



## Sensors for Potentially Explosive Atmospheres



for  
Plastics  
Foil, Paper  
Textile Industries  
Strip Processing  
Lines  
Rolling Mills



[www.haehne.com](http://www.haehne.com)

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## Symbols of this Manual



Sections with this indication are to be obeyed absolutely. The neglect of these references can lead to the endangerment of health and life of persons



Is shown before passages in the text, which supply additional information

## Obligations of the Operator



The user of this products must ensure that only authorized personnel mount these products and operate them who

- know the rules of on-the-job-safety and accident prevention
- have been instructed in the operation of these products
- have read and understood this Operator Manual

Personnel that mount these products, commission, maintain and operate them are obligated

- to obey all rules of on-the-job-safety and accident prevention
- to read the Operator Manual completely and follow all instructions and advice notices
- confirm the above with their signature

For the purpose of the Manual authorized personnel for the installation (mounting), inspection, maintenance and commissioning are considered to be personnel with a professional education, technical experience as well as knowledge of the applicable standards and directives and in addition are in a position of access the work situation and recognize potential hazards ahead of time.

Register please here:

\_\_\_\_\_

Type of Sensor / Designation

\_\_\_\_\_

Serial No. of Sensor

I confirm with my signature that I have read and understood this Operator Manual.

\_\_\_\_\_

City/Place

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

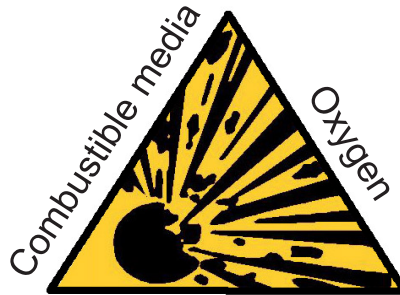


### Explosion

An explosion is an oxidation or a decomposition reaction with a sudden rise of temperature and pressure. Thereby generating sudden increase in volume and release of energy in a violent manner in confined spaces e.g. through potentially explosives atmospheres and compressed gases.

### Precondition for an explosion

An explosion can result only if three factors are present:



### Potential ignition source

The presence of a potential ignition source is a determining element for the categorization of equipment according the Directive 2014/34/EC (previously 94/9/EC).

### Types of ignition sources according to EN 1127-1 are:

- hot surfaces
- flames, hot gases and particle
- mechanical generate sparks
- electrical equipment
- electrical equalizing current, cathodic corrosion protection
- static electricity, thunder bolt, switching operations
- electromagnetic fields/ IR radiation, visible light
- ionizing radiation, UV radiation
- ultrasound
- adiabatic compression and shock waves
- chemical and biological reactions

### Endangered areas

Typical danger zones are in refineries, refuel and loading equipment for combustible gases, liquids and matter, chemical, plants, paint shops, e. g. coaters.

### Danger Zones

The user of the equipment has to determine the danger zone according to Directive 99/92/EC. The user of the equipment has the responsibility for determination the endangerment, the risks evaluation and the documentation of the relevant safety measures. The user must establish an explosion prevention document defining the following points:

- Categorization of zones corresponding to endangerment potential
- Determination of the temperature classes and the explosion groups
- Determination of the present ambient temperatures

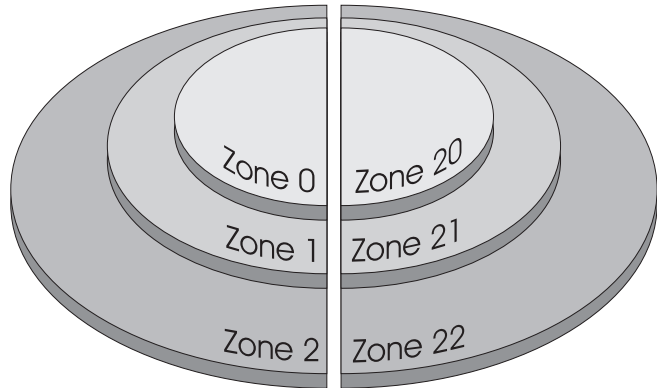
Such an explosion prevention document is the basis for the supplier for the recommendation and the delivery of suitable products and components (Industrial Safety Directive)

## Principle of Explosion Protection



### Classification in Zones

Explosion hazard zones are classified depending on the frequency and duration of the potentially explosive atmosphere.



Hazard by Gas, Vapor, Mist		
Zone 0 (category 1G): A place in which an explosive atmosphere consisting of a mixture of air with flammable substances in the form of gas, vapor or mist is continuously present or for long periods of time.	Zone 1 (category 2G): A place in which an explosive atmosphere consisting of a mixture of air with flammable substances in the form of gas, vapor or mist occasionally can occur in normal operation.	Zone 2 (category 3G): A place in which an explosive atmosphere consisting of a mixture of air with flammable substances in the form of gas, vapor or mist can occur in normal operation but, if it does occur, will persist for a short period only.
Hazard by Dust		
Zone 20 (category 1D): A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods of time.	Zone 21 (category 2D): A place in which an explosive atmosphere in the form of a cloud of combustible dust in air occasionally can occur in normal operation.	Zone 22 (category 3D): A place in which an explosive atmosphere in the form of a cloud of combustible dust in air can occur in normal operation but, if it does occur, will persist for a short period only.
Equipment Categories		
Equipment category 1G/1D: This equipment is designed in such a way that it can be used in accordance with the specification provided by the Manufacturer resulting in very high degree of safety. Equipment of this category must provide the required degree of safety even in very seldom occurring malfunctions of the equipment. They contain explosion prevention measures that provide safety even in the event of a failure of one technical prevention measure because a second independently technical prevention measure. This applies also to two independently occurring failures.	Equipment category 2G/2D: This equipment is designed in such a way that it can be used in accordance with the specification provided by the Manufacturer resulting in high degree of safety. The technical explosion prevention measures provide the necessary measure of safety even in frequent equipment malfunctions and failures, which can commonly be expected, the necessary degree of safety.	Equipment category 3G/3D: This equipment is designed in such a way that it can be used in accordance with the specification provided by the Manufacturer resulting in a normal degree of safety. Equipment in this category provides the necessary measure safety under normal operating conditions.



CE 0123	Notified body, which supervises the production facility
II 2 G Ex ia IIC T6...T1 Gb	Explosion protection marking for gases
II 2 G Ex ia IIC T135°C Db	Explosion protection marking for dusts
BVS 05 ATEX E 091 X	Examination certificate number

Meaning of designation		
	<b>Explosion Protection Symbol</b>	
<b>II</b>	<b>Equipment Group II</b>	Use of the device in dust or gas hazardous areas, however not underground (mining industry)
<b>2</b>	<b>Category 2 (High level of security)</b>	Occasional / rare occurrence of explosive atmospheres
<b>G</b>	<b>Atmosphere G=Gas →</b>	Zones 1 and 2
<b>D</b>	<b>Atmosphere D=Dust →</b>	Zones 21 and 22
<b>Ex ia</b>	<b>Intrinsically Safe Equipment</b>	Equipment may be operated only with intrinsically safe electric circuits → use of safety barriers is necessary
<b>IIC</b>	<b>Explosion Group</b>	The explosion group describes the danger of the gases. It increases from the explosion group IIA to IIC, The devices with the explosion group IIC are certified also for IIA and IIB.
<b>IIIC</b>	<b>Explosion Group</b>	The explosion group describes the danger of the dusts. It increases from the explosion group IIIA (combustible lint) to IIIC (conductive dusts), The devices with the explosion group IIIC are certified also for IIIA and IIIB.
<b>T6 - T1</b>	<b>Temperature Class</b>	Equipment is approved for these temperature classes, if the max. Surface temperature of each corresponding class is not exceeded. The temperature classes range from T1 to T6, whereby materials which fall into the temperature class T6, represent the highest danger. However there is only one gaseous material in the classes to T6/T5.
<b>T135°C</b>		Maximum permissible surface temperature of the device
<b>Gb / Db</b>	<b>Equipment Protection Level (EPL)</b>	Device with "high" level of protection for use in gas or dust explosive areas. There is no danger of ignition in normal operation or when a predictable error / malfunction.



### Are suitable for the use in potentially explosive atmospheres within areas of the zones 1 and 2 or zone 21 and 22

The sensors of the HAEHNE GmbH for potentially explosive atmospheres are designed for the measurement of forces acting on mechanical sensors. Strain gauges applied to these sensors generate a voltage in the measuring bridge which is proportional to the forces acting on the sensors.

### Instruction



For the safe operation of the sensors of the group II, category 2 within gas and dust potentially explosive atmospheres it is necessary to ensure through the use of installation and protection devices that normal operating conditions do not damage or overload the equipment.

*HAEHNE* - sensors are supplied as complete measuring system consisting of the following components: sensors, J-Box, safety barrier and the associated measuring amplifier with option F or Option Fxx-yyzzz. The safety barriers in the combination E (SIBA-E) are to be used for the application area Gb and with safety barriers in the combination D (SIBA-D) for the application area Db. Each measuring system consists of firmly assigned components.

The J-Box contains the resistances for the adjustment of zero point and nominal rating and is considered as a simple electrical equipment.

In the case of orders containing more than one measuring system, it is prohibited to exchange individual components among themselves.

The manufacturer cannot be held responsible for damage, which is caused by disregarding the safety instructions and warnings.

