HAUBER
ELEKTRONIK

Vibration monitoring unit
HE100 series

MADE IN GERMANY

CE IECEE EAC c UL us LISTED Proc. Cont. Eq. for Ord. Loc.

Ex IECEx EAC Ex

- Vibration velocity (mm/s, rms)
- ATEX / IECEx / EACEx Zone 1 / 2 / 21 / 22
- Analogue current output: 4–20 mA
- Frequency ranges: 10 Hz–1,000 Hz
  1 Hz–1,000 Hz

Manufacturing date:	_____
Type designation:	_____
Serial number:	_____

Instruction Manual

Vibration monitoring unit
Type HE100

Standard and ATEX / IECEx / EACEx

Version: 2020-03-27

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

Should any question arise, please contact:
HAUBER-Elektronik GmbH
Fabrikstraße 6
72622 Nürtingen
Germany
Tel.: +49 (0) 7022 / 21750-0
Fax: +49 (0) 7022 / 21750-50
info@hauber-elektronik.de
www.hauber-elektronik.de

1 Table of contents

2 Safety information

2.1 General

The safety information is designed to protect people and property from damage and hazards resulting from unintended use, incorrect operation or other negligent handling of devices, especially in potentially explosive atmospheres. For this reason, you should read this instruction manual carefully before undertaking any work on the product or commissioning it. The instruction manual must be accessible to operating personnel at any time.

Please check that all documentation is in place prior to commissioning or other work on the product. If not all documentation has been handed over in full, or if further copies are required, then they can also be sourced in other languages.

The product has been constructed to the state of the art. Nevertheless, it is impossible to rule out dangers emerging from this product which could endanger people, machines and systems, should it be subject to inappropriate handling, non-intended use or use and maintenance by insufficiently trained persons.

Every person employed by the operator and involved in the set-up, operation and maintenance of this product must have read and understood this instruction manual.

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 risk of explosion.

This symbol indicates a risk of electric shock.

This symbol points to non-safety-related information.

3 Scope of this instruction manual

This instruction manual for the HE100-type vibration monitoring unit applies to the following variants:
Standard / ATEX / IECEx / EACEx

The functionality of the versions is identical. The ATEX / IECEx / EACEx versions also possess certifications and labels which permit use in potentially explosive atmospheres. For further information, see chapter "Application areas and type plate examples” on page 6.

4 Vibration monitoring unit type HE100

The HE100-type vibration monitoring unit is used to measure and monitor absolute bearing vibrations in machines in line with DIN ISO 10816.
It has the following features:

- Operating principle: The two-wire system.
- Measurement value: The effective value (rms) of the vibration velocity in mm/s, in accordance with DIN ISO 2954.
- Analogue current output: Interference-free DC signal from 4–20 mA, proportional to the measuring range of the monitoring unit.
- Cable breaks on the monitoring cable can be detected by a downstream evaluation component: DC signal value < 3.5 mA.

5 Intended use

The HE100-type is used exclusively for measuring mechanical vibrations in machines and mechanical systems. Its use is only permissible within the specifications stated in the data sheet. **Main fields of application**: Fans, ventilators, blowers, electric motors, pumps, centrifuges, separators, generators, turbines and similar oscillating mechanical systems.

6 Scope of supply

All versions include:

- Vibration monitoring unit
- Instruction Manual

7 Documents and certificates

The following documents and certificates pertaining to type **HE100** can be viewed and downloaded here: *http://www.hauber-elektronik.de/english/index.html*

- EC type examination certificate ATEX; no.: PTZ 16 ATEX 0029 X
- EC type examination certificate IECEx; no.: PTZ 18.0009 X
- EACEx certificate RU C-DE.HA65.B.00053/19
- EAC declaration

8 Transfer of liability when operating in potentially explosive atmospheres

The owner of the system is exclusively liable for the appropriate configuration of the electrical connections with respect to explosion protection regulations and correct commissioning.

If the system is installed by a sub-contractor on behalf of the owner, the system may only be commissioned after the sub-contractor has issued written confirmation in the form of a certificate of installation that the system has been installed correctly and professionally in accordance with the applicable legal regulations.

The operator is obliged to notify the responsible authorities of the initial commissioning of explosion-protected systems or system components and their re-commissioning following extensive changes or maintenance.

