

## User Manual

(Translation of the original instructions)



Picture shows Aluminium-case without ground on earth terminal

## Electronic Vibration Monitoring Unit

### ESW®-small-Compact (hol601)

date: 12 January 2018

technical modification possible

holthausen elektronik GmbH is certified according to DIN EN ISO 9001:2015.



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### Important information

These operation instructions are to be read through completely and carefully heeded before starting the device. Failure to heed or adhere can result in claims on manufacturer's liability becoming null and void for damages ensuing there from.

Manual action of any manner on the device – with the exception of proper procedures and those described in these operation instructions – lead to forfeit of guarantee and exclusion from liability.

The device is solely intended for the usage as described below. It is particularly not intended for the direct or indirect protection of persons.

holthausen elektronik GmbH assumes no liability whatsoever as regards suitability for some specific purpose.

If any question should remain open, please never hesitate to contact us.

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## 1. Generally basical safety-indications

Don't use this device as the only invigilator, if a malfunctioning of ESW®-small-Compact could lead to damages on goods or Persons.

To obtain the desired result be sure, that the device with its technical data fits to the bulk of the object you want to supervise.

The sensor is sensitive to shock. A downfall out lower height to a hard substratum can destroy the sensor.

The assembling place and the execution of the assembling of the sensor determine decisively the quality of the sensor signal. The assembling may only happen through qualified and instructed persons.

The electrical hook up is to be done by instructed persons. A mistake by the connection can entail to faulty functions, outfall or ruination of the sensor and electronics.

The ESW® should not be used on machines with a very energetic high-frequency solid-borne. Through resonance apparitions in the sensor, the device can indicate a much too great or too small value.

Powerful noise sources for instance inverters, in direct closeness of the sensor, electronics or cabling, can result in faulty behaving of the apparatus.

Potential differences and balance currents in the mass guidance can result in faulty behaving too.

The connection cable is resistant against many but not every type of chemical and mechanical stress. Through a damaged cable chemicals could get inside the unit and destroy the electronic. Then the unit would loose their function.

Therefore the conditions from the mounting surrounding must be checked. Then the cover material from the cable have to be proofed if it resists these requirements. You can get an overview from the chemical resistance of the cover material from us.

## 2. Packing and the transport

Note:

- The sensor is sensitive to shock. A downfall out lower height to an hard substratum can destroy the sensor.
- Avoid to kink or tie a knot in the cable.
- Keep the electronic in a dry place.
- In case of a downfall or heckling or squeezing, could the casing or the operation elements or the board get defects.

With adequate warning-labels and through a qualified packaging and storage, you can protect the sensor and electronics at carriage against influences from outside.

### 3. Application

The ESW®-small-Compact unit will be installed on machines like ventilators, blasts, separators or decanters in order to protect these machines in the application against inadmissible mechanical vibration. The unit monitor continuously the intensity of vibration and warn reliably during exceeding of, inside the unit, adjusted limit values. Moreover it is always possible to measure the actual vibration value at the analog output. The permanent temperatur monitoring inside the case also is a feature of this unit (see 18.1).

### 4. Measurement principle

The sensor converts mechanical oscillations into an electrical alternating voltage. The subsequent electronics converts the AC signal into a DC voltage, which is equivalent to the measured oscillation speed. The sensitivity, and thus the measuring range, can be selected in the device using a switch. The electronics compares the measured value with two threshold values G1 and G2, which can be set in the device using two potentiometers. The threshold values can be steplessly set between 10% and 100% of the possible measuring range. The analog output can be used as an aid for adjustment when setting the threshold values G1 and G2. If the measured value crosses a threshold value the corresponding alarm relay is switched after the expiry of a permanently set response delay period. If the measured value falls below the threshold value the alarm is cancelled after the expiry of the release delay period.

The response delay and the release delay depend on the version (see specific data sheet) and can lie between 0.2s and 25s (fixed by factory).

Alternatively the device can also be equipped with alarm memory (see Point 16).

In addition, the measured value controls a constant current source. A current in the range 0 to 20mA or 4 to 20mA which is proportional to the measured value and corresponds to the measuring range is delivered over the "analog output" cable terminals.

