

Instructions for use

(Translation of the original instructions)

Electronic vibration monitor

ESW[®]-Mini/Ex-C-014 (HOL6550/Ex-C-014)



Similar to figure

Read the instructions for use before starting any work!

Date: 27 March 2019

Technical specifications subject to change without notice!

holthausen elektronik GmbH is certified in accordance with DIN EN ISO 9001:2015.

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Important Information

Prior to commissioning the device, please read through this entire manual and follow the instructions contained herein. The manufacturer shall not accept any liability for any damage resulting from the failure to observe or comply with these instructions.

Tampering with the device, except as described in this manual, will invalidate the warranty and the manufacturer's liability.

The device is exclusively designed for the purpose described below.
In particular, it is not intended for direct or indirect protection of persons.

holthausen elektronik GmbH shall not assume any warranty regarding the device's suitability for other purposes.

If you have any questions, please contact us by telephone or in writing and we will be happy to be of assistance to you.

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1. General Basic Safety Instructions

Do not use this device as the sole monitoring device in situations where failure of the device may result in material or personal damages.



The device complies with the requirements of Performance Level C as specified in EN13849, and may not be used in locations or environments requiring a higher performance level.

In order to achieve the desired results, make sure that the device and its technical data are suitable for being used with the device/equipment to be measured and the parameters you want to monitor.

The installation location of the sensor and the method used for installing the sensor have a decisive impact on the quality of the sensor signal. The sensor may only be installed by appropriately qualified and instructed staff.

Electrical connections must be made by appropriately instructed staff. Errors made during connection may lead to malfunctioning, failure, or destruction of the sensor and the electronics.

The connecting cable is resistant to many, but not all, chemicals. A defective cable may allow chemicals to penetrate the housing and irreparably damage the electronics, in which case the device would no longer be functional.

Therefore, the conditions at the intended operating site must be determined and an inspection must be executed as to whether the sheathing material can withstand these requirements. We will be pleased to provide you with an overview of the chemical resistance of the sheathing material.

1.1 Symbols Used in This Document

Safety Instructions Safety instructions in this manual are identified by symbols. The safety instructions are prefaced by signal words indicating the extent of danger involved. Observe the safety instructions in all cases and act carefully in order to avoid accidents, personal damages, and material damages.



DANGER!

... indicates an immediately hazardous situation that will result in death or serious injuries if it is not avoided.



WARNING!

... indicates a possibly hazardous situation that may result in death or serious injuries if it is not avoided.



CAUTION!

... indicates a possibly hazardous situation that may result in minor or light injuries if it is not avoided.



CAUTION!

... indicates a possibly hazardous situation that may result in material damages if it is not avoided.

Tips and Recommendations



NOTE!

... draws your attention to useful tips and recommendations, as well as information for efficient and fault-free operation.

2. Intended Use

2.1. The Problem

Vibrations can occur in many technical areas. Often they can be neglected or are even necessary, but sometimes they are also undesirable or dangerous. Furthermore, dangerous vibration conditions can also develop from initially unnoticeable vibrations or occur completely unexpectedly.

The causes can often be attributed to mechanical defects or imbalances, or to the improper use of the machine. The consequences potentially include a deterioration of the product quality, production losses, and safety hazards, but will at least include increased wear. Increased automation and, for example, high noise levels often prevent acoustic or visual monitoring. Early detection, material conservation, and the limitation of potential loss offer a significant potential for cost reductions.

2.2. Application Area

The device is used to protect machines, mechanical equipment and devices, and last but not least the operating staff against the consequences of inadmissibly high vibration stress. It permanently monitors the vibration level and generates a warning if the limit value is exceeded. Moreover, the current value of the vibration parameter can be measured at any time via the analogue output.

2.3. Foreseeable Misuse



WARNING!

- Never change the limit value to reduce supposed false alarms. Clarify the cause of the alarms.
- Manipulation of the switching contacts of the alarm output or dismantling the device will disable the monitoring function.
- Every modification may endanger the safety

2.4. Special features

The device does not require any special maintenance!

If the device is to be transferred to the manufacturer for inspection purposes, please enclose a detailed description of the fault and provide the name of a contact person to be contacted in the event of any queries.

2.5 Special Conditions Regarding the Secure Application and/or Instructions on Use regarding the application of the device group in ATEX zone 1 and zone 21

Equipotential bonding

The housing of the measurement device must be integrated in the equipotential bonding system of the machine to be monitored by means of the attachment or the terminal.

