

4.7 Calculation example for the selection of the Zener barrier

The nominal voltage of the power supply in front of the Zener barrier is $24 V_{DC} \pm 5\%$. This results in:

- greatest supply voltage: $V_{Sup\ max} = 24 V \cdot 1.05 = 25.2 V$

- smallest supply voltage: $V_{Sup\ min} = 24 V \cdot 0.95 = 22.8 V$

The series resistance of the Zener barrier is listed with 295 ohm. The following values must still be calculated:

- Voltage drop at the barrier:
 $V_{ab\ barrier} = 295 \Omega \cdot 0.02 A = 5.9 V$ (with full conduction)

- Terminal voltage at the transmitter with Zener barrier:
 $V_{KI} = V_{Sup\ min} - V_{ab\ barrier} = 22.8 V - 5.9 V = 16.9 V$

- Minimum supply voltage of the transmitter (according to data sheet):
 $V_{KI\ min} = 12 V_{DC}$ (corresponding to $V_{B\ min}$)

Condition:

$$V_{KI} \geq V_{KI\ min}$$

Result:

The terminal voltage of the probe with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the probe which lies at 12 V_{DC}. This means, the Zener barrier has been selected correctly regarding the supply voltage.

Note that no line resistances have been listed in this calculation. However, these will lead to an additional voltage drop that must be taken into account.

5. Electrical Installation

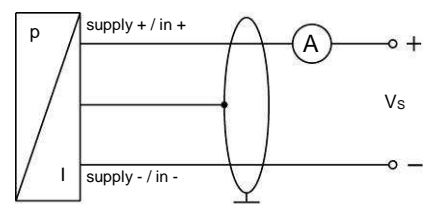
	Danger of death from electric shock - Switch off the power supply before installing the device!
	Danger of death from explosion - Risk of explosion if the operating voltage is too high (max. 28V _{DC})! - Connect the device as described in the user manual

Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

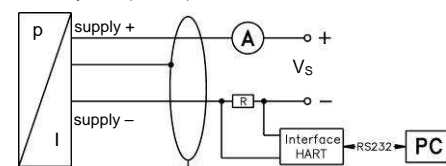
Pin configuration:

Electrical connection	cable colours (IEC 60575)
Supply +	wh (white)
Supply -	bn (brown)
Shield	gnye (green-yellow)

Wiring diagram:



2-wire-system (current) HART®



A minimum static bending radius has to be complied with. For static installation use the 10-fold cable diameter, for dynamic applications use the 20-fold diameter.

Prevent the damage or removal of the PTFE filter which is fixed over the end of the air tube on devices with cable outlet and integrated air tube.

For a identification, the intrinsically safe cables are marked with light blue shrink tubing (over the cable insulation). If the cable has to be modified (e.g. shortened) and the marking at the cable end has been lost in the process, it must be restored (for example, by marking it again with light blue shrink tubing or an appropriate identification sign).

For the electrical connection a shielded and twisted multicore cable has to be used.

If a transition is desired from a probe cable with gauge tube to a cable without gauge tube, we recommend our terminal box KL 1 or KL 2.

Devices with TPE-cable
 - Application in water with a temperature >70°C destroys the cable
 - Applications at media temperatures >70°C have to be clarified with BD|SENSORS in advance

Usually, the required cable is included in the scope of delivery. If it is although necessary to connect an existing or special cable, the total resistance will increase. For applications, where this additional resistance of the connecting cable could cause problems, this cable has to be checked with the following calculation.

$$R_L = \frac{\rho \cdot 2 \cdot l}{A}$$

with R_L : resistance of connecting cable in Ω
 ρ : specific resistance in $\Omega \text{ mm}^2/\text{m}$
 l : cable length in m
 A : cross section of conductor in mm^2

$$V_{tot} = (R_{L1} + R_{L2} + \dots + R_{Lmax}) \cdot 0.02 A$$

with V_{tot} : total voltage drop
 R_{load} : load resistance (to be taken out of the current data sheet)

following condition has to be fulfilled:

$$V_S > V_{tot} + V_{Bmin}$$

with V_S : planned supply voltage
 V_{Bmin} : minimal supply voltage (to be taken out of the current data sheet)

6. Characteristics

6.1 HART® communication (in H-devices)

	Danger of death from explosion - The intrinsically safe circuit for connecting a HART® communications interface (HART® communicator or HART® modem) may be broken only if there is no risk of an explosion.
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The analogue output signal is overridden by an additional signal according to the HART®-specification. The device can be configured via a HART®-communication device. Therefore we suggest our programming kit CIS 150 (available as accessory). It consists of HART®-modem, connecting cables as well as configuration software and allows a simple and time-saving configuration of all parameters. (The software is compatible with all Windows®-systems from Windows 98 and higher.)