9 Application areas and type plate examples

Version	Standard CE / IEC /EAC UL Proc. Cont. Eq. for Ord. Loc.	ATEX / IECEx / EACEx Pressure-resistant casing, Ex db Protection through housing, Ex tb	ATEX / IECEx / EACEx Intrinsic safety Ex ib
Application area	Atmospheres not at risk of explosion	Potentially explosive atmospheres of zones 1 and 21 2 and 22	Potentially explosive atmospheres of zones 1 and 21 2 and 22
Marking	c UL us LISTED E507077 Process Control Equipment for Ordinary Location	II 2G Ex db IIC T4 Gb II 2D Ex tb IIIC T120 °C Db -40 °C ≤ T_{Amb} ≤+60°C PTZ 16 ATEX 0029 X **IECEx** II 2G Ex db IIC T4 Gb II 2D Ex tb IIIC T120 °C Db -40 °C ≤ T_{Amb} ≤+60°C IECEx PTZ 18.0009 X 1Ex db IIC T4 X Ex tb IIIC T120 °C X -40 °C ≤ T_{Amb} ≤+60°C № TP TC 012/2011	II 2G Ex ib IIC T4 Gb II 2D Ex ib IIIC T125 °C Db -40 °C ≤ T_{Amb} ≤+60°C PTZ 16 ATEX 0029 X **IECEx** II 2G Ex ib IIC T4 Gb II 2D Ex ib IIIC T125 °C Db -40 °C ≤ T_{Amb} ≤+60°C IECEx PTZ 18.0009 X 1Ex ib IIC T4 X Ex ib IIIC T125 °C X -40 °C ≤ T_{Amb} ≤+60°C № TP TC 012/2011
Type plate	HAUBER ELEKTRONIK MADE IN GERMANY Type: HE100.00.16.00.00.00.000 Item-no.: 10935 Serial-no.: 107863 Measuring range V_{Eff}: 0...16 mm/s Frequency range V_{Eff}: 10...1000 Hz -40 °C <= TAmb <= +60 °C Manufacturer: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen GERMANY www.hauber-elektronik.de c UL us LISTED Proc. Cont. Eq 507077 Тип: HE100.00.16.00.00.00.000 Зав. №.: 107863 Диапазон измерения: 0...16 mm/s Диапазон частоты: 10...1000 Гц -40 °C <= Ta <= +60 °C Производитель: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen Германия www.hauber-elektronik.de	HAUBER ELEKTRONIK MADE IN GERMANY Type: HE100.01.16.00.00.00.050 Item-no.: 10962 Serial-no.: 107080 Measuring range V_{Eff}: 0...16 mm/s Frequency range V_{Eff}: 10...1000 Hz -40 °C <= TAmb <= +60 °C II 2G Ex db IIC T4 Gb II 2D Ex tb IIIC T120 °C Db 0063 PTZ 16 ATEX 0029 X IECEx IECEx PTZ 18.0009 X Manufacturer: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen GERMANY www.hauber-elektronik.de Тип: HE100.01.16.00.00.00.050 Зав. №.: 107080 Диапазон измерения: 0...16 mm/s Диапазон частоты: 10...1000 Гц -40 °C <= Ta <= +60 °C 1Ex db IIC T4 X Ex tb IIIC T120 °C Xb No TP TC 012/2011 Производитель: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen Германия www.hauber-elektronik.de	HAUBER ELEKTRONIK MADE IN GERMANY Type: HE100.02.16.00.00.00.000 Item-no.: 10971 Serial-no.: 108392 Measuring range V_{Eff}: 0...16 mm/s Frequency range V_{Eff}: 10...1000 Hz -40 °C <= TAmb <= +60 °C II 2G Ex ib IIC T4 Gb II 2D Ex ib IIIC T125 °C Db 0063 PTZ 16 ATEX 0029 X IECEx IECEx PTZ 18.0009 X Manufacturer: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen GERMANY www.hauber-elektronik.de Тип: HE100.02.16.00.00.00.000 Зав. №.: 108392 Диапазон измерения: 0...16 mm/s Диапазон частоты: 10...1000 Гц -40 °C <= Ta <= +60 °C 1Ex ib IIC T4 X Ex ib IIIC T125 °C X No TP TC 012/2011 Производитель: HAUBER-Elektronik GmbH Fabrikstraße 6 ◦ 72622 Nürtingen Германия www.hauber-elektronik.de

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.

10 General Conditions for Safe Operation

The following conditions must be met for safe operation in potentially explosive atmospheres.

10.1 HE100.01 (protection ‘pressure resistant housing’)

Electrical data

		min	**typ.**	**max.**
Supply voltage	U_n	10 V DC	24 V DC	30 V DC
Current	I_n	4 mA	4...20 mA	25 mA

Tabular 1: Electrical data HE100.01

10.2 HE100.02 (ignition protection class "intrinsically safe")

With the ignition protection class intrinsically safe Ex ib IIC or IIC, the sensor must only be operated in a certified intrinsically safe electrical circuit. The maximum values must not be exceeded.

The following values relate to the vibration monitoring unit and the supply and signal circuit.

Electrical data

Max. input voltage of the vibration monitoring unit	U_i	30 V DC
Max. input current of the vibration monitoring unit	I_i	25 mA
Max. input power of the vibration monitoring unit	P_i	600 mW
Capacity of the vibration monitoring unit	C_i	44 nF
Inductance of the vibration monitoring unit	L_i	0 µH

Tab. 2: HE100.02 electrical data

Other conditions

1. Extended ambient temperature range of -40°C to +60°C
2. Equipotential bonding takes place during installation.
3. The instruction manual is to be heeded.
4. The following feed/inlet isolating amplifiers are tested and approved by Hauber-Elektronik GmbH for intrinsically safe operation:
   - Endress und Hauser
     Active barrier RN221N with HART® diagnosis
   - PHOENIX CONTACT Deutschland GmbH
     feed and isolating amplifier MACX MCR-EX-SL-RPSSII 2865340
   - Pepperl+Fuchs
     SMART transmitter supply unit KFD2-STC3-Ex1
   - R. STAHL Schaltgeräte GmbH
     transducer supply unit 9260/13-11-10s art. no. 261384
5. The Ex i version must only be operated with the Ex i cable approved by Hauber-Elektronik. On this cable, pin 5 of the M12 connector is assigned to the cable shield. (HE article number: 11141 (2m), 11142 (5m), 11143 (10m), additional lengths available in stock)

HAUBER-Elektronik is not responsible for changes to the specification of the feed/inlet isolating amplifier mentioned.

