



Brüel & Kjær Vibro

A member of the NSK Group

B&K vibro

Instructions

Displacement sensor system series ds822

Measuring range 2 mm



Keep accessible for future reference

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Instructions **Sensor ds822 2 mm**, C105507.002 / V05, en, date of issue: 03/22/2024

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1 Safety



NOTE!

This manual is a part of the product. Read the manual carefully before using the product and keep it accessible for future use.



CAUTION!

This symbol warns of dangerous situations which can result from misuse of the product.



NOTE!

This symbol provides general and useful information for using the product.

1.1 Disclaimer

Observing this technical documentation is a basic requirement for the proper and safe operation of the product. We accept no liability for personal injury, damage to property or financial loss caused by failure to observe this technical documentation. In such cases, any liability for material defects is excluded.

1.2 Intended usage

The eddy-current displacement sensor system is intended solely for measuring mechanical distances and oscillations and is used primarily for the condition monitoring of slide bearings or rotating shafts. The use of the measuring chain is indoors or outdoors, when the driver is installed in a suitable protective housing.

If sensors and cables are used in a way not described in the relevant user manuals, function and protection may be impaired and serious personal damage, death or serious, irreversible injuries may result.

- Exclusively use sensor as specified in data sheet. Any use other than specified is considered inappropriate. Brüel & Kjær Vibro does not assume any liability for damages resulting from inappropriate use. The user is solely responsible.
- Mounted sensors must not be used as steps.
- Ensure that system is exposed only to admissible environmental influences specified in technical system data sheet.
- Maintain electrical equipment in regular intervals. Remedy defects, e.g. loose wires, defective connectors, immediately.

Hot surfaces

- In line with the user manuals, sensors and cables can be operated in extensive ambient temperature ranges, whereby they can become hot through self-heating on housing walls and can produce burning.
- When mounted at external heat or cold sources (e.g. machine parts), systems, sensors and cables can adopt dangerous temperatures, whereby burning, among other things, can occur in the event of contact.

1.3 Limitations

The eddy-current displacement sensor system may be used only within the scope defined by the technical specifications.

Limitations of the user manual

Not all assembly and connection options are described in this manual.

1.4 General information

Never put damaged products into operation. Immediately report any damage.

1.5 User Qualification

Personnel must be trained according to IEC 60079-14. In addition, personnel must be aware of the general installation regulations for electrical equipment and the relevant national regulations regarding the construction of explosion-protected facilities. Ensure that all work in conjunction with our systems is performed by skilled, expert and authorized workers (for ATEX systems according to EN 60079-14). Among these works are:

Installation and Commissioning

Installation and commissioning primarily concern work on electrical equipment. These works may be performed exclusively by electricians or workers instructed and supervised by an electrician in accordance with electrotechnical regulations/directives.

Change of System Specification

Any change of system specification has its effects on monitoring process with stationary systems and on the measuring sequence with portable measuring systems.

1.5.1 Recommendations to User

If the use of the system in conjunction with machines or plant sections can produce risks outside of Brüel & Kjær Vibro's responsibility, the user is expected to prepare and distribute safety technical instructions or warnings and to ensure that the personnel concerned has received and understood it.



CAUTION!

If system is integrated into a machine or designed to be assembled, commissioning must not take place until the machine the system is to be integrated in conforms to the EC directives.

Personnel must be trained according to IEC 60079-14. In addition, personnel must be aware of the general installation regulations for electrical equipment and the relevant national regulations regarding the construction of explosion-protected facilities.



1.5.2 Prohibition of Unauthorized Modifications

System and accessories must not be changed neither in construction nor safety technology without the express consent of Brüel & Kjær Vibro. Any unauthorized modification excludes Brüel & Kjær Vibro's liability for resulting damages.

1.6 Information on delivery and transport



CAUTION!

Protect the displacement sensor system from shocks, dust and dirt during storage and transport. Protect the sensor tip using the supplied protective rubber cap.

1.7 Information on assembly and disassembly



NOTE!

To ensure that the displacement sensor system is functioning properly, do not change the physical length of any of the system cables.

You must also ensure that the components used, the displacement sensor and the extension cable, add up to a nominal system length of 5 m or 10 m.



CAUTION!

Danger of injury through moving machine parts. Shut down the plant before installing the displacement sensor.



CAUTION!

Live components can cause the driver to become defective. Close the electrical connection and apply voltage only once all parts of the displacement sensor system have been connected correctly.



NOTE!

The driver housings may not contact each other or any other conductive parts.

Assembly of the sensor:



CAUTION!