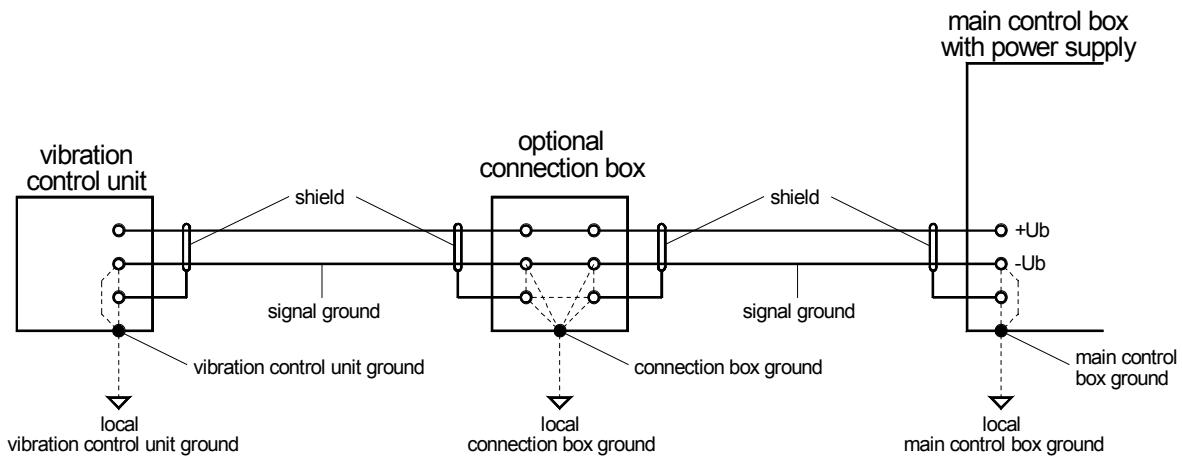
All important electronic components of the device can be checked using the self-test functions of the device (Point 18).

All important functions are permanently verified in normal operation. The functions such as, e.g., the relay test which would disturb the measuring operation, can be carried out by the user when required the pressing the switch (S1).

**Optionally** the device can be delivered with a self-test on starting. This carries out a complete function test every time the device is switched on (Point 18.3).

**Attention:** Pay attention on requirement by entrance in EEx-Zone

## 5. Grounding concept



If an isolated installation is not specially requested, usually through the attachment with screws each case is connected to the local machine ground.

Inside the ESW®-small-Compact the case potential, the cable shield and the internal signal ground could be connected with each other by choice (see 13).

In big facilities with considerable energy consumption and distances between the machines could such big potential difference be build up, that substantial balancing current on the ground network will occur. Dependent on intensity of such currents is arising of interference's or damaging of the unit the result!

Potential differences could also arise on machines, with small distances not clear crossing of ground potential for example painted color or movable parts like suspension mounting.

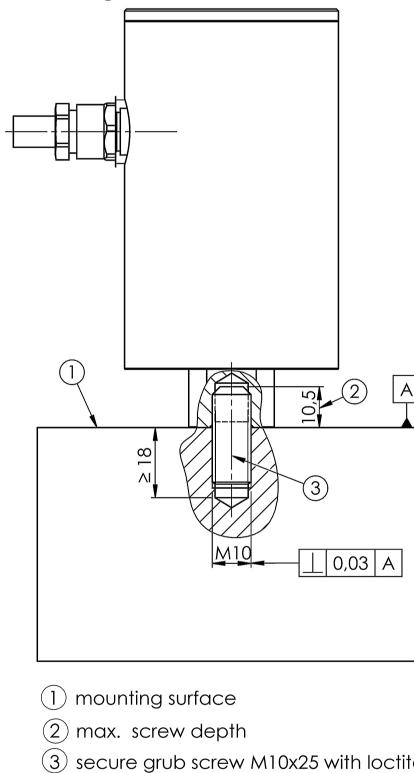
Energetic high frequency interference energy could be added to the measurement signal-wire by inductivity or trough capacity that could change the real existing measurement value! In this way, for example parallel going elements could act as coupling-capacitor and winded up grounding cable could act like a cut off choke.

