Standard length
7	1 1/8" UNEF	Unified National Fine	Short form type

The standard switches type HBSO are available in two types. The HBSO2 is calibrated for PAG oil and the HBSO1 is calibrated for all other oil types:

- Mineral oil (M – Dielectric constant 2.2)
- Mineral oil with special treatment (hydrocracked oil) (M* – dielectric constant 2.2)
- Polyalphaolefins (PAO – dielectric constant 2.2)
- Alcylbenzene (AB – dielectric constant 2.2)
- Polyolester (E – dielectric constant 2.2)
- Polycol (PAG – dielectric constant 3.5)

The type of oil used should depend on the recommendation of the compressor manufacturer. An overview of the different types of oils and what they are based on is available below:

Manufacturer	Type of oil	Based on
CPI	CP 1009-68	M*
	CP 1008-68	M*
	CP 412-100	PAG
	CP-4600-46F	PAO
	Solest 68	E
	Solest 120	E
	Solest 220	E
	CP-1515-68	PAG
	CP-1515-100	PAG
	CP-1516-68	PAG
	CP-1516-100	PAG
	CP-4601-68	PAO
	CP-4601-100	PAO
	CP-9001-68	M
	CP-9001-100	M
	CP-1507-68	PAG
	CP-1507-100	PAG
	CP-4600-68F	PAO
	CP-4624-46F	PAO
	CP-4624-68F	PAO
Klüber Lubrication	Summit RHT 68	M*
	Summit NGSH-100	PAO-E
Shell	S2 Fr-A68	M*
	Clavus SG 68	PAG
	Clavus 46	M
	Clavus 68	M
	Clavus G46	M
	Clavus G68	M
	S4 FR-V 46	AB
	S4 FR-V 68	AB
	Clavus R68	E

Manufacturer	Type of oil	Based on
	Clavus R100	E
	S4 FR-F 68	E
	S4 FR-F 100	E
	S3 R68	M
	S4 PV 190	PAG
	Clavus SG68	PAG
Petro Canada	Reflo 68A	M*
TEXACO	Capella Premium	M*-PAO
Paramo	Mogul Komprimo ONC 68	M*
TOTAL	Lunaria NH 68	M*
	Lunaria NH 46	M
	Lunaria SH 46	PAO
	Lunaria FR 68	M
	Planetelf ACD 100FY	E
TOTAL	Planetelf ACD 150FY	E
	DACNIS LPG 150	PAG
Fuchs	Reniso Ultracool 68	M*-PAO
	Reniso PG 68	PAG
	Reniso S68	AB
	Reniso Synth 68	PAO
	Reniso KS 46	M
	Reniso KC 68	M
	Reniso Triton SE 55	E
	Reniso Triton SEZ 80	E
	Reniso Triton SEZ 100	E
	Reniso Triton SE 170	E
	Reniso PAG 220	PAG
	Reniso C 85 E	E*
	Reniso C 130 E	E*
	Reniso C 170 E	E*
NXT Lubricants	NXT-717	M*
Mobil	Zerice S32	AB
	Zerice S68	AB
	Gargoyle Artic SHC 226E	PAO
	Gargoyle Artic SHC NH68	AB-PAO
	Gargoyle Arctic 300	M
	Gargoyle Artic C Heavy	M

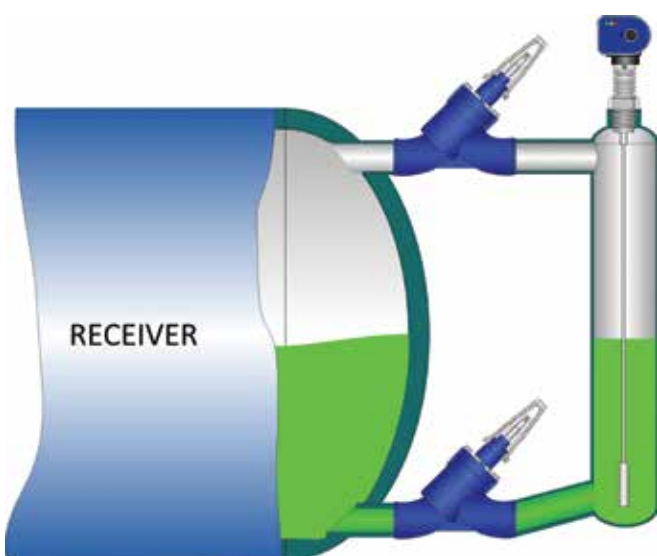
Manufacturer	Type of oil	Based on
	EAL Artic 68	E
	EAL Arctic 100	E
	Glygoyle 11	PAG
	Glygoyle 22	PAG
Castrol	Aircol 299	M
	Aircol AMX 68	M
	Aircol 2294	PAO
	Aircol SW68	E
	Aircol SW220	E
	PD 68	M

