

User Manual

(Translation of the original instructions)



Picture shows high grade steel case

Electronic Vibration Monitoring Unit

ESW[®]-small-Ex-...Compact (hol660/Ex/compact)

date: 30 April 2019

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-Ex-...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.

A mistake by the connection can entail to faulty functions, outfall or ruination of the sensor and electronics.

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-Ex-...Compact unit will be installed on machines like ventilators, blasts, separators or decaners 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.

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 17).

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 Special conditions for safe use in Ex zones

5. Special conditions for safe use in Ex zones

The ESW[®]-small-Ex... is an operation resource for use in highly explosion-prone areas in accordance with Directive 2014/34/EU in the categories 2G (Zone 1) for gases and 2D (Zone 21) for dusts. The exact range of application can be found on the label of the device.

Special conditions for application safety and instructions for using the device

The dimensions of the flameproof joints are in parts other than the relevant minimum or maximum values of IEC 60079-1:2007. For information on the dimensions of the flameproof joints contact the manufacturer.

The enclosure has to be integrated into the potential equalisation of the machine to be monitored; this can be done either via the fastenings or via the connecting terminal. The installer has to ensure that the equipotential bond is established by a qualified specialist in accordance with the relevant VDE regulations.

Lead in and connection cable

The free cable end of the vibration monitor has to be connected either in an enclosure in one of the types of protection stated in sec. 1 of IEC60079-0:2007 or outside the explosive atmosphere.

The open end of the supply cable must be connected in accordance with current wiring regulations.

In applications in Zone 21 it must be ensured when installing the connection cable that electrostatic charging cannot lead to ignitable discharges.

The lead in and the connection cable are supplied with the device and are certified for the above mentioned application range for a minimum temperature resistance from - 40°C to +90°C and comply with the requirements of the applicable installation regulations.

Connection cable

Caution: The device must never be transported suspended from the connecting cable. It is not permitted to change the connection at the device or to change the cable.

Since the lead in does not have its own cable relief, the connecting cable must be fixed by the user in the proximity of the lead in within a radius of approx. 20cm. The fixing must be executed in such a manner that the cable has no kinks and it is not damaged.

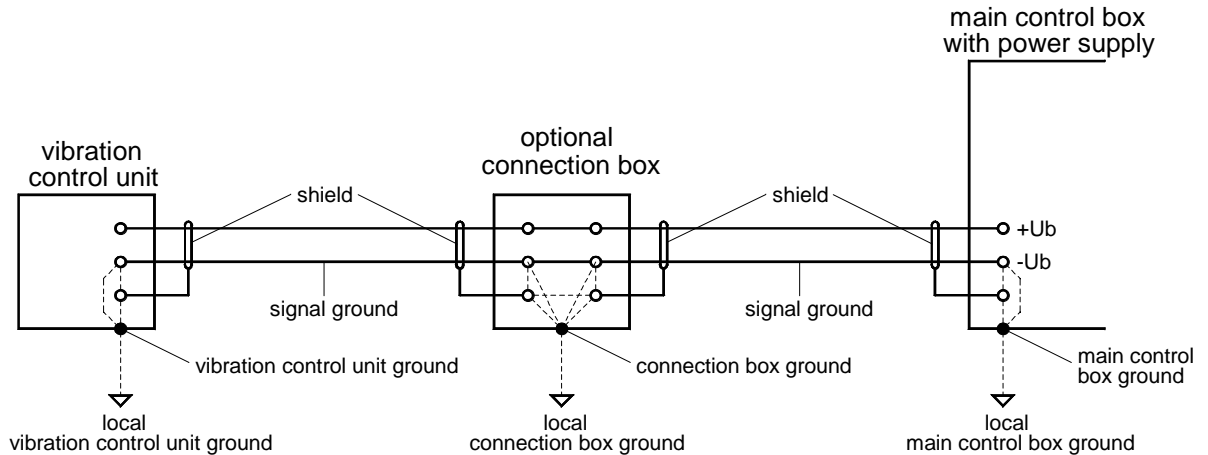
General points to be observed

The operator, installer has to find out the Ex regulation applicable for his/her area of application and comply with the same.

The temperature specifications refer to values without pouring. When pouring, the installation conditions should be observed.

The supply voltage must be power limited components and executed according to the applicable Ex provisions.

6. 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-Ex 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.