**Memorize: Earth connection is not the same everywhere!**

- ➔ Check the situation
- ➔ Plan the grounding concept
- ➔ Select the facility / realization

## 6. Mounting of the vibration control unit

- Whole mounting-, connecting- and adjustment-work should be done from qualified personal only!
- Protect the ESW®-small-Compact definitely against drop, stroke and other mechanical shock!
- The case of the unit must be connected over the attachment or the ground-on-earth-Terminal with the potential compensation of the monitored machine. The connection must be extremely low resistive as well as for long time stable. Doing this, take urgent notice to the valid VDE-regulations.



The ESW®-small-Compact will be mounted via one threaded pin AM10\*25 per DIN 913 on the machine to be monitored.

### Important

1. Measuring axis has to be coinciding with vibration excitation axis (see case drawing page 17).
2. Take note of the label with instruction notes.
3. The surface has to be plain, clean and free of paint and rust.
4. The tap hole has to be perpendicular to the surface and free of metal-cuttings or other foreign material. Further more the tap hole and the screw have to be free of paint, rust, grease or other isolating components.
5. The grub screw has to be locked with liquid thread protection against unintended loosening.
6. The unit has to be fixed, tight on the surface.
7. The advises to „connection cable“ (page 6), as well as „Opening and closing of the vibration control unit“ (page 9) are absolutely to note.

## 7. Opening and closing of the vibration control unit

The user must switch off the power supply, before opening the measurement unit. To open the unit the user needs a 0,9mm type of wrench "inbus - key" and a forehead key with two-bore nut, with size of 4mm. The case cover is ensured with a M2 screw. These must be loosened before opening of the case cover, with an "inbus - key". After adjustment of the unit, please control the position of the DIP-switches

Before closing the unit the O-Ring must be examine. You have to insert a new O-Ring (43 x 2mm, LT170 – original spare part) if the old one is brittle, deformed, damaged or already a few month in use.

Please pay attention that the thread and the interior room is oil- and dirt- free. Cleaning around and inside the unit should be done only with clean and dry cloth. The closing and the sealing of the unit is done after app. seven pitches of cover-nut thread, and ensured via the M2 screw.

### Advises for dismantling

Before dismantling the measurement unit, the power supply must be switched off. The connection cable has to be loosened from the supporting surface to avoid damaging of the cable. The vibration control unit should be set free via a 22mm wrench key.

## 8. Maintenance

The ESW®-small-Compact is maintenance free.

Tools for case cover opening: 0,9mm type of wrench (Inbus-key)  
Adjustable forehead key for two bore nut size 4mm

Factory: H. Sartorius Nachf. GmbH & Co

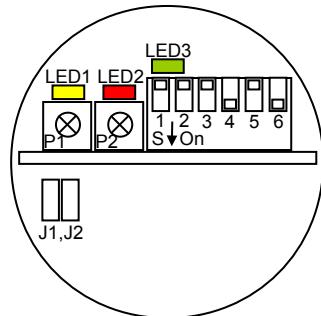
phone +49 (0) 21 02 / 44 00 - 0  
fax +49 (0) 21 02 / 44 00 - 24

## 9. Display- and operation- elements

The display and operating elements will be accessible after unscrewing the cover of the ESW®-small-Compact.

### Display elements

LED1	yellow flashes	Limit value G1 exceeded or adjust Limit value K1
	yellow on	Limit value G1 exceeded longer than the rise time, K1 has switched
LED2	red flashes	Limit value G2 exceeded or adjust Limit value K2
	red on	Limit value G1 exceeded longer than the rise time, K2 has switched
LED3	green on	Operating voltage "on"
	green flashes	Self test "active" or error code signal



### Operating elements

P1	Potentiometer for setting Limit value G1	10 bis 100%
P2	Potentiometer for setting Limit value G2	10 bis 100%
S1	Self test inactive	OFF
	Self test activated	ON
S2	Analog output corresponds to measured value Set-Mode (Analog output corresponds to limit value)	OFF ON
S3	switcher for the choice of the Limit values Analog output corresponds to adjust Limit value G1 Analog output corresponds to adjust Limit value G2	OFF ON
S4	Analog output 4 to 20mA 0 to 20mA	OFF ON
S5, S6	measuring range adjustment (see chapter 11)	
J1, J2	ground- adjustment (see chapter 13)	

## Setting instructions

The following points apply for devices with optional “self-test on starting”:

After applying the operating voltage the device starts a complete function test. The green LED3 flashes during the function test (see 18.3).