Oil system temperature: The standard oil switch design handles oil temperatures ranging from +0...+80 °C. A high temperature application is available for +0...+120°C. The limitation in temperature is based on the electronic components. A cooling extension part is also added to the high temperature sensor.

Design recommendations – level sensor:

The level sensor can be installed either in a tank or in a standpipe. Standpipes are typically used in industrial plants, as the sensor can be maintained without emptying refrigerant from the tank. However, there is no limitation to installing the sensor in the tank. Installation in a tank also limits the primary problem of boiling refrigerant. The risk of problems with the mechanical part is 1:500.

The standpipe must be designed with a pipe diameter of DN32...DN100. The bigger the size, the fewer problems there will be due to boiling. The pipe must also be insulated with proper insulation to minimise boiling. The connection pipe from the tank can be smaller than the standpipe, however with a minimum of DN32. The lowest pipe should be designed with an angle of 5-10 degrees from horizontal, in order for oil to drain back to the tank.



When the level is measured and controlled in a plate heat exchanger and a constant level is maintained, the refrigerant overflow can create problems if the HBLT-Wire sensor is used. The reason for the disturbance is the measurement principle where the standpipe is used as reference. To avoid measurement disturbance, a “protection pipe” can be installed.

Oil in refrigeration systems

The differences between oils and where the different types are most suitable

The following topics are important when it comes to selection of oil

- Requirements for oils
- Oil types
- Important characteristics and data relating to oils
- Which oil we should choose
- What damages the oil
- Oil analyses
- Examples of problems with oils

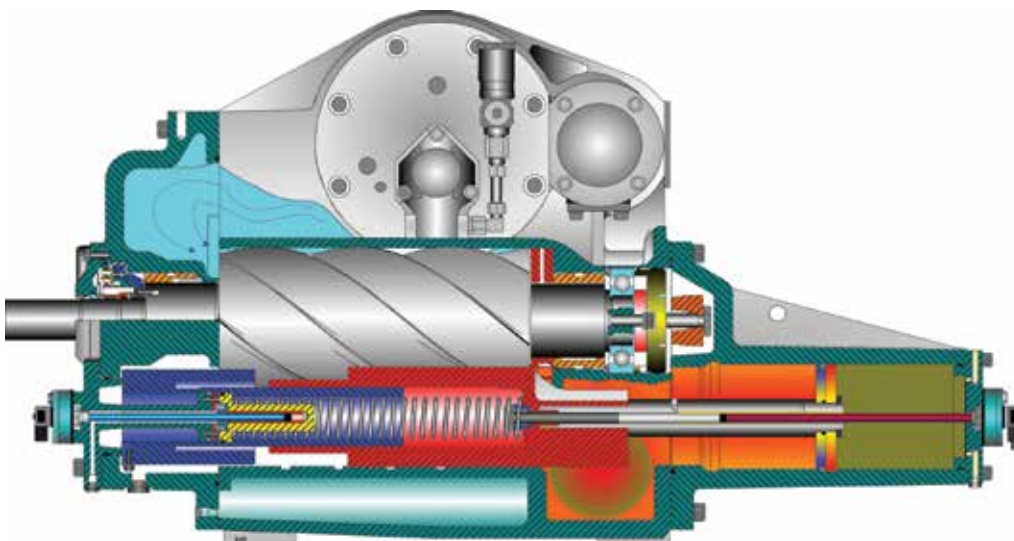
Requirements for oils in refrigeration and heating pump systems

The oil must:

- Provide the necessary lubrication to bearings and sliding surfaces
- Provide the necessary sealing to the compression chambers for the rotating compressor (screw and scroll)
- Remove heat from bearings and stuffing boxes as well as compression heat
- Have adequate viscosity at current operational pressures and temperatures
- Have a miscibility/solubility ratio at the current temperature

Synthetic oils:

- Medium
- Reaction with and effect on other materials
- Environmental considerations (health, degradability, etc.)
- Price and availability



Oil types for refrigeration and heat pump systems

Mineral oils (refined crude oils):

- Naphthenic and paraffinic
- Hydro-treated/cracked

Synthetic oils:

- Alkylbenzene (AB)
- Polyalphaolefins (PAO)

- Polyester (POE)
- Polyalkylene glycol (PAG)
- Polyvinyl ether (PVE)

Important data for the oil that is being assessed:

Oil type

Viscosity and viscosity index

Miscibility/solubility curves with current refrigerant

Flash point

Pour point

Initial acid number

Aniline point etc.

Important data regarding the oil

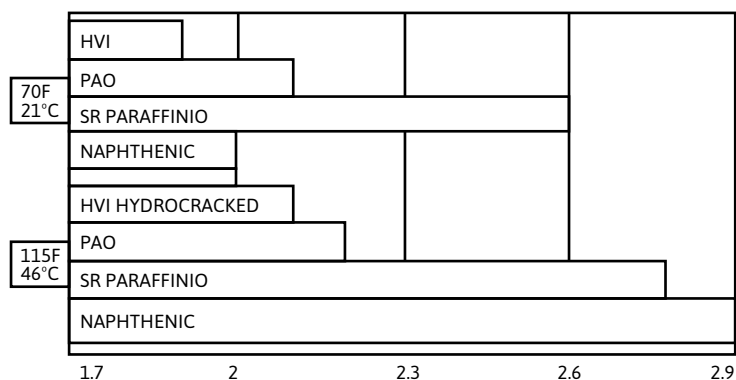
Viscosity class, ISO VG

ISO VG No.	Viscosity area Kinematic cSt at +40°C
15	13.5 – 16.5
22	19.8 – 24.2
32	28.8 – 35.2
46	41.4 – 50.6
68	61.2 – 74.8
100	90.0 – 110.0
150	135.0 – 165.0
220	198.0 – 242.0
320	288.0 – 352.0
460	414.0 – 506.0

The compressors are generally designed for a viscosity of 8 cSt

SOLUBILITY WITH AMMONIA

ISO 68 REFRIGERATION OILS



The miscibility of the oil with NH₃ refrigerant.

The oil's miscibility with the refrigerant

This is important for the oil return and the oil drain is either:

- Fully miscible
- Partially miscible
- Not miscible

Oil miscibility with the refrigerant depends on the oil type and the refrigerant, pressure, and temperatures.

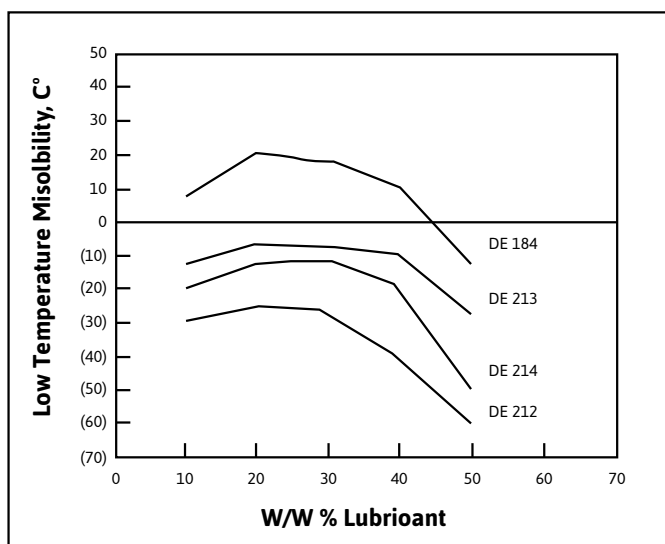
Miscibility with refrigerant, POE/R134a

EMKARATE®RLE

Typical Physical Properties

Figur 1	DE
	212
Viscosity, cst	
40°C	14,0
100°C	3,4
Viscosity Index	118
TAN, mg KOH/gm	<0,1
Flash Point	
Open Cup, °C	222
Pure Point, °C	-58

How Temperature Misolbilty vs. Gencentration



The curves only apply to the actual POE oil Emkarate RLE series. Other POE and other refrigerants generate a different curve.

