



## Vibration Monitoring Unit Series HE050



**IO-Link**



**IECEE**



- Vibration speed (mm/s, rms)
- Vibration acceleration (g, rms)
- Vibration acceleration (g, peak)
- Temperature (°C)
- Output 1: IO link or digital switching output
- Output 2: Analogue current output 4-20 mA or digital switching output
- Configurable frequency range: 10-1000 Hz

Date of manufacture: \_\_\_\_\_

Type description: \_\_\_\_\_

Serial no.: \_\_\_\_\_

## **Operating instructions**

### **Vibration Monitoring Unit Type HE050**

**Version: 2023-03-28**

**Attention!**

Prior to commissioning the product, the instruction manual must be read and understood.

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Subject to modifications.

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## 2 Safety information

### 2.1 General

*The safety instructions are intended to protect people and property from damage and hazards that could arise as the result of improper use, incorrect operation or other misuse or devices, especially in explosive areas. Therefore, please read the operating instructions carefully before working on the product or operating it. The operating instructions must be accessible to operating personnel at all times.*

Please make sure that all documents are present and complete before commissioning or performing other work on the product. If the documents have not all been delivered in full or if further copies are necessary, they can also be obtained in other languages.

The product is built according to the latest state of the art. However, hazards to people, machinery and systems can still arise as the result of improper handling, unintended use or operation and maintenance by persons inadequately trained on the product.

All those who are involved in the installation, operation and maintenance of the product in the operator's plant must read and understand the operating instructions.

The product may only be assembled, disassembled, installed and repaired by instructed, sufficiently trained and authorised personnel.

### 2.2 Symbols used



This symbol indicates a hazard from electrical current.



This symbol indicates safety-related information.



This symbol indicates information unrelated to safety.

## 3 Scope of this instruction manual

This instruction manual for the HE050-type vibration monitoring unit applies to all variants of the HE050.

## 4 Vibration Monitoring Unit Type HE050

Vibration monitoring unit type HE050 is a sensor that measures the vibration speed, vibration acceleration and temperature and can be used for purposes such as monitoring the absolute bearing vibrations of machinery in line with DIN ISO 10816. It offers the following features.

- Two freely configurable outputs
  - Output 1: IO link or digital switching output
  - Output 2: Analogue current output (4-20 mA) or digital switching output
- Configurable frequency range 10 Hz–1000 Hz. For all possible frequency ranges see "Frequency ranges (Filter settings)" on page 13.
- Optional functional safety SIL 1 certification

## 5 Intended Use

The-type HE050 is used exclusively for measuring mechanical vibrations and temperatures in machines and mechanical systems. It may only be used in accordance with the specifications listed in the data sheet. **Main fields of application:** Fans, ventilators, blowers, electric motors, pumps, centrifuges, separators, generators, turbines and similar oscillating mechanical equipment.



If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## 6 Scope of supply

All versions include:



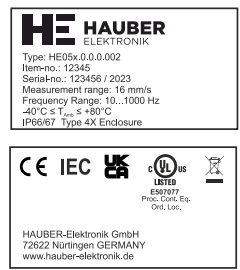
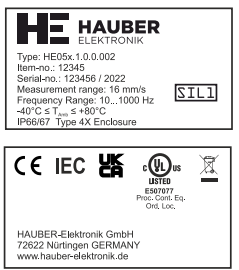
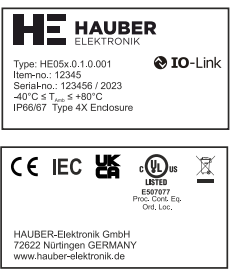

- Vibration monitoring
- Documentation

## 7 Documents and Certificates

You can find the following documents and certificates for HE050 type at [www.hauber-elektro-nik.de](http://www.hauber-elektro-nik.de) where they can be viewed and downloaded:

- cULus certificate
- CE declaration of conformity
- Operating instructions
- IO-link Description File

## 8 Fields of application and example labels

Coding	HE050.0.0.x.xxx	HE050.1.0.x.xxx	HE050.0.1.x.xxx	HE050.1.1.x.xxx
	X	X	X	X
	E507077	E507077	E507077	E507077
Functional safety		SIL 1 classification		SIL 1 classification
Example label				

### Standards applied

You can find a list of standards, including the related issue dates, in the EU type examination certificate for the vibration monitoring unit.