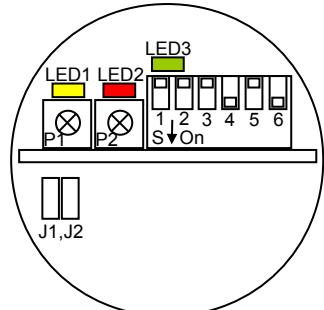
After the function test the relays switches - the switching contacts are closed thereafter.

## 10. Setting instructions

The unit has three measurement ranges, which can be selected by the switches S5 and S6. For the device to operate properly, **both the switches** should not be in “ON” position, since a non-specified measuring range would then be set.

Measuring range      Switch Position

	<b>S5</b>	<b>S6</b>
10mm/s	OFF	OFF
20mm/s	OFF	<b>ON</b>
50mm/s	<b>ON</b>	OFF



## 11. Analog output

As the output value will be submitted constant current, by voting 0 to 20mA or 4 to 20mA. The selection occurs by switching over of switch S4.

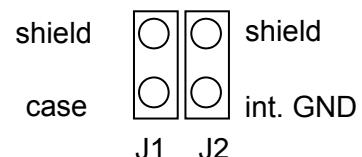
An output current of 20mA meets the 100%-value of the selected measurement range. In the setting of 0 to 20mA is the valid relation 0.2mA per %, in the setting of 4 to 20mA is the valid relation 4mA + (0.16mA per %).

Output range      Switch position

	<b>S4</b>
0 bis 20mA	<b>ON</b>
4 bis 20mA	OFF

## 12. Possible ground configurations

By using the jumper J1 and J2 the case potential, cable shield and the internal signal ground could be connected with each other by choice.



### 13. Analog output settings

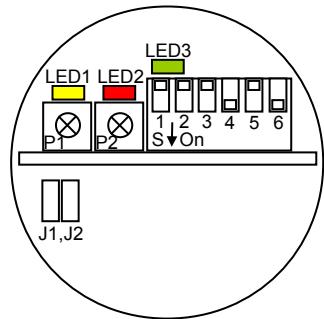
The 0 to 20mA output can be used for displaying of several values on the analog output. With the standard setting (**S2=OFF**) the output current corresponds to the measured signal.

For example, an analog current value of 20mA corresponds to a measured vibration velocity that has reached 100% of the measuring range set.

**Important:** By switching (**S2=ON**) the analog output can be used for setting or reading of the limit values G1 and G2.

The limit value adjustment means a current of 20mA, so that the switch level close to 100% of the adjusted measurement range.

Output Variable	Switch Position
	<b>S3</b>
Limit value G1	OFF
Limit value G2	ON



### 14. Adjustment of the limiting values

If the measuring signal exceeds certain limiting values, the ESW®-small-Compact shall react by switching potential-free relay contacts. These limit values can be set inside the unit by potentiometers. The limit values can be set between 10% and 100% of the selected measuring range.

The limit value G1 will be adjusted with potentiometer P1. Exceeded the value of G1 for longer than the rise time delay for G1, then K1 is switched. The limit value G2 will be adjusted with potentiometer P2. If limit of G2 will be longer than the rise time delay for G2 exceeded, then K2 is switched.

Rest the measured value just from time to time over the limit value, so counts the activation delay time after each overstepping of the limit value once more. A short overstepping of the limit values is shown by flashing of the yellow LED for G1 and the red LED for G2.