The installer must make sure that the equipotential bonding is executed by a qualified skilled person in accordance with the relevant VDE provisions (German Association for Electrical, Electronic, and Information Technologies).

Cable entry and connecting cable

At ambient temperatures of more than 55°C, the cable and the cable entry used must be suitable for an operating temperature of at least 90°C.

Connecting cable

Attention: During transportation, the device must not be suspended from the connecting cable under any circumstances.

Since the cable entry is not equipped with a separate strain relief, the connecting cable must be attached by the user in a radius of approx. 10cm in the vicinity of the cable entry. The attachment must be executed in a way that the cable is neither bent nor damaged.

The following must be observed in general

The operator, installer must inform himself about the ATEX provision applicable to his application area and must comply with this provision.

3. Description of the Device

3.1 Display and Operating Elements

The display and operating elements can be accessed after having opened the cover.



Fig. 1: Display and operating elements

Display elements within the device:

- LED1:** The green “**Supply voltage**” LED will light up as soon as the device is connected to the power supply.
- LED2:** The green “**Power on**” LED will light up when the device is working immaculately. The LED will not be activated during a self-test.
- LED3:** The yellow “**warning**” LED will light up as long as the currently measured value exceeds the set limit value.
- LED4:** The red “**Alarm**” LED will light up as long as the alarm relay remains in the “Alarm” position.

Operating elements within the device:

ST1 for setting the switching threshold for alarm-contact

DIP switches:

S1	Connection shield-housing no connection shield-housing	ON OFF
S2	Connection shield-internal ground no connection shield-internal ground	ON OFF
S3	Self-test active Self-test not active	ON OFF
S4	no function	
S5	no function	
S6, S7	Measuring range	S6 S7
	15mm/s	OFF OFF
	30mm/s	ON OFF
	45mm/s	OFF ON
	60mm/s	ON ON

4. Steps Involved for Use of the Device

4.1 Identifying the Device



WARNING!

Different device versions have different technical data.
The wrong device version may fail during use.

Since the technical data is not directly visible on the device, you need to refer to the type label to ensure that you have the right device for the task at hand.

For this, you must initially determine without any doubt what device version should be used. Then, you should check the type label attached to the device.

In addition to the name of the manufacturer and the serial number, the type label also indicates the device version.

If you have any doubts, please contact the manufacturer to be on the safe side

Type label



Type: ESW[®] Mini-C-14

$\leq T_a \leq$
II 2G Ex d IIC T6 Gb
II 2D Ex tb IIIC T80°C Db
IP 68

S/N:

ATEX: BVS 08 ATEX E 089 X
IECEx: IECEx BVS 13.0102 X

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-Ex (hol6550)



0035

The type label is attached to the device and includes the following information:

- Manufacturer
- Type
- Temperature
- ATEX identification
- Serial no. xxyy – seq. no. (xx=week, yy=year)
- Approval no.

Fig. 2: Type label

4.2 Packing, Shipment, and Storage



CAUTION!

The device may be damaged if it is dropped on a hard surface. The cable may be damaged if it is bent or crushed.

The device must be sealed during transportation and storage to protect it against dirt and moisture. The connecting cable must be coiled with a minimum radius of 100mm and must be protected against being bent or crushed.

The bare ends of the conductors must be protected against accidental contact with unknown voltage levels.

During transportation, the device must be suitably packed to protect it if it is dropped.

4.3 Installing the Device

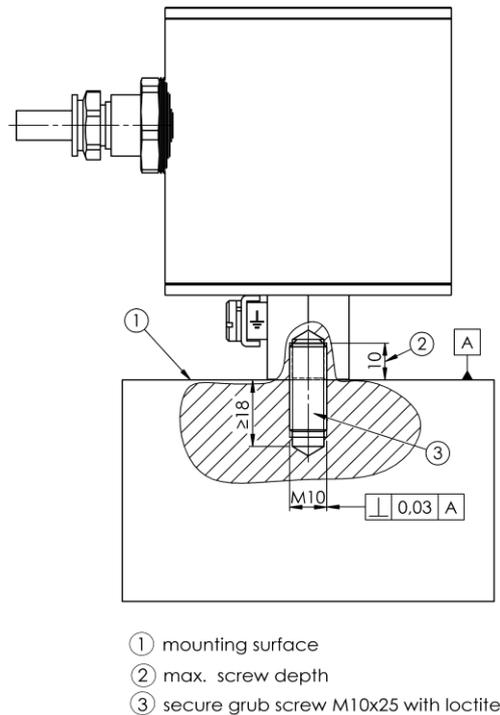


Fig. 3: Installation drawing

The ESW[®]-Mini-Ex-C is attached to the machine to be monitored by means of a threaded pin AM10*25 according to DIN 913.

