VIM8* Vibration Sensors

Manual

CE SIL 2 PL d

Your automation, our passion.

PEPPERL+FUCHS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

Worldwide

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

North American Headquarters

Pepperl+Fuchs Inc.

1600 Enterprise Parkway

Twinsburg, Ohio 44087

USA

Phone: +1 330 425-3555

E-mail: sales@us.pepperl-fuchs.com

Asia Headquarters

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

https://www.pepperl-fuchs.com

1 Introduction 4
1.1 Content of this Document 4
1.2 Target Group, Personnel 4
1.3 Symbols Used 5
1.4 Intended Use 5
1.5 General Safety Instructions 6
2 Product Description 7
2.1 Use And Application 7
2.2 Display and Operating Elements 7
2.3 Vibration Monitoring 8
2.3.1 Vibration Velocity Operating Range 8
2.3.2 Frequency Response 9
2.3.3 Bearing Status Parameter 10
2.4 Accessories 12
3 Installation 13
3.1 Instructions for Mechanical and Electrical Installation 13
3.2 Mounting 14
3.3 Tamper Protection of the Vibration Sensor 15
3.4 Electrical Installation 16
4 Parameterization 19
4.1 Vibration Sensors for Vibration Velocity with Pre-Alarm and Main Alarm 19
4.1.1 Parameterization via Rotary Switch 19
4.2 Vibration Sensors for Vibration Acceleration with Window Function 22
4.2.1 Parameterization via Rotary Switch 23
5 Troubleshooting 27
5.1 What To Do In The Event Of A Fault 27
6 Repair and Servicing 28

2022-08

1 Introduction

1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note

This document does not substitute the instruction manual.

Note

For full information on the product, refer to the instruction manual and further documentation on the Internet at www.pepperl-fuchs.com.

Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com.

The documentation consists of the following parts:

- Present document
- Instruction manual
- Datasheet

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Functional safety manual
- Additional documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

2022-08

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols

Note

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

1.4 Intended Use

The vibration sensor is used exclusively for measuring mechanical vibrations on machines and mechanical systems. Use is only permitted within the specifications stated in the datasheet.

Typical applications are monitoring fans, ventilators, electric motors, pumps, centrifuges, separators, generators, turbines, and similar oscillating mechanical systems. Read through this manual carefully. Familiarize yourself with the device before installing, mounting, or operating.

Some product versions are suitable for use in hazardous areas. The relevant national or international directives and the instruction manual for the product must be followed.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and the plant is guaranteed only if the device is operated in accordance with its intended use.

1.5 General Safety Instructions

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Installation and commissioning of all devices may be performed only by trained and qualified personnel.

It is dangerous for the user to make changes and/or repairs. Additionally, doing so voids the warranty and excludes the manufacturer from any liability. In the event of any serious errors, stop using the device. Secure the device against unintended operation. To have the device repaired, return it to your local Pepperl+Fuchs representative or your sales center.

Note

Disposal

Electronic waste is dangerous. When disposing of the equipment, observe the current statutory requirements in the relevant country of use and local regulations.

2 Product Description

2.1 Use And Application

The vibration sensors of the VIM8* product family determine the vibration magnitude using the root mean square (RMS) method. This form of quadratic average determination or pre-filtering allows precise statements to be made about trends relating to the status of the application. Depending on the product versions, the vibration magnitude is determined either as the vibration acceleration (in g rms) or as the vibration velocity (in mm/s).

The vibration sensors have a safety integrity level (SIL 2) for functional safety applications. Two relay outputs with independently adjustable switching thresholds are available for functional safety monitoring tasks. If a controller evaluates both relay outputs simultaneously, it is possible to monitor a window range, as part of condition monitoring for example. You can set the switching thresholds and associated delay for the response time directly using rotary switches on the vibration sensors and save them as a parameter set using a push button.

You can select a suitable sensor version from the VIM8* product family based on the requirements of your application. The following aspects are the core characteristics of these sensor versions; some sensors have more than one of these characteristics:

- Sensor versions for measuring the vibration velocity have adjustable switching thresholds for a pre-alarm and main alarm.
- Sensor versions for measuring the vibration acceleration have a window function with an adjustable lower and upper switching threshold. An alarm is always triggered if the vibration velocity is outside the monitoring window, i.e., when the speed is below the lower switching threshold or above the upper switching threshold.
- Some sensor versions have an additional analog current output, which outputs a bearing status parameter. This is weighted according to DIN ISO 13373. It enables a qualitative assessment of the condition of rolling-element bearings.
- Some sensor versions are also suitable for use in hazardous areas. The relevant national or international directives and the instruction manual for the product must be followed.

Vibration sensors from the VIM8* product family always have two temperature readings: the measuring head temperature T_M and the ambient temperature T_A.

- The measuring head temperature T_M describes the maximum permissible temperature range directly at the location where the sensor is mounted. The machine surface to be monitored must therefore not exceed or fall below the specified measuring head temperature T_M for the sensor.
- The ambient temperature T_A describes the maximum permissible temperature range for the ambient atmosphere in which the sensor is used.

The two temperatures are related as described below. The measuring head temperature T_M is always permitted to be a higher temperature than the corresponding ambient temperature T_a in the upper range. This means that the machine to be monitored is permitted to heat up to the upper limit of T_M and therefore contribute to the heating of the ambient atmosphere. However, the resulting ambient temperature must not exceed the upper limit of T_A.

Example

Temperature specifications:

- $-35\ °C \leq T_M \leq 125\ °C$
- $-35\ °C \leq T_A \leq 60\ °C$

The machine to be monitored must not exceed 125 °C at the location where the sensor is mounted, while the ambient atmosphere in which the sensor is used must not exceed 60 °C.

2.2 Display and Operating elements

The VIM8* product family of vibration sensors have indicator and operating elements as shown below.

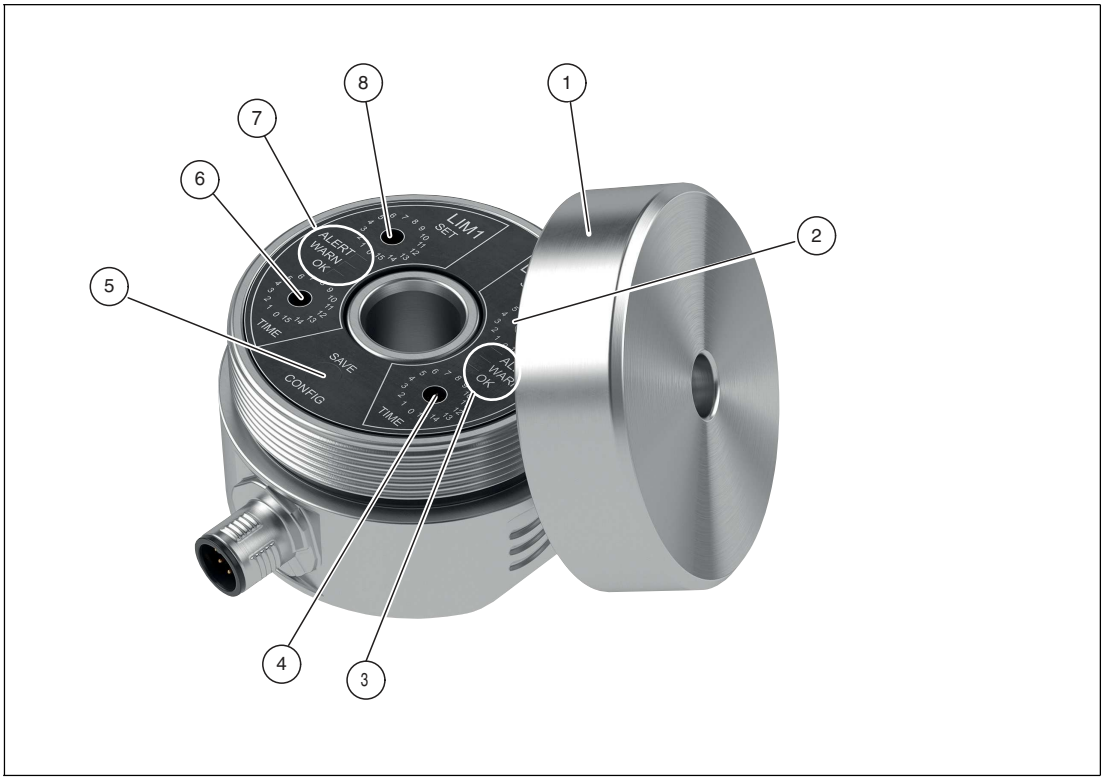

Figure 2.1

1 Housing cover

2 "LIM2 SET" rotary switch for setting the upper switching threshold

3 LED indicators for upper switching threshold LIM2

4 "LIM2 Time" rotary switch for setting the delay for the response time of the upper switching threshold