## 9 Information on the cULus validity range

In order to install the device according to the UL/CSA/IEC standard, the following information must be observed.

### Electrical protection



Devices must be protected by means of fuses, circuit breakers, overheating protection, impedance-limiting switches or similar to ensure protection against excessive power output if there is a fault in the device. Protection must be applied to supply lines and switching lines.



A circuit breaker suitable for 30V/3A according to UL Standard 489/CSA Standard (C22.2) no. 5/IEC 60947-2 must be installed near the device.



A fuse suitable according to UL Standard 248/CSA Standard (C22.2) no. 248/IEC 60127 must be installed near the device. The fuse must have a slow triggering characteristic ("T").

## 10 Technical data

### 10.1 General data



The measuring range and frequency range can be adjusted via IO link.

Measuring accuracy:	$\pm 10\%$ (according to DIN ISO 2954) $\pm 0.5\%$ at calibration point
Calibration point:	without IO link: 90% measuring range @ 159.2 Hz with IO link: 1g (rms) @ 159.2 Hz
Transverse sensitivity:	< 5%
Frequency range:	any can be selected between 10 and 1000 Hz. See also Frequency ranges (Filter settings), page 13.
Maximum acceleration:	$\pm 15\text{ g}$
Lifetime:	10 years

*Tab. 1: General data*

**10.2 Electrical data**

Power supply:	18 – 30 V DC*
Power input (max.):	700 mA
Power input (max.) without switching contacts:	120 mA

**Output Out 1 (pin 4)**

Output signal:	IO link or switching contact
----------------	------------------------------

**Output Out 2 (pin 2)**

Output signal:	4–20 mA (proportional to the measuring range) or switching contact
----------------	--------------------------------------------------------------------

**Switching contacts**

Output signal:	Switching signal
Electrical design:	PNP
Output function:	Contact maker/breaker (low-active/high-active)
Switching level:	0 V: Low 24 V: High High level corresponds to supply voltage minus 2 V
Current rating for each output:	100 mA (Out 1) 500 mA (Out 2)
Short-circuit protection:	yes*
Overload-proof:	yes*

\* Ensure that the supply and bus lines are protected by a UL-approved fuse for UL-compliant sensor operation.

*Tab. 2: Electrical data*



**10.3 Operating range of the vibration monitoring unit**

The operating range is independent from the measuring range. It can be derived from the maximum acceleration, which is  $\pm 15\text{ g}$  across all frequencies. The maximum measurable vibration speed is based on the formula

$$v_{max} = \int a_{max}$$

For sinusoidal vibration,

$$v_{max} = \frac{a_{max}}{2\pi f}$$

applies.

Fig. 1 shows the operating range of the vibration monitoring unit, which is limited by the maximum measurable vibration speed in mm/s, rms depending on the frequency in Hz.