11 Technical data

11.1 General data

Each sensor has one of the measuring and frequency ranges listed. Additional ranges upon request.
Please specify the measuring and frequency range in your query.

Measuring range:	0–8 mm/s (only for frequency range > 10 Hz) 0–16 mm/s 0–32 mm/s 0–64 mm/s
Measurement accuracy:	±10% (as per DIN ISO 2954)
Cross-sensitivity:	< 5%
Frequency range:	10 Hz–1,000 Hz (standard) 1 Hz–1,000 Hz
Calibration point	159.2 Hz and 90% amplitude of the measuring range
Maximum acceleration	±16.5 g
Service life	10 years
MTTF	399 years

Tab. 3: General data

11.2 Electrical data

Output signal:	4–20 mA (proportional to the measuring range)
Voltage supply:	10–30 V DC
Current draw (max.):	25 mA
Apparent ohmic resistance/load (max.):	500 Ω
Fuse*:	30VDC, 3A, medium blow
* Ensure that the supply line is protected by a UL-approved fuse for UL-compliant sensor operation.	

Tab. 4: Electrical data

11.3 Permitted operating temperature ranges

Version	**Ambient temperature (T_A)**	**Measuring head temperature (in the fixing area)**
Standard	-40°C to +60°C	-40 °C to +125°C
ATEX / IECEx / EACEx Pressure-resistant casing, Ex d Protection through housing, Ex tb	-40 °C to +60 °C	-40 °C to +125°C
ATEX / IECEx / EACEx Intrinsic safety Ex ib	-40 °C to +60 °C	-40 °C to +125°C

Tab. 5: Permitted operating temperature ranges

11.4 Operating range of the vibration monitoring unit

The operating range is independent of the measuring range. It is deduced from the maximum acceleration, which is 16.5 g across all frequencies. The maximum measurable vibration velocity is determined by the formula

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

The following applies to sinusoidal vibration

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

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

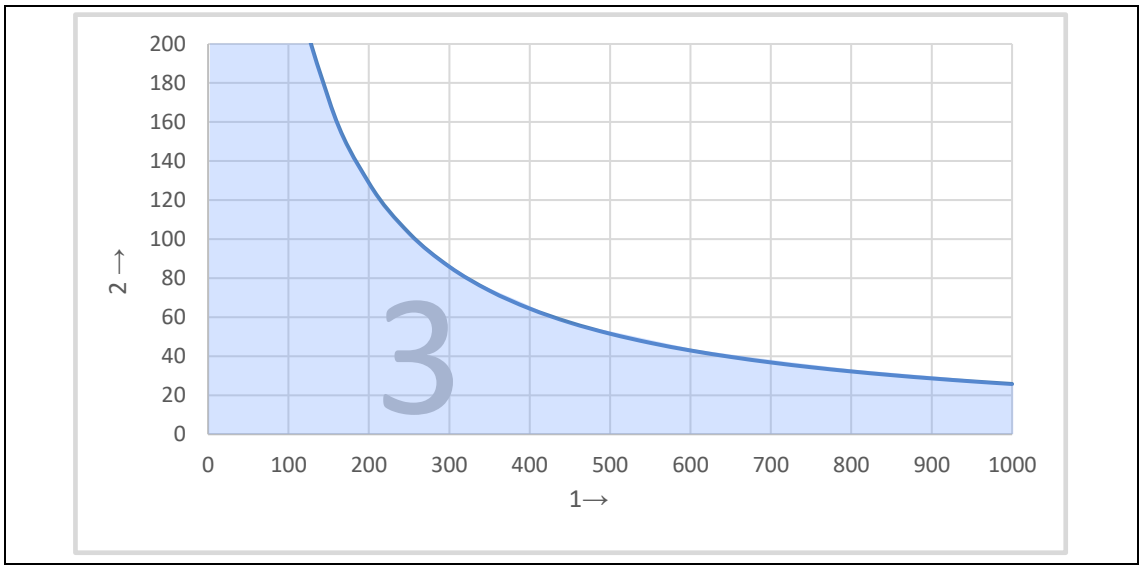


Fig. 1: Operating range diagram

1 Frequency in Hz
2 Vibration velocity in mm/s
3 Operating range of the vibration monitoring unit

Reading examples:

Frequency (Hz)	**Maximum measurable Vibration velocity (mm/s)**
250	103
400	64
1,000	25

Tab. 6: Operating range reading examples

11.5 Typical frequency response

10 Hz–1,000 Hz (standard)

The frequency response is recorded using a reference sensor.