5 "SAVE Config" button for saving the settings for LIM1 and LIM2

6 "LIM1 Time" rotary switch for setting the delay for the response time of the lower switching threshold

7 LED indicators for lower switching threshold LIM1

8 "LIM1 SET" rotary switch for setting the lower switching threshold

Note

The details of the LED indicators differ depending on whether the vibration sensor is the version with a pre-alarm and main alarm or the version with the window function. For a detailed description in terms of application, see chapter 4.

2.3 Vibration Monitoring

2.3.1 Vibration Velocity Operating Range

The operating range of the vibration velocity is not constant over the entire measuring range. It always depends on the current frequency at which the vibration sensor is vibrating.

Essentially, the higher the current frequency, the lower the detectable vibration velocity. This can lead to a significantly high frequency, which can then lead to the current operating range of the sensor in this state being smaller than the specified measuring range.

The maximum detectable operating range can be derived from the maximum detectable acceleration. This is 16.5 g (161.8 m/s^2) for the entire frequency range.

The maximum measurable vibration velocity results from the following physical correlation:

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

The following applies to sinusoidal vibrations:

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

The following figure depicting the vibration monitoring shows the operating range, which is limited by the maximum measurable vibration velocity in mm/s depending on the frequency. The area above the curve shows the operating range that cannot be measured when recording the vibration velocity, because the frequency is too high. The sensor outputs the vibration velocity value that can only just be detected.

Example for a version with a measuring range of 128 mm/s:

- Assumption: Application vibrates at 80 mm/s at 400 Hz
- Sensor output: 64 mm/s
  This is the vibration velocity value that can only just be detected at this frequency.

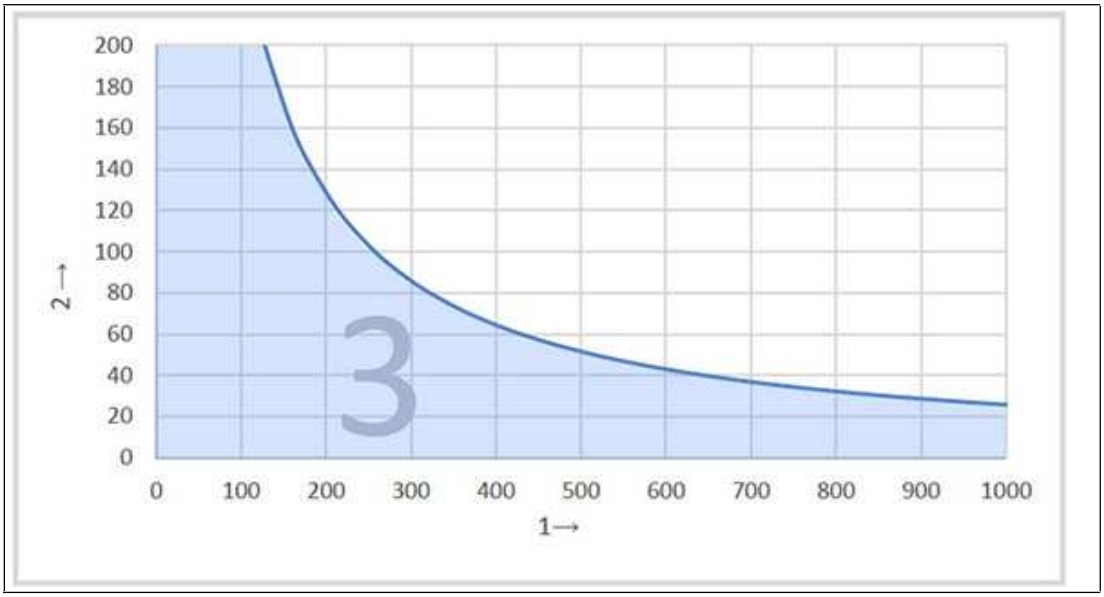

Figure 2.2

1 Frequency in Hz

2 Vibration velocity in mm/s

3 Operating range of vibration monitoring

Reading Example

Frequency (Hz)	Maximum Measurable Vibration Velocity (mm/s)
250	103
400	64
1000	25

Table 2.1

2.3.2 Frequency Response

The typical frequency response of vibration monitoring for two frequency ranges is depicted below.

Frequency Response: 10 Hz to 1000 Hz

The cut-off frequencies are 10 Hz and 1000 Hz with -3 dB damping.

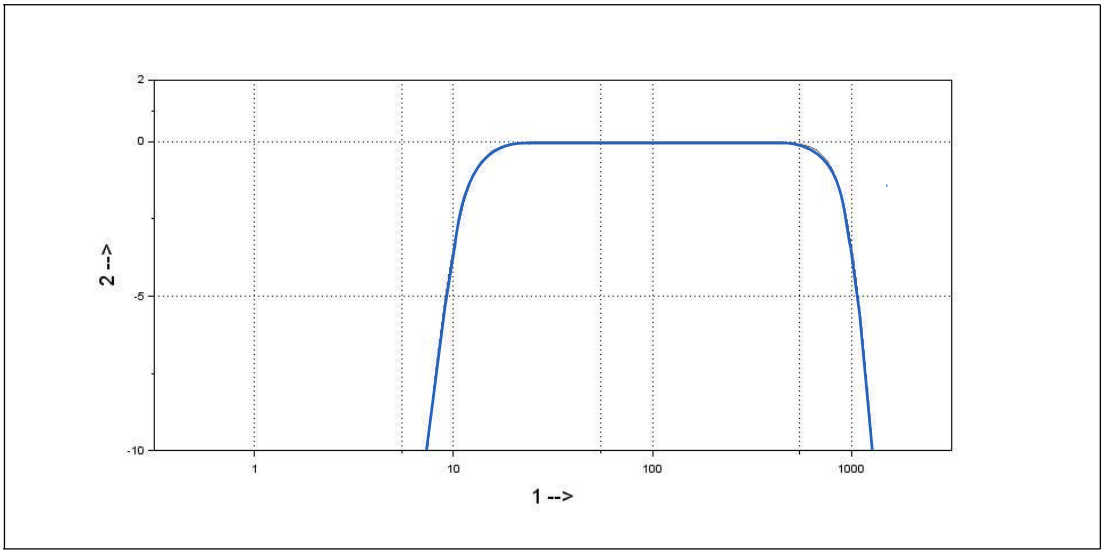

Figure 2.3

1 Frequency in Hz

2 Gain in dB

Frequency Response: 1 Hz to 1000 Hz

The frequency response was recorded using two reference sensors.

The cut-off frequencies are 1 Hz and 1000 Hz with -3 dB damping.