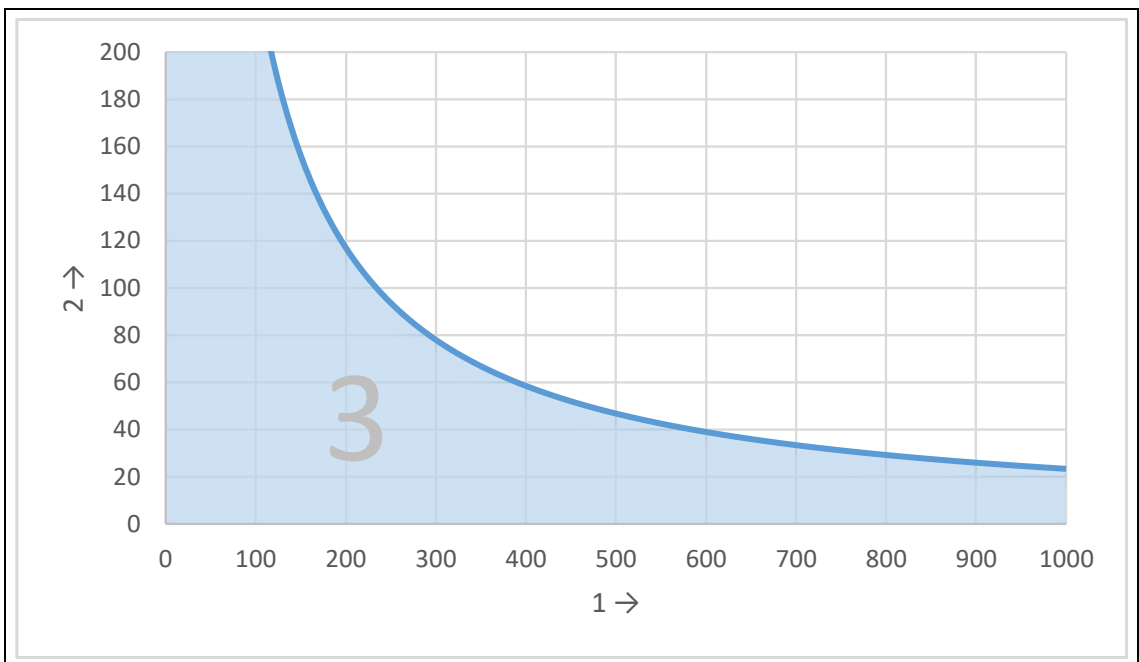


Fig. 1: Operating range diagram

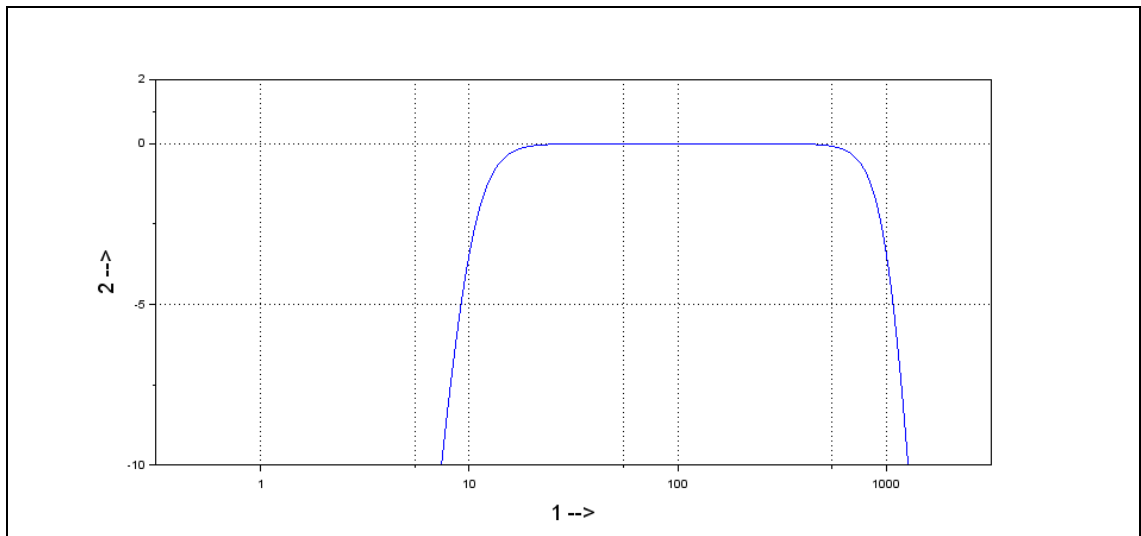
- 1 Frequency in Hz
- 2 Vibration speed (mm/s, rms)
- 3 Operating range of the vibration monitoring unit

**Reading example:**

Frequency (Hz)	Maximum measurable vibration speed (mm/s, rms)
250	93.6
400	58.5
1000	23.4

