

Installation of DAIX precision pressure transducers in potentially explosive environmental conditions



Important notes:





-  Please read these operating instructions carefully prior to installation and commissioning.
-  These operating instructions must be kept in an easily accessible place for future use.
-  The device must only be installed, used, and serviced by persons who are familiar with these operating instructions as well as the applicable regulations on occupational safety and accident prevention.
-  These operating instructions are only valid in combination with the product-specific operating instructions!

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1. General

1.1 Information on proper use

These operating instructions supplement the product-specific operating instructions. This is also why they are only valid in combination with the relevant product-specific instructions.

In principle, these operating instructions only apply to devices with ATEX approval.

A device has Ex Approval (Intrinsic Safety Approval) if this was specified in the order and confirmed in our order confirmation. The type plate also includes a corresponding  symbol.

1.2 Target group

These operating instructions are intended to be used by qualified and skilled personnel.

1.3 Symbols used













: Attention!



: Note

1.4 Safety instructions

To rule out hazards for the operator and his environment, the following instructions must be observed:

-  It is imperative that you observe the relevant regulations regarding explosion protection (VDE 0160, VDE 0165 / EN 60079-14, IEC 6079-0, IEC 6079-11) as well as the relevant regulations for accident protection (German: UVV).
-  Only allow suitably trained and authorised personnel to perform installation, maintenance/service or cleaning work on the device, these persons must also be familiar with the devices!
-  Performing work on live components is absolutely prohibited - with the exception of intrinsically safe components - while there is a potential explosion hazard!
-  Modifying the device or the connections will invalidate the Ex approval and the guarantee!
-  It is the responsibility of the operator to ensure that the chosen device variant is suitable for the intended use and the given environmental conditions. Gneuß will not assume any liability for wrong choices and their consequences!
-  The listed technical data regarding potentially explosive atmospheres correspond to the values certified in the EC type-examination certificate.
-  The technical data listed in the EC type-examination certificate (page 9 ff.) are mandatory and it is imperative that they be observed.
-  The operator is obliged to observe all warning labels on the device regarding operation and maintenance.
-  If installed in zone 0 and p_{atm} is 0.8 bar to 1.1 bar, the maximum temperature range must be between -20 and 60 °C. In zone 1, a temperature range of -20...70°C is permissible.
-  The maximum permissible medium temperatures for the respective temperature classes are found in the table below.

Temperature class	Max. permissible medium temperature
T4	130 °C
T3	195 °C
T2	295 °C
T1	400 °C

2. Product identification

Devices with Ex approval have a different type-label to those without Ex approval. A type-label is shown below.



Fig. 1 The Type-label for a device with Ex approval This kind of type-label must not be removed from the device!

- Please refer to "5.1 Explanation regarding the certificates" to compare Ex-designation, device category and zone

3. Information on installation

3.1 General information

- Ensure that the potential is equalised along the entire route of the lead, within as well as outside the explosion-hazardous area.
- If there is an abnormal risk of damage to the device due to lightning strikes causing overvoltage, increased lightning protection must be provided additionally.
- Follow the limit values listed in the EC type-examination certificate (the values do not include the capacitance and inductance of the connecting cable).
- Pay careful attention to the data sheets and the type-examination certificates of the individual devices in terms of the maximum permissible operating conditions.
- Ensure that any circuit of intrinsically safe components also remains intrinsically safe as a whole.
- The operator is responsible for the intrinsic safety of the overall system (the circuit as a whole).

- Excessive dust deposits (more than 5 mm) and visible large amounts of dust must be avoided!

All selected connecting leads must meet the thermal endurance requirements of the EN 60079-0 standard. The Ex devices must be provided with a corresponding label on the connector. The operator of the facility must also mark intrinsically safe leads (by selecting blue insulated leads or by blue marks at the cable end, for example).

3.2 Potential equalisation

The device must be connected to the potential equalisation, regardless of whether the device is installed in zone 1 or 0. This can be achieved by means of an earth terminal or the earth lead marked accordingly at the cable end. There is also the option of connecting the potential equalisation to a component that is already connected to the potential equalisation.