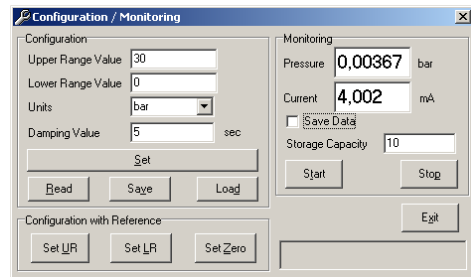


Fig. 6 configurationsoftware

To ensure a trouble-free operation the following requirements should be fulfilled:

maximal cable length between device and power supply:

$$L_{max} = \frac{65 \cdot 10^6}{R_v \cdot C_v} - \frac{40 \cdot 10^3}{C_v}$$

whereas L_{max} : maximum length of cable in [m]
 R_v : resistance of the cable together with the load resistance in Ω
 C_v : capacity of the cable in [pF/m]

resistance R:

$$R = \frac{U - 12}{0.024} \Omega$$

whereas U: power supply in [V_{DC}]

The resistance must be at least 240 Ω .

6.2 Accuracy 0.1 % FSO

Devices with an accuracy of 0.1 % FSO have micro-controlled electronics for processing and improving the signal. As a matter of principle, the processing takes more time than for analogue sensors, which have only an amplifier. Due to this longer response time, the output signal follows the measured value discontinuously. For relatively stable measuring values, this characteristic is secondary. Please compare the specification for the response time in the data sheet.

7. Initial start-up

Before start-up, the user has to check for proper installation and for any visible defects.

The device can be started and operated by authorized personnel only, who have read and understood the operating manual!

The device has to be used within the technical specifications, only (compare the data in the data sheet and the EC type-examination certificate)!

8. Placing out of service

	Danger of injury from media escaping under pressure. - Disassemble in an unpressurised state. - Depressurise the system
	Danger of injury from aggressive media. - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing, e.g. gloves, goggles.

9. Maintenance

In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned using a damp cloth and non-aggressive cleaning solutions without supply.

With certain media, however, the diaphragm may be polluted or coated with deposit. It is recommended to define corresponding service intervals for control. After placing the device out of service correctly, the diaphragm can be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please read therefore the chapter "Repair" below.

A false cleaning of the device can cause an irreparable damage on the diaphragm. Therefore never use pointed objects or pressured air for cleaning the diaphragm.

10. Service / Repair

10.1 Recalibration

During the life-time of a probe, the value of offset and span may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

10.2 Return

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required. Appropriate forms can be downloaded from our homepage www.bdsensors.com. Should you dispatch a device without a declaration of decontamination and if there are any doubts in our service department regarding the used medium, repair will not be started until an acceptable declaration is sent.

	Danger of injury from pollutants - If the device has come into contact with pollutants, wear suitable protective clothing, e.g. gloves, goggles, when cleaning it.
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11. Disposal

The device must be disposed according to the European Directives 2002/96/EG and 2003/108/EG (on waste electrical and electronic equipment) Waste of electrical and electronic equipment may not be disposed by domestic refuse!



Depending on the measuring medium, deposit on the device may cause danger for the user and the environment. Comply with adequate precautions for purification and dispose of it properly.

12. Warranty conditions

The warranty conditions are subject to the legal warranty period of 24 months from the date of delivery. In case of improper use, modifications or damages to the device, we do not accept warranty claims. Damaged diaphragms will also not be accepted. Furthermore, defects due to normal wear are not subject to warranty services.

13. Declaration of conformity / CE

The delivered device fulfils all legal requirements. The applied directives, harmonised standards and documents are listed in the EC declaration of conformity, which is available online at: <http://www.bdsensors.com>. Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

15. Error handling

Malfunction	Possible cause	Error detection / corrective
no output signal	wrong connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective amperemeter (signal input)	inspect the amperemeter (fine-wire fuse) or the analogue input of the PLC
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible, it is recommended to send the device to BD SENSORS for decalcification or cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm; if it is damaged, please send the device to BD SENSORS for repair
wrong or no output signal	manually, thermal or chemically damaged cable	check the cable; a possible consequence of a damaged cable is pitting corrosion on the stainless steel housing; if you determine this please return the device to BD SENSORS for repair

If you detect an error, please try to eliminate it by using this table or send the device to our service address for repair.

	Danger of death from explosion - Working on supplied (active) parts, except for intrinsically safe circuits, is principally prohibited during an explosion hazard. Additionally, the operator is obligated to observe the information concerning operation and maintenance work on the warning signs possibly affixed to the device.
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