Configuration manual

HBLC-xxx – LEVEL SENSOR
For level control of NH3, CO2 or HFC in refrigeration systems

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Safety Instructions

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

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

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

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

Intended use, conditions of use. The level sensor is designed for continuous measurement of liquid CO₂ in refrigeration systems. If HBLC-xxx is to be used in a different way and if the operation of the product in this function is determined to be problematic, prior approval must be obtained from HB Products.

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

Disposal instructions: HBLC-xxx is constructed so that the modules can easily be removed and sorted for disposal.
Installation of HB Configuration Tool

See separate manual for installation of HB Tool.

PC Configuration

The sensor is supplied with the following configuration options and factory settings.

<table>
<thead>
<tr>
<th>Setup</th>
<th>Factory settings</th>
<th>Configuration options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tab ”Edit configuration”</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control mode</td>
<td>Control</td>
<td>Control / Level</td>
</tr>
<tr>
<td>Desired level, SV</td>
<td>35 %</td>
<td>0…100 %</td>
</tr>
<tr>
<td>Proportional band</td>
<td>30 %</td>
<td>0…100 %</td>
</tr>
<tr>
<td>Alarm setting</td>
<td>80 %</td>
<td>0…100 %</td>
</tr>
<tr>
<td>Alarm delay</td>
<td>1 s</td>
<td>0…600 s.</td>
</tr>
<tr>
<td>Filter time constant</td>
<td>1</td>
<td>0…100</td>
</tr>
<tr>
<td>Run in signal</td>
<td>OFF</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>Zero and span calibration function</td>
<td>OFF</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>Refrigerant</td>
<td>NH3 / CO2</td>
<td>NH3, CO2 or HFC</td>
</tr>
<tr>
<td>Sensor probe length in mm</td>
<td>310 mm</td>
<td>310 mm</td>
</tr>
<tr>
<td><strong>Tab ”Advanced settings”</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>High</td>
<td>High / Low</td>
</tr>
<tr>
<td>Alarm Hysteresis</td>
<td>10 %</td>
<td>0…95 %</td>
</tr>
<tr>
<td>Alarm relay function</td>
<td>NC</td>
<td>NO / NC</td>
</tr>
<tr>
<td>Filter function</td>
<td>20 s</td>
<td>0…200 s.</td>
</tr>
<tr>
<td>Output direction</td>
<td>LP</td>
<td>LP / HP</td>
</tr>
<tr>
<td>Ramp function</td>
<td>5</td>
<td>0…100 %</td>
</tr>
<tr>
<td>Valve filter</td>
<td>5</td>
<td>0…100 %</td>
</tr>
</tbody>
</table>

Stepper motor – Configuration:

<table>
<thead>
<tr>
<th>Setup</th>
<th>Factory settings</th>
<th>Configuration options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stepper motor step</td>
<td>480</td>
<td>25…5000</td>
</tr>
<tr>
<td>Stepper motor speed</td>
<td>20 m/s</td>
<td>2…40 m/s</td>
</tr>
<tr>
<td>Home recal. time in hours</td>
<td>2</td>
<td>0…255 hours</td>
</tr>
<tr>
<td>Stepper motor phase current</td>
<td>450 mA</td>
<td>0…750 mA</td>
</tr>
<tr>
<td>Stepper motor holding current</td>
<td>100 mA</td>
<td>0…250 mA</td>
</tr>
</tbody>
</table>

**CAUTION!** Factory settings do not guarantee safe operation, since the configuration parameters depend on the type of compressor/separator.

**NOTE!** If the program is shut down and started up again, the cable to the sensor must be disconnected (M12 plug) and reconnected.
Description of Functions – Parameter Setup

It is also possible to configure the sensor to direct regulation of modulating valve. The other parameter must be set by the application. Detailed description is given below:

**Control/Level mode**

**Control/level mode**: Here one chooses if the sensor/system should measure or control.

- **Level mode = measurement and control mode = control (default).**

**Setpoint level in %**

**Desired level, SV**: Shows the percentage level that one wants to remain in the container or the level indicator.

**P-band in %**

**Proportional band**: Control area that describes how much the valve should open, dependent upon the deviation from the desired level. If proportional band is set to 10%, for example, a liquid level that is under 5% will make the valve open 50%; the valve will open to 100% if the level is under 10%. Small proportional band results in a system which reacts quickly, while a large proportional band results in a system that reacts more slowly.