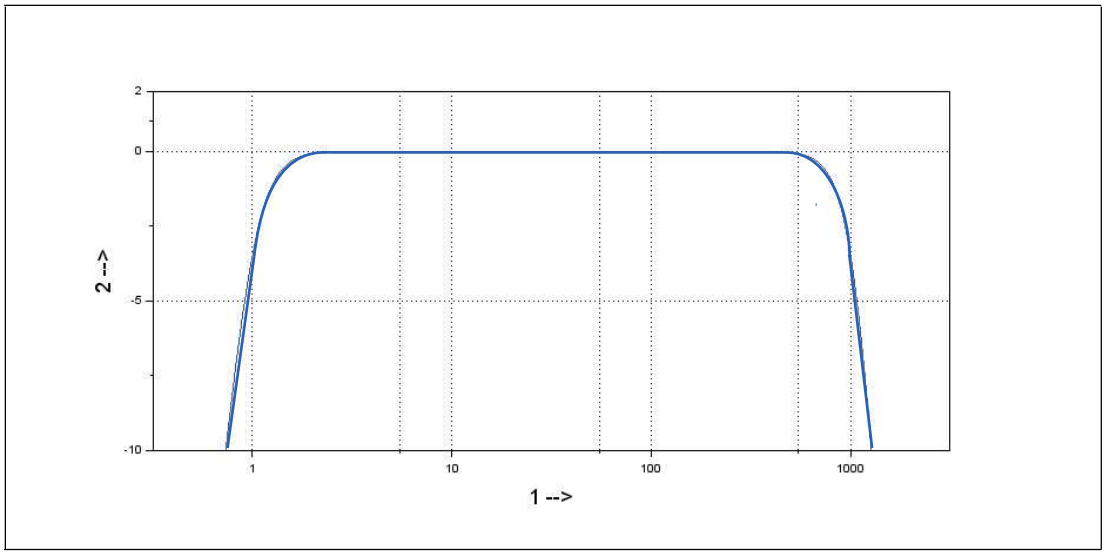

Figure 2.4

1 Frequency in Hz

2 Gain in dB

2.3.3 Bearing Status Parameter

Some product versions have an additional analog current output that outputs a bearing status parameter. This is weighted according to DIN ISO 13373-3 and enables rolling-element bearings to be diagnosed according to DIN ISO 13373-3.

The bearing status parameter according to DIN ISO 13373-3 considers the ratio of the highest peak value of the acceleration in m/s^2 to the root mean square of the acceleration in m/s^2. An averaging time of t = 1 s is defined for the root mean square of the bearing status parameter. The highest peak value is determined over the time period of the averaging period, i.e., t = 1 s.

The frequency range under consideration is between 10 Hz – 10 kHz. The signal ratio based on the crest factor is used to diagnose the bearing condition of rolling-element bearings. The DIN ISO 13373-3 standard categorizes the rolling-element bearing condition into four ranges:

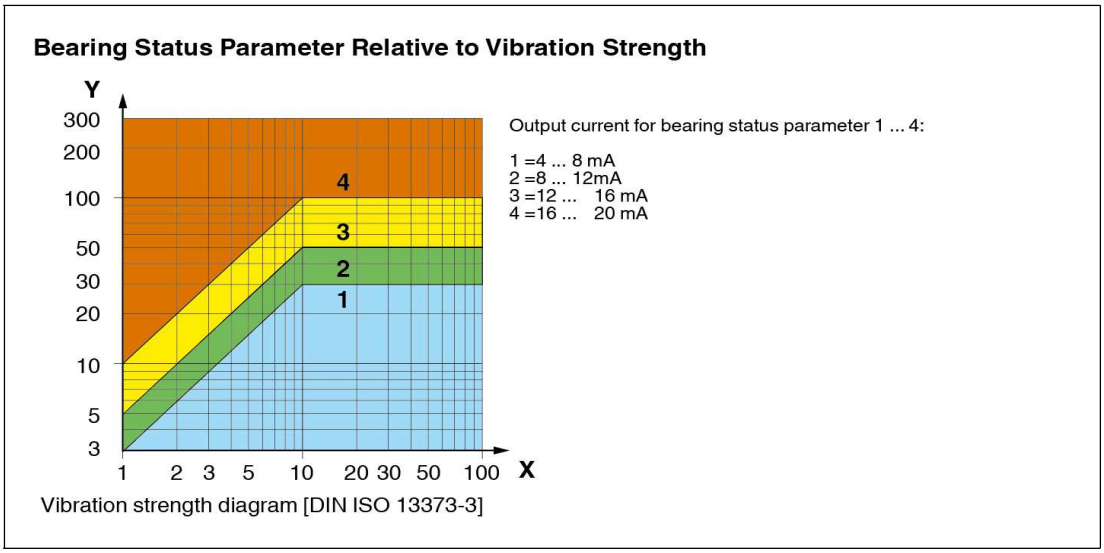

Figure 2.5

X Root mean square of acceleration (total value from 10 Hz to 10 KHz in mm/s^2

Y Maximum peak value of acceleration in mm/s^2

1 Range 1 = very low value

2 Range 2 = usual (normal state)

3 Range 3 = warning message

4 Range 4 = alarm

Note

This vibration strength diagram is not recommended for machines with heavy background noise or for gear-powered machines.

The vibration monitoring continuously determines the bearing status parameter. The bearing status parameter is scaled to the current output 4 mA – 20 mA using the following vibration strength diagram.

Ranges and their output signals

Range	Meaning	Output signal I [mA]
Range 1	The bearing status parameter is very small. No bearing damage can be detected. We recommend that you repeat the measurement or adjust the installation location. If the bearing status parameter remains in range 1, you can approve it as a normal range after carrying out a test, such as frequency analysis and time range analysis.	$4 \leq I \leq 8$
Range 2	The bearing status parameter is in the normal range. The characteristic value is in the usual normal state. There is no bearing damage.	$8 \leq I \leq 12$
Range 3	The bearing status parameter is in the warning range. We recommend carrying out a frequency analysis and time range analysis to test the bearing.	$12 \leq I \leq 16$
Range 4	The bearing status parameter is in the alarm range. We recommend replacing the bearings to troubleshoot the issue.	$16 \leq I \leq 20$

Table 2.2

2.4 Accessories

Note

Various accessories are available for the VIM8* vibration sensors. These are available online at **www.pepperl-fuchs.com**, on the product page for the relevant VIM8* vibration sensor.

Available Accessories

Accessories	Use
Cordset for plug versions	Electrical installation for plug versions
Mounting adapter	Adapter with different thread sizes for specific mounting requirements at the mounting point
Rubber protective sleeve	Flexible plastic cover for additional protection of the sensor against chemical and mechanical influences.
Flexible metal conduit	Flexible metal conduit for additional protection of the internal cable against chemical and mechanical influences.

Table 2.3

3 Installation

3.1 Instructions for Mechanical and Electrical Installation

Note

Further installation-relevant information on technical data, mechanical data, and available connection lines for the relevant vibration sensor types can be found in the corresponding datasheet.

Always observe the following instructions to ensure safe operation of the vibration sensor:

Warning!

Work must be performed by trained and qualified personnel only.

Commissioning and operation of this electrical device must be performed by trained and qualified personnel only. This means individuals who are qualified to commission (in accordance with safety engineering), connect to ground, and label devices, systems, and circuits.

Warning!

Perform work only when the system is de-energized!

De-energize your device before performing work on the electrical connections. Short circuits, voltage peaks, and similar events can lead to faults and undefined statuses. This presents a significant risk of personal injury and property damage.

Caution!

Work in a hazardous area!

De-energize your device or remove the housing cover before performing work on the electrical connections.

Seal all unused cable glands with protective covers. Prevent the inside of the device from becoming contaminated when the connector is disconnected.

Separate plug and socket devices must always be de-energized.

The housing cover must be properly screwed on for the sensor to be commissioned.

Lock the connection with interlock protection. Pay attention to the warning marking.

Do not remove the warning marking "Warning – Do not disconnect when energized!"

Ensure that the device and its measuring head are only operated in their permissible temperature ranges. Please refer to the relevant datasheet.

Warning!

Protect cables against interference and damage.

Protect the connection cable and any extension cables from electrical interference and mechanical damage. Always observe the local regulations and instructions.

Warning!

Check electrical connections before switching on the plant!

Check all electrical connections before switching on the plant. Incorrect connections present a significant risk of personal injury and property damage. Incorrect connections can lead to malfunctions.

Caution!

The housing must be grounded.

The housing of the vibration sensor must be grounded when mounting, either via the machine body or via a separate protective conductor (PE).