• 4 Hz. . . 1,200 Hz acceleration sensor

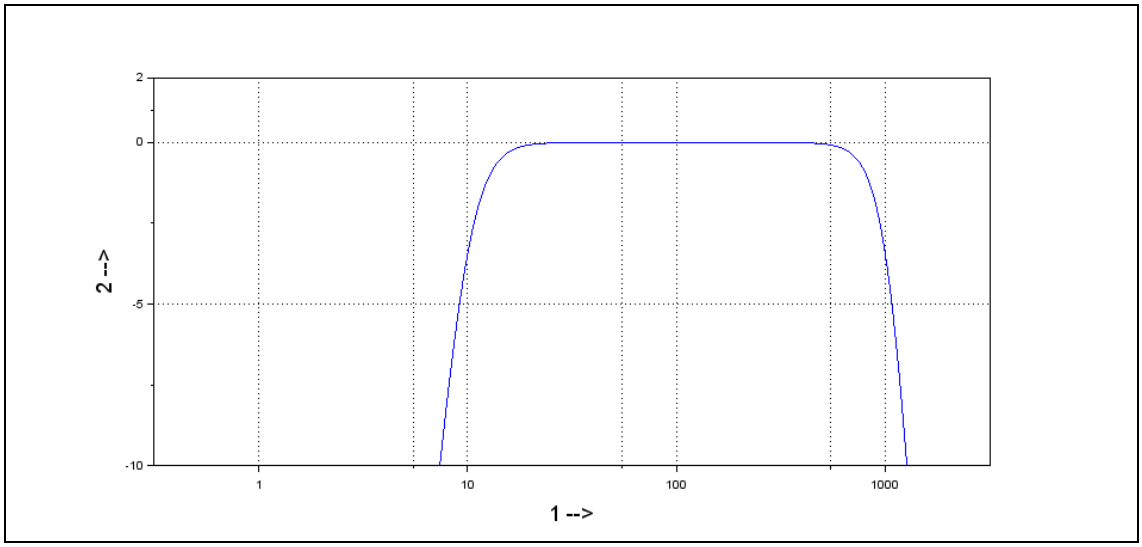


Fig. 2: Typical frequency response 10 Hz–1,000 Hz

1 Frequency in Hz

2 Amplification in dB

1 Hz to 1,000 Hz

The frequency response is recorded using two reference sensors.

• 1 Hz. . . 10 Hz laser sensor

• 10 Hz. . . 1,200 Hz acceleration sensor

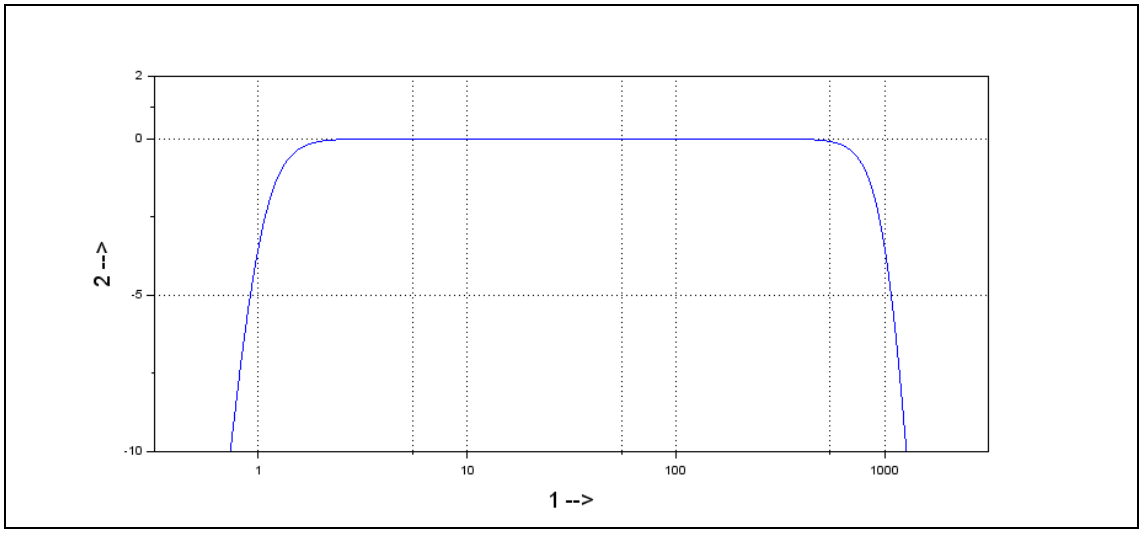


Fig. 3: Typical frequency response 1 Hz–1,000 Hz

1 Frequency in Hz

2 Amplification in dB

11.6 Mechanical data

Additional materials and fixings can be found in section "HE100 type code" on page 21.