3.3 Overvoltage protection

If the pressure transducer is used as equipment of category 1 G, a suitable overvoltage protective device must be connected ahead of the transducer (for further information, refer to BetrSichV [Ordinance on Industrial Safety and Health] previously TRbF100, as well EN60079-14).

4. Electrical connection for 2-wire technique

4.1 Signal circuit

The required zener barrier or supply isolators must be selected with great care when operating an intrinsically safe device in an explosion hazardous area, to ensure that full use can be made of the device properties. The diagram below shows a typical configuration of power supply, zener barrier and precision pressure transducer for the signal circuit.

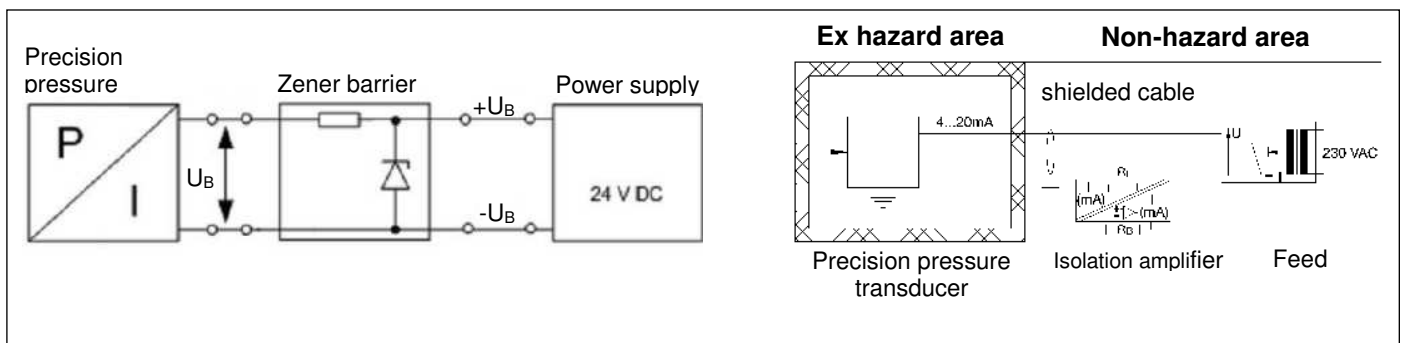


Fig. 2 Diagrams circuit

4.2 Signal circuit with auto-zeroing and calibration

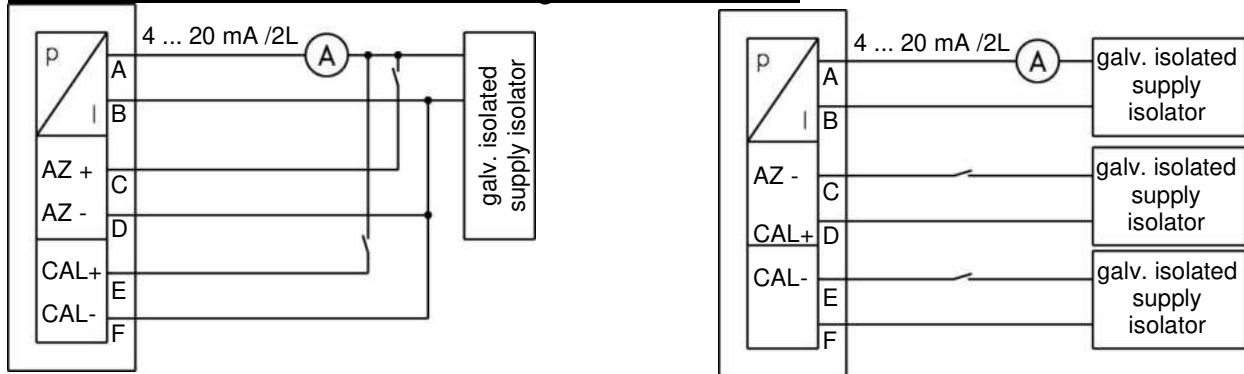


Fig. 3 Diagrams circuit

- Please note that the limit values specified in the type-examination certificate must not be exceeded even when more than one supply isolator is used.
- Also note item (17) of the type-examination certificate which specifies special requirements for intrinsically safe operation.
- Please note that it is prohibited to conduct intrinsically safe circuits as well as circuits that are not intrinsically safe via the connector when the device is used in explosion-hazardous areas. The auto-zeroing circuit or the calibration circuit must either be supplied by the same supply unit that supplies the signal circuit or by a separate supply unit that also meets the requirements for galvanically isolated supply units (see connection diagrams).

4.3 Example description of connections

A supply voltage of, for example, 24 V_{DC}, is supplied by the power supply unit and is conducted through the zener barrier. The zener barrier contains series resistors and zener diodes as protective components. Then an operating voltage is applied to the device causing a specific signal current flow in proportion to the respective pressure.

- When intrinsically safe devices are used as zone 0 equipment, supply must occur by means of floating and galvanically isolated supply isolators.

4.4 Functional criteria for selecting zener barriers and supply isolators


The supply voltage must not drop below the minimum supply voltage $U_{B \min}$ of the device because otherwise the correct function of the device cannot be guaranteed. The minimum supply voltage is specified in the respective data sheet of the product concerned under the item "Output signal/Auxiliary power".