If threshold value 1 is set in the SET mode, the green LED lights up and the yellow LED flashes. If the threshold value 2 is set, the green LED lights up and the red LED flashes. Should e.g. G1 be set to 15mm/s = 30% in the measuring range 50mm/s, then with S3=OFF is set to threshold value G1. Then an output current of 6 mA (= 30% of 20 mA) is set using potentiometer P1.

**At the analog output, the threshold values are always output with reference to 0-20 mA even if the output current range is set to 4-20 mA.** That means, an output current of 2mA (potentiometer at the left stop) means 10% of the measuring range as alarm threshold and 20 mA (potentiometer at the right stop) corresponds to 100% of the measuring range as alarm threshold.

For setting the threshold value G2, S3 is set to ON and the same procedure is repeated. **After setting the threshold values care should be taken to bring S2 back to "OFF" position** in order to start the normal operation again.

If the potentiometers are adjusted without bringing S2 into ON position, the device gives an error message. (Protection against unintentional adjustment and defective potentiometers.)

## 15. Example to adjust the limit value

Analog output 0 to 20mA (10% to 100% = 2mA to 20mA, mean 0.2mA per %)

**Example:**

**Adjust the limit value G1 to 22.5%, and the limit value G2 to 35%:**

Measured range 20mm/s	S5	OFF
	S6	ON

<b>SET-Mode</b> active	S2	ON
Balancing of the limit value G1	S3	OFF

Set the output current to 4.5mA via P1 (22.5% of 20mA is 4.5mA)

<b>SET-Mode</b> active	S2	ON
Balancing of the limit value G2	S3	ON

Set the output current to 7mA via P2 (35% of 20mA is 7mA)

<b>Standard-Mode</b> (SET-Modus not active)	S2	OFF
Measuring variable "vibration velocity"	S3	On oder OFF

Self test off	S1	OFF
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## 16. Optional alarm memory

Additional supply with alarm memory. After the activation of the alarm relay K1 (and/ or K2) the unit will remain in the alarm status until an external and manually reset will be activated. This feature is used in such cases, where the vibration control unit is mounted on unreviewable and difficult accessible places. Through this advanced memory function every alarm is registered. Because of variable mounting of one or more parallel connected reset buttons, it is possible to reset the alarm memory from any place or location.

The reset occurs by connection of the external reset contact (violet wire) to ground or +Ub (see specific datasheet).

## 17. Self-test

In order to check the functioning of the ESW®-small-Compact, self-test functions have been integrated into the device. A large part of the functions is automatically monitored when the device is in operation. Other functions can be checked only manually by pressing the self-test switch, since these would disturb the running operation.

## 17.1 Automatic self-test in the background

If an error occurs, the green LED flashes one to three times depending on the type of the error, the pre and main contact trips and a fault current of 22mA can be measured at the analog output. Items that are monitored include:

- Operating voltage (Error code: LED flashes twice)
- Temperature (Error code: LED flashes twice)
- Threshold value potentiometers (must be changed in the set mode only)  
(Error code: LED flashes once)
- Sensor (Error code: LED flashes thrice)

If the cause of the error is remedied, the device goes back to its normal operation.

## 17.2 Self-test called externally by the user

**The test called by the user consists of 2 parts. The device cannot resume normal measuring operation during the test.**

**The sensitivity of the analog part is checked first. For this purpose, in place of the sensor signal a test signal is fed internally and the measured values are outputted at the analog output. In the event of an error an alarm is outputted at the pre and main contact. Subsequently, the on and release delay times for the pre and main contact are outputted.**

- The self-test is activated by means of switch (S1) in the device (ON) and is visually indicated by the flashing green LED. The entire test takes a few seconds.
- Next, a current of exactly 4 mA must be measurable for 2 s at the analog output.
- Later the sensor is disconnected internally and the following analog levels are checked using a test signal. The values measured by the processor are outputted at the analog output. If sensitivity is set to 10mm/s, a current of approx. 16 mA must be outputted for 2 s. If sensitivity is set to 20mm/s, it should be possible to measure approx. 8mA for 2 s followed by 16mA for another 2s at the analog output. If the measuring range is set to 50mm/s, currents of 3.2mA followed by 6.4mA and 16mA are expected at the analog output. If the deviation in the 16mA value is more than 20%, an alarm is outputted.
- This is followed by the test for the delay and release periods for the relay. In this test, a current of 22 mA is outputted at the analog output.
- Afterwards the two delay periods of the relays expire, which is indicated by the flashing of LEDs (yellow for threshold value 1, red for threshold value 2).
- After the expiry of response delay 1 for threshold value 1, relay 1 responds and the yellow diode lights for a time period equal to release delay 1. Then the relay releases again and the LED goes out.

