

Instruction Manual

HBDX – SENSOR & REGULATOR

For gas quality measurement and regulation in industrial refrigeration systems





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UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY

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Safety Instructions

CAUTION! Always read the operational guidelines before commencing work! Heed all warnings to the letter! Installation of HBDX requires technical knowledge of both refrigeration and electronics. Only qualified personnel should work with the product. The technician must be aware of the consequences of an improperly installed sensor and must be committed to adhering to the applicable local legislation.

If changes are made to type-approved equipment, this type approval becomes void. The product's input and output, as well as its accessories, may only be connected as shown in this guide. HB Products assumes no responsibility for damages resulting from not adhering to the above.

Explanation of the symbol for safety instructions. In this guide, the symbol below is used to point out important safety instructions for the user. It will always be found in places in the chapters where the information is relevant. The safety instructions and the warnings in particular, must always be read and adhered to.

	CAUTION! Refers to a possible limitation of functionality or risk in usage.
	NOTE! Contains important additional information about the product and provides further tips.
	The person responsible for operation must commit to adhering to all the legislative requirements, preventing accidents, and doing everything so as to avoid damage to people and materials.

Intended use, terms of use. The HBDX sensor and regulator are designed for measurement and regulation of ammonia gas quality in industrial refrigeration systems. If the HBDX is to be used in a different way and if the operation of the product in this function is determined to be problematic, prior approval must be obtained from HB Products.

Preventing collateral damage: Make sure that qualified personnel assess any faults and take necessary precautions before attempting to make replacements or repairs, so as to avoid collateral damage.

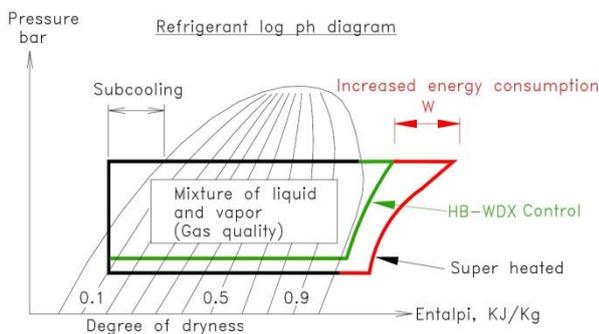
Disposal instructions: HBDX is constructed so that the modules can easily be removed and sorted for disposal.

Introduction

HBDX is an intelligent sensor with an in-built microprocessor. It is designed to regulate the gas quality in DX industrial refrigeration systems. It sends a 4-20 mA signal, which is proportional to the sensor's determined measurement area. In addition to the 4-20 mA signal, the sensor also has an in-built controller.

The controller can be set up with all the parameters necessary to regulate a modulating motor valve.

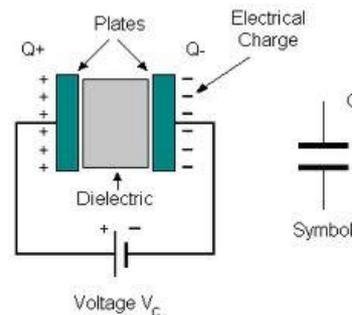
The sensor can be delivered with a cable for direct supply to and regulation of a motor valve.



Measurement Principle

The sensor is a capacitive sensor. The capacitive measurement principle is based on the electrical properties in the proximity of a capacitor. A capacitor is an electrical component that is capable of building and retaining an electrical charge.

A capacitor basically consists of two plates. When a charge is applied to one plate, the other plate will be charged with the opposite polarity and retain the charge until it has been grounded. The magnitude of the charge that can be generated (the capacitance) depends, among other things, on what is found between the plates. The substance between the plates is referred to as a dielectric.



Rather than two plates, sensors for level measurement are usually shaped as cylindrical rods. When liquid covers the sensor, the measured capacity is changed.

The conductivity of a material can vary depending on temperature, chemical composition, and the homogeneity of the material, and therefore it can in some cases require a different factory calibration.

HB Products sensors are calibrated so that they differentiate between conductive and non-conductive liquids.

In refrigeration systems, oil and liquid CO₂ are not regarded as conductive fluids, whereas refrigerants such as ammonia, HFCs, and brine are regarded as conductive fluids.