When using a galvanically isolated supply isolator with linear limiting, it must be taken into consideration that the terminal voltage of the device is reduced due to linear limiting, as is the case with a zener barrier. It must further be noted that a certain voltage drop also occurs on the optional signal isolation amplifier, causing an additional reduction of the operating voltage of the position transducer.

4.5 Test criteria for selecting the zener barrier

For values not to drop below $U_{B \min}$, it is important to test which minimum supply voltage is available when the device is fully modulated. Full modulation, i.e. a maximum/nominal output signal (20 mA) is achieved by applying the maximum physical input signal (pressure).

Generally you will find the information you need to choose the right zener barrier in the technical data of the barrier. It is also possible to determine the value by computation however. Assuming a maximum signal current of 0.02 A, a specific pressure drop in accordance with Ohm's law will result on the series resistor of the zener barrier. This pressure drop is subtracted from the voltage of the power supply to obtain the terminal voltage that is applied to the device when fully modulated. If this voltage is lower than the minimum supply voltage, you should either select a different barrier or a greater supply voltage.

 When selecting the control gear, the maximum operating conditions according to the type-examination certificate must be observed. To evaluate the control gear, refer to the current data sheets of the relevant devices to ensure that the circuit of intrinsically safe components remains intrinsically safe as a whole.

4.6 Example of a computation for selecting the zener barrier

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

- maximum supply voltage:

$$U_{\text{Sup max}} = 24 \text{ V} * 1.05 = 25.2 \text{ V}$$

- minimum supply voltage:

$$U_{\text{Sup min}} = 24 \text{ V} * 0.95 = 22.8 \text{ V}$$

The series resistance of the zener barrier is specified at 295 ohms. The following values remain to be determined:

- voltage drop at the barrier:

$$U_{\text{from barrier}} = 295 \text{ } \Omega * 0.02 \text{ A} = 5.9 \text{ V (when fully modulated)}$$

- terminal voltage of the device with zener barrier:

$$U_{\text{Term}} = U_{\text{Sup min}} - U_{\text{from barrier}} = 22.8 \text{ V} - 5.9 \text{ V} = 16.9 \text{ V}$$

- minimum supply voltage of the device (according to data sheet):


$$U_{\text{Term min}} = 10 \text{ V}_{DC} \text{ (equals } U_{B \min} \text{)}$$

Constraint:

$$U_{\text{Term}} \geq U_{\text{Term min}}$$

Result:

The terminal voltage of the device with a zener barrier is 16.9 V and therefore higher than the minimum supply voltage of the device of 12 V_{DC}. This means that the correct choice of zener barrier was made in terms of supply voltage.