Important:

1. The measurement axis of the ESW[®]-Mini-Ex-C must be aligned with the present direction of vibration.
2. The instructions attached to the device must be complied with in all cases.
3. The mounting surface must be flat, clean and free of paint and rust.
4. The threaded hole must be perpendicular to the mounting surface and free of chips and other foreign material. Moreover, the threaded hole must not contain any paint, rust, lubricant, or insulation material either. The same applies to the threaded hole present in the device and to the actual threaded pin.
5. The threaded pin must be secured using a suitable liquid thread securing agent to prevent accidental loosening.
6. The contact between the device and the mounting surface must be non-positive.
7. The instructions regarding the "Connecting cable", as well as regarding the process of "Opening the Measuring Device" on pages 6 and 10 must be observed in any case.



CAUTION!

The cable entry is not equipped with a separate strain relief. After the device has been installed, the connecting cable is routed. In doing so, care must be taken that the cable is fitted with sufficient flexibility on the one hand, to ensure that it is not yanked off during excessive vibration. On the other hand, it must be routed firmly enough to ensure that it cannot itself generate noises due to impacts, that it is protected against damage during normal operation, and that it does not create a risk of accidents due to tripping or stumbling over it. The bending radius of the connecting cable must in no case be less than 70mm.

4.4 Connecting the Cable

Once the cable has been properly routed, the individual wires must be connected in accordance with the wiring diagram.



CAUTION!

Check the supply voltage and switch it off during any installation work.

4.5 Opening and Closing the Measurement Device

Before opening the measurement device, the operator of the measurement device must de-energise it. In order to open the measurement device, the user needs a 1.5mm Allen key and a face pin wrench for round nuts with two holes with a size of 4mm.

The housing cover is secured with an M3 setscrew. This setscrew must be loosened with the help of an Allen key before opening the housing cover.

After having set the measurement device, the switch position must be checked.

Before installing the cover, the O-ring must be checked. If the O-ring is brittle, deformed, damaged, or if it has been used for several months already, the O-ring must be replaced by a new one (62 x 2mm made of LT-170).

It must be observed that the thread pitches and the interior are free of any dirt and oil. Cleaning work on and inside the device must only be conducted with a clean and dry cloth. The device is closed and leak-proof after approx. seven thread pitches and after the cover was secured with the help of the M3 setscrew.

Loosening the setscrew located at the housing bottom and opening the housing bottom are inadmissible.



Figure 4: Open device

4.6 Commissioning

Initially, the settings must be made in accordance with the instructions. Then, the power supply is switched on and a start-up test is executed. The LEDs, the analogue output, and the relay switching states should be monitored during the test. Upon completion of the test, the device cover is put back on.



CAUTION!

Switching actions on the relay contacts during the commissioning phase could be interpreted incorrectly within the framework of the subsequent analysis.

4.7 Setting the Ground



CAUTION!

Excessive discharge currents may damage the device.

If the ground may be one of the reasons for a failure, the following steps should be executed.

Initially, disconnect all grounds and check the levels between the individual grounds under different load conditions. If required, install the device in an isolated manner for testing purposes.

In the event of excessive levels, localise and, if possible, remedy the cause.

Conduct the test by using the DIP switches S1 and S2 to test different ground connections in order to minimise the disturbances.

Ultimately, bring the DIP switches S1 and S2 to the desired position and close the device. Check that both the device and the supply cable are attached securely.

S1	Connection shield-housing no connection shield-housing	ON OFF
S2	Connection shield-internal ground no connection shield-internal ground	ON OFF

4.8 Setting the Limit Values



WARNING!

The correct limit values depend on the measurement task and must not be changed without careful consideration of the impacts. If a large number of alarms are generated, the reason for these should initially be established rather than simply changing the limit value.

- In order to change the limit values, the device must initially be opened.
- Now, the desired limit value are set using the limit value step switches. The step switch are marked with the numbers 0 to 9. In this, switch position 1 corresponds to a limit value of 10%, position 6 corresponds to a limit value of 60%, and position 0 corresponds to a limit value of 100% of the measurement range.
- In the end, the device is closed again.