Tab. 3: Reading example of operating range

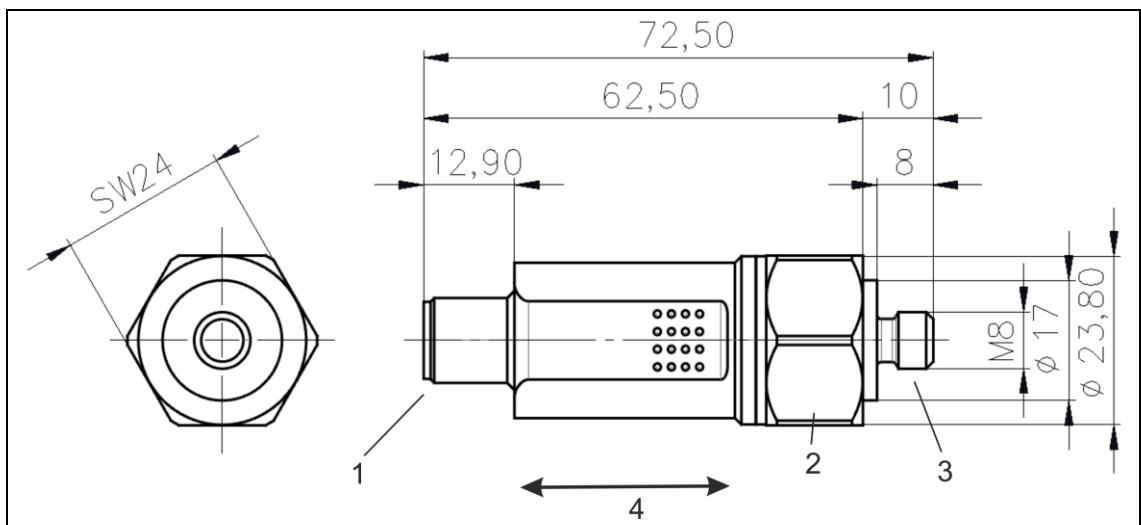
**10.4 Typical frequency response**



*Fig. 2: Typical frequency response 10 Hz–1000 Hz*

- 1 Frequency in Hz
- 2 Amplification in dB

**10.5 Housing dimensions**



*Fig. 3: Housing with M12 connector*

All dimensions in mm

- 1 M12 connector
- 2 Width A/F 24
- 3 Fixing
- 4 Measuring direction along the fixing axis

**10.6 Mechanical data**



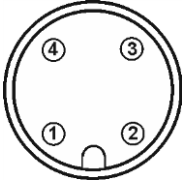
Additional materials and fixings can be found in section "Coding HE050" on page 18.

Housing material:	Stainless steel V2A, material no.: 1.4305 (standard)
Fastening:	Width across flats 24 (hexagonal) M8 x 8 mm Pitch: 1.25 mm (standard)
Installation type:	standing/vertical or lying/horizontal
Measuring direction:	Along the fastening axis
Tightening torque sensor	8 Nm
Max. torque of the M12 union nut on the connector	0.4 Nm
Weight:	approx. 90 g
Protection class:	When connected: IP 66/67 Type 4X enclosure Product is suitable for outdoor use
Ambient temperature $T_A$ :	$-40\text{ °C} \leq T_A \leq +80\text{ °C}$
Measuring head temperature $T_M$ :	$-40\text{ °C} \leq T_M \leq +85\text{ °C}$
Max. humidity:	100%

Tab. 4: Mechanical data

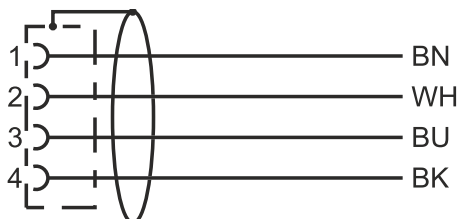
**11 Connection**

**Connector, M12, 4-pin**



Pin 1:	L+	18 – 30 V DC
Pin 2:	Out 2	4–20 mA or switching contact
Pin 3:	L-	0V / GND
Pin 4:	Out 1	IO link or switching contact

For the vibration monitoring unit HE050, Hauber cables type C and type F are suitable. They have the conductor colours of a typical connection cable.