### Attention!



Operating electrical equipment in adverse circumstances and in proper handling in potentially explosive atmospheres can endanger the health and safety of people and in certain circumstances animals as well as operating machinery and equipment.

*HAEHNE* - sensors for potentially explosive atmospheres can be used only in accordance with the specific operating instructions.

Substantial damage to people and property can be caused by inappropriate installation, employment in areas not intended for, incorrect operating procedures, ignoring safety notes, inadmissible removal of parts of the equipment or protective covers as well as structural changes to the sensors.

The operating conditions must be strictly observed during installation and suitable measures must be undertaken to ensure their permanent effectiveness.

### Installation, Start-Up

In general the information contained in the individual product descriptions, technical data sheets and operating instruction manuals apply. In order to correspond, however, to the requirements of EN 60079-0 and EN 60079-11, the following conditions must be strictly observed:

- The sensors must be connected with safety barriers and the J-Box of the associated measuring amplifier. It is absolutely necessary to ensure that the amplifier/J-Box/safety barrier - combinations are **not** within an area with the potentially explosive atmosphere. In addition, the device combination as on the pages "Wiring SIBA E" and "Wiring SIBA D" can be interconnected.



- If the amplifiers and safety barriers are not supplied by *HAEHNE*, care must be taken to ensure that the maximum values of the intrinsically safe circuits are not exceeded and that the connection diagrams are strictly adhered to.
- The connecting cables must have strain relief devices to guard against excessive cable pull or pressure.
- If the factory attached explosion proof sensor cables need to be extended, it is necessary to ensure that given restrictions (capacitance, inductance) are strictly observed. The use of explosion proof of cables with **same parameters** is absolutely necessary.
- The safety barriers provided by *HAEHNE* are suitable for a temperature range of - 20° C to + 60° C. In case of the use of other safety barriers it is necessary to ascertain their suitability.
- In addition, it is necessary to ensure that the valid regulations and operating instructions of the final user are strictly observed.
- For applications in Group III

The intrinsically safe circuit is not reliably separated from the ground. Along the intrinsic circuit, potential equalization is absolutely necessary. The sensors must be constructed in such a way that intensive electrostatic charging processes can be excluded.

## Repairs



- Repairs to the sensors can be made only by qualified technical personnel authorized by the manufacturer with original spare parts.
- Inappropriate repairs represent substantial danger to the user.
- The unauthorized opening of the sensor results in the loss of explosion proof protection warranty.
- Defective devices must be disconnected from the power supply and replaced immediately.

## Maintenance

- Under no circumstances are changes allowed to the *HAEHNE* sensors classified for potentially explosive atmospheres.
- Periodic maintenance of *HAEHNE* sensors for explosive atmospheres is not necessary.
- Recalibration should be made according to predetermined fixed periods/intervals.

## Employment of the sensors in measuring rolls



If *HAEHNE* explosion protection sensors are used in a measuring roll, then the employment in the environments of category IIC Gb and IIIC Db is permitted if, in addition to the points covered in the manual of explosion protection and related to the sensor mounted in the roll, the following additional points are considered:

- The circumferential speed of the measuring roll should not exceed a value of 1 meter/second
- The measuring roll should not scratch at other objects.
- Plastic parts may not exceed a total area of 20 cm<sup>2</sup>.
- The ball bearings of the measuring roll must be replaced after 90 % of the nominal life span of the bearing. Even if the nominal life goes far beyond this period, the replacement of the ball bearings must be carried out from the manufacturer of the measuring roller due to the aging process of the lubrication. To reduce the risk of a defective bearing due to a production error, the bearings must be checked regularly for running noise and smooth running.





Force sensor

Typ \*\*\* \*\* \* \*\*F  
 Typ \*\*\* \*\* \* \*\*Fxx-yyzzz

In the complete type denomination, the wild cards are replaced by letters or numbers to indicate the different sensor variations.

Typ \*\*\* \*\* \* \*\*F\*\*\*  
 Typ \*\*\* \*\* \* \*\*Fxx-yyzzz\*\*\*

Typ \*\*\* \*\* \* \*\*F\*\*\*

Optional: non ex-relevant characteristics for special dimensions  
 Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

Typ \*\*\* \*\* \* \*\*Fxx-yyzzz\*\*\*

Optional: non ex-relevant characteristics for special dimensions  
 Permissible ambient temperature range  
 $-yy \text{ } ^\circ\text{C} \leq T_a \leq zzz \text{ } ^\circ\text{C}$   
 (determined by the permissible operation temperatures of the used materials)  
 Resistance of the DMS  
 35 für (350  $\Omega$ )-DMS  
 70 für (700  $\Omega$ )-DMS  
 10 für (1000  $\Omega$ )-DMS  
 Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

Example:

The force sensor type \*\*\* \*\* \* \*\*F70-20120 has (700  $\Omega$ )-DMS and is suitable for use in a temperature range between -20  $^\circ\text{C}$  and +120 $^\circ\text{C}$

A change in the ignition behavior of the observed gases at ambient temperatures outside the atmospheric range (outside -20  $^\circ\text{C}$  ... +60  $^\circ\text{C}$ ) has not been studied in the context of authorization and must be assessed separately by the operator.

For dust-applications, the sensors are marked as T135 $^\circ\text{C}$ .

EC - Type Examination:

BVS 05 ATEX E 091 X

Group, Category, Ignition protection:

- II 2 G Ex ia IIC T4 Gb für Typ \*\*\* \*\* \* \*\*F
- II 2 G Ex ia IIC T4 Gb für Typ \*\*\* \*\* \* \*\*F\*\*\*
- II 2 G Ex ia IIC T6...T1 Gb für Typ \*\*\* \*\* \* \*\*Fxx-yyzzz
- II 2 G Ex ia IIC T6...T1 Gb für Typ \*\*\* \*\* \* \*\*Fxx-yyzzz\*\*\*
- II 2 D Ex ia IIIC T135 $^\circ\text{C}$  Db (for all types)

is suitable for hazardous areas of zones 1 and 2 or 21 and 22



Guide Line Conformity	Norms	Quality assurance production
Directive 2014/34/ EC (previously 94/9 EC)	EN IEC 60079-0:2018 EN 60079-11:2012	CE 0123

#### General Parameters

Electrical characteristics

Maximum input voltage	$U_i$ DC = 17 V
Maximum input current	$I_i$
- for applications Gb	500 mA
- for applications Db	250 mA
Maximum input power	$P_i$
- for applications Gb	2 W
- for applications Db	550 mW

The force sensors contain concentrated capacitors or inductors

#### Parameters for Type \*\*\* \*\* \* \*\*F

#### Parameters for Type \*\*\* \*\* \* \*\*F\*\*\*

The internal capacitance and internal inductance resulting only from line capacitance and line inductance of the connected connecting line (max. 20 m length).

Maximum internal capacitance	$C_i$ 3,2 nF
Maximum internal inductance	$L_i$ 14 $\mu$ H
Ambient temperature range	$T_a$ -20 °C...+60 °C

#### Parameters for Type \*\*\* \*\* \* \*\*Fxx-yyzzz

#### Parameters for Type \*\*\* \*\* \* \*\*Fxx-yyzzz\*\*\*

Variants with device socket (without connecting cable)

Maximum internal capacitance	$C_i$ negligible
Maximum internal inductance	$L_i$ negligible

Variants with connecting cable

Maximum internal capacitance and maximum internal inductance	$C_i$ $L_i$
resulting only from line capacitance and line inductance of the connected connecting line:	
Capacity coating	160 nF/km
Inductance coating	0,68 $\mu$ H/m

Ambient temperature range	$T_a$
Minimum ambient temperature	$T_{a,min}$
depending on the type characteristic „yy“:	-yy °C
Maximum ambient temperature	$T_{a,max}$
depending on the type characteristic „xx“ and „zzz“ and the desired temperature class	



For Sensors with classification	Type characteristic xx = 35	Type characteristic xx = 70	Type characteristic xx = 10
	T <sub>a,max</sub> = smaller value of		
<b>T1</b>	(380 °C, zzz °C)	(415 °C, zzz °C)	(405 °C, zzz °C)
<b>T2</b>	(230 °C, zzz °C)	(265 °C, zzz °C)	(255 °C, zzz °C)
<b>T3</b>	(135 °C, zzz °C)	(170 °C, zzz °C)	(160 °C, zzz °C)
<b>T4</b>	(70 °C, zzz °C)	(105 °C, zzz °C)	(95 °C, zzz °C)
<b>T5</b>	(35 °C, zzz °C)	(70 °C, zzz °C)	(60 °C, zzz °C)
<b>T6</b>	(20 °C, zzz °C)	(55 °C, zzz °C)	(45 °C, zzz °C)
<b>T135°C</b>	(100°C, zzz °C)	(100°C, (zzz -10) °C)	(100°C, zzz °C)

#### Example:

The materials of the force sensor type \*\*\* \*\* \* \*\*F70-20120 are suitable for use at -20° C up to 120 C°. For the classification of the sensor into the individual temperature classes, the upper limit of the permissible ambient temperature is calculated from the maximum temperature of the temperature class reduced by the heating of the DMS and the permissible temperature of the used materials:

The force sensor is suitable for T6 in ambient temperatures -20 °C up to 55 ° C. It is suitable for T5 in ambient temperatures -20 °C up to 70 °C, for T4 in ambient temperatures -20 °C up to 120 °C and for T3 in ambient temperatures -20 °C up to 120 °C. For temperatures -20 °C up to 100 °C, the sensor can be used in dust-explosive areas.