The oil's absorption / solubility of refrigerant

The absorption of the refrigerant changes the viscosity of the oil by:

- High temperature reduces absorption
- High pressure increases absorption

The ability of the oil to absorb the refrigerant depends on the oil type and the refrigerant. You need access to information on this so as to choose an oil that has adequate viscosity in the operational conditions of the system.

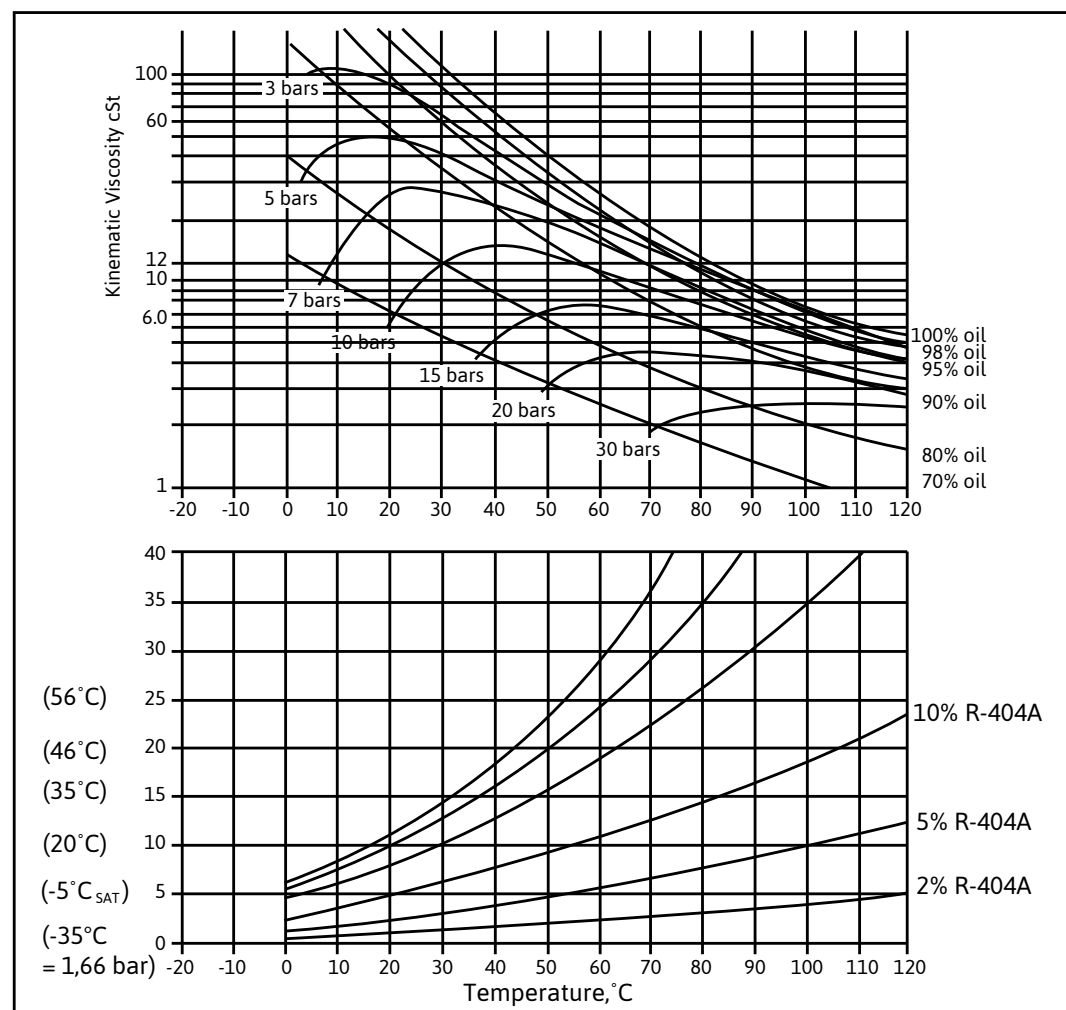
The viscosity of the oil is different for reciprocating and screw compressors

For screw compressors the oil is added into the oil separator. Here, the pressure and temperature are relatively high. The oil's solubility with different refrigerants and actual viscosity at a given operational condition.