The ceramic sensor tip is sensitive to shock. Transport and store the displacement sensor only with the included protective rubber cap. Always keep the protective rubber cap for later use.

To avoid damage, make sure, especially during assembly and while operating the machine, that the sensor tip does not come into contact with other objects.

Loose ceramic particles can lead to damage within the machine.

Check the tip of the sensor for damage before every assembly. Never install a defective sensor.

Assembly, disassembly or replacement of components:



NOTE!

Never pull the cable to open the connection. Doing so may damage the cable and the connector ends.

1.8 Explosion protection

The measuring chain is suitable for use in potentially explosive environments. See chapter 5 “Explosion protection” on page 21 for details.



2 Product description

Observe the safety information in chapter "Safety"!

2.1 Basic function

The displacement sensor systems of the ds82x family are based on the non-contacting eddy-current measurement process. The distance is measured between the tip of the displacement sensor and an electrically conductive surface and sent via a proportional voltage signal to a subsequent electronic monitor. This records the status of the rotating shafts as a part of surveillance of the machine.

2.2 Components of the displacement sensor system

The eddy-current displacement sensor system consists of the components of displacement sensor with an integrated cable, an optional separate extension cable and the driver (oscillator/demodulator).

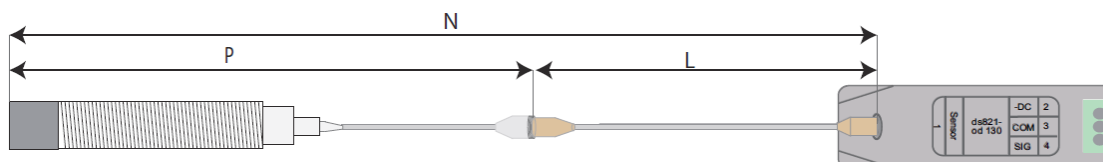
The name of a component is a combination of the series name ds822 and the component designation (**mc** = complete system, **ds** = displacement sensor, **ec** = extension cable or **od** = driver). Each series is available in system lengths of 5 m and 10 m.



Figure 2-1) Example non-contacting displacement sensor system Series ds822

1. Driver ds822.od11x
2. Extension cable ds822.ec10x
3. Colour coding: Blue denotes a measuring range of 2 mm
4. Assembly adapter
5. Displacement sensor ds822.ds100x

2.3 Nominal overall length of the displacement sensor system



The nominal system length (N) refers to the length of the components displacement sensor (P) and extension cable (L). The optional extension cable is required whenever the length of the displacement sensor is 0.5 m or 1.0 m and with the help of the additional extension cable must be extended to the nominal system length of 5 m or 10 m.

If the displacement sensor already has the nominal system length, no additional extension cable is required. In this case, the displacement sensor system consists only of the components displacement sensor and driver.

Example: correct installation for a nominal length N of 5 m:

$$P = 0.5 \text{ m} \quad L = 4.5 \text{ m} \quad P+L = 5.0 \text{ m} = N$$

Example of incorrect installation for a nominal length N of 5 m:

$$P = 0.5 \text{ m} \quad L = 4.0 \text{ m} \quad P+L = 4.5 \text{ m} \neq N$$

It should be $N = 5.0 \text{ m}$. The nominal overall length has not been complied with.



3 Delivery, storage, transport

Observe the safety information in chapter "Safety"!

3.1 Delivery

Check the packaging for damage upon delivery and make sure that the contents are complete.

Supplied components	Displacement sensor	Extension cable	Driver	Complete displacement sensor system
Displacement sensor	X			X
Protection cap	X			X
2 nuts ¹	X			X
1 sealing ring ²	X			X
Extension cable³		X		X
Driver			X	X
Assembly adapter			X	X
Acceptance test certificate acc. to DIN EN10204	X	X	X	X
Measurement protocol (works calibration)				X
Instruction	X	X	X	X

Table 3-1) Components included in scope of supply

3.2 Storage and transport

We recommend storing the system in its original packaging. The following conditions must be observed:

Stacking height:	max. 6 packages
Storage temperature:	-20 °C to +70 °C
Humidity	max. 75%

Packaging dimensions

Displacement sensor system complete (max. 3 parts):
Internal dimensions (WxDxH): 235 x 165 x 180 mm

In the case of single parts (only 1 or 2 parts):
Internal dimensions (WxDxH): 235 x 165 x 125 mm

¹ not available for ds1003 (reverse mount sensor)

² only available for ds1003, (reverse mount sensor).

³ not available if the length of the displacement sensor with integrated cable corresponds to the nominal system length of 5 m or 10 m.