Housing material:	Stainless steel V2A, material no.: 1.4305 (standard)
Fixing:	Width A/F 24 (hex) M8 x 8 mm Incline: 1.25 mm (standard)
Assembly type:	Standing/vertical or lying/horizontal
Measurement direction	Along the fixing axis
Max. torque oft the Sensor	8 Nm
Max. torque of the M12 union nut on the connector	0.4 Nm
Weight:	ca. 200 g
Protection class:	IP 66/67 (in mated condition)

Tab. 7: Mechanical data

11.7 Housing dimensions

11.7.1 Version: Standard and ATEX / IECEx / EACEx Intrinsic safety, Ex i

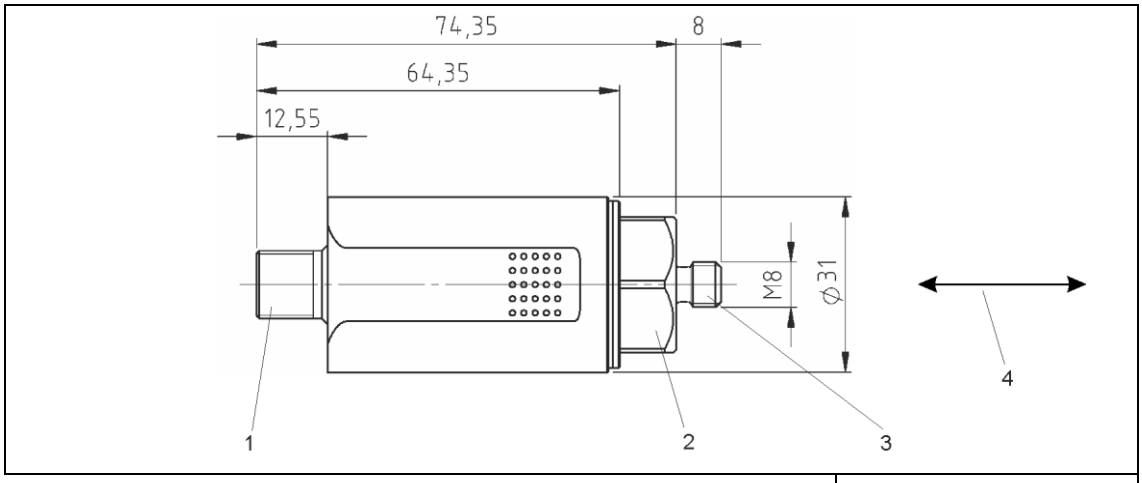


Fig. 4: Housing with M12 connector

All dimensions in mm

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

11.7.2 Version: ATEX / IECEx / EACEx Ex d

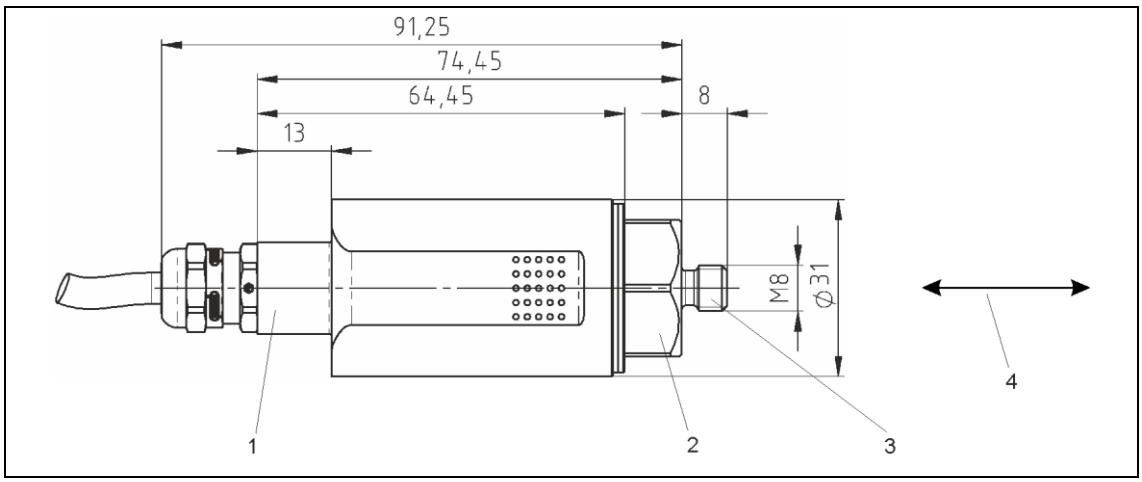


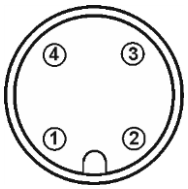
Fig. 5: Housing with integrated cable All dimensions in mm