## **12 IO-Link description of functionality**

### **12.1 Introduction**

IO-Link is the first standardised IO technology worldwide (IEC 61131-9) for the communication with sensors and also actuators. The powerful point-to-point communication is based on the long established 3-wire sensor and actuator connection without additional requirements regarding the cable material. So, IO-Link is no fieldbus but the further development of the existing, tried-and-tested connection technology for sensors and actuators.

To write and read data via IO-Link, an IO-Link master is required, which you can purchase separately.

### **12.2 Software-parameterization service**

We offer the creation and application of bespoke parameters within the frame of possibilities which is given further on. Some sets of parameters can be found in chapter "Coding HE050" on page 18.

### **12.3 General data**

Meets standards for IO-Link system and interface 1.1 (V.1.1.3)  
Compliance IO-Link 1.1. Version 1.1.3 / Package 2020

All parameters and addresses are listed comprehensively within the IO-Link description file available in the download section of our [homepage](#). This chapter only serves as an overview of the products functions.

### **12.4 Measured values and process values**

Following measured values and process values can be monitored via IO-Link continuously.

- Effective value vibration velocity (0,01 mm/s, rms)
- Effective value vibration acceleration (0,01 g, rms)
- Effective value vibration acceleration (0,01 g, peak)
- Temperature (1 °C)
- State of internal self test
- Error state
- State of all switching signals

### **12.5 Outputs**

The two outputs can be configured as follows:

Output 1 acts, as soon as the sensor is connected to an IO-Link master, as the sensors IO-Link interface. Alternatively (When not connected to an IO-Link master) output 1 can be left unoccupied or act as a digital switching output.

Output 2 can either be configured as an analogue current output 4...20 mA or as a digital switching output. It can also be configured as "disabled". All measured values can be output as an analogue signal. The measuring range of the analogue signal can be freely set within a framework defined by the manufacturer.

## 12.6 Switching signal

Two configurable switching signals ("pre-alarm" and "main alarm") are available in the sensor for each measured or process variable, which can be output via IO-Link or one of the two outputs configured as a switching contact.

The following settings can be configured individually for each switching signal:

- Limit values (in the respective unit of the measurement parameter)
- Time delay in ms (1 ms ... 60000 ms)
- Mode:
  - o 0: deactivated
  - o 1: Alarm function ('single Point'). In this mode, the limit value 2 is ignored.
  - o 2: Window function, i.e., the signal switches as soon as the limit value falls below 2.
- Hysteresis:
  - o Describes the switching delay in terms of the limit. In the standard version, this is fixed at 2% and can only be freely configured for the temperature (0 K ... 20 K)

## 12.7 Frequency ranges (Filter settings)

Four predefined frequency ranges can be selected:

0: 10 Hz ... 1000 Hz

1: 10 Hz ... 500 Hz

2: 10 Hz ... 100 Hz

3: 10 Hz ... 50 Hz

## 12.8 Maintenance Data

Following data is available exclusively via IO-Link and cannot be output via any other output.

### Counter

It is possible to set a third limit value for each measured value and for each process value (independent of the previously mentioned switching signals). Regarding this limit value there is a counter for the number of exceedances and another counter for the total duration of all exceedances. An IO-Link event reporting the exceedance of a defined counter reading can be created for both counters.

## 13 Installation and commissioning

### 13.1 General notes

**Installation and commissioning of the vibration monitoring unit may only be performed by an authorised specialist familiar with the safety regulations governing handling electrical components.**



Protect the connection cable and any extension cable from electrical interference and mechanical damage! Local regulations and instructions must be observed in doing so!



The connection cable used must be suitable for the field of application.

We recommend HAUBER cables type C or F. For further information, see chapter "Accessories" on page 16.