The combination of the *HAEHNE* products: amplifier - force sensor - J-Box - safety barrier modules make the electrical circuits within a hazardous area intrinsically safe. This intrinsically safety depends on the existing external capacitance  $C_o$  and the external inductance  $L_o$ .

Safety barriers Combination E (SIBA-E) are used for the explosion-proof gas IIC Gb.

When using safety barriers from *HAEHNE*, the following maximum values must be observed:

Explosion Group	External Capacitance ( $C_o$ )	External Inductance ( $L_o$ )
IIB	1 $\mu$ F	0,5 mH
IIC	375 nF	30 $\mu$ H

The measuring sensor can be taken as free of inductance and capacitance. The sensor connection cable supplied as standard with the force sensor has a capacitance from 160 nF per km and an inductance from 0,68  $\mu$ H per meter of length. This results in the maximum deliverable cable length of 44 m.

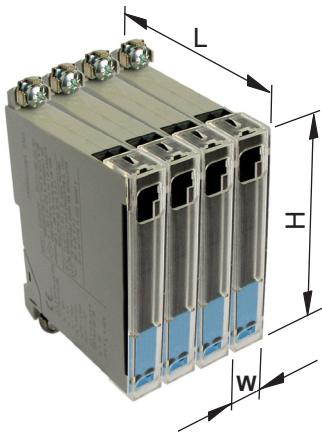
Together with possible additional customer cable installation the values for external capacitance and inductance should not be exceeded.

### Attention!



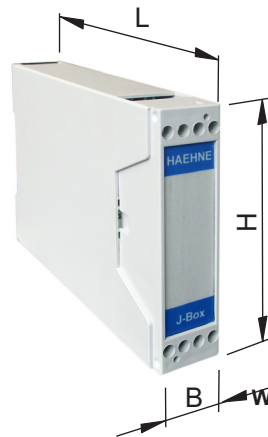
The sensors, the connection cables and the additional energy limiting devices should be operated within a single system of potential equalization.

### Safety Barriers



Dimensions in mm:  
12 x 70 x 83 (W x L x H)

### Adaption Modul J-Box



Dimensions in mm:  
22,5 x 110 x 75 (W x L x H)

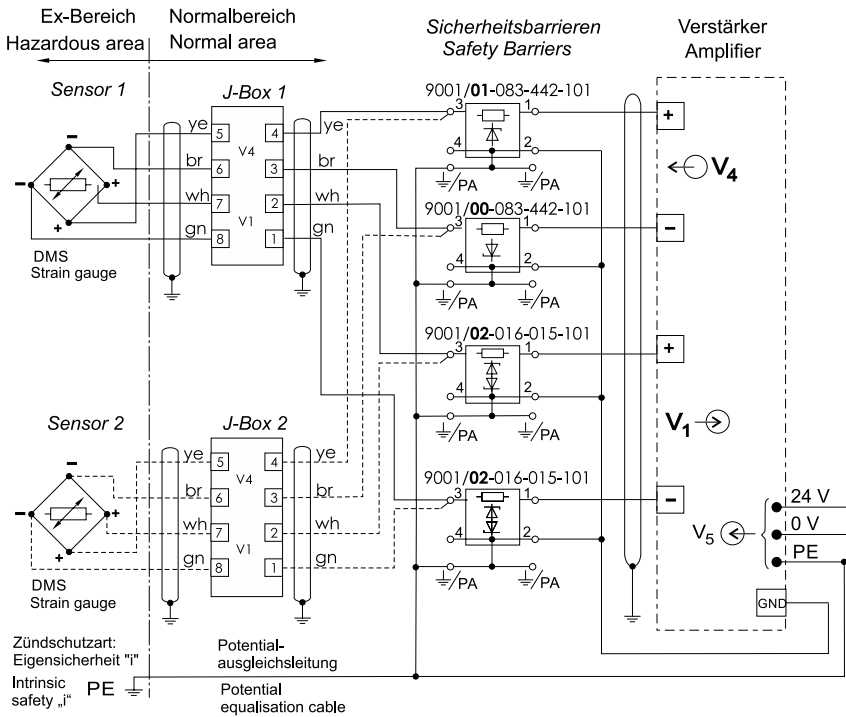
### Note

The technical information, pictures and dimensions provided here are non-committal. Claims cannot be based on this information. We reserve the right to make improvements and changes without altering the manual.





for HAEHNE 1-channel Amplifier  
AMA, AME, DMA, DA-PN, DA-PB, DA-EN, DA-EC and MAC

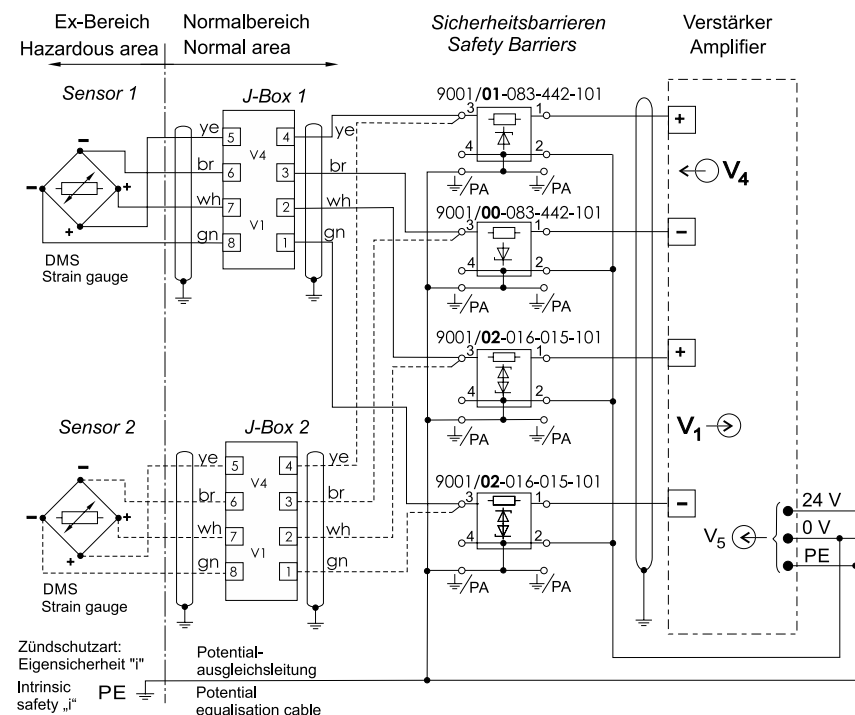


In the control cabinet cables under 5 m of length do not have to be shielded.

The "Technical Information" of the amplifiers show the labeling of the terminals

V <sub>1</sub>	Output signal of full bridge strain gauge
V <sub>2</sub>	Direct voltage output
V <sub>3</sub>	Filtered voltage output
V <sub>4</sub>	Excitation voltage to the full bridge strain gauge in the sensors
V <sub>5</sub>	Supply voltage 24 V DC
I <sub>1</sub>	Current output (option C and N)

for HAEHNE Amplifier Busbox-PS 2



### Note



The pin assignment of deviating core colors can be found on the respective product description of the sensor

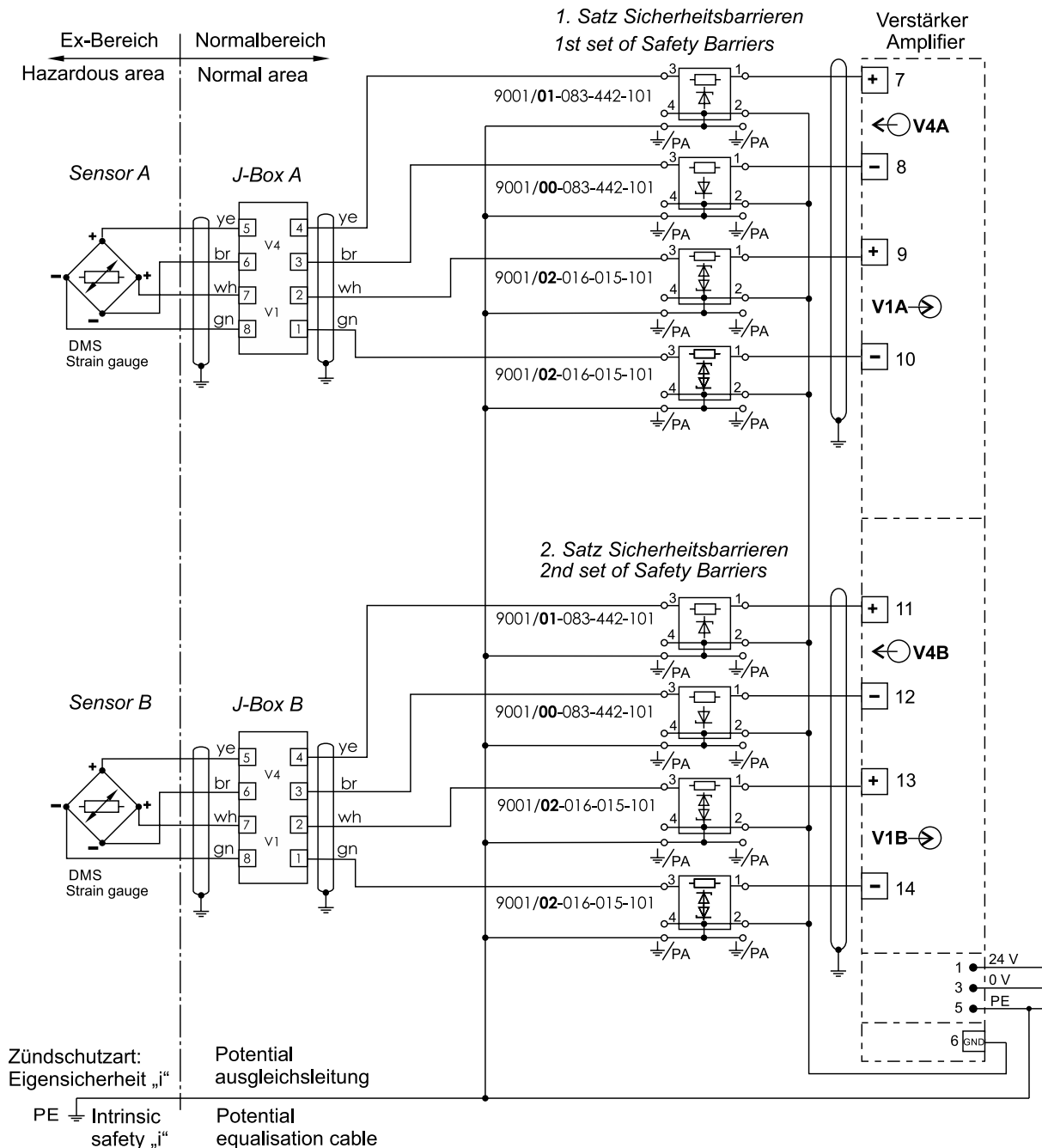
### Attention!