Caution!

Do not perform any electrical modifications!

It is not permitted to perform electrical modifications on the vibration sensor. If you open or modify the device yourself, you are endangering yourself and others, voiding any warranty, and absolving the manufacturer of any liability.

Caution!

Ensure that the data cable and power supply cable are physically separate!

To prevent interference, route the cordset for the vibration sensor so that it is a suitable distance away from power supply cables. Shielded cables must be used to ensure reliable data transfer. A perfect ground connection must be ensured. Always observe the local regulations and instructions.

2022-08

3.2 Mounting

Prerequisites

Mounting the vibration sensor on the mounting surface:

- The mounting surface must be clean and flat, i.e., free of paint, rust, etc.
- The measuring head surface of the vibration sensor must lie flat on the mounting surface.
- Use the supplied hexagon socket cap head screw M8 x 20 and the spring washer M8 to mount the vibration sensor.
- The mounting surface must either have a threaded hole M8 with a depth of 15 mm or you can select a suitable thread adapter as an accessory.

Mounting the Vibration Sensor

For safe and error-free operation, observe the following requirements during mounting:

- Mount the vibration sensor on the mounting surface correctly to obtain accurate data.
- Avoid mounting the vibration sensor on auxiliary structures. If it is absolutely necessary to use auxiliary structures, make sure these are designed to be as rigid as possible.
- Earth and ground loops are among the most common problems when using measuring setups with sensitive sensor technology. These loops are caused by unwanted differences in potential in the circuit between the sensor and the control interface. As a countermeasure, we recommend our standard grounding concept or, depending on the application, our alternative grounding concept
- Make sure that the ground connection is electrically safe.

1. Unscrew the housing cover from the lower part of the housing using a hexagon wrench (SW 8).

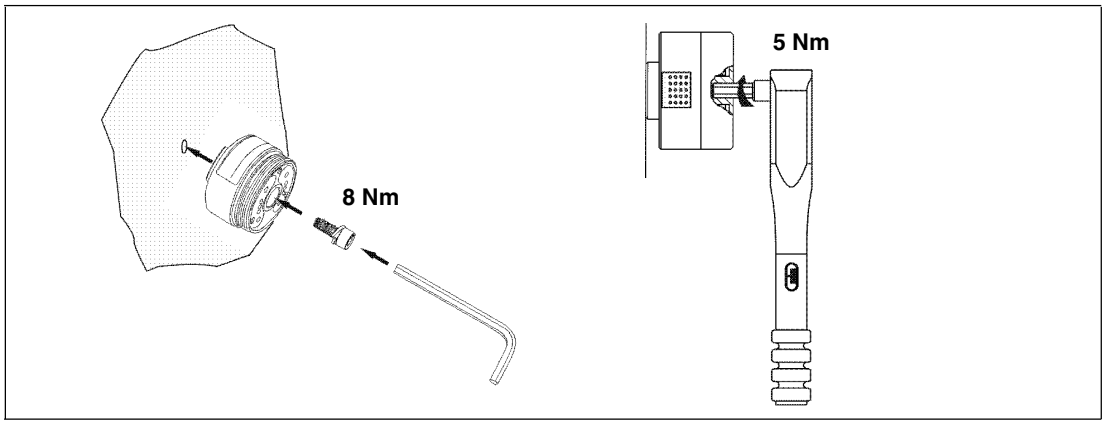

Figure 3.1

2. Screw the vibration sensor firmly to the mounting surface.
   - Insert the supplied hexagon socket cap head screw M8 x 20 and the spring washer M8 on the vibration sensor.
   - Tighten the hexagon socket cap head screw to a torque of 8 Nm using a torque wrench (SW 6).
3. Screw the housing cover onto the lower part of the housing and tighten the housing cover to a torque of 5 Nm using a torque wrench (SW 8).

Note

To prevent the housing cover from galling with the lower part of the housing, the thread is treated at the factory with a mounting paste for stainless-steel connections.

4. For plug versions: Connect the connection cable and note that the tightening torque of the connector's M12 union nut must not exceed 0.4 Nm.

3.3 Tamper Protection of the Vibration Sensor

Note

Since safety-relevant settings for vibration monitoring can be changed by third parties by unscrewing the housing cover, we recommend sealing the vibration sensor with a sealing label. The seal label marked "SEALED" is destroyed when the housing cover is unscrewed and therefore shows the plant operator that someone has attempted to tamper with the device.

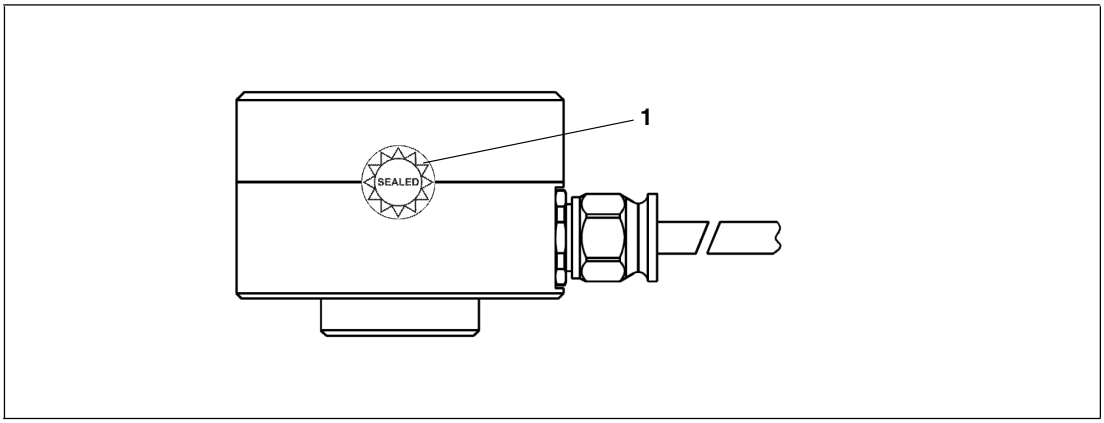

Figure 3.2

1. After mounting the vibration sensor, attach the seal label (1) to the point joining the housing cover and the lower part of the housing.

3.4 Electrical Installation

Note

Installation Diagram

Earth and ground loops are among the most common problems when using measuring setups with sensitive sensor technology. These loops are caused by unwanted differences in potential in the circuit between the sensor and the control interface.

Two different grounding concepts are described below. The appropriate concept should be selected for the application. Note that different cable types and other accessories may be required depending on the grounding concept.

Note

Various accessories are available for the VIM8* vibration sensors. These are available online at **www.pepperl-fuchs.com**, on the product page for the relevant VIM8* vibration sensor.

Grounding Concept 1 (Recommended)

Only applicable for:

- Versions with an integrated cable outlet
- Plug versions with a P+F connection cable accessory
- Assumption: Earth loops are not expected.

Situation/Requirements of the Application	Effects of the Grounding Concept
No EMC faults expected from the machine side, e.g., from the frequency inverter	• The machine should be connected to the sensor housing, or there is no effect on the quality of the measurements provided by the sensor. • EMC faults that still directly affect the sensor head can discharge via the machine earth.
Earth loops are possible	This grounding concept cannot prevent earth loops because there is a connection between the machine earth (point 1 in Fig.) and the earth at the control interface (point 4 in Fig.). Grounding concept 2 is recommended for applications with long cables or with a risk of earth loops.
Coupled interference must be deflected	• Deflected via machine earth (-> point 1 in Fig.) or • Deflected via earth at the control interface (-> point 4 in Fig.)

Table 3.1

The following diagram applies to each version with an integrated cable outlet or to each plug version that is used in combination with a suitable P+F connection cable accessory. This grounding concept is also recommended if no sources for EMC pollution, such as frequency inverters, are used on the machine side. In this grounding concept, the sensor cable shield is connected to the sensor housing. The sensor housing is at the same potential as the machine earth and the earth of the control interface.