- After the expiry of response delay 2 for threshold value 2, relay 2 responds and the red LED lights for a time period equal to release delay 2. Then the relay releases again and the LED goes out.
- After the completion of this test procedure the test is repeated until the switch S1 set to OFF again.

**Note:** In case of short release delay periods (e.g. 0.5 s) the relay switches over “apparently immediately” after responding (after the expiry of the response delay period).  
If an **alarm memory** is present for one of the two relays, the system must be reset using an external reset button. Only after doing so, the test procedure starts all over again.

This self-test checks that part of the electronics which cannot be monitored in the background. In combination with the automatic tests in the background an unambiguous conclusion regarding the function of the device can be drawn.

In the event of an error the relays do not go back to their idle state and the self-test can no more be terminated by resetting S1. In addition, the green LED flashes four times briefly and a fault current of 22mA can be measured at the analog output.

The test continues further when the cause of the error is remedied.

Function	Switch position	
Self-test ON	<b>S1</b> <b>ON</b>	After execution of the self check the switch S1 must be adjusted OFF “absolutely back to”, in order to ensure a regular function of the ESW®-small-...Compact. The actual test run is however only terminated.
Self-test OFF	OFF	

### 17.3 Self-test on starting (optional)

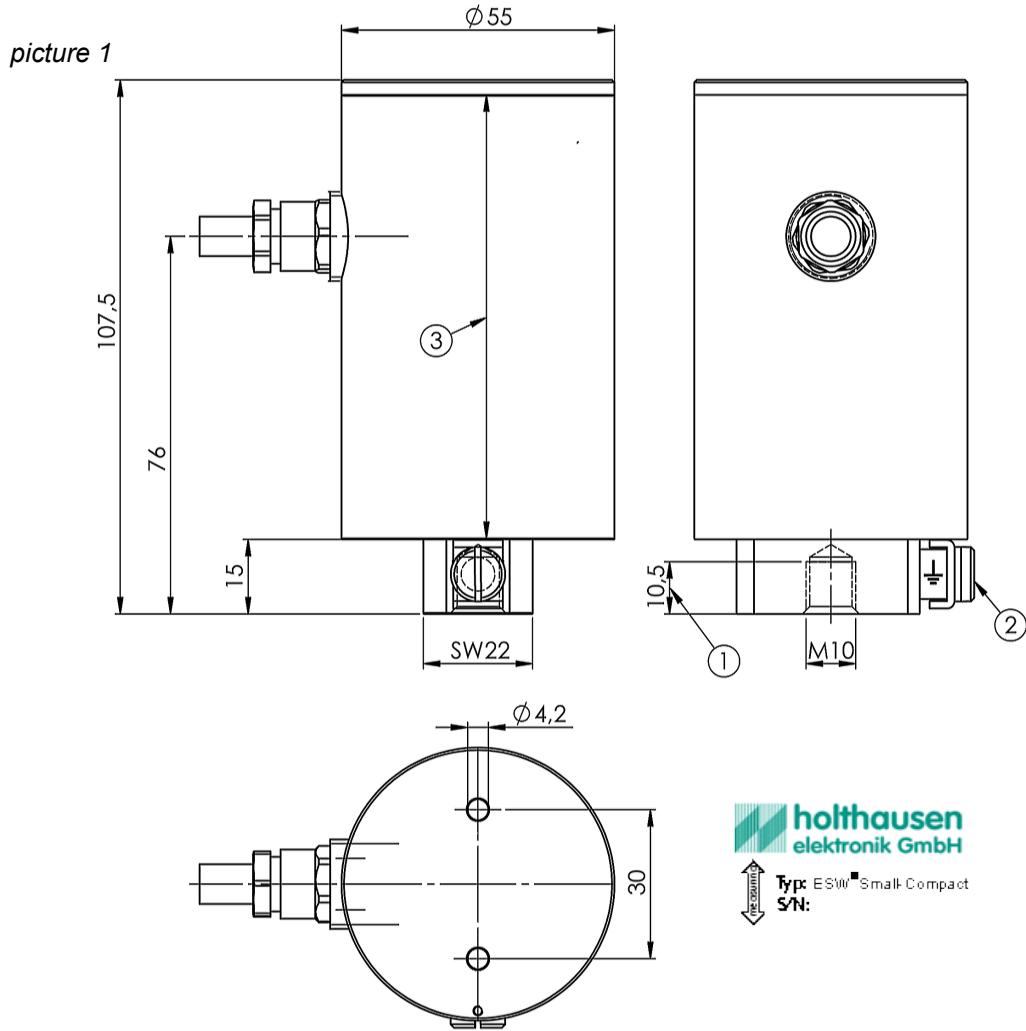
The tests running automatically in the background and the externally called self-test are run on application of the operating voltage. In the event of an error the relays do not go back to their idle state. During the duration of the test the green LED keeps flashing (it is common to have non-uniform flashing during the changeover period between the individual tests.)  
The test continues further when the cause of the error is remedied.