Design

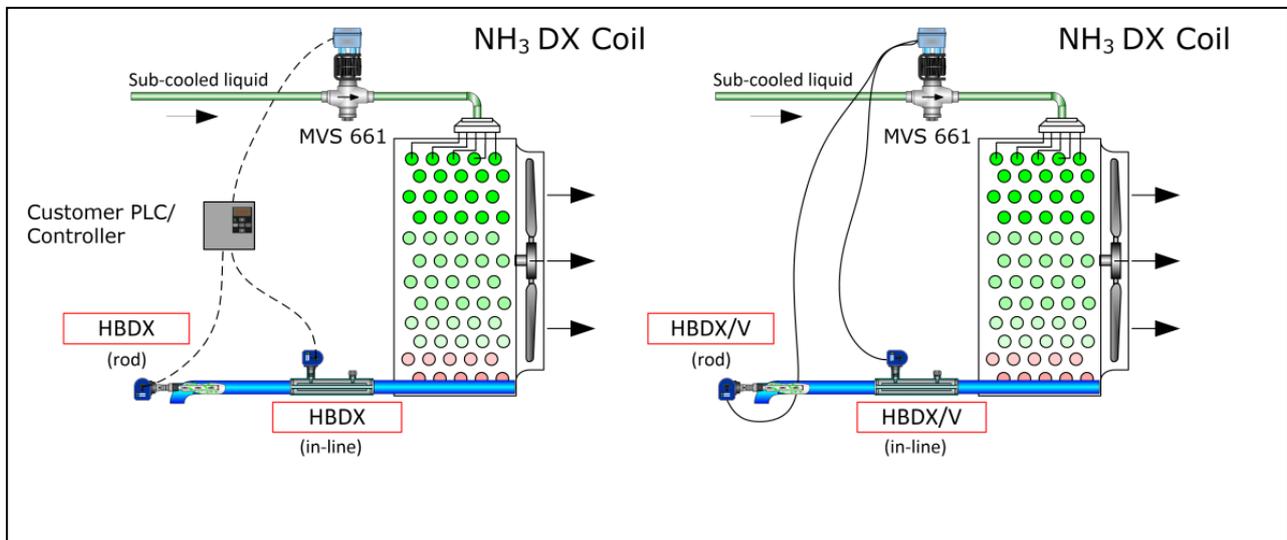
The sensor consists of a mechanical part and an electronic part. These can be easily separated by loosening 2 pointed screws, or for a housing with pre-mounted taps, by pressing the sensor towards the mechanical part and turning the housing counter-clockwise until a flat spring presses it out of the installation position. The electronic part is designed in accordance with waterproof rating IP65 and to resist vibrations. The mechanical parts are produced in AISI304/PTFE and tested to withstand high pressure.

The HBDX sensor is available in an In-line version (DN25, DN40, & DN50) as well as a Rod-style version (3/4" & 1" NPT/BSPP). Similarly, it can be supplied with or without a cable for direct connection of the modulating valve or stepper motor valve.



Rod-Style

In-line Style



On the left, you can see the sensor and controller placed in the customer's PLC. To the right, you can see the sensor with an in-built controller and direct control of the valve. This version is available for modulating valves and stepper motors.

Software

The sensor is supplied with the latest firmware.

The sensor is set up with a configuration tool, "HB Tool", using a PC.

Technical Data

Supply:

Voltage:	24 V DC \pm 10%
Electricity consumption:	Max 600 mA
Plug:	M12, 5 pins –
DIN 0627	

Valve control:

Analogue output:	4-20 mA/step
Regulation type:	P-regulation
Alarm output:	Max 1 A (24W)

Valve cable:

Cable length:	3 m
Cable diameter:	3 x 0.75 mm ²
Screwed cable connector:	PG7 / M8

Installation conditions:

Ambient temperature:	-30...+50°C
Refrigerant temperature:	-50...+80°C
Max. operational pressure:	100 bar
Waterproof rating:	IP65
Vibrations:	IEC 68-2-6 (4g)

Certifications:

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

Mechanical specifications:

Thread connection:	$\frac{3}{4}$ " & 1" NPT & BSP
Weld union:	DN25, DN40 & DN50
Materials – mechanical parts:	AISI304
Materials – electronic parts:	Nylon 6 (PA)
Housing design:	Front

Configuration & indication:

Configuration	With PC
LED Indication	Green, yellow, and red

M12 cable – 5 m:	HBxC-M12/5
Cable diameter:	5 x 0.34 mm ²
Screwed cable entry:	PG7 / M8
Connector type:	90°
Cable:	PVC-OB grey
Approval cable:	CSA

HBDX can be connected to other modulating 24 V DC valves.