ST1

- 1 \triangleq 10%
- 2 \triangleq 20%
- .
- .
- 9 \triangleq 90%
- 0 \triangleq 100%

Fig. 5: Interior view

4.9 Setting the Measuring range

The device provides for the option of setting the measuring range.



WARNING!

The set measuring range must not be modified in a careless manner. If alarms are generated frequently, the reason must be localised and remedied initially.

- In order to set the measuring range, the device must be opened.
- The DIP switches S6 and S7 can be used to set the measuring range according to the specifications.
- In the end, the device is closed again.

Measuring range	Switch position	
	S6	S7
15mm/s	OFF	OFF
30mm/s	ON	OFF
45mm/s	OFF	ON
60mm/s	ON	ON

4.10 Triggering the Self-Test Function

A) Triggering the start-up test

Deactivate and then activate the device.
The device carries out a start-up test and will then operate normally.
The scope of the test is defined ex factory.

B) Triggering the start-up test with an internal switch

Open the device.
Status S3 = OFF => activate (ON) and deactivate (OFF) DIP switch S3
Status S3 = ON => deactivate (OFF) and activate (ON) DIP switch S3
Close the device.
The device will carry out a self-test and will then operate normally.
The scope of the test is defined ex factory.

C) self-test triggered by external pushbutton

confirm external button for self-test (control cable to +24V)
The device carries out a self- test and will then operate normally.
The scope of the test is defined ex factory

D) Activating and deactivating the automatic self-test

Open the device.
S3 set to ON: automatic self-test is activated
S3 set to OFF: automatic self-test is deactivated
Close the device.
The device will carry out a self-test, accept the setting,
and will then operate normally. The scope of the test is defined ex factory.

4.11 Troubleshooting in the Case of Malfunctions

If, right from the start, the device reacts differently to what is expected, initially check the device version and the factory settings resulting from the aforementioned.

If the device suddenly indicates disproportionately high or low values, the operating conditions of the machine, the machine itself, and the installation of the device should be checked. Loose components, rattling, background noises, etc. may result in incorrect indications.

Malfunction:	Alarm relay permanently indicates an alarm, analogue output delivers 0mA
Visible reaction:	All LEDs remain inactive
Possible reasons:	No power supply Cable connected incorrectly
Malfunction:	Alarm relay permanently indicates an alarm, analogue output delivers 22mA
Visible reaction:	LED test-OK remains inactive Limit value LED is illuminated LED alarm contact is illuminated
Possible reasons:	Incorrect power supply Analogue output open or connected incorrectly
Malfunction:	Analogue output current does not match the value to be expected Alarm relay energises too early or too late
Visible reaction:	None, everything seems to be normal
Possible reasons:	Device is installed incorrectly, is loose, rattles Interfering noise source Limit value incorrect
Possible remedy:	Make sure that the device is mounted securely Set the correct limit value
Malfunction:	Analogue output current 0mA or > 22mA
Visible reaction:	None, everything seems to be normal
Possible reasons:	Incorrect wiring connections Incorrect load impedance
Possible remedy:	Measure directly on the device Check the wiring

4.12 Normal Use of the Device

During normal use the level of the analogue output can be monitored to determine whether and to what extent the level of vibration changes depending on the use of the machine.
If the indicated vibration level changes abruptly, the reason for this should be determined.



NOTE!

In order to provide for the functional safety of the device at all times, the self-test function should be used on a regular basis. The frequency depends on the use of the device and the operating conditions, e.g. every 100 hours of operation or on a monthly basis.

Furthermore, correct seating and immaculate condition of the device should be checked on a regular basis.

4.13 Removal of the Device



CAUTION!

To avoid short-circuits and false alarms, make sure that the power supply and the signal evaluation are switched off and/or disconnected.

In order to electrically disconnect the device from the machine and physically remove it from the machine, all connections must initially be de-energised in order to prevent short-circuits. Then, the downstream evaluation must be prepared for the disconnection in order to avoid false alarms. The cable connections can then be disconnected from the device. The cable glands and clamps must then be loosened and the cable must be pulled back up to the device. The device can now be unscrewed and removed together with the cable. All moving and sharp-edged parts are then re-secured or removed. The mounting holes for the device must be protected using suitable sealing plugs. The removal of the device must be indicated on the machine.