1 Cable gland for integrated cable
2 Width A/F 24
3 Fixing
4 Measuring direction along the fixing axis

12 Connections

Version:	Standard

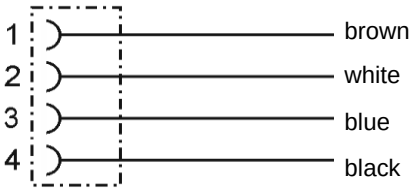
Plug, M12, 4-pole



Pin 1:	10…30 V DC
Pin 2:	NC
Pin 3:	4…20 mA
Pin 4:	NC
NC:	Not Connected

Version:	ATEX / IECEx / EACEx pressure-resistant casing Ex d ATEX / IECEx / EACEx protection through housing, Ex tb

integrated cable

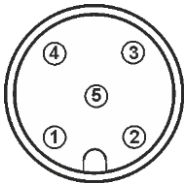


PUR sheathed cable; Ø: approx. 6.5 mm, 4-pole, 0.34 mm²

Pin 1:	10…30 V DC
Pin 2:	NC
Pin 3:	4…20 mA
Pin 4:	NC
NC:	Not connected

Version:	ATEX / IECEx / EACEx intrinsic safety Ex i

Plug, M12, 5-pole



Pin 1:	10…30 V DC
Pin 2:	NC
Pin 3:	4…20 mA
Pin 4:	NC
Pin 5:	Sensor housing
NC:	Not Connected

The system operates according to the two-wire principle.
I.e. the entire function (voltage supply and current signal) is achieved using 2 wires (Pin 1 and Pin 3).

To avoid capacitive interference, pins 2 and 4 must remain **open/unoccupied**.

13 Assembly and disassembly

13.1 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).

13.2 Fixing the vibration monitoring unit to the mounting surface

13.2.1 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.

13.2.2 Tool

- Hex key, width A/F 24

13.2.3 Work steps and instructions

- Screw vibration monitoring unit into the threaded hole of the mounting surface in a friction-locked manner using a hex key. 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. As a countermeasure, we recommend our standard earthing concept or, depending on the application our Alternative earthing concept

Ensure that the earth connection is electrically secure.

14 Installation and commissioning

14.1 General notes

Installation and commissioning the vibration monitoring unit must be performed by an authorised specialist who is familiar with the safety regulations when handling electrical components.

Protect the connection cable and any extension cables from electrical interference or mechanical damage. Comply with the local regulations and directives.

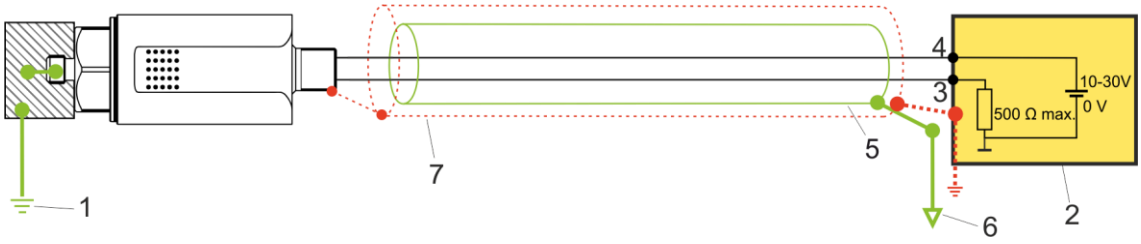
14.2 Wiring diagram

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.

14.2.1 Standard earthing concept

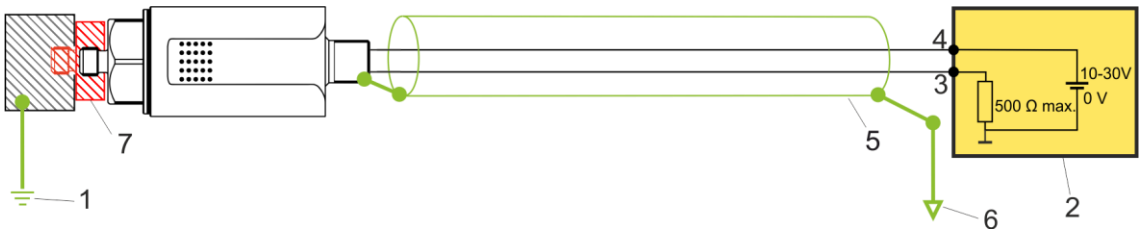
With the standard earthing concept, the sensor cable shield has no connection to the sensor housing (dashed circle). The sensor housing has the same potential as the machine earth.



1 Machine earth
2 Evaluation unit (measuring device, PLC, etc.)
3 Blue – 4–20 mA current signal
4 Brown – 10–30 V DC
5 Cable shield
6 Evaluation unit earth potential

14.2.2 Alternative earthing concept

With the alternative earthing concept, the sensor cable shield is connected to the sensor housing. The sensor housing is uncoupled from the machine earth by means of an EMC adapter (red). With the alternative earthing concept, an electrically secure earth connection can only be ensured for versions with an M12 plug connection. For versions with an integrated cable, the alternative earthing concept cannot be used.