The calibration resistors in the J-Box are specified for the corresponding sensor only and can only be connected to this sensor. Therefore, the sensor and the J-Box carry the identical measurement location designation. For example sensor 04711-5 must be connected to the J-Box 04711-5.



for HAEHNE Amplifiers DA-2PN, DA-2PB, DA-2EN and DA-2EC



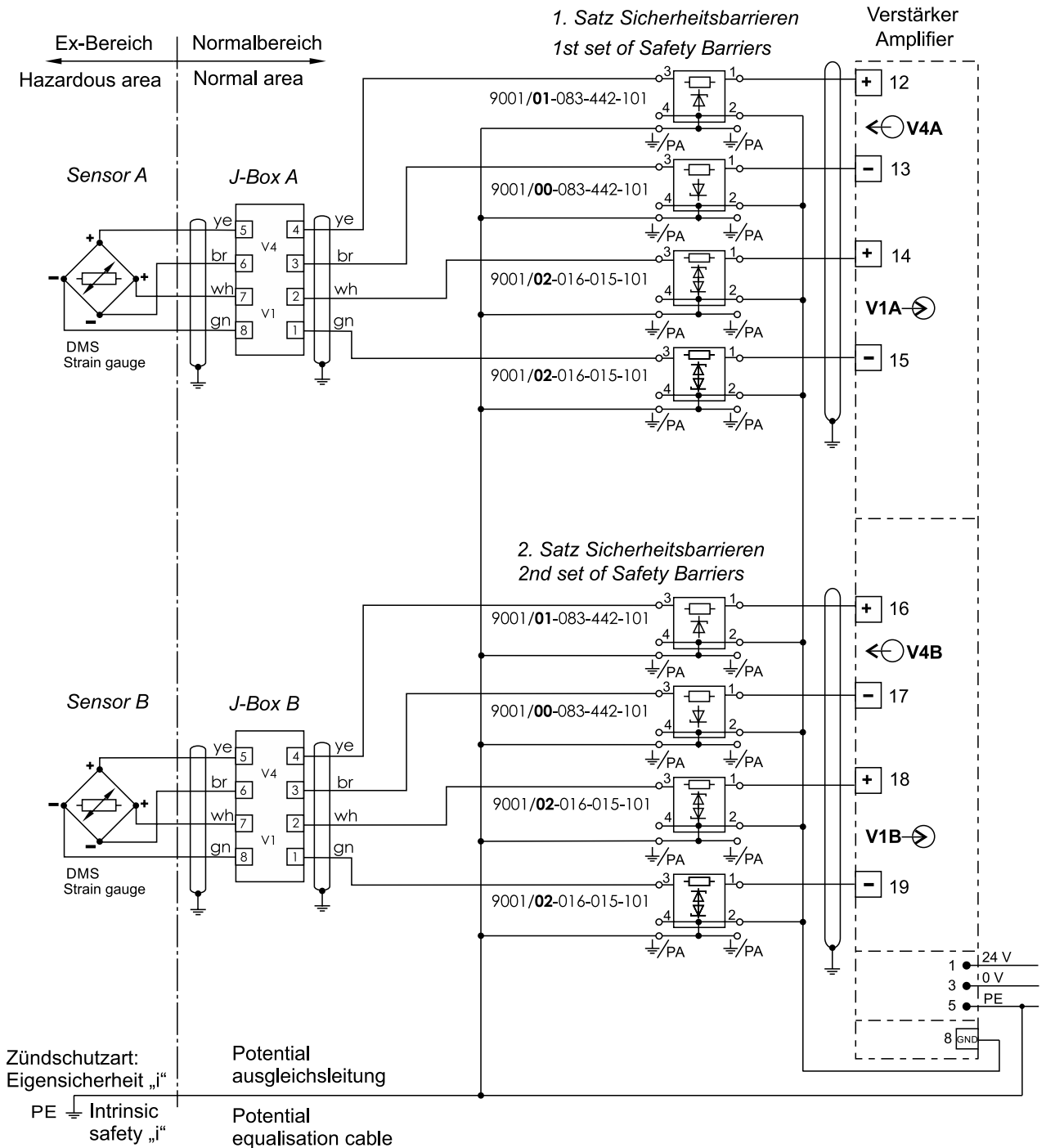
### Note

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for HAEHNE Amplifier DCM



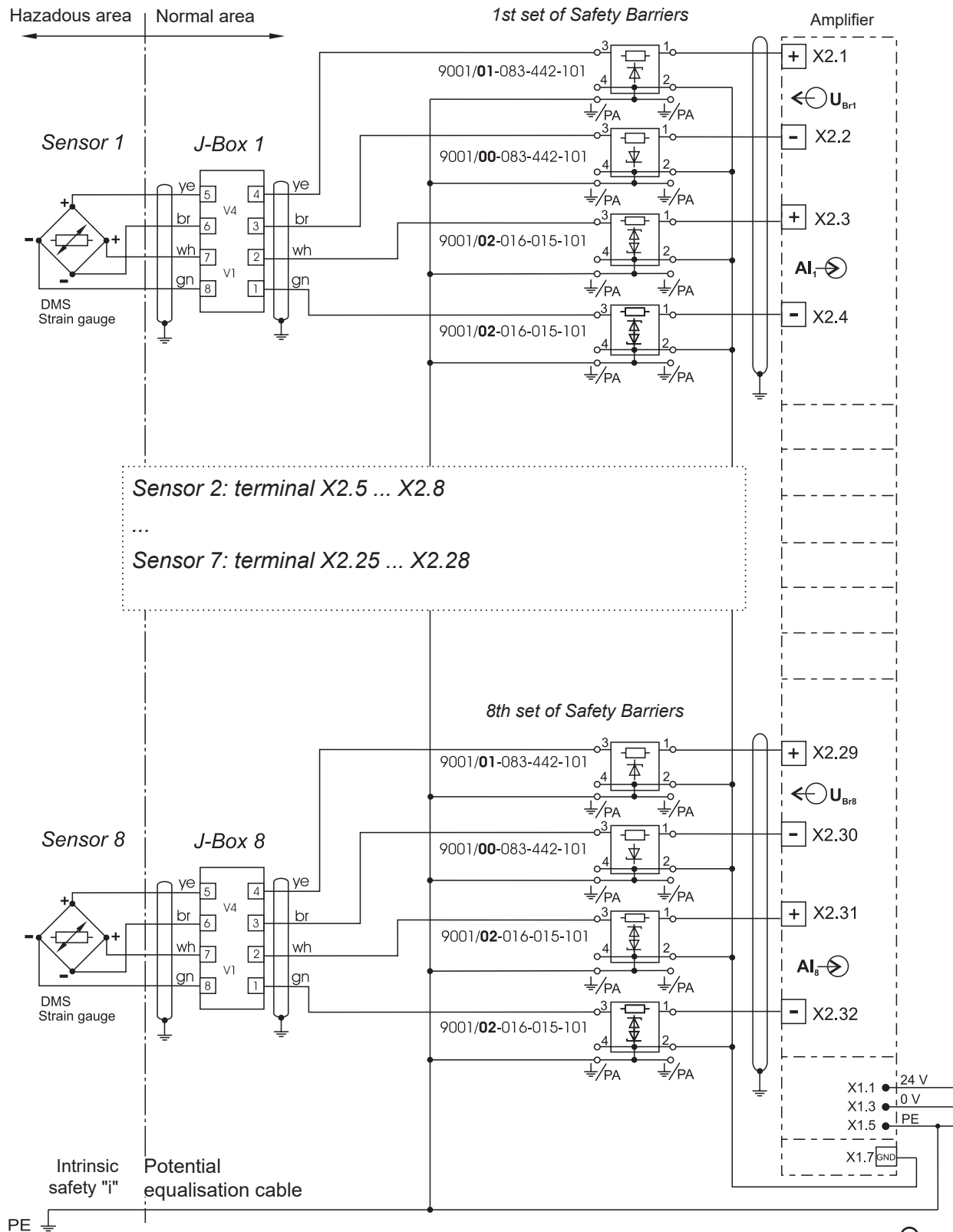
### Note

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### for HAEHNE Amplifier DCX



### Note

The pin assignment of deviating core colors can be found on the respective product description of the sensor







The combination of the HAEHNE products: amplifier - force sensor - J-Box - safety barrier modules make the electrical circuits within a hazardous area intrinsically safe. This intrinsic safety depends on the existing external capacitance  $C_o$  and the external inductance  $L_o$ .