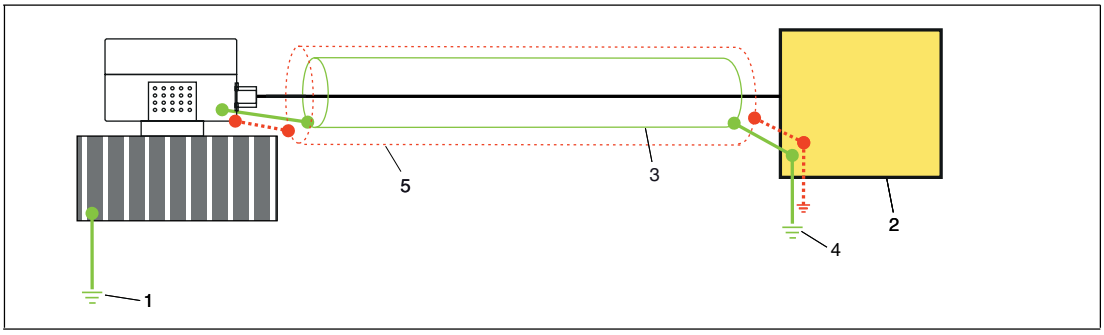

Figure 3.3

1 Machine earth

2 Control interface (measuring instrument, PLC, etc.)

3 Cable shield

4 Ground potential for the control interface

5 Optional flexible metal conduit (only available for version with an integrated cable)

The grounding concept provides that the sensor cable shield is electrically connected to the sensor housing via the knurled nut and is at the ground potential on the control interface or the switch cabinet. The sensor side is the same on sensor versions with an integrated cable outlet.

In principle, there is a risk that very long cable lengths with a long distance between the machine earth (1) and the earth (4) of the control interface could lead to an earth loop. This would lead to continuous equipotential bonding between the machine and the control interface. To prevent these earth loops, there should be no grounding (4) on the control interface. See grounding concept 2 for more information. Nevertheless, further coupled interferences can discharge via the machine earth (1).

2022-08

Grounding Concept 2 (Special Case)

Only applicable for:

- Versions with an integrated cable outlet
- Plug versions with connection cable accessories from third-party suppliers.
- Assumption: Earth loops are expected.

Situation/Requirements of the Application	Effects of the Grounding Concept
No EMC faults expected from the machine side, e.g., from the frequency inverter	• The machine should be connected to the sensor housing, or there is no effect on the quality of the measurements provided by the sensor. • EMC faults that still directly affect the sensor head can discharge via the machine earth.
Prevention of earth loops necessary, e.g., when using a long cable approx. 500 m in length.	The earth on the control interface (-> point 4 in Fig.) is not integrated. On the control interface, there is insulation between the cable shield and the earth. This grounding concept can prevent earth loops because there is no connection between the machine earth (point 1 in Fig.) and the earth at the control interface (point 4 in Fig.).
Coupled interference must be deflected	Deflected via earth at the control interface (-> point 1 in Fig.)

Table 3.2

The following diagram applies to each version with an integrated cable outlet or to each plug version that is used in combination with a suitable P+F connection cable accessory. This grounding concept is also recommended if no sources for EMC pollution, such as frequency inverters, are used on the machine side.

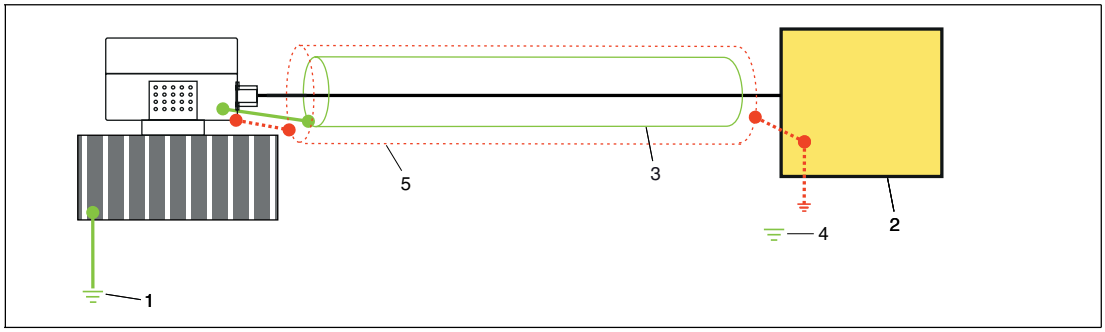

Figure 3.4

1 Machine earth

2 Control interface (measuring instrument, PLC, etc.)

3 Cable shield

4 Ground potential for the control interface

5 Optional flexible metal conduit (only available for version with an integrated cable)

In this grounding concept, the sensor cable shield is connected to the sensor housing. The sensor housing is at the same potential as the machine earth but is separated from the earth of the control interface.

In principle, there is a risk that very long cable lengths with a long distance between the machine earth (1) and the earth (4) of the control interface could lead to an earth loop. This would lead to continuous equipotential bonding between the machine and the control interface. To prevent these earth loops, there should be no grounding (4) on the control interface. Nevertheless, further coupled interferences can discharge via the machine earth (1).

4 Parameterization

4.1 Vibration Sensors for Vibration Velocity with Pre-Alarm and Main Alarm

Vibration sensors for monitoring vibration velocity have adjustable switching thresholds as limit values and adjustable delay times for generating a pre-alarm and a main alarm via relay outputs.

If the vibration value is exceeded, a pre-alarm or a main alarm is triggered at the switching contacts.

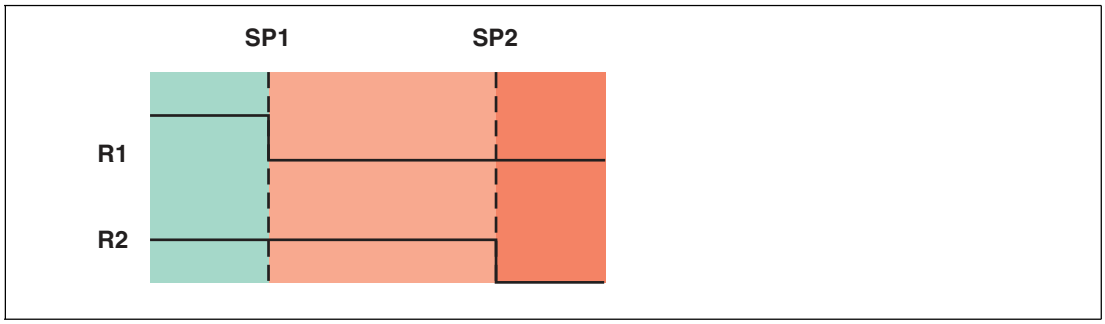

Figure 4.1 Vibration sensor with pre-alarm and main alarm

R1 Relay contact output R1

R2 Relay contact output R2

SP1 Switching threshold LIM1

SP2 Switching threshold LIM2

W Critical state = pre-alarm from SP1/main alarm from SP2 = relay open = like de-energized state

4.1.1 Parameterization via Rotary Switch

Indicators and Operating Elements for Parameterization

Caution!

Work in a hazardous area!

De-energize your device or remove the housing cover before performing work on the electrical connections.

Seal all unused cable glands with protective covers. Prevent the inside of the device from becoming contaminated when the connector is disconnected.

Separate plug and socket devices must always be de-energized.

The housing cover must be properly screwed on for the sensor to be commissioned.

Lock the connection with interlock protection. Pay attention to the warning marking.

Do not remove the warning marking "Warning – Do not disconnect when energized!"

Ensure that the device and its measuring head are only operated in their permissible temperature ranges. Please refer to the relevant datasheet.

The VIM8* product family of vibration sensors have indicator and operating elements as shown below.