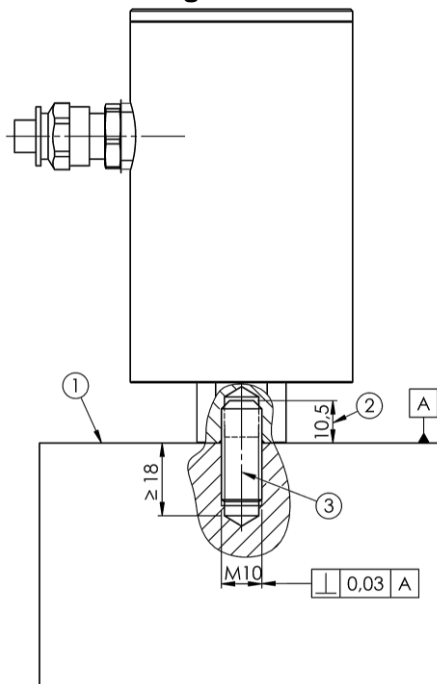
Energetic high frequency interference energy could be added to the measurement signal-wire by inductivity or trough capacity that could change the real existing measurement value! In this way, for example parallel going elements could act as coupling-capacitor and winded up grounding cable could act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

Memorize: Earth connection is not the same everywhere!

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

7. Mounting of the vibration control unit

- Whole mounting-, connecting- and adjustment-work should be done from qualified personal only!
- Protect the ESW[®]-small-Ex-...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.



- ① mounting surface
- ② max. screw depth
- ③ secure grub screw M10x25 with loctite

The ESW[®]-small-Ex-...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.

8. 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. 5 pitches of cover-nut thread, and ensured via the M2 screw.

Advices 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.

9. Maintenance

The ESW[®]-small-Ex-...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

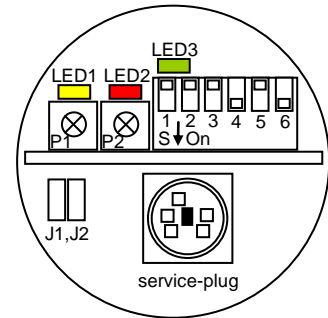
fax +49 (0) 21 02 / 44 00 - 24

10. Display- and operation- elements

The display and operating elements will be accessible after unscrewing the cover of the ESW[®]-small-Ex-...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 Self test activated	OFF 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 18.1).

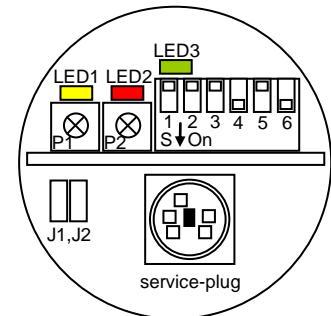
After the function test the relays switches - the switching contacts are closed thereafter.

11. Measurement range switching

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

	S5	S6
10mm/s	OFF	OFF
20mm/s	OFF	ON
50mm/s	ON	OFF



12. 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.

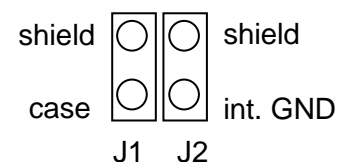
An output current of 20mA meets the 100%-value of the selected measurement range. In the setting of 0 to 20mA is the valid relation 0.2mA per %, in the setting of 4 to 20mA is the valid relation 4mA + (0.16mA per %).

Output range Switch position

	S4
0 bis 20mA	ON
4 bis 20mA	OFF

13. 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.



14. 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.

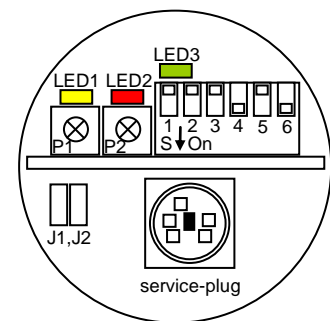
For example, an analog current value of 20mA corresponds to a measured vibration velocity that has reached 100% of the measuring range set.

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
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	S3
Limit value G1	OFF
Limit value G2	ON



15. Adjustment of the limiting values

If the measuring signal exceeds certain limiting values, the ESW[®]-small-Ex-...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.)

16. 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

SET-Mode 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)

SET-Mode active	S2	ON
Balancing of the limit value G2	S3	ON

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

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

Self test off

	S1	OFF
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17. 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).

18. Self-test

In order to check the functioning of the ESW[®]-small-Ex-...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 using the self-test switch, since these would disturb the running operation.

18.1 Self-test on starting (optional)

Depending on the version no test, only the analog output (simple) or relay and analog output (complete) is checked – please refer to the specific technical data sheet.

After power on the self test starts automatically. During the duration of the test the green LED keeps constant flashing. In the event of an error the relays do not go back to their idle state. 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.

18.2 Automatic self-test in the background

The operating voltage, temperature, threshold value potentiometers and sensor are monitored in background.

If an error occurs, the green LED flashes depending on the type of the error (18.4 error code), the pre and main contact trips and a fault current of 22mA can be measured at the analog output.

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

18.3 Self-test called externally by the user

Depending on the version only the analog circuit (simple), also analog output (advanced) or analog circuit, relay and analog output (complete) is checked – please refer to the specific technical data sheet.