Safety barriers Combination D (SIBA-D) are used for the explosion-proof dust IIIC Db.

When using safety barriers from HAEHNE, the following maximum values must be observed:

Explosion Group	External Capacitance ( $C_o$ )	External Inductance ( $L_o$ )
IIIB / IIIC	1 $\mu$ F	2 mH

The measuring sensor can be taken as free of inductance and capacitance.

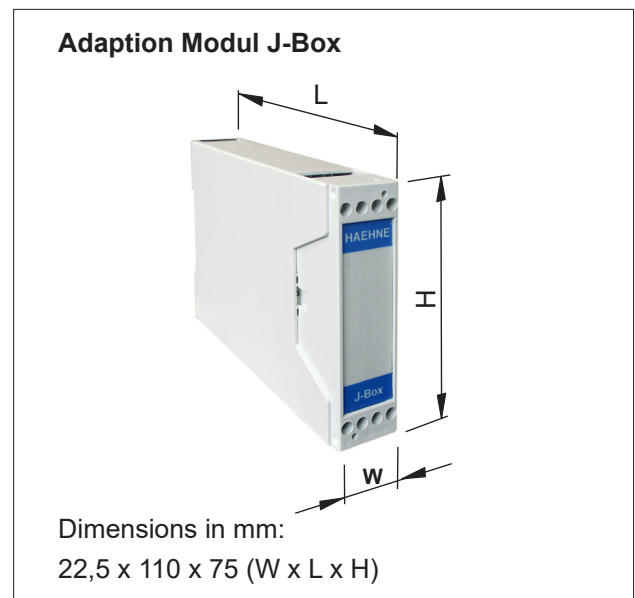
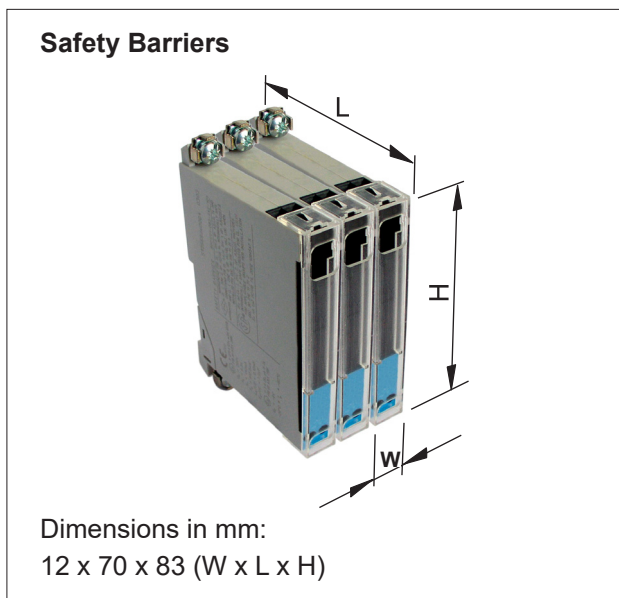
The approval of the sensors applies to dust and gas hazardous areas; the maximum cable length available is 44 m (see page 12).

Together with possible additional customer cable installation the values for external capacitance and inductance should not be exceeded.

### Attention!



The sensors, the connection cables and the additional energy limiting devices should be operated within a single system of potential equalization.



### Note

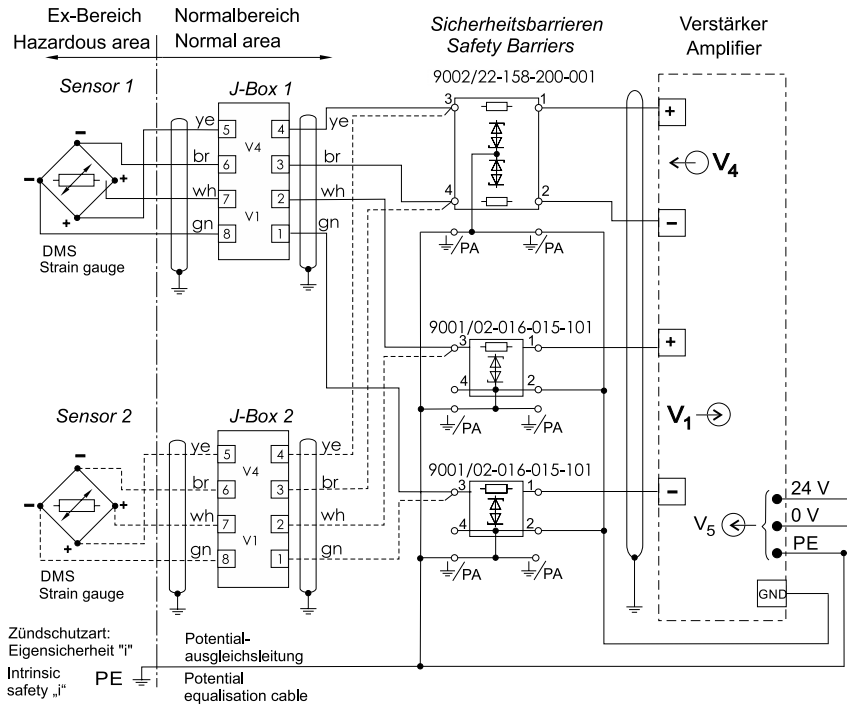


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#### for HAEHNE 1-channel Amplifier

AMA, AME, DA-PB, DA-PN, DA-EC, DA-EN, DMA and MAC

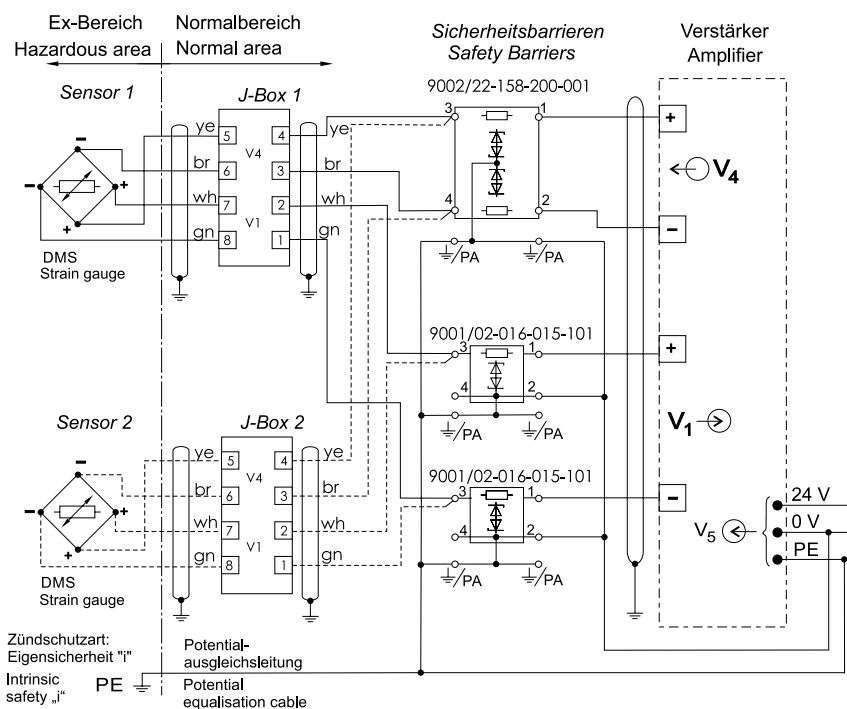


In the control cabinet cables under 5 m of length do not have to be shielded.