**Caution:** if the device has an external RESET, the external RESET output must be actuated to complete the relay test.

The normal operation starts after the completion of the test.

**18. Housing size (in mm), with optional ground on earth terminal**

Case material: Aluminium-, V2A- or V4A



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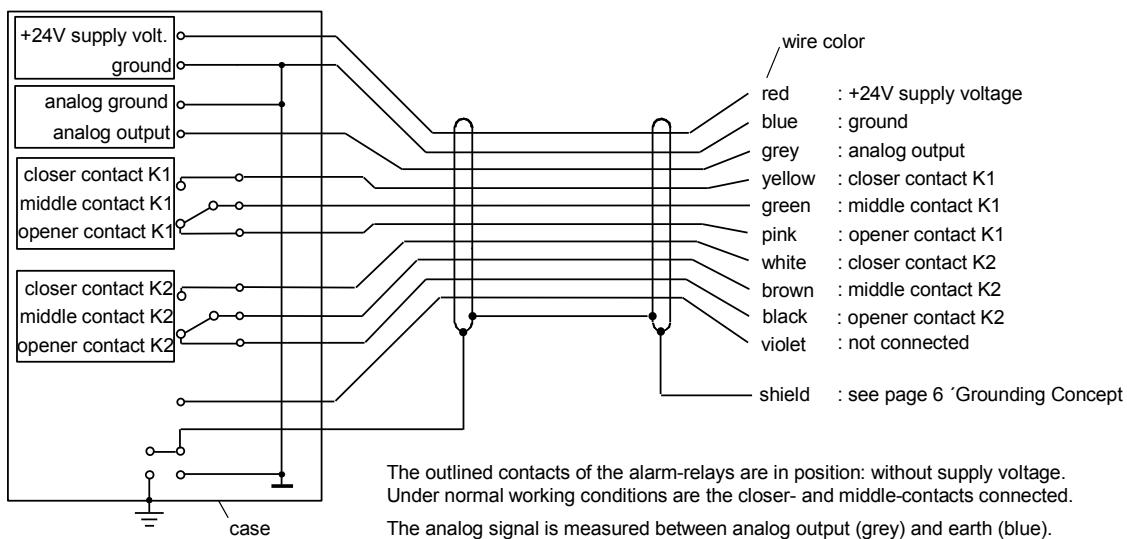
- ① max. useable depth of thread
- ② ground terminal 4mm<sup>2</sup> (optional)
- ③ measuring axis

The unit will be mounted via one threaded pin AM10\*25 per DIN 913.

## 19. Cable connection draft

### ESW®-small-Compact

#### Version without external reset



#### Version include external reset