**The device cannot resume normal measuring operation during the test.
In event of an error the green LED flashes depending on the type of alarm (18.4 error codes) and error alarm is outputted at the pre and main contact.**

The self-test is activated by means of switch in the device (S1=ON) and is visually indicated by the constant flashing green LED.

- For **2s** a current of **4mA** must be measurable at the analog output.
- Then a current of **12mA ±20%** must be measurable for **2s**.

This is followed by the test for the delay and release periods for the relays. In this test, a current of **22mA** 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. The actual test run is however only terminated.

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).

Caution: If an **alarm memory** is present, 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 self-test can no more be terminated by resetting S1. The test continues further when the cause of the error is remedied.

Function	Switch position	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-Ex-Compact. The actual test run is however only terminated.
	S1	
Self-test ON	ON	
Self-test OFF	OFF	

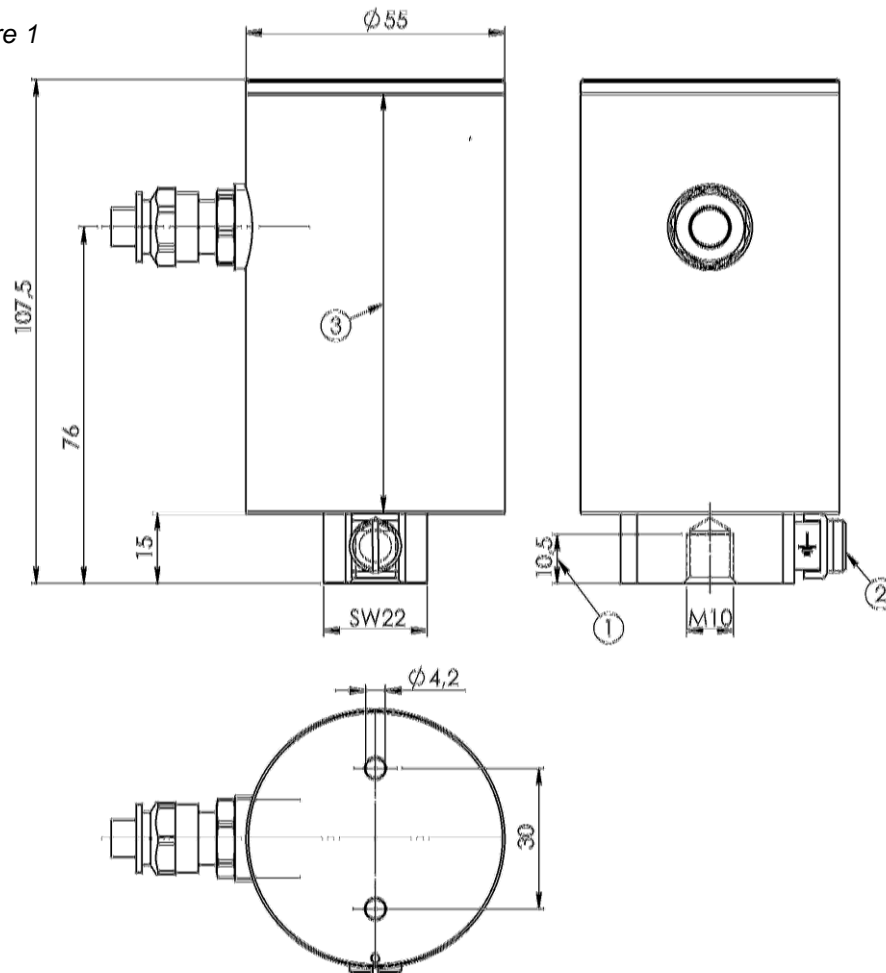