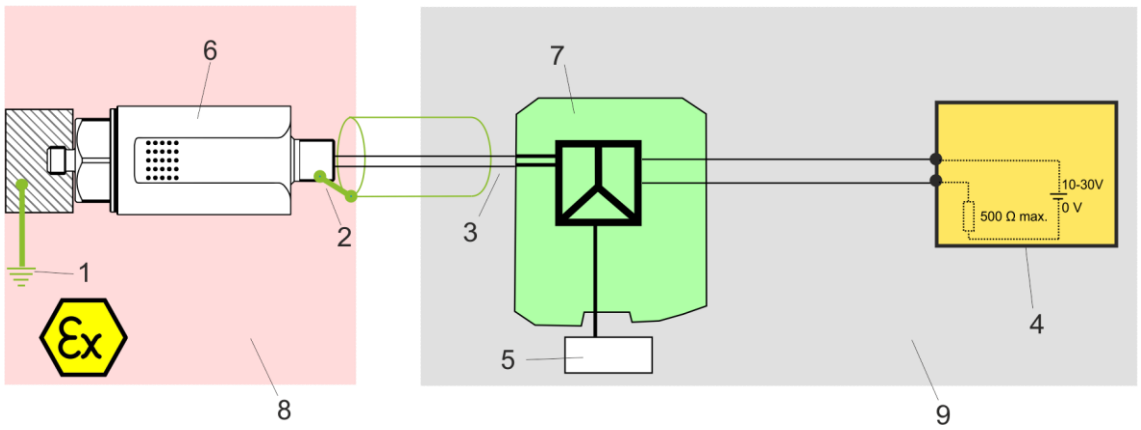


1 Machine earth
2 Evaluation unit (measuring device, PLC, etc.)
3 Blue – 4–20 mA current signal
4 Brown – 10–30 V DC
5 Cable shield
6 Evaluation unit earth potential
7 EMC adapter (Hauber art. no. 10473)

Please advise us if you are opting for the alternative earthing concept when enquiring. We will offer you the relevant sensor cable and the EMC adapter.

14.2.3 Potentially explosive atmosphere, Ex i earthing concept

For the Ex i sensor, the shield is routed via Pin 5 of the plug connection to the potential of the sensor housing, which is typically on the machine earth.



1	Machine earth	5	Power supply
2	The shield of the Ex i cable is on the potential of the housing via Pin 5 of M12 connector	6	Hauber Ex i sensor
3	Do not earth the shield	7	Isolating amplifier
4	Evaluation unit (measuring device, PLC, etc.)	8	Potentially explosive atmospheres of zones 1 and 21 / 2 and 22
		9	Area not at risk

15 Maintenance and repair

15.1 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.

Replace defective cables immediately!
A defective vibration monitoring unit must be completely replaced.

The vibration monitoring unit HE100 is maintenance-free.

15.2 Fault resolution table

Fault	Cause	Action
No measured value (4-20 mA)	No voltage supply	Check voltage source and/or supply cable
	Connection cable interrupted	Replace connection cable
	Fuse defective	Replace fuse
	Connection has incorrect polarity	Establish correct connection polarity
	Vibration monitoring unit defective	Replace vibration control unit
Incorrect measurement value	Vibration monitoring unit not friction-locked.	Mount vibration monitoring unit in a friction-locked manner.
	Vibration monitoring unit mounted in wrong position.	Mount vibration monitoring unit in correct position.
EMC problems		For further information, see chapter "Alternative earthing concept” on page 18.

Tab. 8: Fault resolution table

16 Transport, storage and disposal

The sensor must be protected by suitable packaging against damaging environmental influences and against mechanical damage during transport.

The sensor must not be stored in ambient temperatures beyond the permitted operating temperature.

The product contains electronic components and must be disposed of in a proper manner according to local regulations and legislation.