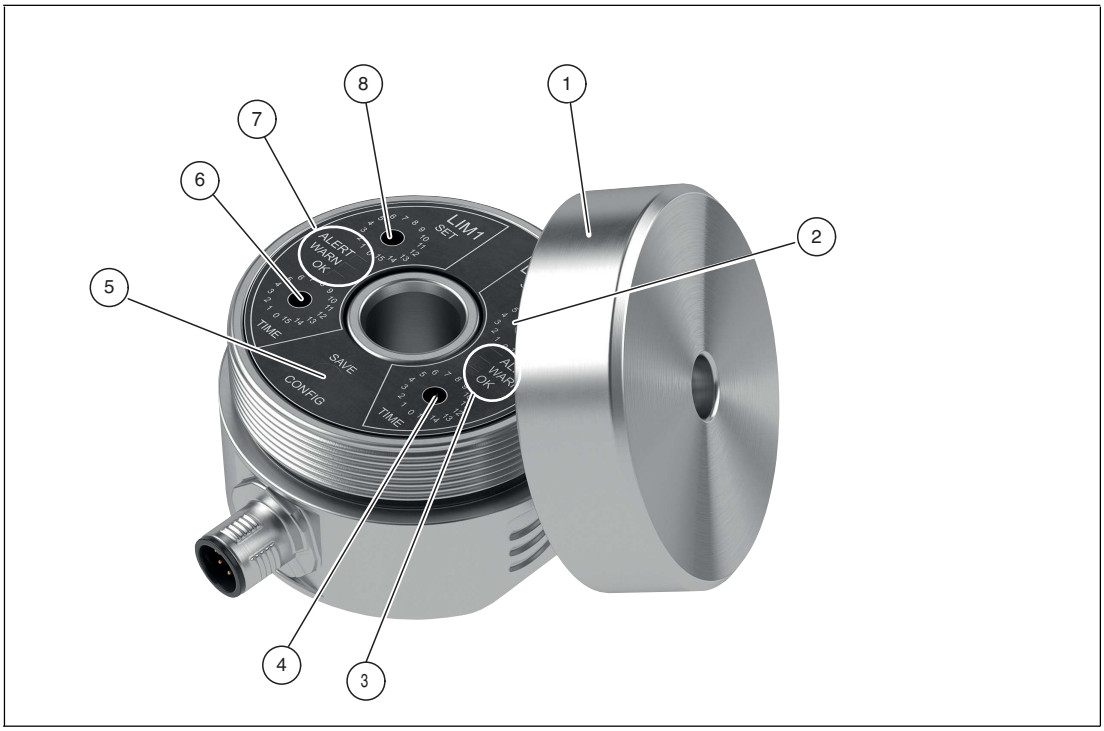

Figure 4.2

1 Housing cover

2 "LIM2 SET" rotary switch for setting the upper switching threshold

3 LED indicators for upper switching threshold LIM2

4 "LIM2 Time" rotary switch for setting the delay for the response time of the upper switching threshold

5 "SAVE Config" button for saving the settings for LIM1 and LIM2

6 "LIM1 Time" rotary switch for setting the delay for the response time of the lower switching threshold

7 LED indicators for lower switching threshold LIM1

8 "LIM1 SET" rotary switch for setting the lower switching threshold

Operating States and LED Indicators

Operating state	Measured value	Relay contacts	LED status
OK	≤ limit value	Closed	Green
WARNING	> limit value, delay time passing	Closed	Green + yellow
ALARM	> limit value, delay time passed	Open	Red
Fail Safe State	0 mA	Open	Red + yellow + green
De–energized	0 mA	Open	All LEDs off

Table 4.1

2022-08

Adjustable Limit Values and Delay Times

The rotary switches for limit values (switching thresholds) and delay for the response times each have 16 positions. The measuring range of the vibration monitoring is divided into 16 linearly rising stages.

Note

Select the setting for LIM1 SET as a pre-alarm less than LIM2 SET, otherwise the device will not save the setting.

Limit values (mm/s)

SET position	Measuring range in mm/s								
	0 ... 8	0 ... 10	0 ... 16	0 ... 20	0 ... 25	0 ... 32	0 ... 50	0 ... 64	0 ... 128
0	0.0	0	0	0	0	0	0.00	0	0
1	0.5	0.625	1	1.25	1.563	2	3.13	4	8
2	1.0	1.25	2	2.5	3.125	4	6.25	8	16
3	1.5	1.875	3	3.75	4.688	6	9.38	12	24
4	2.0	2.5	4	5	6.25	8	12.50	16	32
5	2.5	3.125	5	6.25	7.813	10	15.63	20	40
6	3.0	3.75	6	7.5	9.375	12	18.75	24	48
7	3.5	4.375	7	8.75	10.938	14	21.88	28	56
8	4.0	5	8	10	12.5	16	25.00	32	64
9	4.5	5.625	9	11.25	14.063	18	28.13	36	72
10	5.0	6.25	10	12.5	15.625	20	31.25	40	80
11	5.5	6.875	11	13.75	17.188	22	34.38	44	88
12	6.0	7.5	12	15	18.75	24	37.50	48	96
13	6.5	8.125	13	16.25	20.313	26	40.63	52	104
14	7.0	8.75	14	17.5	21.875	28	43.75	56	112
15	7.5	9.375	15	18.75	23.438	30	46.88	60	120

Table 4.2

As a general rule: Limit value = (measuring range upper limit)/16 x SET position

For example: Limit value setting

Measuring range:	0 ... 32 mm/s
SET position:	8 (9)
Limit value:	16 mm/s (18 mm/s)

Delays for the response time

Time position	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Delay time(s)	0	1	2	3	4	5	7.5	10	12.5	15	17.5	20	25	30	45	60

Table 4.3

The delay time is used to stop the relay outputs from switching back and forth. The delay time specifies the minimum time that the vibration measurement must be above the set limit value for the relay output to be able to switch. If the limit value is undershot again, the relay output switches back immediately since the delay time is not effective in this situation. The following figure illustrates this.

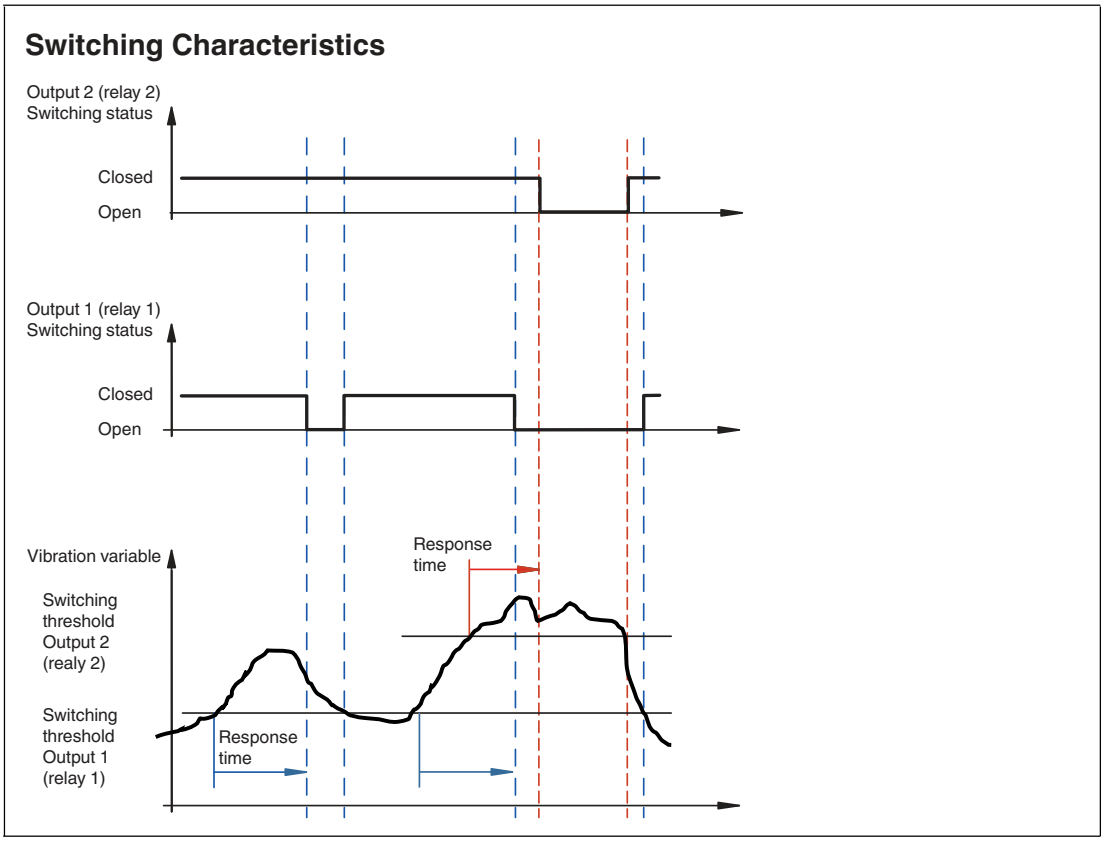

Figure 4.3

Parameterizing the Device

The device is parameterized via **LIM1**, **LIM2**, and **TIME** HEX switches. The HEX switches are located under the housing cover on the front of the device.