4 Installation

Read the safety information in the chapter "Safety" before installation. To assemble the displacement sensor system, proceed in the following order:

- 4.1 Assembling the displacement sensor
- 4.2 Assembling the driver (oscillator/demodulator)
- 4.3 Connect the components together
- 4.4 Setting up the measuring chain and the displacement sensor
- 4.5 Electrical connection

Requirements:

- The displacement sensor system is complete (see "Table 3-1) Components included in scope of supply" on page 12).
- The overall length of the measuring system neither exceeds nor falls below the nominal length.
- The required clearances and the width of the measuring track are considered (9.3.2 Properties of the measuring track and 9.3.3 Required clearances and minimum distances for displacement sensors).
- The sensitivity of the target material is known.

Operation as category 1/2 device



CAUTION!

If the measuring chain is operated as a category 1/2 device (sensor in zone 0 and driver in zone 1), the conduits between zone 0 and zone 1 (gas-tight partition!) must be gas-tight and comply with protection class IP 67 (EN 60529).

If an isolating transformer is used the communication link connected to the housing of the driver, is grounded with a resistance of $\leq 10^9 \Omega$.

- When used as an IIC equipment the driver must be installed in an ATEX-protective housing and must be cleaned with a damp cloth only, to avoid static charges on the type plate.



CAUTION!

To prevent static charging, all sensor cables within zone 0 must be fitted with a steel protective conduit or steel tube securely connected to the local potential equalisation (contact resistance $\leq 1 \text{ M}\Omega$). If electrostatic charging is possible on a driver and the measuring chain is conducted on an isolating transformer at once, the driver has to be protected with an additional housing or has to be grounded with a resistor $\leq 10^9 \Omega$.

- The steel protective conduit or steel tube must be galvanically connected to the sensor housing.



Operation as category 2 device



CAUTION!

If the sensor cable is used in zone 1 and must comply with the requirements of explosion group IIC, it must be protected from static charging by a steel protective conduit or steel tube.

- The steel protective conduit or steel tube must be galvanically connected to the sensor housing.

If the sensor cable is used in zone 1 and must comply with the requirements of explosion group IIB or IIA, it may be mounted without additional steel protective conduit or steel tube.

Recommended accessories for trouble-free operation:

- Install the driver in a housing/control cabinet. For this purpose, the protective driver housings AC-2126 for up to 3 drivers and AC-2127 for up to 6 drivers are recommended.
- Use shielded signal wiring (preferably AC-1114 between the driver and connected electronics. The connection cable has to be heat-resistant at least + 85 °C.
- Install the sensor cable between machine housing and driver housing in a protective steel conduit.
- Ensure that there is a minimum distance of 1 m between the signal and sensor cable and any other power or control cables.

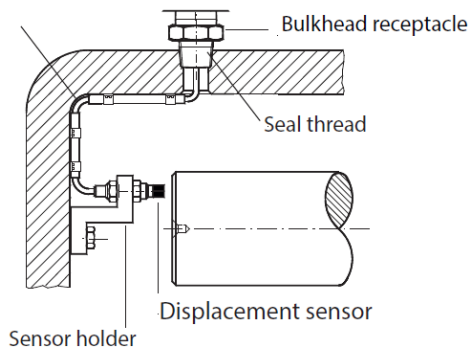
4.1 Assembling the displacement sensor

4.1.1 Displacement sensor for front-side mounting

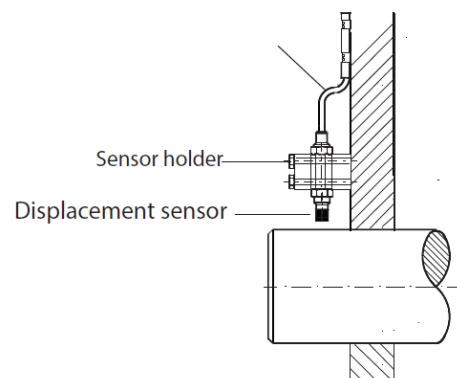
The front side-mountable displacement sensors are supplied with two nuts. You can use these nuts to lock it in place after adjustment (4.4 Setting up the measuring chain and the displacement sensor). Depending on the application, the sensor can be mounted forward-facing either within a machine or outside of a machine or through the machine housing. To avoid measurement errors, we recommend in all cases that the sensor be mounted with the help of a suitable sensor holder. The sensor holder must be mounted in a position where it cannot move relative to the object to be measured during machine operation.