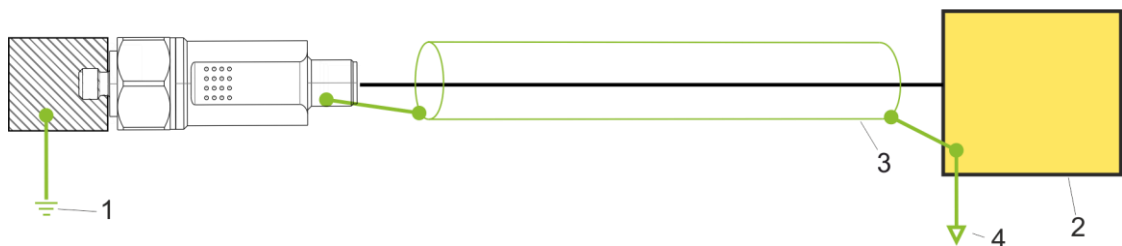
### 13.2 Wiring diagram / earthing concept

Earth/ground loops are amongst the most common problems in measurement set-ups with sensitive sensor technology. These issues arise due to unintentional differences in potential in the electrical circuit between the sensor and evaluation unit.



Ensure that the earth connection is electrically secure.

The earthing concept stipulates that the sensor cable shield is electrically connected to the sensor housing through the knurled nut and is at earth potential on the evaluation unit or the switch cabinet. For longer wires, we recommend separating the disconnecting the shield at the evaluation unit (4) to prevent compensating currents through the shield.



*Fig. 4: Standard Earthing concept*

- 1 Machine earth
- 2 Evaluation unit (measuring device, PLC, IO link master, etc.)
- 3 Cable shield
- 4 Evaluation unit earth potential

## 14 Assembly and disassembly

### 14.1 General notes

Assembly and disassembly work on and with the vibration monitoring unit may only be performed by an authorised specialist familiar with the safety regulations governing handling electrical components!



The housing of the vibration monitoring unit must be earthed via the fixing – through the machine earth of the mounting surface or through a separate protective conductor (PE)!

### 14.2 Fixing the vibration monitoring unit to the mounting surface

#### Prerequisites

- Mounting surface is clean and flat, i.e. free of paint, rust, etc.
- Measuring head area of the vibration monitoring unit must lie flat on the mounting surface.

#### Tool

- Open-end spanner, width A/F 24

#### Work steps and instructions

- Screw vibration monitoring unit into the threaded hole of the mounting surface in a friction-locked manner using an open-end spanner. The tightening torque should be 8 Nm.
- The tightening torque of the M12 union nut of the plug connection must not exceed 0.4 Nm.



To obtain precise measurement values, the vibration monitoring unit must be fixed to the mounting surface in a friction-locked manner!



Auxiliary structures for fixing are to be avoided! If unavoidable, make them as firm as possible!



Earth/ground loops are amongst the most common problems in measurement set-ups with sensitive sensor technology. These issues arise due to unintentional differences in potential in the electrical circuit between the sensor and evaluation unit. We recommend our Wiring diagram / earthing concepts as a countermeasure.



Ensure that the earth connection is electrically secure.

## 15 Accessories

The following accessories are available for the vibration monitoring unit type HE050.

### **Connection cables (other lengths available by request):**

- Cable type C (M12 connector on open end of wire)
  - 1.5 m (item no.: 13051)
  - 3 m (item no.: 13052)
  - 10 m (item no.: 11888)
  
- Cable type F (M12 connector on M12 socket)
  - 1.5 m (item no.: 13187)
  - 3 m (item no.: 13363)

### **IO link:**

- USB IO link master parametrization tool (item no.: 12987)

### **Protection against environmental factors:**

- HE rubber protective nozzle for type HE050 (item no.: 12524)



## 16 Maintenance and repair

### 16.1 General notes



Repair and cleaning work on vibration monitoring units may only be performed by an authorised specialist familiar with the safety regulations governing handling electrical components.



Before repair and cleaning disconnect the monitoring unit from the power supply! Separate plug connections must always be de-energized!



Immediately replace defective connection cables!  
A defective vibration monitoring unit must be completely replaced!



The vibration monitoring unit HE050 is maintenance-free!