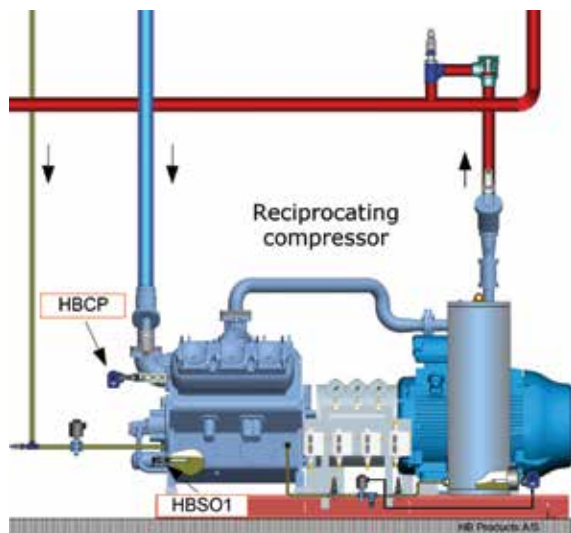
CPUI Solest 120 (POE)

R-134a	9% DII, 16 cSt
R-22	19% DII, 6,7 cSt
HP-62	12% DII, 15 cSt
R-12	22% DII, 5 cSt

Initially there are many options...



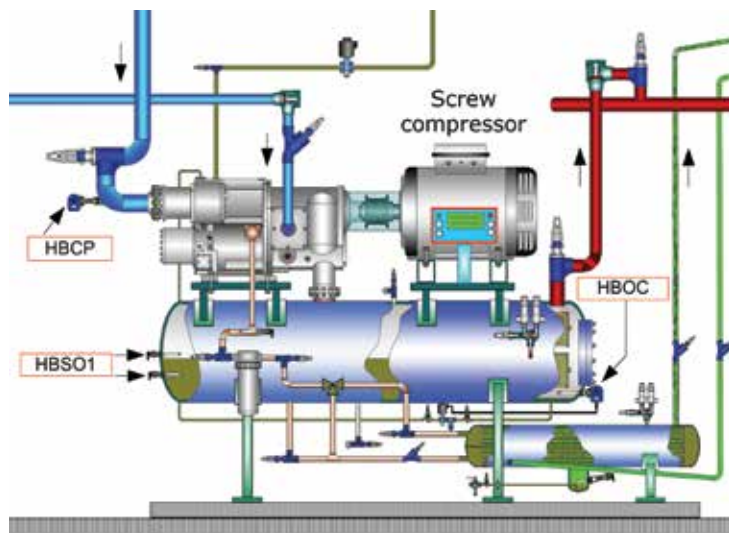
Kuldeprocess med R404A mellem $p_0/p_k = -35$ og 35 gC Olje Mobil EAL Artic 68:



For reciprocating compressors the oil is added to the crankcase. The temperature and pressure are relatively low here.

With a reciprocating compressor:

- Pressure in the crankcase is 1.66 bar
 - Absorbed refrigerant 2%
 - Resulting viscosity 60 cSt
- For high viscosity. Choose an oil with a lower viscosity.



For screw compressors, oil is added to the oil separator. The pressure and temperature are relatively high here.

With screw compressor:

- Pressure in the oil separator, 15 bar
 - Absorbed refrigerant, 13%
 - Resulting viscosity, 6.8 cSt
- For low viscosity. Choose oils with a higher viscosity.
 Cooling to about 50 °C yields 12 cSt.