1. Remove the protective cap from the sensor tip.
2. Attach the displacement sensor using a sensor holder suitable for the chosen type of assembly.
3. Position the sensor so that it lies vertically to the measuring track.
4. To avoid damage, make sure that the tip of the sensor does not touch the measuring object. Adjust the sensor through the display of the measured gap voltage.
5. Install the extension cable. For fixing with cable clamps, we recommend the use of a suitable protective conduit.
6. For assembly within the machine:
 - Seal the opening in the housing with a bulkhead receptacle to prevent medium inside the machine (e.g. gas or oil) escaping to the outside. We are not liable for damage resulting from an inexperienced assembly.

Assembly of sensor within the machine housing



Assembly of sensor outside the machine housing



4.1.2 Displacement sensor for rear-side mounting

The sensor for rear-side mounting is assembled with the help of a sensor holder, which preferably includes an integrated bulkhead receptacle.

- Fix the displacement sensor using a retainer that is appropriate for the type of installation. We recommend using the holder AC-101/AC-3101.



4.2 Assembling the driver (oscillator/demodulator)

Assemble either:

- with assembly adapter on a hat-rail
- with assembly adapter via screw mounting on a firm surface

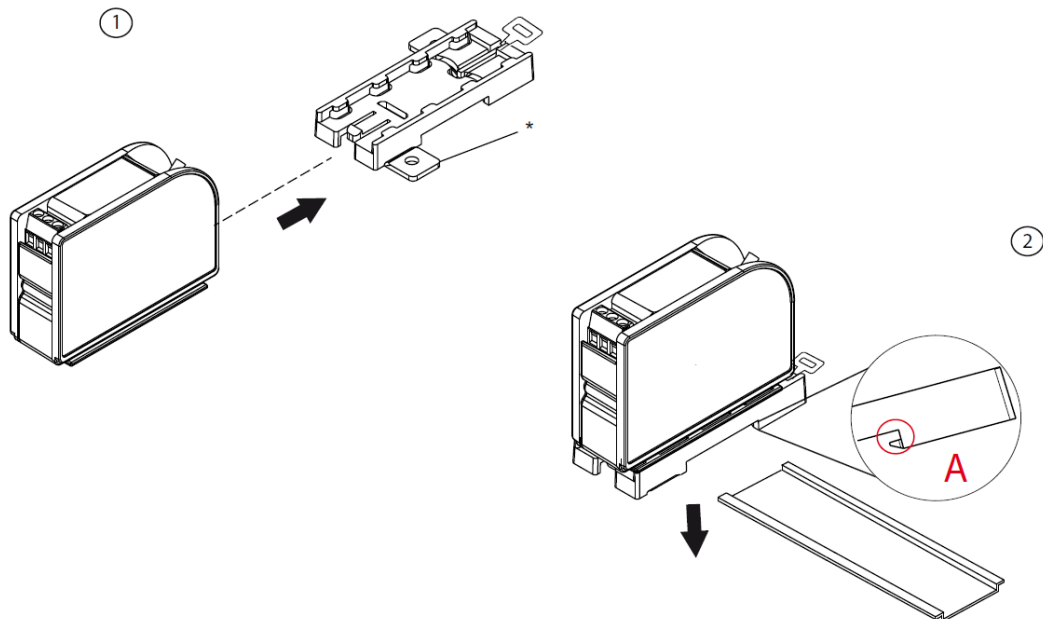
The driver must be mounted electrically insulated on its mounting socket and inside a protective housing, because the driver housing is part of the intrinsically safe circuit. The distance of the driver housing to adjacent drivers, or any other conductive part of the housing, must always be above 2 mm. The mounting socket ensures that this minimum gap is observed.



CAUTION!

The driver is category 2 equipment and must always be positioned outside zone 0. In areas exposed to explosion hazards, it may only be connected to an intrinsically safe supply circuit (Ex ia IIC).

4.2.1 Mounting on hat-rail



**For mounting on a hat-rail, the mounting tabs for screw mounting can be separated at the predetermined breaking point.*

1. For screw mounting, break off both tabs and attach the driver with the assembly adapter by sliding it into place (figure ①).
2. Affix the assembly adapter to a hat-rail (DIN EN 60715 TH35): Place rear part of the assembly adapter (see figure above, item A) onto the guides of the hat-rail and press driver and adapter downwards until the adapter clicks into place (figure ②).

You need to secure the installed driver against misalignment with hat-rail end clamps. The hatrail end clamps are included with our recommended protective driver housings AC-2126 for up to 3 drivers, and AC-2127 for up to 6 drivers.

4.2.2 Screw mounting



NOTE!

The screws for the installation are not included in the delivery contents.