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$V_1$	Output signal of full bridge strain gauge
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$V_4$	Excitation voltage to the full bridge strain gauge in the sensors
$V_5$	Supply voltage 24 V DC
$I_1$	Current output (option C and N)

#### for HAEHNE Amplifier Busbox-PS 2



### Note



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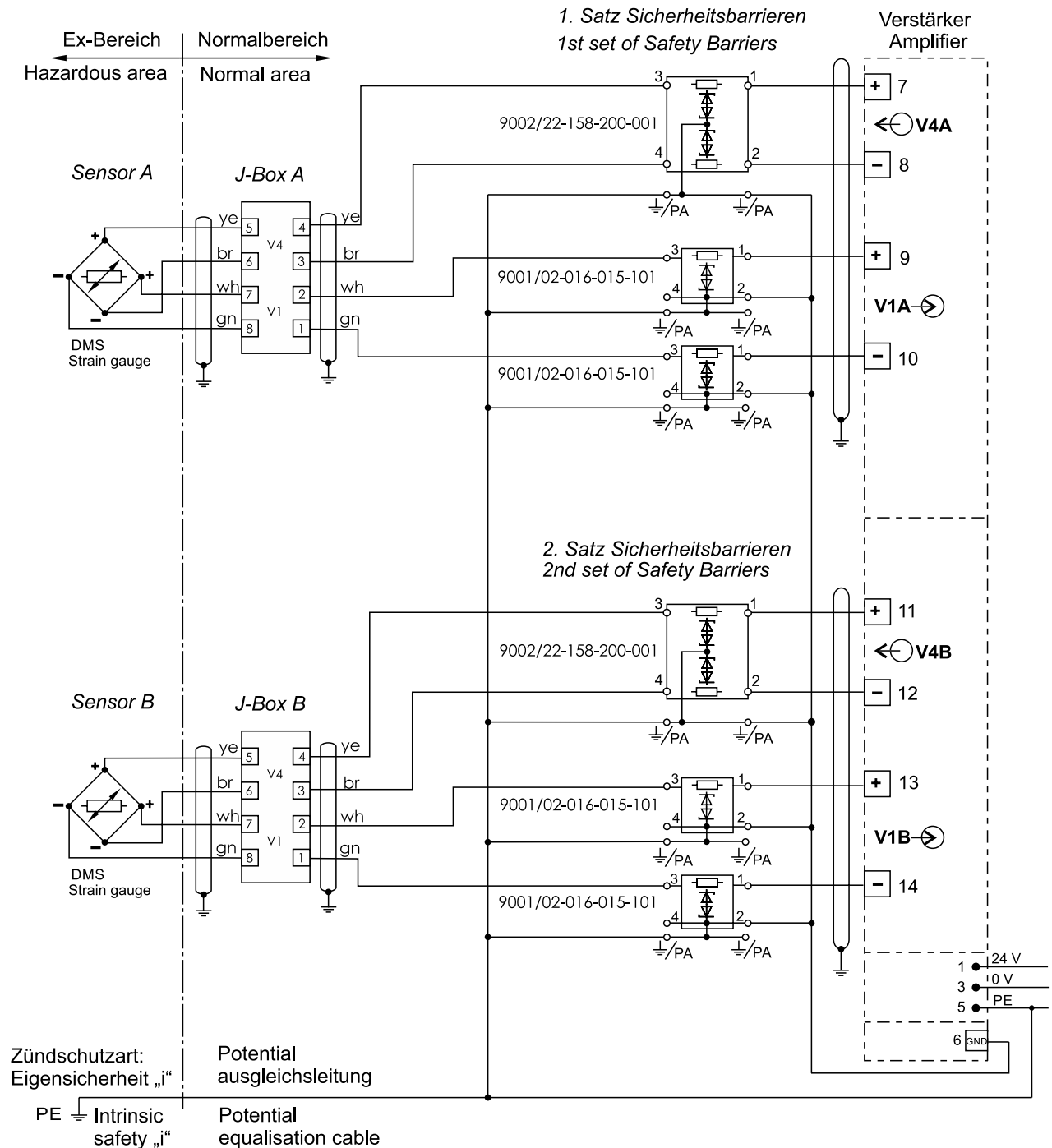
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for HAEHNE Amplifiers DA-2PN, DA-2PB, DA-2EN and DA-2EC



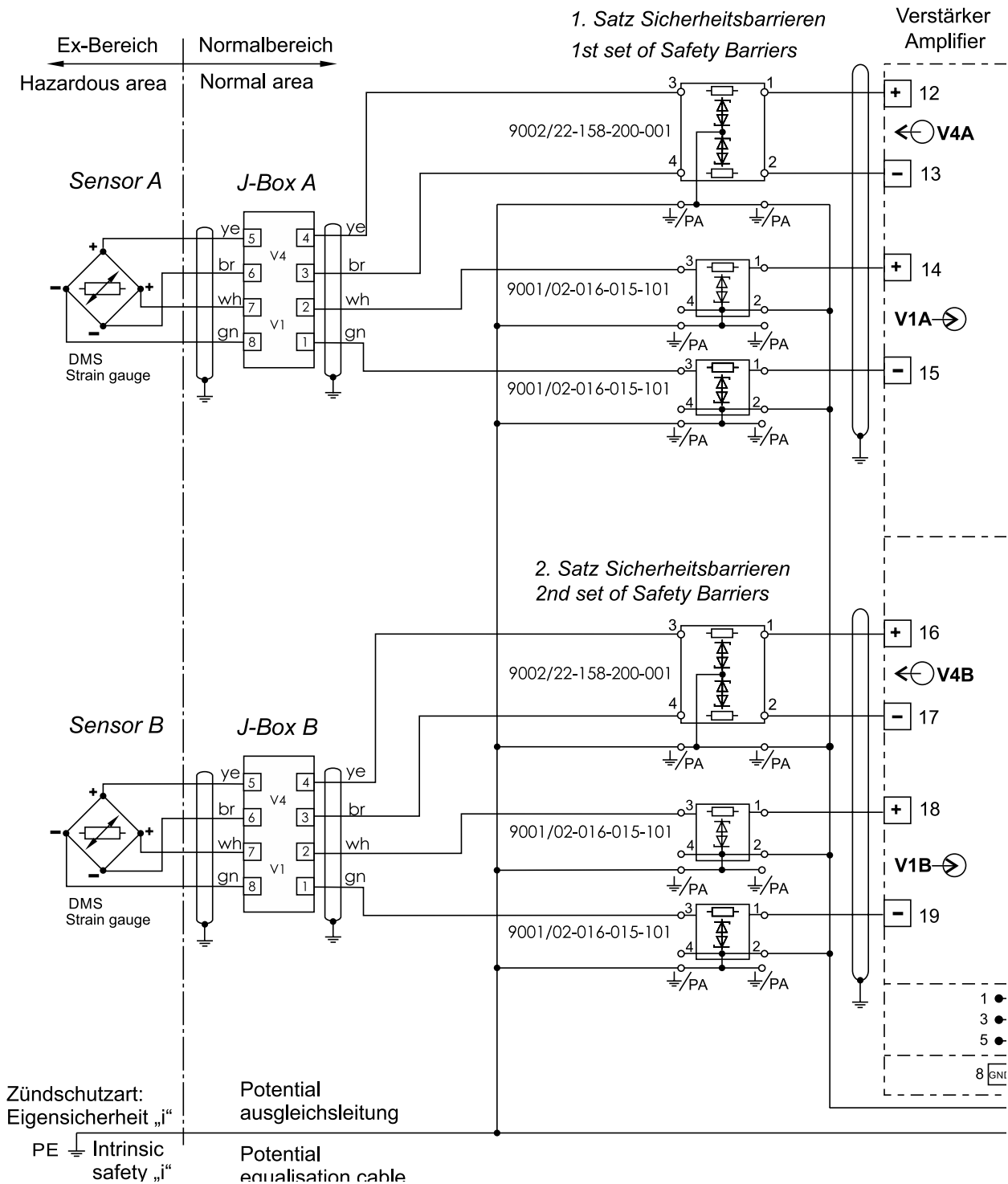
### Note

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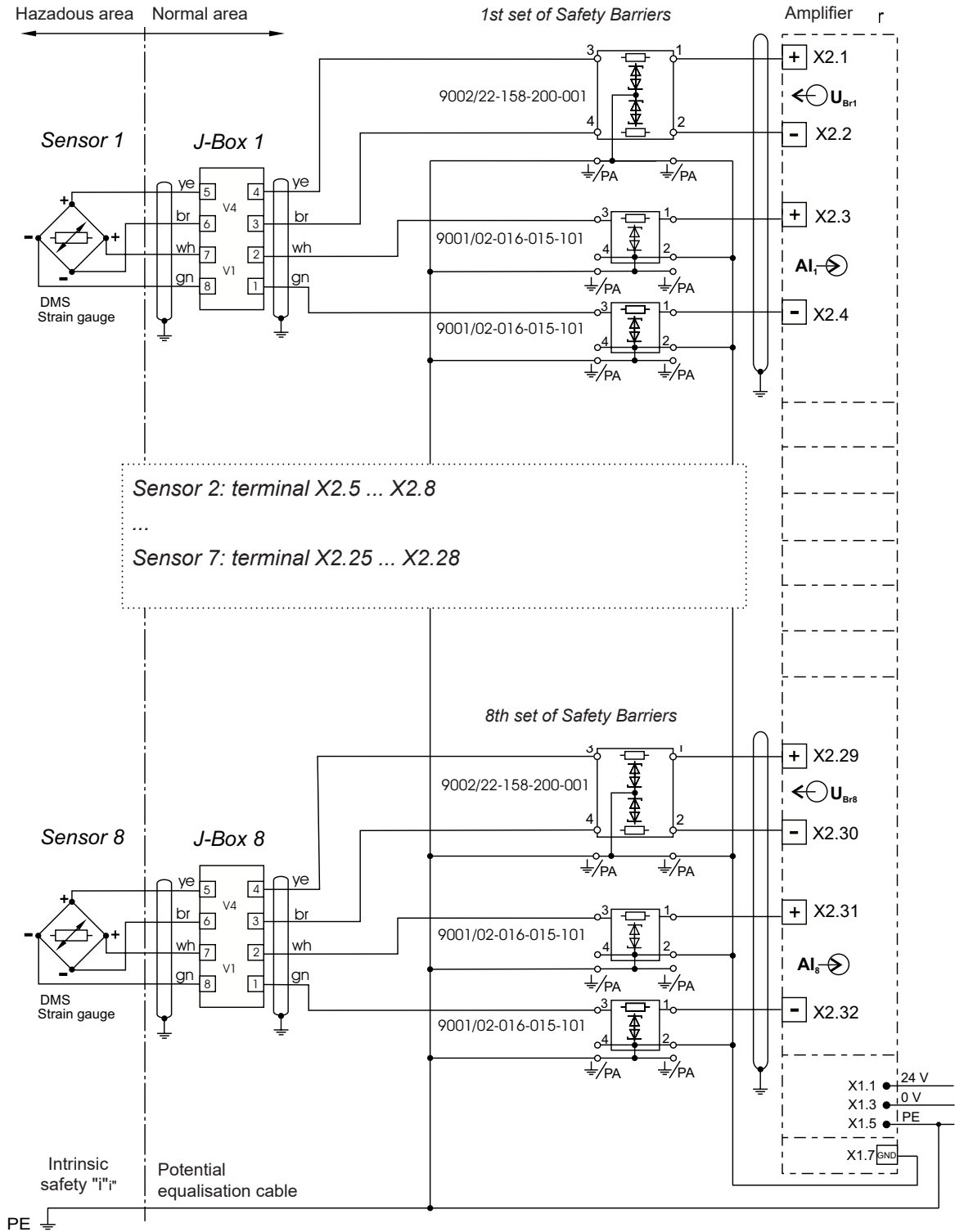
for HAEHNE Amplifier DCM