Lubricating oil recommended by e.g. GEA screw compressors – refrigerant R717 (NH3)

Manufacture	Type of oil	Basis	Viscosity at 40°C in cSt	Flash point in °C	Pour point in °C	Remarks	NSF Grade
CPI	CP 1009-68	M	68	226	-40	Hydrotreated for R717 only	H2
	CP1008-68	M	64.9	240	-39		H2
Klüber Lubrication	Klüber Summit RHT 68	M	68	240	-39		H2
Shell	Shell Clavus S 68	M	68	232	-39		
Petro Canada	Reflo 68A	M	58	236	-42		H2
TEXACO	Capella Pre-mium	M/PAO	67	262	-42		
Paramo	Mogul Kompri-mo ONC 68	M	68	230	-33		
TOTAL	Lunaria NH68	M	68	230	-36		
Fuchs	Reniso Ultracool 68	M/PAO	62	250	-48		
NXT Next Lubri-cants	NXT-717	M	60.6	249	-56		

Lubricating oil recommended by e.g. GEA screw compressors – refrigerant R744 (Co2)

Manufacture	Type of oil	Basis	Viscosity at 40°C in cSt	Flash point in °C	Pour point in °C	Remarks	NSF Grade
CPI	CP-4600-68F	PAO	68			immiscible	H1
	CP-4624-46F	PAO	46				H1
	CP-4624-68F	PAO	68				H1
Fuchs	Reniso C 85E	E		278		Complete miscible	
	Reniso C 130 E	E	136		-27		
	Reniso C 170 E	E	170		-30	Attend to the miscibility	
Shell	Clavus SG 68	PAG	73.5	>250	-48	Partially miscible only	

Thorough assessments must be made

- Conditions associated with the actual compressor
- Operational conditions (pressure and temperature)
- Conditions in the refrigerant circulation
- Oil carry-over / oil return / oil drainage
- Effect on the heat exchanger
- Effect on stuffing and materials
- Air and water in the circulation

As a general rule, it is a combination or interaction between the mentioned factors that damage the oil and lead to a “chain reaction”.

It is not just the situation in the compressor that plays a role

- The compressor manufacturer will have requirements for which oil or selection of oils must be used, and will determine this based on technical compressor-related considerations
- The technician must determine the technical conditions of the oil based on the entire system
- The final selection of oil must be carried out based on all the “players”
- Often, an oil will be chosen which leads to a low viscosity in practice. For periods, there may be operational conditions that lead to “wet suction”. The oil thins out and the viscosity becomes too low.

What damages the oil?

The most important factors:

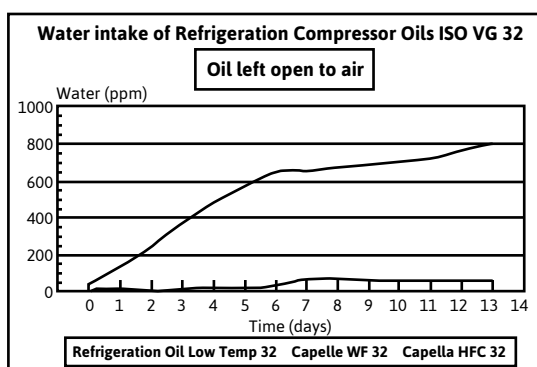
- Air (oxidation)
- Water
- High temperatures
- Different chemical reactions

As a general rule, it is a combination or interaction between the mentioned factors that damage the oil and lead to a “chain reaction”.



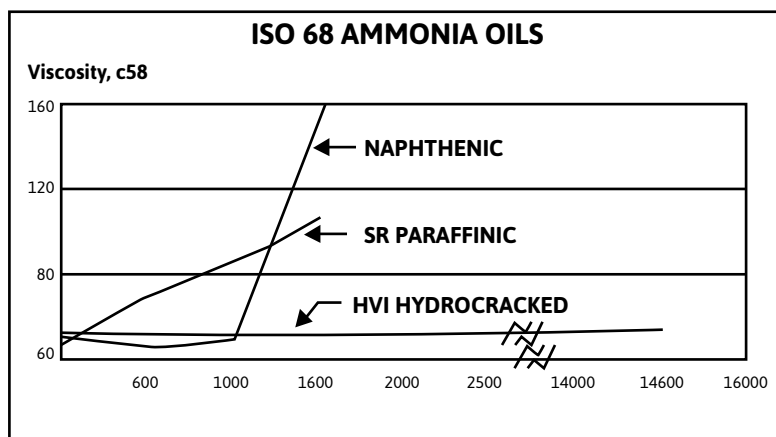
A compressor has a “cold” and “hot” side...