**Alarm setting in %**

**Alarm, H/L**: Indicates the desired alarm level. It is given in % of max measurement range.

**Alarm delay in sec**

**Delay – alarm**: The delay from when the liquid level falls/rises to under/over the selected alarm, indicated in seconds.

**Filter time const. in sec.**

**Filter function**: Averages the measurement so that the control function is performed based on an average measurement in a programmable time span (in seconds). This is increased if there are brief fluctuations in the measurement which lead to unstable control.

**Run in signal**

**Decentralised activation**: with this function it is possible to activate centralised control. If one does not want this, the function must be set to OFF, otherwise the sensor’s control function will not work (power LED will blink when run-in signal is active or if this function is deactivated).
**Zero & span ca. function**

**Calibrating function:** ON in case calibration of the sensor is allowed. After start-up and possibly the first calibration, the tool can be connected and is deactivated.

**Refrigerant**

**Refrigerant:** Indicates the type of refrigerant the sensor shall measure on.

**Measurement length in mm**

Measurement in mm: Indicates the length of the sensor in mm

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**High or low alarm**

**High or low alarm:** Here one inputs the desired alarm type - high or low. Low alarm can be set between 0 and 50%, and high alarm can be set between 50 and 100%.

**Alarm hysteresis in %**

**Hysteresis – alarm:** Indicates the deviation required before the alarm is deactivated, following activation of the alarm.

Alarm hyster in procent of the probes calibrated span 0 and 100%.

Alarm setting is as well in i % of the probes calibrated span 0 and 100%.

E.g. alarm setting = 80%, Alarm hysteresis = 25%
Alarm relay function

Alarm relay function: Here, the relay function is indicated, depending upon the instructions – NO or NC (normally open/normally closed).

Output direction

Control mode: Here one selects either LP-mode (low pressure control) or HP-mode (high pressure control). In LP-mode, the container is filled so that the level is maintained, and in HP-mode the container is emptied so that the level is maintained. LP-mode = 4-20 mA. HP-mode = 20-4 mA.

Set LED indication

Enter LED function: Determines the function LED lighting has.

Ramp function: Since there can be great fluctuations in the process parameters during process start-up, it is possible to establish a ramp function (at start-up only). When it is set to “0”, the function is inactive.

Valve damping: Depending which valve is installed, it may be necessary to dampen the speed at which the valve opens. This is used especially when the valve reacts too quickly/strongly. When it is set to “0” or “100”, the function is inactive.

Stepper motor configuration

If HBLC is connected to the stepper motor, the following values must be input under advanced settings:
**Stepper motor step**
Input the stepper motor’s max number of steps here. This is available in the valve’s technical data. This value can be set in the range from 25…5000 steps.

**Stepper motor speed**
Input the stepper motor’s speed in m/s. This is available in the valve’s technical data. This value can be set in the range from 2…40 m/s.

**Home recal. time in hours**
Input the time that specifies how often the valve should recalibrate itself. This value can be set in the range from 0…255 hours.

**Stepper motor phase current**
Input the motor’s current requirements here. These are available in the valve’s technical data. This value can be set in the range from 0…750mA.

**Stepper motor holding current**
Input the stepper motor’s holding current here. This is available in the valve’s technical data. This value can be set in a range from 0…250 mA.

In the diagnostic menu application values are read:
- zero value is specified as a pF value
- Current pF value
- Range in pF
- Graphic illustration of 4-20 mA signal in the range of 0-100%

Calibration: Since it is rarely possible to make max calibration at 100%, you can perform a max calibration, for example, 50% filled tank. The sensor calculates a 100% value from this calibration.

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