



#### 4.6 Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage  $V_{S \min}$  of the transmitter must not fall short since a correct function of the device can otherwise not be guaranteed. The minimum supply voltage has been defined in the respective product-specific data sheet under "Output signal / supply".

When using a galvanically insulated amplifier with linear bonding, note that the terminal voltage of the transmitter will decrease like it does with a Zener barrier. Furthermore, you have to note that the supply will additionally decrease with an optionally used signal amplifier.

#### 4.7 Test criteria for the selection of the Zener barrier

In order not to fall below  $V_{S \min}$ , it is important to verify which minimum supply voltage is available at full level control of the transmitter. The full level control, i.e. a maximum or nominal output signal (20 mA), can be reached by applying the maximum physical input signal (pressure).

The technical data of the barrier will usually provide the information needed for the selection of the Zener barrier. However, the value can also be calculated. If a maximum signal current of 0.02 A is assumed, then – according to Ohm's law – a particular voltage drop will result from the series resistance of the Zener barrier. This voltage drop is subtracted by the voltage of the power supply and as a result, the terminal voltage is obtained which is applied on the transmitter at full level control. If this voltage is smaller than the minimum supply voltage, another barrier or a higher supply voltage should be chosen.

When selecting the ballasts, the maximum operating conditions according to the EC type-examination certificate must be observed. When assessing these, refer to their current data sheets to ensure that the entire interconnection of intrinsically safe components remains intrinsically safe.

#### 4.8 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:  $V_{S \text{ up max}} = 24 V * 1.05 = 25.2 V$

- smallest supply voltage:  $V_{S \text{ up min}} = 24 V * 0.95 = 22.8 V$

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

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

- terminal voltage at the transmitter with Zener barrier:  
 $V_{KI} = V_{S \text{ up min}} - V_{ab \text{ Barriere}} = 22.8 V - 5.9 V = 16.9 V$

- minimum supply voltage of the transmitter, e. g. LMK 351 (according to data sheet):  
 $V_{KI \text{ min}} = 12 V_{DC}$  (corresponding to  $V_{S \text{ min}}$ )

#### Condition:

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

#### Result:

The terminal voltage of the transmitter with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the transmitter which lies at 12 V<sub>DC</sub>. 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

**WARNING!** Install the device only when depressurized and currentless!

**DANGER!** Danger of explosion when surpassing the maximum supply of 28 V<sub>DC</sub>!

The supply of the transmitter shall be double isolated from hazardous voltages.

The transmitter shall be supplied by Limited Energy Source (per UL 61010) or NEC Class 2 Power Source.

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

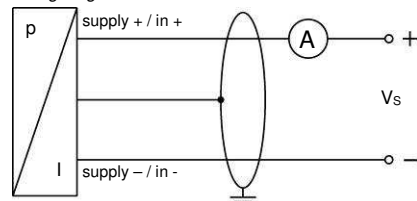
#### Pin configuration:

Electrical connections	ISO 4400	Binder 723 (5-pin)	M12x1 (4-pin)
Supply +	1	3	1
Supply -	2	4	2
Shield	ground pin	5	4

Electrical connections	Buccaneer (4-pin)	TRIM TRIO® (4-pin)
Supply +	1	1
Supply -	2	2
Shield	4	4

Electrical connections	field housing	cable colours (DIN 47100)
Supply +	IN +	wh (white)
Supply -	IN -	bn (brown)
Shield	⏏	gn/ye (green / yellow)

#### Wiring diagram:



For devices with cable gland as well as cable socket, you have to make sure that the external diameter of the used cable is within the allowed clamping range. Moreover you have to ensure that it lies in the cable gland firmly and cleftlessly!

For the installation of a device with cable outlet following bending radiuses have to be complied with:

cable without ventilation tube:

static installation : 5-fold cable diameter

dynamic application: 10-fold cable diameter

cable with ventilation tube:

static installation : 10-fold cable diameter

dynamic application: 20-fold cable diameter

Please note for devices with ISO 4400 or Buccaneer plug, that the cable socket has to be mounted properly to ensure the ingress protection mentioned in the data sheet. Please check if the delivered seal is placed between plug and cable socket. After connecting the cable fasten the cable socket on the device by using the screw.

On devices with field housings, the terminal clamps are situated under the metal cap. To install the device electrically, the cap must be screwed off. Before the cover is screwed on again, the O-ring and the sealing surface on the housing have to be checked for damages and if necessary to be changed! Afterwards screw the metal cap on by hand and make sure that the field housing is firmly locked again.

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 clear 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.

#### 6. Initial start-up

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

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

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

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

Intelligent devices with optional communication interfaces can also be configured by these electronics. Offset, span and damping are programmable within the limits given in the data sheet. For configuring the device, the programming kit CIS 510 consisting of Adapt 1, Windows® compatible programming software P-Scale 510, power supply and connecting cable is necessary. This can be ordered additionally from BD SENSORS.

#### 7. Placing out of service

**WARNING!** Disassemble the device only in current and pressure less condition! Check before disassembly, if it is necessary to drained off the media before dismantling!

**WARNING!** Depending on the medium, it may cause danger for the user. Comply therefore with adequate precautions for purification.

#### 8. Maintenance

**DANGER!** The operator is obligated to observe the information concerning operation and maintenance work on the warning signs possibly affixed to the device.

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, in switched-off state.

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 usually 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 note the chapter "Service/Repair" below.

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

#### 9. Service / Repair

##### 9.1 Recalibration

During the life-time of a transmitter, 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.

##### 9.2 Return

Upon every return of the device, no matter if for recalibration, decalcification, modifications or repair, it is necessary to contact us to guarantee a quick execution of your request. Please inform us by sending an email to: sale@bdsensors.cz. Include the number of devices sent and request a RMA. Afterwards clean the device, pack it shatterproof and send it to BD SENSORS indicating the RMA.

#### 10. Disposal

The device has to be disposed of according to the European Directives 2002/96/EC and 2003/108/EC (on waste electrical and electronic equipment). It is prohibited to place electrical and electronic equipment in domestic refuse!



**WARNING!** Depending on the used 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.

#### 11. 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 of 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.

#### 12. 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!** 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.

Improper action and opening can damage the device. Therefore **repairs on the device may only be executed by the manufacturer!**

#### 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.