18.4 Error code

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

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

Case material: Aluminium-, V2A- or V4A

picture 1



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

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

Authorization N.B.: BVS 08 ATEX E 088 X

Material: Aluminium, high grade steel V2A or V4A

Weight: approx. 1000g

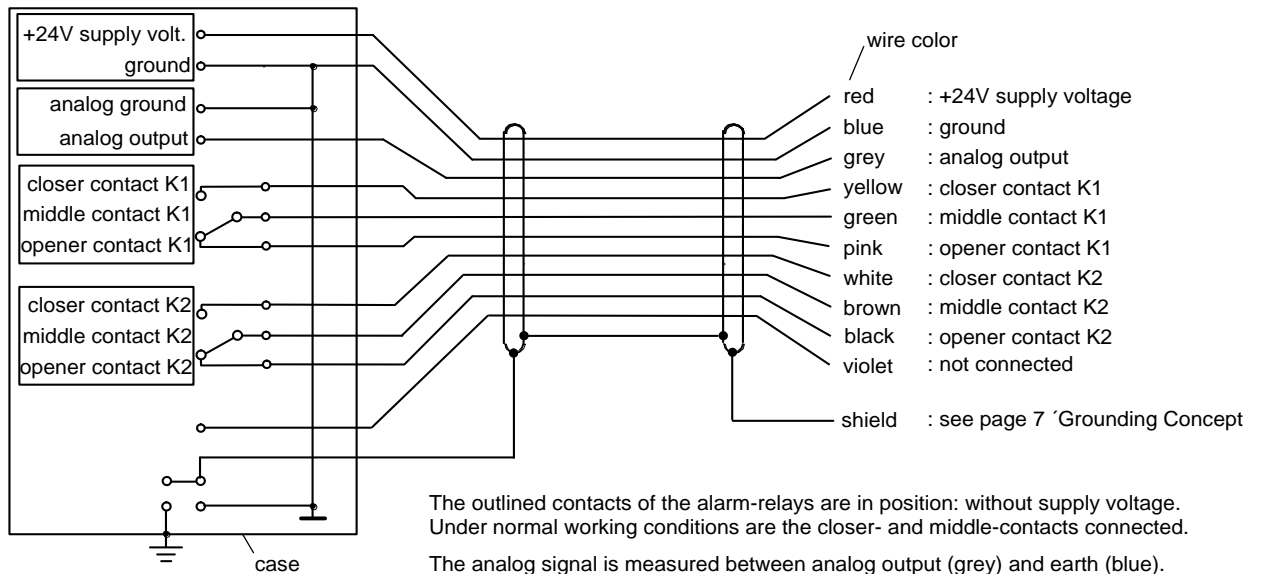
Protection: IP 68

Cable insertion: CAPRI Type ADE 1F-4F, IP68, with Neopren-airtight ring

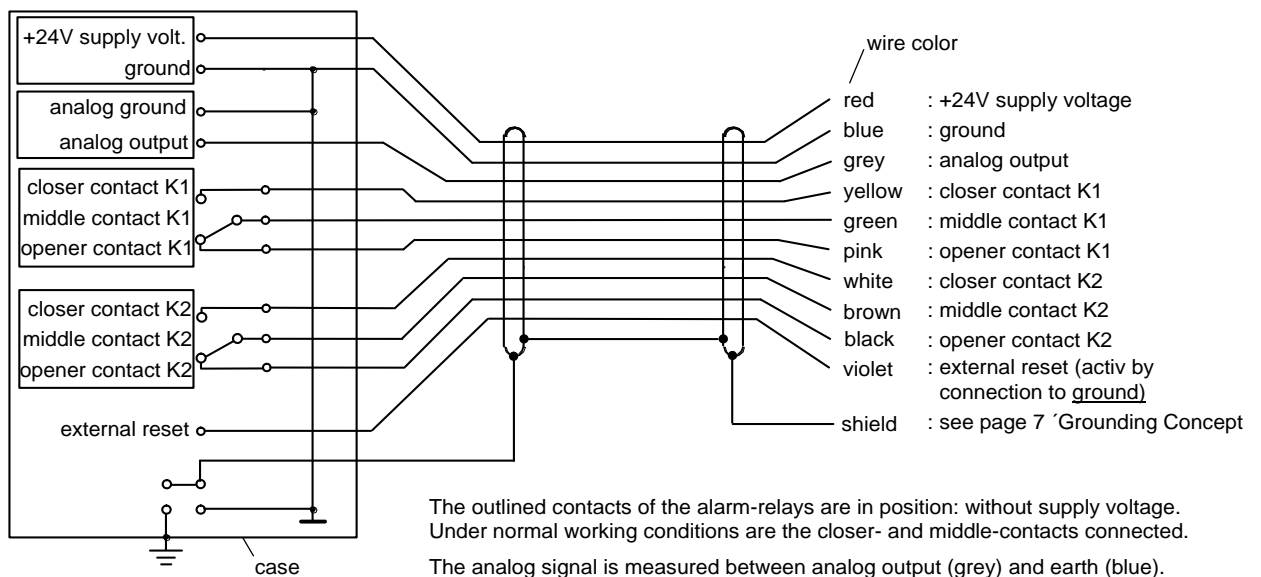
20. Cable connection draft

ESW[®]-small-Ex-...Compact

Version without external reset



Version include external reset



21. Type registration

The unit with the type registration ESW[®]-small-Ex..... is certified by the ATEX guideline 2014/34/EU for the use in gas-air-mixture under atmospheric conditions or burnable dust.

Labeling / Registration



Typ: ESW[®] Small-Compact

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

S/N:

Wevelinghoven 38
D-41334 Nettetal
www.esw.eu

-Ex (hol660)



ATEX: BVS 08 ATEX E 088 X
IECEx: IECEx BVS 13.0006 X



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