High water content



There must be no water in the refrigeration circuit! A water content that is too high will break down the oil, the refrigerant, and the materials in the refrigeration circuit.

High temperatures



The temperature is important for the “chemistry” of the oil. Too high temperatures break down the oil and lead to vaporisation of the volatile elements. The viscosity and “pourpoint” will increase.

Oil analysis

The most important factors:

- Visual determination
- Acid number, mgKOH/g (TAN)
- Water content, ppm
- Viscosity, cSt
- Solid contaminants, mg/l
- IR analysis (“element analysis”)

Please note: The location where the oil test is carried out in the system is of importance, and so is the method by which it is stored until the analysis is carried out in the lab.

Requirement for analysis values

The most important factors:

Acid number, mgKOH/g (TAN) NOTE Basis initial acid number

- Increase <0.05: no measures
- Increase 0.05-0.10: monitor
- Increase >0.10: change oil etc.

Water content, ppm

- New oil 20-50 ppm depending on the oil type
- Possible to achieve 20-50 ppm in a “good system”
- Increase 0.05-0.10: monitor
- 70-100 ppm: monitor
- 100-200 ppm: change oil and possibly filter dehydrator

Viscosity, cSt

- Viscosity will either stay at the original value or increase, rarely decrease
- Increase up to 20% can generally be accepted
- A drop is normally due to an error in the analysis

Solid contaminants, mg/l

Stamp: Normally with 25-50 mg/l Change oil and filter > 100-150 mg/l

Screw: Normally with 10-30 mg/l

Change oil and filter > 50-75 mg/l

Result of oil analysis

Example of the oil analysis for a VP system converted from R12 to R134a

Standards

Sensors and controls by HB Products are developed and produced in accordance with current standards. Draft standards are also taken into account for new developments and during the reworking and modification of our existing products.

The CE quality mark

The CE quality mark is a declaration by the manufacturer that the labeled product complies with the worldwide standards and guidelines that are applicable for the product. The following guidelines apply to products produced by HB Products:

89/36/EEC: EMC Directive (EN 60 947-5-2)

73/23/EEC: Low Voltage Directive

And for Ex products: 94/9/EC

Manufacture declaration: The HB Products A/S manufacture declaration are all available on our homepage and confirms that the company's products have been certified for conformity with the respective applicable guidelines.

The EMC standard

EMC simulations	Standard	Range
Conducted emission from the power art	IEC 60945	10 kHz-30 MHz
Electric field radiated emissions	IEC 60945	150 kHz – 2 GHz
RF electromagnetic fields	EN 61000-4-3	1 MHz – 2 GHz; 100 V/m
Conducted Interference RF	EN 61000-4-6	150 kHz – 80 MHz; 10 V
Conducted Interference AF	IEC 60533	50 Hz – 10 kHz; 3V/0,5V
ESD	EN 61000-4-2	+/- 8 kV Contact / Air discharge
Burst	EN 61000-4-4	+/- 2 kV DC powerpart / signal lines
Surge – lines/ground	EN61000-4-5	+/- 1 kV
Surge – lines/lines	EN61000-4-5	+/- 0,5 kV
High voltage	IEC 60092-504	550 V
Power supply, variations and interruptions	EN61000-4-11	Ub +50% / -25%

The Environmental simulations

Environmental simulations	Standard	Range
Vibration	ISO 16750-3:2007	10 Hz – 2000 Hz / 4 g
Free fall	IEC16750	
Mechanical shock	DIN EN 60068-2-27:1995	100 g / 11 ms
Dry cold	DIN EN 60068-2-1:2006	-40°C (-40°F) / 24 h
Dry heat	DIN EN 60068-2-2:2008	+125°C (257°) / 96 h
Temperature cycling	DIN EN 60068-2-14:2000	
Damp heat	DIN EN 60068-2-78:2002	
Damp heat, steady state	DIN EN 60068-30:2006	
Protection	DIN 40050	IP68
Pressure resistant	Directive 97/23/EC (PED)	100/150 bar (depending on product)
HELIUM leak test	EN 473:2008	