 Please note that this calculation did not include any line resistances. These do, however, cause an additional voltage drop that needs to be taken into account.

5. EC Type Examination Certificate

5.1 Explanation regarding the certificates

Different EC type-examination certificates apply depending on the device you own. This is due to further development of the products and a different test centre being responsible for renewing approval of these products. For information on which certificate is valid for your device, please refer to the EC type-examination certificate number on the type-label (Comp. Fig. 1)

Regarding **(12) The device label must include the following information:**

 Use the table below to determine the meaning of the information on the type-label or in the certificate. The following table only applies to device group II.

Equipment group					
Explosion protection	II				
Equipment category					
Zone 0 – gas, vapour, mist	1G				
Marking according to EN and ignition protection type					
Intrinsically safe design		Ex ia			
Explosion group ¹					
II C			II C		
Temperature class					
Equipment category gases (1G,2G)					T4

¹ For specific information on the maximum permitted gap and minimum ignition current ratio, please refer to the corresponding standard or VDE [Association of German Electrical Engineers] publication.

5.2 EC Type-Examination Certificate – IBExU 07ATEX1084X)

IBExU Institut für Sicherheitstechnik GmbH
An-Institut der TU Bergakademie Freiberg

[1] **EC-TYPE EXAMINATION CERTIFICATE**
according to Directive 94/9/EC, Annex III

(Translation)

[2] Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres, Directive 94/9/EC

[3] EC-Type Examination Certificate Number: **IBExU07ATEX1084 X**

[4] Equipment: Device series DAIX

[5] Manufacturer: Gneuß Kunststofftechnik GmbH

[6] Address: Mönichhusen 42
32549 Bad Oeynhausen
Germany

[7] This equipment mentioned under [4] and any acceptable variation thereto are specified in the schedule to this EC-Type Examination Certificate.

[8] IBExU Institut für Sicherheitstechnik GmbH, NOTIFIED BODY number 0637 in accordance with article 9 of the Council Directive 94/9/EC of 23rd March 1994, certifies that the under [4] mentioned equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in confidential test report IB-07-3-143 of 6th July 2007.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2004, EN 60079-11:2007 and EN 60079-26:2004.

[10] If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified under [17] in the schedule to this EC-Type Examination Certificate.

[11] This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this directive apply to the manufacture and supply of this equipment.

[12] The marking of the equipment mentioned in [4] shall include the following:

Ex II 1G Ex ia IIC T4



IBExU Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7 - 09599 Freiberg, Germany
☎ +49 (0) 3731 3805-0 - 📠 +49 (0) 3731 23650

Authorised for certifications Explosion protection

By order

(Dr. Lösch)


 - Seal-
(ID no. 0637)

Freiberg, 6th July 2007

Certificates without signature and seal are not valid.
Certificates may only be duplicated completely and unchanged. In case of dispute, the German text shall prevail.

Schedule

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IBExU07ATEX1084 X

IBExU Institut für Sicherheitstechnik GmbH
An-Institut der TU Bergakademie Freiberg

- [13] **Schedule**
- [14] **to the EC-TYPE EXAMINATION CERTIFICATE IBExU07ATEX1084 X**
- [15] **Description of equipment**

The device series DAIX are used for measurement in plastic smelting. The equipment is provided for use in potentially hazardous areas, where category 1G devices are required. As power supply specified intrinsically safe power supplies of the category „ia“ can to be used. The electronics assembly and the sensor are in a stainless steel housing. The electrical connection is carried out via a plug.

Technical Data

Supply electric circuit in type of protection Intrinsic Safety Ex ia IIC
(Pin A and Pin B)

	U_i	30 V DC
	I_i	100 mA
	P_i	750 mW
effective inner capacity	C_i	negligible
effective inner inductivity	L_i	negligible

Digital input in type of protection Intrinsic Safety Ex ia IIC
(Pin C/ E and Pin D/ F)

	U_i	30 V DC
	I_i	100 mA
	P_i	750 mW
effective inner capacity	C_i	negligible
effective inner inductivity	L_i	negligible

The supply connections have an inner capacity of max. 13.2 nF opposite the housing.