Function

HBDX is designed to regulate gas quality in industrial refrigeration systems.

The HBDX sensor also has an in-built controller. The parameters for regulating a modulating motor valve can easily be set up in a configuration tool (HB Tool).

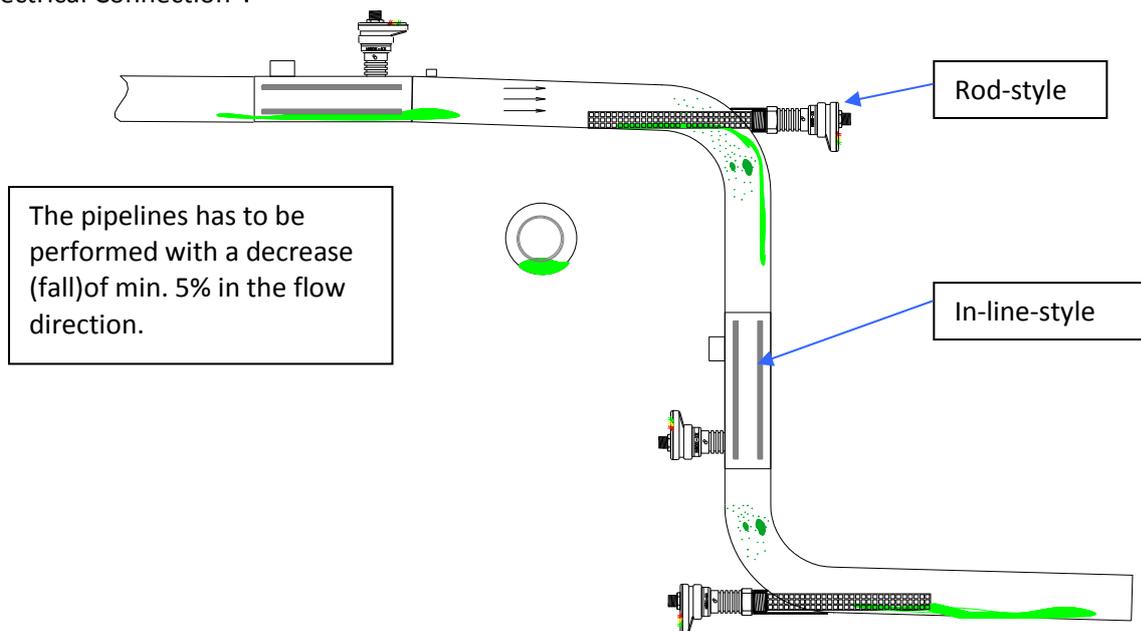
Installation Guidelines

The following applies to system design:

- 1) The sensor's measurement signal depends on correct installation. Below, you can find the correct possible installation options. The pipe dimension must be designed so that the gas speed is in the area of 10...20 m/s.
- 2) The inline type must be installed in a vertical pipe.

- 3) Rod style must be installed horizontally or vertically (pointing downwards). The sensor must be placed so that it is located at the bottom of the pipe, with a maximum gap of 1-2 mm between the sensor and the internal surface of the pipe.
- 4) The sensor must be installed with a standard unshielded cable. If the EMC is higher than described in EN 61326, a shielded cable must be used.
- 5) A pressure and temperature sensor is recommended to be installed to control flow when the system is in Superheat and defrost mode.

HBDX can be delivered with a cable for direct control of a modulating motor valve or stepper motor, or alternatively without. It is supplied with a 5-wire cable with an M12 connector, as described in the section "Electrical Connection".



CAUTION! In case of welding work on the system, the electronic part must be removed. Welding work can damage the electronics.

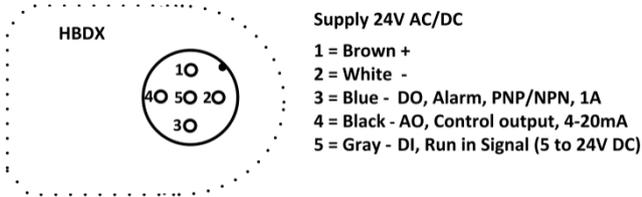
Accessories:

The sensor can be supplied with the following accessories:

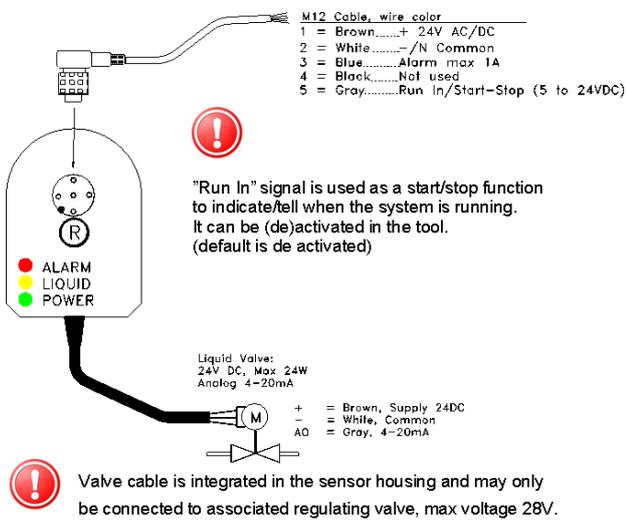
- 1) Modulating valve – Siemens MVS661.xxx
- 2) Stepper motor – Carel



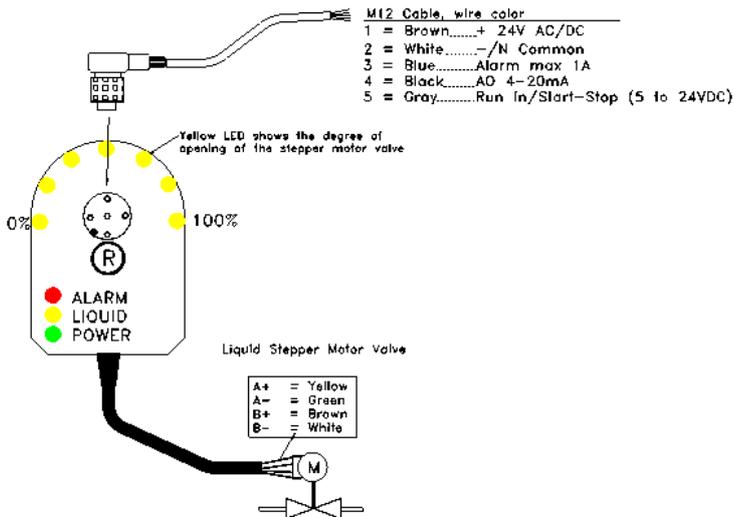
Power Connection



Connection diagram for HBDX with analogue output on the supply cable.



Connection diagram for HBDX/C with analogue output on the independent valve cable (modulating valves).



Connection diagram for HBDX/S with analogue output on the independent valve cable (stepper motor).

See separate manual for configuring the stepper motor driver.

“Run In” signal is used as the operating signal (start/stop function). This can be (de)activated in the tool.

LED Indication

LED indication:

- 1) Green LED indicates 24 V DC supply flashes during operation. If “run in” is not used, this function must be deactivated in the tool
- 2) Yellow LED indicates regulation. The flash sequence indicates if the valve is closing or opening.
- 3) Red LED indicates a high or low alarm level, depending on the set-up.



LED signal	ON/OFF/Frequency	Functionality
Green	On	Supply voltage connected
	Flash	Run-in start signal / operation.
	OFF	No supply voltage
Yellow	ON	Activation of the valve regulation / during calibration
	OFF	Valve regulation not active
Red	ON	Alarm, low or high depending on set-up
	OFF	No alarm

Fault Detection

General:



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

Fault Detection

Fault	Reason	Correction of fault
No LED is on / no function	No supply to the sensor or defective cable/plug.	Check for fault in the power supply or replace the supply cable.
No contact activation	There may be dirt between the electronic housing and the mechanical housing	Separate the two parts and clean the spring tip. Remember to apply silicone grease to the spring tip to avoid problems with moisture.
Valve is not regulating.	Wiring implemented incorrectly or wrong configuration of dip switches.	Connect the valve correctly and/or configure the valve’s dip switches according to instructions.
There is no relation between the output signal and the gas quality and overheating.	The sensor is not calibrated correctly.	Carry out calibration.

Practical measurement of output signals:

4-20 mA signal: Function and stability of the 4-20 mA signal can be checked by connecting a hand-held multimeter. If the supply is connected and the power LED flashes and there is no output signal, the electronics may be defective.



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Sensor Repair

The sensor electronics are completely encased and can therefore not be repaired.
In case of defects with the sensor, it will typically only be necessary to replace the electronics.

Complaints are processed by HB Products' dealers/distributors.
Please consider their complaint procedures before returning the sensor.

Further Information

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

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