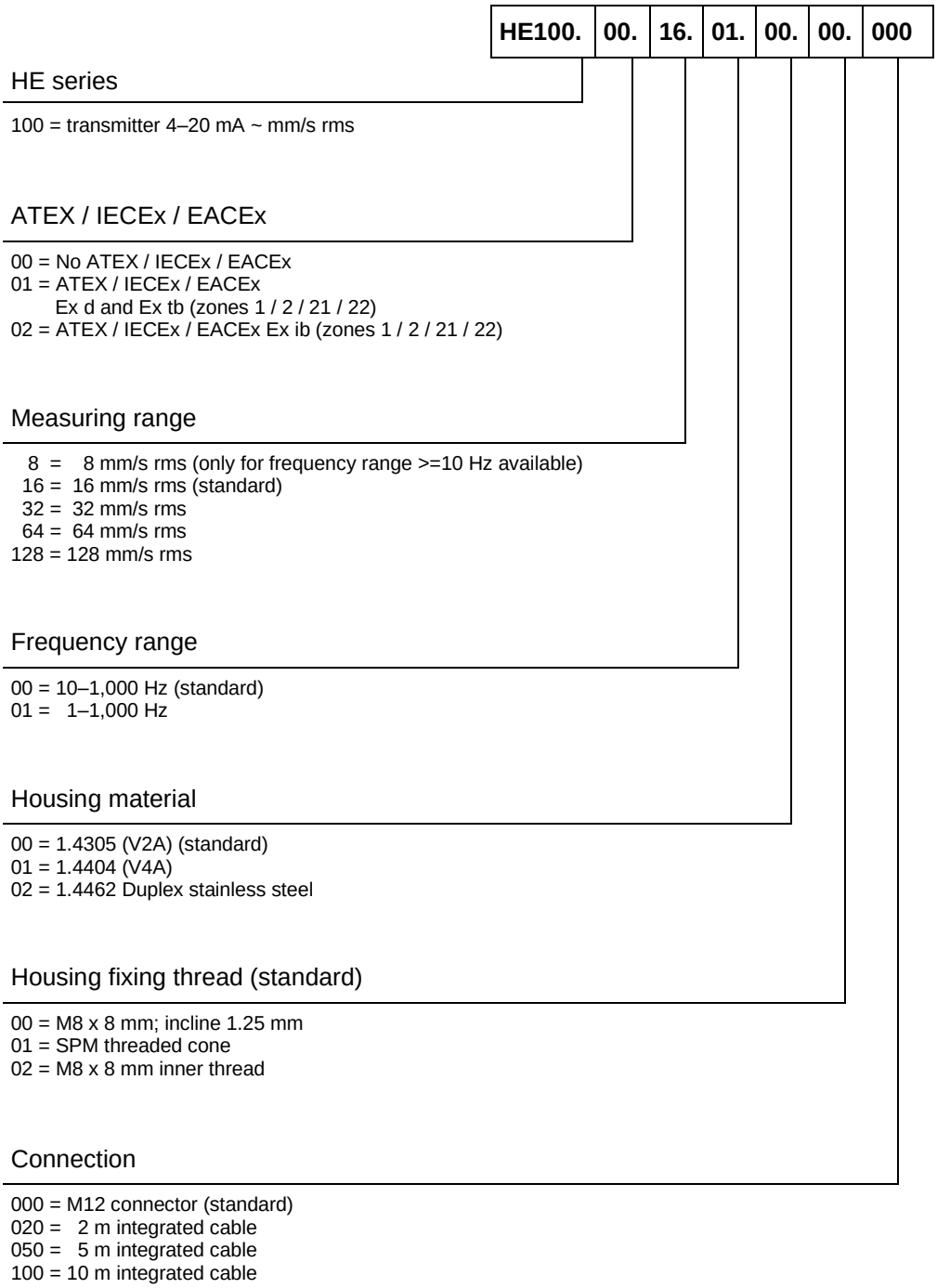
17 Accessories

Accessories	Standard	ATEX / IECEx / EACEx Ex d, tb	ATEX / IECEx / EACEx Ex i
Factory calibration certificate – Art-No.:10419	x	x	x
Evaluation device types 652 and 656	x	x	x
HE400-type portable measuring instrument	x		
ATEX / IECEx / EACEx supply isolation amplifier for intrinsic safety Ex I – Art-No.:10993			x
Magnetic base – Art-No.:10054	x		
Various mounting adapters; e.g. M8 -> M10	x	x	x
Configurable mating plug	x	x	
Connection cable, socket M12, 4-pin, 0.34 mm², L= 2 m, 5 m, 10 m, or customised	x		
ATEX / IECEx / EACEx connection cable for intrinsic safety Ex i, M12, 4-pin, 0.34 mm², L= 2 m, 5 m, 10 m, or customised			x
Rubber nozzle– Art-No.:10986	x	x	x
Metallic protective hose	x	x	x
EMC adapter – Art-No.:10473	x		

For use OUTDOORS or using SPRAY WATER, the vibration monitoring unit should have the rubber nozzle pulled over it for additional protection.

Rubber nozzle

18 HE100 type code



Is your desired configuration not listed? Please get in touch with us, we can offer you a customer-specific solution.

19 EU declaration of conformity

We	HAUBER-Elektronik GmbH Fabrikstraße 6 72622 Nürtingen-Zizishausen Germany
declare of our own accord that the product	vibration sensor/monitoring unit, **evaluation devices**
to which this declaration refers, satisfies the basic health and safety protection requirements of the directives and standards cited below.	

Directive 2014/30/EU Electromagnetic Compatibility	EN 61000-6-3:2005 EN 61000-6-3:2007 + A1:2011
NG (atmospheres not at risk of explosion)	**Type range** 640; 642; 648; 650; 651; 652; 656; 663; 664; 673; 674; 675; 677; 687; HE100; HE101; HE102; HE103; HE400

Potentially explosive atmospheres	**Category: Ex II 2 G / Ex II 2 D**
Directive 2014/34/EU Devices and protection systems for intended use in potentially explosive atmospheres	

Type	HE100	**Ex II 2 G Ex d IIC T4 Gb** **Ex II 2 D Ex tb IIIC T120°C Db** **Ex II 2 G Ex ib IIC T4 Gb** **Ex II 2 D Ex ib IIIC T125°C Db**	NB 2572 PTZ 16 ATEX 0029 X IECEx PTZ 18.0009 X
Conformity with the type Annex VII CE 0063		Standard(s)	EN 60079-0:2012 +A11:2013 EN 60079-1:2014 EN 60079-11:2012 EN 60079-31:2014 IEC 60079-0 7th ed. IEC 60079-1:2014 7th ed. IEC 60079-11:2011 7th ed. IEC 60079-31:2013 7th ed.

Nürtingen, 08/03/2019 Ort und Datum *Place and date*	 Tobias Bronkal Geschäftsführender Inhaber *Managing Proprietor*