1. The safety function is deactivated during parameterization. Take measures to maintain the safety function while the device is being parameterized.
2. Open the cover (housing cover).
3. Briefly press the **Save Config**button.

   ↳ The LEDs on the HEX switches indicate the current parameterization.
4. Parameterize the limit values and delay times using the relevant HEX switch.

   ↳ All LEDs will start flashing as soon as a switch position is changed.
5. To save the parameterization, press and hold the **Save Config** button for 3 seconds.

   ↳ The LEDs permanently lit in the selected HEX switch position indicate that the parameterization was saved successfully. The LEDs go out automatically after approx. 5 minutes.
6. Close the cover and tighten the housing cover to a torque of 5 Nm using a torque wrench (SW 8) (see chapter 3.2).

   The measuring signal is only validated again and meets the requirements for the safety function once the parameterization mode is closed.

2022-08

4.2 Vibration Sensors for Vibration Acceleration with Window Function

Vibration sensors for monitoring vibration acceleration have a window function to set a lower and upper switching threshold for alarm signals.

The lower limit value of the window range is set at switching threshold LIM1 and the upper limit value is set at switching threshold LIM2. An alarm is triggered if the acceleration value is above or below the adjustable window range.

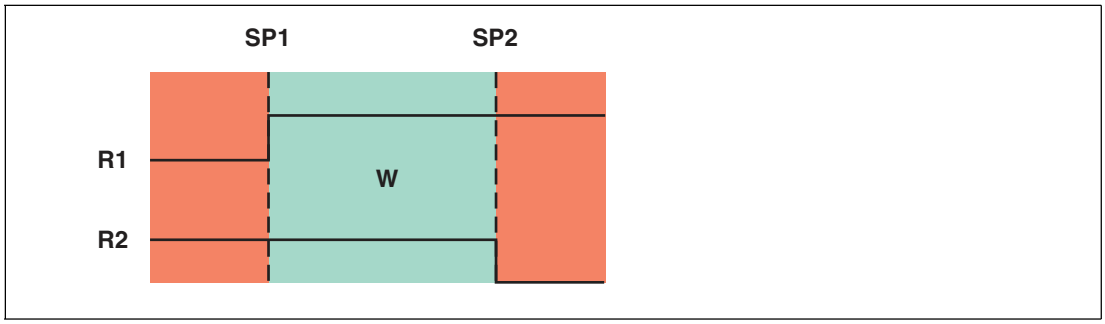

Figure 4.4 Vibration sensor with window function

R1 Relay contact output R1

R2 Relay contact output R2

SP1 Switching threshold LIM1

SP2 Switching threshold LIM2

W Window area
Critical state = out of window (SP1, SP2) = relay is open = like de-energized state

4.2.1 Parameterization via Rotary Switch

Indicators and Operating Elements for Parameterization

Caution!

Work in a hazardous area!

De-energize your device or remove the housing cover before performing work on the electrical connections.

Seal all unused cable glands with protective covers. Prevent the inside of the device from becoming contaminated when the connector is disconnected.

Separate plug and socket devices must always be de-energized.

The housing cover must be properly screwed on for the sensor to be commissioned.

Lock the connection with interlock protection. Pay attention to the warning marking.

Do not remove the warning marking "Warning – Do not disconnect when energized!"

Ensure that the device and its measuring head are only operated in their permissible temperature ranges. Please refer to the relevant datasheet.

The VIM8* product family of vibration sensors have indicator and operating elements as shown below.

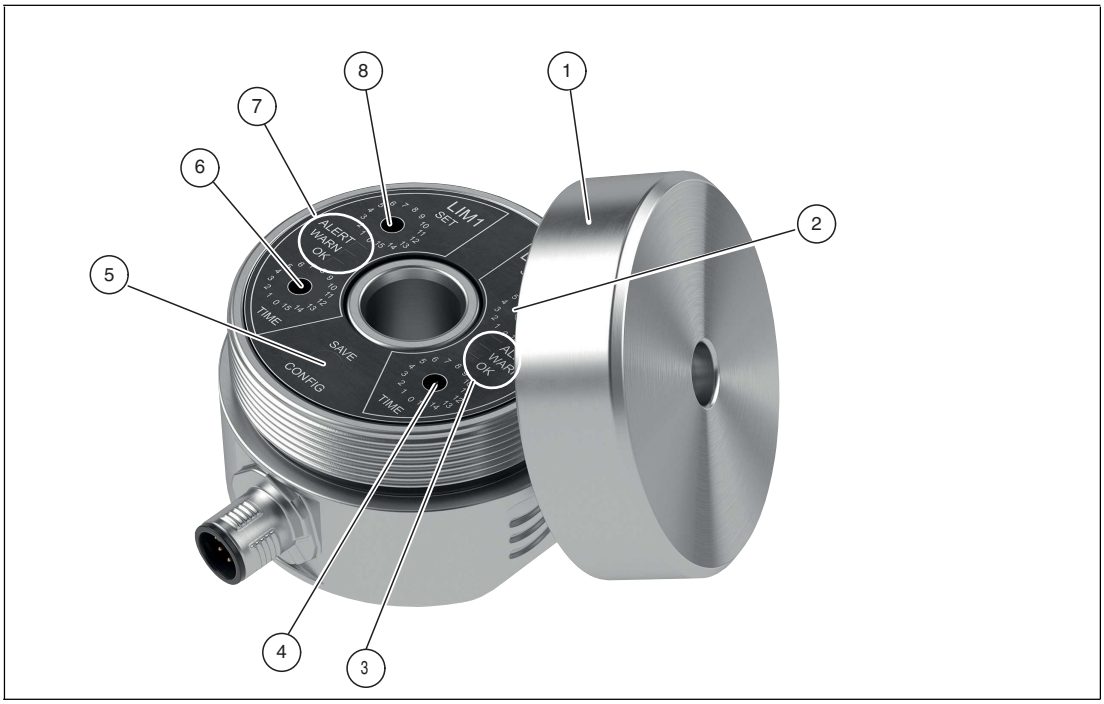

Figure 4.5

1 Housing cover

2 "LIM2 SET" rotary switch for setting the upper switching threshold

3 LED indicators for upper switching threshold LIM2

4 "LIM2 Time" rotary switch for setting the delay for the response time of the upper switching threshold

5 "SAVE Config" button for saving the settings for LIM1 and LIM2

6 "LIM1 Time" rotary switch for setting the delay for the response time of the lower switching threshold

7 LED indicators for lower switching threshold LIM1

8 "LIM1 SET" rotary switch for setting the lower switching threshold

Operating States and LED Indicators

Operating state	Measured value	Relay contacts	LED status
OK	≤ limit value	Closed	Green
WARNING	> limit value, delay time passing	Closed	Green + yellow
ALARM	> limit value, delay time passed	Open	Red
Fail Safe State	0 mA	Open	Red + yellow + green
De–energized	0 mA	Open	All LEDs off

Table 4.4

Adjustable Limit Values and Delay Times

The rotary switches for limit values (switching thresholds) and delay for the response times each have 16 positions. The measuring range of the vibration monitoring is divided into 16 linearly rising stages.