Ambient temperature range from -20 °C to +70 °C

The maximum permissible medium temperatures have to be taken from the following table:

Temperature class	max. permitted medium temperature [°C]
T4	130
T3	195
T2	295
T1	400

- [16] **Test report**

The test results are recorded in the test report IB-07-3-143 of 6th July 2007.
The test documents are part of the test report and listed there.

Summary of the Test Result:

The device series DAIX fulfills the requirements of type of protection Intrinsically safety ‚ia‘ on an electrical component for Equipment Group II Category 1G, Explosion Group IIC and temperature class T4.

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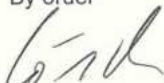
[17] Special conditions

- The equipment designed with connector have to be installed in such a way, that the degree of protection IP20 always will be kept.
- The safety and assembly notes contained in the operating instructions and the ambient temperature range $-20\text{ °C} \leq T_a \leq +70\text{ °C}$ have to be observed.
- The device may only operate in explosive atmospheres which requires equipment of Category 1, if there are atmospheric conditions (temperature from -20 °C to $+60\text{ °C}$ pressure from 0.8 bar to 1.1 bar).

[18] Essential Health and Safety Requirements

Confirmed by norms (see [9]).

By order


(Dr. Lösch)Freiberg, 6th July 2007

6. Appendix

6.1 Possible ignition sources

- electrostatic discharge (on plastic parts)
- lightning discharge
- hot surfaces (caused, for example, by incorrectly configured components or an incorrect combination of components)
- electric sparks or arcs
- friction and impact sparks
- electromagnetic radiation
- optical radiation
- ionised radiation
- ultrasound
- voltage surges
- chemical reactions
- open flames



Defective components, as well as incorrectly configured or incorrectly combined components can also become an ignition source in the event of a malfunction. For this reason, please take great care when selecting the components to be used.



Implement all necessary safety measures relevant to your specific application to rule out any risk of ignition!



EG - Konformitätserklärung EC Declaration of Conformity

Gneuß GmbH
Mönichhusen 42
32549 Bad Oeynhausen
Germany

erklärt hiermit, dass die nachfolgend aufgeführten Produkte mit untenstehenden Publikationen übereinstimmen.

declares that the following listed products fulfil the below mentioned requirements.

DAIX

Europäische Richtlinien / *European Directives:*

- 2004/108/EG - EMV-Richtlinie / *EMC Directive*
- 94/9/EG - Richtlinie für Ex-Bereiche / *Directive for Ex-areas*
- 2002/95/EG - RoHS-Richtlinie / *RoHS Directive*

Harmonisierte Normen oder Dokumente / *Harmonized standards or documents:*

- EN 61000-6-2 (2006)
- EN 55011 (2009) + A1:2010
- EN 60079-0 (2013)
- EN 60079-11 (2012)
- EN 60079-26 (2009)

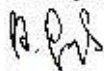
Kennzeichnung nach Baumusterprüfbescheinigung:
marking according to EC-Type Examination Certificate:

II 1G Ex ia IIC T4

EG-Baumusterprüfbescheinigungsnummer:
Number of EC-Type Examination Certificate:

IBExU07ATEX1084 X

Bad Oeynhausen, 2013-04-22



Dr. Stephan Gneuß

Mitglied der Geschäftsleitung/
Member of the board



Peter Rosendahl

Produktmanager Messtechnik und Sensoren/
Product Manager Measurement and Sensors

The contents of these operating instructions reflect the situation at the time of printing. The instructions were drawn up to the best of our knowledge and in good faith. It is nevertheless possible that mistakes have crept in. We regret we cannot accept any liability for incorrect information nor any consequences thereof.

– Technical specifications are subject to change without notice –

Gneuss Kunststofftechnik GmbH
Moerichhusen 42
32549 Bad Oeynhausen, Germany
Phone: +49 (0) 5731 5307-0
Fax: +49 (0) 5731 5307-77
Mail: gneuss@gneuss.com
www.gneuss.de