5. Method of operation

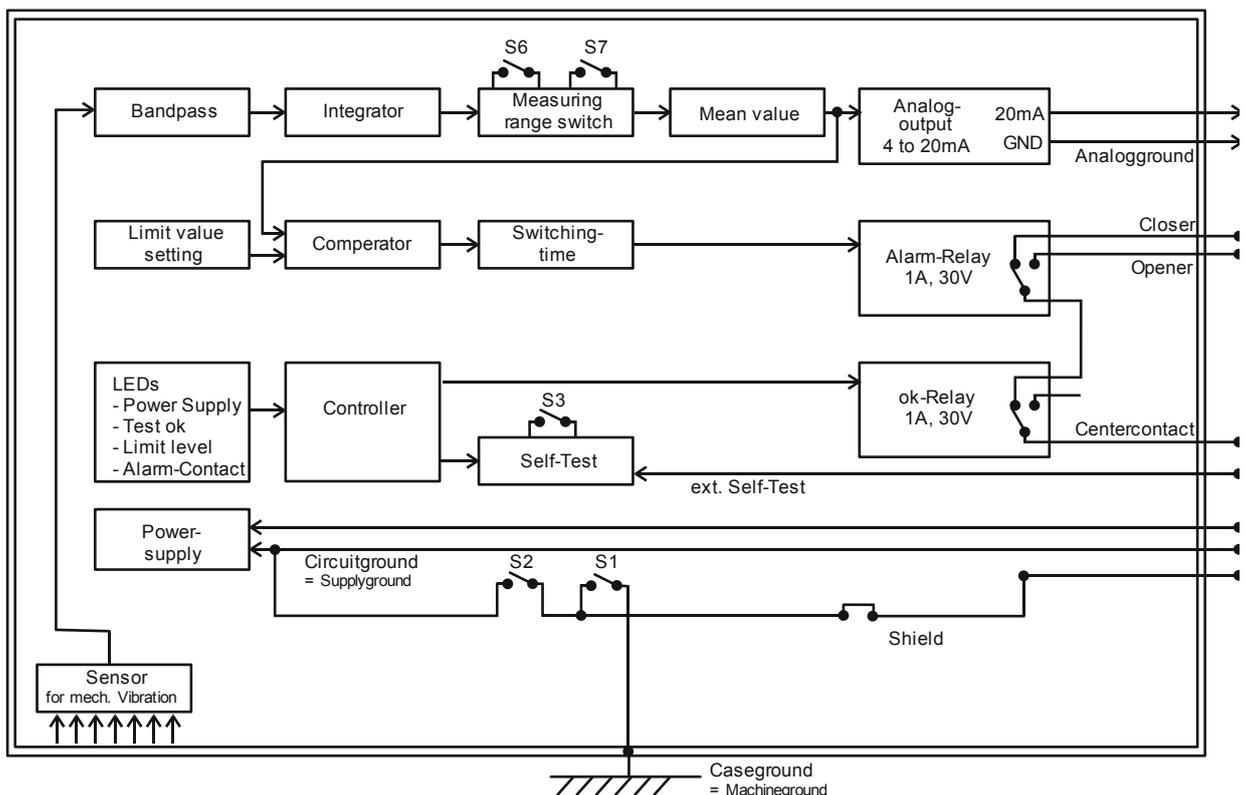


Figure 6: Functional diagram

Sensor

The task of the sensor is to register mechanical vibrations at the installation location and to convert these vibrations into electrical signals. In doing so, it only registers vibration shares in its primary vibration direction, however.

Bandpass filter

The bandpass filter filters the relevant signal components from the pending mixture of signals and suppresses interference signals.

Integrator

The integrator converts the sensor signal into a vibration speed signal, since the speed of vibration is proportional to the energy of the vibrations.

Measuring range

The measuring range defines the sensitivity of the device. Depending on the device version, the measuring range is either set fixedly or it can be set using the switches S6 and S7 on the DIP switch in the housing.

LED indicators

The LED indicators provide information on the current device status.

The green "Power Supply" LED will light up when power is applied to the device.

After the device has been switched on, during the start-up test, and during subsequent tests, the green "**Test OK**" LED will initially flash and then will light up permanently if no faults are found in the device. If a fault is detected during the test, the LED does not light up.

The yellow "**Limit pre-contact**" LED will light up as soon as and as long as the measured value exceeds the limit values for the pre-contact.