### Note

The pin assignment of deviating core colors can be found on the respective product description of the sensor





### Note

The pin assignment of deviating core colors can be found on the respective product description of the sensor



## Declaration of conformation



HAEHNE Force Sensors

Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (Richtlinie 2014/34/EU (vorher 94/9/EG))  
*Equipment and protective systems intended for appropriate use in potentially explosive atmospheres [directive 2014/34/EC (previously 94/9/EC)]*

Die Firma  
*The Manufacturer*

HAEHNE  
Elektronische Messgeräte GmbH  
Heinrich-Hertz-Str. 29  
40699 Erkrath

erklärt hiermit, dass alle Ex-Schutz Kraftmesssensoren mit der  
*declares hereby, that all force measurement sensors for the use in potentially explosives atmospheres with*

Kennzeichnung	CE 0123 Ex II 2G Ex ia IIC T4 Gb	für Typ *** ** * **F
Designation	CE 0123 Ex II 2G Ex ia IIC T4 Gb	für Typ *** ** * **F***
	CE 0123 Ex II 2G Ex ia IIC T6... T1 Gb	für Typ *** ** * **Fxx-yyzzz
	CE 0123 Ex II 2G Ex ia IIC T6... T1 Gb	für Typ *** ** * **Fxx-yyzzz***
	CE 0123 Ex II 2D Ex ia IIIC T135° C Db	(für alle Typen)

entwickelt und gefertigt wurden in Übereinstimmung mit den unten aufgeführten harmonisierenden Normen für elektrische Betriebsmittel in explosionsgefährdeten Bereichen.  
*developed and manufactured in accordance with the harmonized European standards for electrical apparatus for potentially explosive atmospheres:*

### EN IEC 60079-0:2018

Allgemeine Bestimmungen  
*General requirements*

### EN 60079-11:2012

Eigensicherheit "i"  
*Intrinsic safety "i"*

Die bezeichneten Produkte entsprechen dem aktuellen Stand der Technik und den Anforderungen, die in der Richtlinie 2014/34/EU (vorher 94/9/EG) „Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen“ festgelegt sind.

*The designated products are in conformity with the requirements of the directive 2014/34/EC (previously 94/9/EC) „Equipment and protective systems intended for use in potentially explosive atmospheres“.*

EG-Baumusterprüfbescheinigung BVS 05 ATEX E 091 X ausgestellt durch:

The EC-type examination certification BVS 05 ATEX E 091 X issued by:

DEKRA EXAM GmbH (NB 0158)

Dinnendahlstr. 9

D-44809 Bochum

Erkrath, den 19.02.2020

Ort, Datum (*Place, Date*)

Dr. F. Goronzy, Geschäftsführer (*General Manager*)

## Certificates



CERTIFICATE 認許証書 CERTIFICADO CERTIFICAT CERTIFIKAT

- (1) Certificate
- (2) about the acceptance of the product quality assurance



- TRANSLATION
- (3) Equipment and components intended for use in potentially explosive atmospheres – Directive 2014/34/EU
  - (4) Number of Certificate:  
**TPS 24 ATEX Q 052103 0007** Issue 00
  - (5) Product Category: Electrical equipment and components, Equipment group II, categories 2G and 2D, type of protection „I“; "Force Measurement Sensors"
  - (6) Manufacturer: **Haehele Elektronische Messgeräte GmbH**
  - (7) Address: **Heinrich-Hertz-Straße 29, 40699 Erkrath, Germany**
  - (8) TÜV SÜD Product Service GmbH notified body No. 0123 in accordance with Article 18 of the Council Directive 2014/34/EU of February 26<sup>th</sup> 2016, certifies that the manufacturer maintains a quality assurance for the product, which conforms with Annex VII of the Directive.
  - (9) This certificate is based upon the Audit Report No. 713317757, issued on 2024-04-08, and is valid until 2027-03-12.  
The certificate can be withdrawn if the manufacturer does not longer satisfy the requirements of appendix VII.  
The results of the quality assurance re-assessment are part of the certificate.
  - (10) According to article 16 (3) of the Directive 2014/34/EU, the CE-marking shall be followed by the identification number 0123 identifying the notified body, involved in the production control stage.



Certification Body Explosion Protection  
Ridderstrasse 65, 80339 München

München, April 10, 2024

Dipl.-Ing. (FH) Arno Butzke  
QM TC - CRT MUC



Quality Assurance Certificates without signature are not valid. The certificate may be circulated only without alteration.



Translation

### EC-Type Examination Certificate

- (1) - Directive 94/9/EC -
- (2) Equipment and protective systems intended for use in potentially explosive atmospheres
- (3) **BVS 05 ATEX E 091**
- (4) Equipment: **Force Sensor type \*\*\*\* \* F**
- (5) Manufacturer: **HAEHNE GmbH**
- (6) Address: **40699 Erkrath, Germany**
- (7) The design and construction of this equipment and any acceptable variation thereto are specified in the appendix to this type examination certificate.
- (8) The certification body of EXAM BBG Prüf- und Zertifizier GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in the test and assessment report BVS PP 05.2061 EG.
- (9) The Essential Health and Safety Requirements are assured by compliance with:  
EN 50014:1997 + A1 – A2 General requirements  
EN 50020:2002 Intrinsic safety "I"
- (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 in the appendix to this certificate.
- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
- (12) The marking of the equipment shall include the following:

II 2G EEx ia IIC T4

**EXAM BBG Prüf- und Zertifizier GmbH**  
Bochum, dated 20. June 2005

Signed: Dr. Jockers  
Certification body

Signed: Dr. Eichhoff  
Special services unit



(13) Appendix to

### EC-Type Examination Certificate

**BVS 05 ATEX E 091**

- (15) **15.1 Subject and type**  
Force Sensor type \*\*\*\* \* F  
In place of \*\*\* the complete description characters and numeric are inserted which specify the application:  
Type \*\*\*\* \* F  
not ex-relevant identifications such as force measuring range, type of building, size, sensor designation
- 15.2 Description**  
The force sensor is used for the acquisition of tension and compression forces and the conversion of this signal into a proportional electrical signal.  
The sensor consists of strain gauges in a bridge circuit which are glued on a gauging member.  
The force sensor is a simple apparatus according to section 5.4 of EN 50020 :2002.  
The electrical connection of the sensor to a corresponding control unit is made with a fixed cable with maximum 20 m in lengths.
- 15.3 Parameters**

Voltage	Ui	DC	17	V
Current	Ii		500	mA
Power	Pi		2	W
Effective internal capacitance	Ci		3,2	nF
Effective internal inductance	Li		14	µH
Ambient temperature range	Ta		-20 °C up to +60 °C	

- (16) Test and assessment report  
BVS PP 05.2061 EG as of 20.06.2005
- (17) Special conditions for safe use  
None

We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, 26.05.2008  
BVS-Schu/Ar E 0734/08

**DEKRA EXAM GmbH**

Certification body

Special services unit

DEKRA 認許証書 CERTIFICADO CERTIFICAT CERTIFIKAT

Translation

### EU-Type Examination Certificate Supplement 3

- 1 **Equipment intended for use in potentially explosive atmospheres**  
Directive 2014/34/EU
- 2 EU-Type Examination Certificate Number: **BVS 05 ATEX E 091 X**
- 3 Product: **Force sensors type \*\*\*\* \* F, type \*\*\*\* \* Fxx-yyzzz, type \*\*\*\* \* Fxx-yyzzz**
- 4 Manufacturer: **Haehele Elektronische Messgeräte GmbH**
- 5 Address: **Heinrich-Hertz-Str. 29, 40699 Erkrath, Germany**
- 6 This supplementary certificate extends EC-Type Examination Certificate No. BVS 05 ATEX E 091 X to apply to products designed and constructed in accordance with the specification set out in the appendix of the said certificate but having any acceptable variations specified in the appendix to this certificate and the documents referred to therein.
- 7 DEKRA Testing and Certification GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in the confidential Report No. BVS PP 05.2061 EG.
- 8 The Essential Health and Safety Requirements are assured in consideration of:  
**EN IEC 60779-0:2018 General requirements**  
**EN 60779-11:2012 Intrinsic Safety "I"**
- 9 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.
- 10 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.
- 11 The marking of the product shall include the following:  
 II 2G Ex ia IIC T6...T1 Gb type \*\*\*\* \* Fxx-yyzzz  
 II 2D Ex ia IIC T135°C Db type \*\*\*\* \* Fxx-yyzzz  
 II 2D Ex ia IIC T4 Gb type \*\*\*\* \* F  
 II 2D Ex ia IIC T135°C Db type \*\*\*\* \* Fxx