2022-08

Note

Select the setting for LIM1 SET as a lower switching threshold less than LIM2 SET, otherwise the device will not save the setting.

Limit values (mm/s)

SET position	Measuring range in g					
	0, 1	0 ... 2	0 ... 4	0 ... 6	0 ... 8	0 ... 10
0	0	0	0	0	0	0
1	0.063	0.125	0.25	0.375	0.5	0.625
2	0.125	0.25	0.5	0.75	1	1.25
3	0.188	0.375	0.75	1.125	1.5	1.875
4	0.25	0.5	1	1.5	2	2.5
5	0.313	0.625	1.25	1.875	2.5	3.125
6	0.375	0.75	1.5	2.25	3	3.75
7	0.438	0.875	1.75	2.625	3.5	4.375
8	0.5	1	2	3	4	5
9	0.563	1.125	2.25	3.375	4.5	5.625
10	0.625	1.25	2.5	3.75	5	6.25
11	0.688	1.375	2.75	4.125	5.5	6.875
12	0.75	1.5	3	4.5	6	7.5
13	0.813	1.625	3.25	4.875	6.5	8.125
14	0.875	1.75	3.5	5.25	7	8.75
15	0.938	1.875	3.75	5.625	7.5	9.375

Table 4.5

As a general rule: Limit value = (measuring range upper limit)/16 x SET position

For example: Limit value setting

Measuring range:	0 ... 4 g
SET position:	8 (9)
Limit value:	2 g (2.25 g)

Delays for the response time

Time position	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Delay time(s)	0	1	2	3	4	5	7.5	10	12.5	15	17.5	20	25	30	45	60

Table 4.6

The delay time is used to stop the relay outputs from switching back and forth. The delay time specifies the minimum time that the vibration measurement must be above the limit value LIM2 or below the limit value LIM1 for the relay output to be able to switch and to indicate that the value is outside of the window range. When the value re-enters the window range, the relay output switches back immediately since the delay time is not effective in this situation. The following figure illustrates this for relay 2.

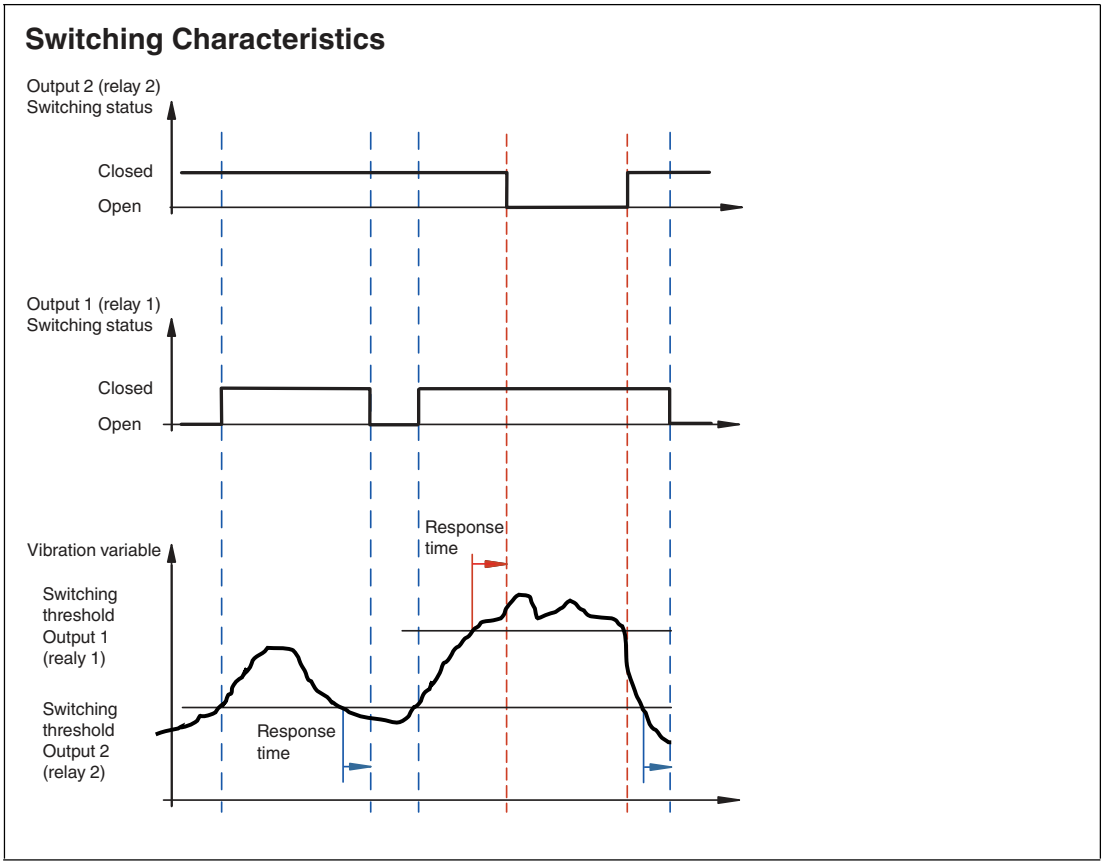

Figure 4.6

Parameterizing the Device

The device is parameterized via **LIM1**, **LIM2**, and **TIME** HEX switches. The HEX switches are located under the housing cover on the front of the unit.

1. The safety function is deactivated during parameterization. Take measures to maintain the safety function while the device is being parameterized.
2. Open the cover (housing cover).
3. Briefly press the **Save Config**button.

   ↳ The LEDs on the HEX switches indicate the current parameterization.
4. Parameterize the limit values and delay times using the relevant HEX switch.

   ↳ All LEDs will start flashing as soon as a switch position is changed.
5. To save the parameterization, press and hold the **Save Config** button for 3 seconds.

   ↳ The LEDs permanently lit in the selected HEX switch position indicate that the parameterization was saved successfully. The LEDs go out automatically after approx. 5 minutes.
6. Close the cover and tighten the housing cover to a torque of 5 Nm using a torque wrench (SW 8) (see chapter 3.2).

   The measuring signal is only validated again and meets the requirements for the safety function once the parameterization mode is closed.

2022-08

5 Troubleshooting

5.1 What To Do In The Event Of A Fault

In case of a fault, use the following checklist to determine whether a fault with the vibration monitoring can be remedied.

If none of the information provided in the checklist solves the problem, contact Pepperl+Fuchs via your sales office with any queries. Have details of the model number and firmware version of the sensor ready if possible.

Checklist

Error	Cause	Remedy
No measured value	No supply voltage	Check the voltage supply and/or supply lines.
	Interruption in the connection cable	Replace the connection cable.
	Faulty fuse	Replace the external fuse upstream of the sensor in the power supply area.
	Reversed polarity in the connection	Check the voltage supply and ensure the polarity is correct.
Relay contact does not switch	Incorrect limit value set	Set the correct limit value
	No supply voltage	Check the voltage supply and/or supply lines.
	Interruption in the connection cable	Replace the connection cable.
	Faulty fuse	Replace the fuse in the voltage supply area of the sensor.
	Reversed polarity in the connection	Check the voltage supply and ensure the polarity is correct.
Incorrect measured value	Vibration sensor not mounted correctly	Check that the sensor is mounted correctly. Ensure that the sensor thread is tightened with a tightening torque of 8 Nm.
	Vibration sensor mounted in the wrong position	The vibration behavior can vary depending on the measuring point / mounting point. Therefore, mount the sensor as precisely as possible at the point where you want to estimate/monitor the corresponding vibration behavior.
EMC problems	Earth loops / ground loops	Check the explanations provided in the chapter "Electrical Installation" for the relevant sensor grounding concept ().
The settings are not saved	Value for LIM1 is set to a greater value than LIM2	Set the value for LIM1 to a lower value than for LIM2.

Table 5.1

6 Repair and Servicing

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

2022-08

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

Pepperl+Fuchs Quality
Download our latest policy here:

www.pepperl-fuchs.com/quality

PEPPERL+FUCHS

www.pepperl-fuchs.com

/ DOCT-8222