The yellow "**Limit main contact**" LED will light up as soon as and as long as the measured value exceeds the limit values for the alarm and/or main contact.

The red "**Alarm Contact**" LED will light up as soon as and as long as the alarm relay is energised, and at the same time the "Test OK" LED goes out.

Limit value setting

The task of the device is to monitor the measured value and to permanently compare it to a set limit value in order to energise the alarm relay if the limit value is exceeded.

The limit values can be set using a step switch in the device.

The limit values can be set in a range from 10% to 100% of the measurement range.

Signal processing

In the signal processing module the measured signal is initially rectified and averaged.

On the one hand, this average value is output as an analogue value and, on the other hand, it is also compared to the limit value. If the measured value exceeds the limit value, an alarm is generated after the activation delay has expired. If the measured value subsequently falls below the limit value, the alarm is cancelled upon expiration of the de-energisation delay. The alarm controls the alarm relay.

Self-test function

To ensure operational reliability, various functional tests are designed.

Each time the device is switched on, a start-up test is executed initially.

Furthermore, there are permanent tests in the background.

Moreover, there are manually started tests and tests that are started automatically on a regular basis.

The manually started test procedure can be started within the device using the switch S3.

The automatically started test can also be activated or deactivated by the corresponding setting of S3 during start-up.

Analogue output

The analogue output provides constant current corresponding to the mean level of the measured signal. The analogue output is extremely immune to interference and can be transmitted over long distances (several 100m) using a twisted wire pair.

The load impedance may be between 0 and 500Ohm.

Switching output

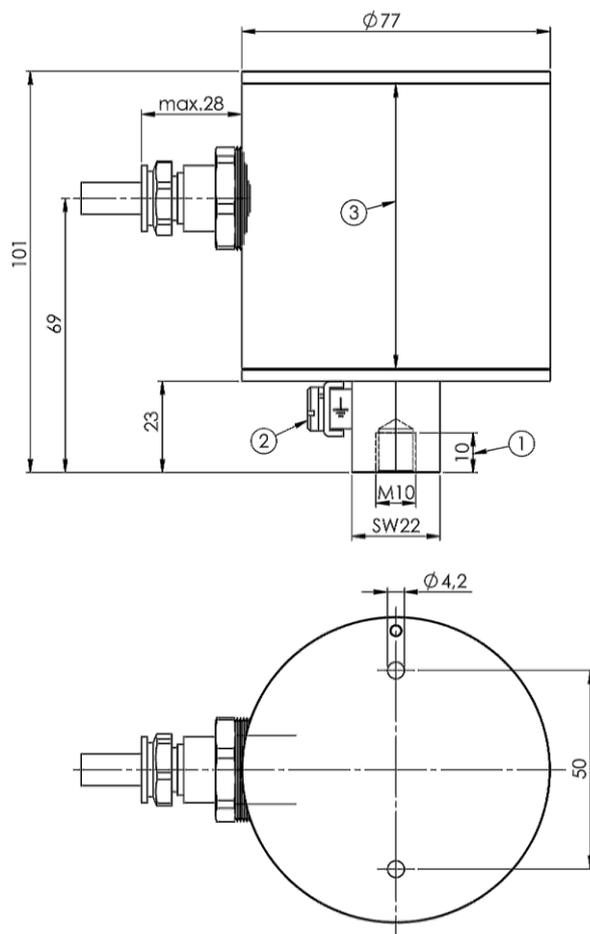
The device has a pre-contact relay, an alarm relay, and an OK relay. The contacts of alarm relay and OK relay are wired in series.

During normal operation, all relays are energised. The corresponding contacts K1 and/or K2 will be de-energised and generate a warning and/or an alarm when the measured values exceed the set limit values for pre-contact and main contact for the duration of the response delay.

The OK relay and the alarm relay are de-energised when a malfunction is detected within the device. If required, a test function can be incorporated ex factory, within the framework of which the alarm relay switches twice and the OK relay switches once to check the functionality of the relays.

6. Technical Data

6.1 Dimensions



- ① max. useable depth of thread
- ② ground terminal 4mm² (optional)
- ③ measuring axis

Fig. 7: Dimensions

Approval no.:	BVS 08 ATEX E 089 X
Material:	Stainless steel V4A
Weight:	2100g
Protection:	IP 68
Cable entry:	CAPRI type ADE 1F-4F, IP 68, with neoprene sealing ring