DEKRA Testing and Certification GmbH  
Bochum, 2020-05-11

Signed: Jörg-Timm Kilsch

## Certificates



**13 Appendix**

**14 EU-Type Examination Certificate**  
BVS 05 ATEX E 091 X  
Supplement 3

**15 Product description**

**15.1 Subject and type**

Force Sensors type \*\*\*\* Fxx-yyzzz  
type \*\*\*\* Fxx-yyzzz \*\*\*  
type \*\*\*\* F  
type \*\*\*\* F\*\*\*

In the complete type denomination, the wildcards are replaced by letters or numbers to indicate the different sensor variations:

Type \*\*\*\* Fxx-yyzzz

- Permissible ambient temperature range yy °C ≤ T<sub>a</sub> ≤ zzz °C (determined by the permissible operation temperatures of the used materials)
- Resistance of the DMS  
35 for (350 Ω)-DMS  
70 for (700 Ω)-DMS  
10 for (1000 Ω)-DMS
- Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

Type \*\*\*\* Fxx-yyzzz \*\*\*

- Optional: marking for custom dimensions (not ex-relevant)
- Permissible ambient temperature range yy °C ≤ T<sub>a</sub> ≤ zzz °C (determined by the permissible operation temperatures of the used materials)
- Resistance of the DMS  
35 for (350 Ω)-DMS  
70 for (700 Ω)-DMS  
10 for (1000 Ω)-DMS
- Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

Type \*\*\*\* F

- Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

Type \*\*\*\* F\*\*\*

- Optional: marking for custom dimensions (not ex-relevant)
- Non ex-relevant characteristics like force measuring range, type of building, size, sensor designation

**Example:**  
The force sensor type \*\*\*\* F35-20060 has (350 Ω)-DMS and is suitable for use in a temperature range between -20 °C and +60 °C.

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Certification body, Dimmenstr. 3, 44809 Bochum, Germany  
Phone +49 234 3696-400, Fax +49 234 3696-401, e-mail DTC-Certification-body@dekra.com

**15.2 Description**

The force sensors are used for the acquisition of tension and compression forces and the conversion of these forces into a proportional electrical signal.  
The sensors consist of strain gauges in a bridge circuit which are glued on a metallic gauging member. The gauging member is inside a metallic sleeve.  
The force sensors are simple apparatus according to clause 5.7 of EN 60079-11:2012. They are intended for use in explosive areas requiring equipment with EPL Ob exp. Db.  
The electrical connection of the sensors type \*\*\*\* F and type \*\*\*\* F\*\*\* to a corresponding control unit is made with a fixed cable with max. 20 m length. The new sensor type \*\*\*\* F\*\*\* differs from the previously approved sensor type \*\*\*\* F only in the dimensions, there is no ex-relevant technical difference.  
The electrical connection of the sensors type \*\*\*\* Fxx-yyzzz and type \*\*\*\* Fxx-yyzzz \*\*\* is made with a fixed cable with variable cable length or a connection socket. The new sensor type \*\*\*\* Fxx-yyzzz \*\*\* differs from the previously approved sensor type \*\*\*\* Fxx-yyzzz only in the dimensions, there is no ex-relevant technical difference.  
Depending on the type key ending "xx-yyzzz", the sensors are suitable for different ambient temperature ranges and are classified as T1...T6. For dust-applications, the sensors are marked as T135 °C.

**Reasons for the supplement**

- Update of standard
- Modification of the existing type designation of the force sensor
- Introduction of new force sensor types

**15.3 Parameters**

**15.3.1 For type \*\*\*\* Fxx-yyzzz and type \*\*\*\* Fxx-yyzzz \*\*\***

**15.3.1.1 Electrical parameters**

	U <sub>i</sub>	DC	17	V
Maximum input voltage	U <sub>i</sub>			
Maximum input current for Gb-applications	I <sub>i</sub>		500	mA
Maximum input power for Db-applications	P <sub>i</sub>		250	mW
Maximum input power for Gb-applications	P <sub>i</sub>		2	W
Maximum input power for Db-applications	P <sub>i</sub>		550	mW

The force sensors do not include concentrated capacitances or inductances.  
For variants with connection socket (no connected cable)  
Maximum internal capacitance C<sub>i</sub> negligible  
Maximum internal inductance L<sub>i</sub> negligible

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For variants with permanently connected cable  
Maximum internal capacitance C<sub>i</sub>  
and maximum internal inductance L<sub>i</sub>  
are calculated only from the cable capacitance and cable inductance:  
Capacitance per unit length C<sub>l</sub> 160 pF/m  
Inductance per unit length L<sub>l</sub> 0.68 µH/m

**15.3.1.2 Ambient temperature range**

Minimum ambient temperature depending on the type characteristic „yy“:

Type characteristic „yy“	T <sub>a,min</sub> °C
xx = 35	-yy

Maximum ambient temperature depending on the type characteristics „xx“ and „zzz“ and the desired temperature class:

For sensors with (350 Ω)-DMS  
Type characteristic xx = 35

Classification	Lower value of (°C)
For T1-classification	lower value of (38) °C, zzz °C
For T2-classification	lower value of (23) °C, zzz °C
For T3-classification	lower value of (13) °C, zzz °C
For T4-classification	lower value of (7) °C, zzz °C
For T5-classification	lower value of (3) °C, zzz °C
For T6-classification	lower value of (2) °C, zzz °C
For T135 °C-classification	lower value of (10) °C, zzz °C

For sensors with (700 Ω)-DMS  
Type characteristic xx = 70

Classification	Lower value of (°C)
For T1-classification	lower value of (41) °C, zzz °C
For T2-classification	lower value of (26) °C, zzz °C
For T3-classification	lower value of (17) °C, zzz °C
For T4-classification	lower value of (10) °C, zzz °C
For T5-classification	lower value of (7) °C, zzz °C
For T6-classification	lower value of (5) °C, zzz °C
For T135 °C-classification	lower value of (10) °C, (zzz - 10) °C

For sensors with (1000 Ω)-DMS  
Type characteristic xx = 10

Classification	Lower value of (°C)
For T1-classification	lower value of (40) °C, zzz °C
For T2-classification	lower value of (25) °C, zzz °C
For T3-classification	lower value of (16) °C, zzz °C
For T4-classification	lower value of (9) °C, zzz °C
For T5-classification	lower value of (6) °C, zzz °C
For T6-classification	lower value of (4) °C, zzz °C
For T135 °C-classification	lower value of (10) °C, zzz °C

**Example:**  
The materials of the force sensor type \*\*\*\* F35-20060 are suitable for use at -20 °C up to 60 °C.  
For the classification of the sensor into the individual temperature classes, the upper limit of the permissible ambient temperature is calculated from the maximum temperature of the temperature class reduced by the heating of the DMS and the permissible temperature of the used materials. The force sensor is suitable for T6 in ambient temperatures -20 °C up to 20 °C. It is suitable for T5 in ambient temperatures -20 °C up to 25 °C and for T4 in ambient temperatures -20 °C up to 60 °C.  
For temperatures -20 °C up to 60 °C, it can be used in dust-explosive areas.  
A change of the ignition behavior of the regarded gases for ambient temperatures outside atmospheric conditions (outside -20 °C up to +60 °C) has not been regarded for this certification and has to be assessed by the operator.

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**15.3.2 For type \*\*\*\* F and type \*\*\*\* F\*\*\***

**15.3.2.1 Electrical parameters**

	U <sub>i</sub>	DC	17	V
Maximum input voltage	U <sub>i</sub>			
Maximum input current for Gb-applications	I <sub>i</sub>		500	mA
Maximum input power for Db-applications	P <sub>i</sub>		250	mW
Maximum input power for Gb-applications	P <sub>i</sub>		2	W
Maximum input power for Db-applications	P <sub>i</sub>		550	mW

The force sensors do not include concentrated capacitances or inductances.  
The internal capacitance and internal inductance are calculated only from the capacitance and inductance of the permanently connected cable (max. length 20 m):  
Maximum internal capacitance C<sub>i</sub> 3.2 nF  
Maximum internal inductance L<sub>i</sub> 14 µH

**15.3.2.2 Ambient temperature range**

Type characteristic „yy“	T <sub>a</sub>
xx = 35	-20 °C up to +60 °C

**16 Report Number**  
BVS PP 05.2061 EU, as of 2020-05-11

**17 Special Conditions for Use**  
For Use in Group III:  
The intrinsically safe circuit is not safely separated from earth. Along the intrinsically safe circuit, potential equalization must exist.  
The sensors have to be installed in such a way, that intensive electrostatic charging processes are excluded.

**18 Essential Health and Safety Requirements**  
The Essential Health and Safety Requirements are covered by the standards listed under item 9.

**19 Drawings and Documents**  
Drawings and documents are listed in the confidential report.

We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

DEKRA Testing and Certification GmbH  
Bochum, 2020-05-11  
BVS-FroMu A 20190861

*[Signature]*  
Managing Director

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Represented by:

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