### 16.2 Troubleshooting Table

Fault	Cause	Action
No measured value (4-20 mA)	No analogue output configured	Configure output
	No power supply	Check power source and/or supply
	Discontinuity in connecting cable	Replace connecting cable
	Fuse defective	Replace fuse
	Connection has incorrect polarity	Connection of correct pole
	Vibration monitoring unit faulty	Replace vibration monitoring unit
Switching contact doesn't switch	No switching contact configured	Configure switching contact
	Wrong limit value set	Set correct limit value
	No power supply	Check power source and/or supply
	Discontinuity in connection	Replace connecting cable
	Fuse defective	Replace fuse
	Connection has incorrect polarity	Connection of correct pole
	Defective monitoring unit	Replace monitoring unit
False reading	Vibration monitoring unit not mounted in a friction-locked manner	Mount vibration monitoring unit in a friction-locked manner
	Vibration monitoring unit installed in wrong place	Install vibration monitoring unit in correct place
	EMC problems	"Wiring diagram / earthing concept" on page 14.

Tab. 5: Troubleshooting Table

## 17 Coding HE050

HE050.	0.	1.	0.	001
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### HE series

050 = vibration sensor

### Certifications

0 = CE / IEC / UKCA / cULus  
 1 = CE / IEC / UKCA / cULus + SIL 1

### IO link

0 = no IO link  
 1 = IO link (alternative function output 1)

### Housing

0 = 1.4305 (V2A) with fastening M8 x 8 mm; incline 1.25 (Standard)  
 1 = 1.4404 (V4A) with fastening M8 x 8 mm; incline 1.25 mm  
 2 = 1.4462 duplex stainless steel with fastening M8 x 8 mm; incline 1.25 mm

### Software parameter settings (factory default)

	Output 1	Output 2
001 =	IO link	-
012 =	-	4-20 mA ~ 0-8 mm/s, rms; 10 Hz-1000 Hz
013 =	-	4-20 mA ~ 0-10 mm/s, rms; 10 Hz-1000 Hz
002 =	-	4-20 mA ~ 0-16 mm/s, rms; 10 Hz-1000 Hz
014 =	-	4-20 mA ~ 0-20 mm/s, rms; 10 Hz-1000 Hz
003 =	-	4-20 mA ~ 0-25 mm/s, rms; 10 Hz-1000 Hz
004 =	-	4-20 mA ~ 0-32 mm/s, rms; 10 Hz-1000 Hz
005 =	-	4-20 mA ~ 0-50 mm/s, rms; 10 Hz-1000 Hz
006 =	-	4-20 mA ~ 0-64 mm/s, rms; 10 Hz-1000 Hz
015 =	-	4-20 mA ~ 0-1 g, rms; 10 Hz-1000 Hz
016 =	-	4-20 mA ~ 0-2 g, rms; 10 Hz-1000 Hz
017 =	-	4-20 mA ~ 0-4 g, rms; 10 Hz-1000 Hz
018 =	-	4-20 mA ~ 0-6 g, rms; 10 Hz-1000 Hz
019 =	-	4-20 mA ~ 0-8 g, rms; 10 Hz-1000 Hz
020 =	-	4-20 mA ~ 0-10 g, rms; 10 Hz-1000 Hz



Don't see your desired configuration listed? Please contact us and we can offer you a solution for your specific needs.

## 18 Transport, storage and disposal

The sensor must be protected from damaging environmental factors and mechanical damage during transport with the use of adequate packing.

The sensor may not be stored in ambient temperatures outside the permitted operating temperature.

The product contains electronic components and must be disposed of properly in accordance with local laws and regulations.

## 19 EU declaration of conformity

### Declaration of conformity

HAUBER-Elektronik GmbH  
Fabrikstraße 6  
D-72622 Nürtingen-Zizishausen

declares under our sole responsibility that the products listed below that relate to this declaration meet the basic health and safety requirements of the norms and directives below.

### Product series

HE050, HE055

### Signature

Nürtingen, 17/02/2022

Place and date

### Norms and directives

EU Directive	Norms
<b>2014/30/EU</b>	EN 61000-6-7:2005 EN 61000-6-3:2007 + A1:2011 EN 55011:2016 + A1:2017
<b>2011/65/EU</b>	



Tobias Bronkal, Managing Owner