A suitable surface of at least 7x10 cm is required for screw mounting:

- Solid metal:2 screws M4x12 A2-70
.....2 washers A2, inner diameter 4.5 mm
..... Depth of thread: 12 mm
- Steel:2 sheet metal screws A2
.....2 washers A2, inner diameter 4.5 mm
..... Steel thickness 1.2...1.4 mm Core hole diameter: 3.3 mm
- Aluminium2 sheet metal screws A2
.....2 washers A2, inner diameter 4.5 mm
..... Aluminium thickness 1.2...1.4 mm Core hole diameter: 3.2 mm

1. Mark the positions for both drill holes (section 9.2 Dimensioning of assembly adapter).
2. Drill two mounting holes.
3. Connect the assembly adapter with the driver.
4. Mount the assembly adapter in the mounting surface with two screws and the washers using the mounting tabs and secure (e.g. Loctite 243 medium strength, Loctite 270 high strength):
5. Tighten screws alternately.



4.3 Connect the components together

Connection options:

- Connection via extension cable
- Direct connection



CAUTION!

The intrinsically safe measuring circuit is connected to the plug housings. Before start-up the plug connection with the extension cable must be suitably insulated. For cables in tight protective conduit or pipe systems, the plug connector may also be insulated using the appropriate insulation set AC-108.

4.3.1 Connecting and disconnecting plug connections

The connector ends of the displacement sensor and the extension cable feature self-latching plug connections. They are plugged together, and not joined by a screw connection.



To assemble, observe the following order:

1. Hold one of both plug connector **ends** in each hand.
2. Push both plug connectors together until they audibly click into place.

To disconnect, observe the following order:

1. Hold one of both plug connector **ends** in each hand.
2. Pull on the **silver serrated part of the plug** to disconnect the connection.

4.3.2 Connection via extension cable

1. Connect the extension cable with the integrated cable of the displacement sensor.
2. Connect the extension cable to the driver.

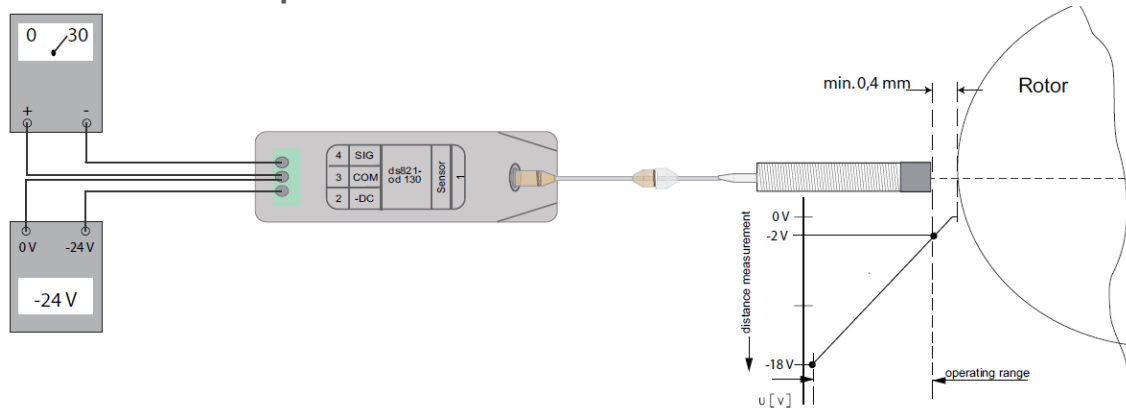
4.3.3 Direct connection

→ Connect the displacement sensor directly to the driver.

4.4 Setting up the measuring chain and the displacement sensor

The displacement sensor should be adjusted when the rotor is stationary.

4.4.1 Measurement set-up



As a rule, a displacement measuring chain is adjusted with the help of a voltmeter and the "operating voltage".

The measuring system is adjusted through the position of the sensor type to the object to be measured. The displacement sensor is inserted and fixed in place by positioning it in the linear measuring range (see drawing). To avoid damaging the sensor tip, the prescribed minimum separation to the shaft (maximum displacement) must be maintained.

The minimum distance to the target must be selected so that even in the event of maximum deflection of the shaft the distance (axial or relative to the shaft) does not fall below 0.4 mm.

In case of an axial measurement, the axial bearing clearance design and the current position of the shaft must be considered in order to prevent damage to the sensor tip.

- The displacement sensor system is fully assembled and connected to a power supply and a monitoring system.
- The physical separation should lie between 0.4 mm and max. 2.4 mm.

→ Switch on the voltage for the driver.

You will obtain an output signal proportional to the measurement distance in the range -2V...-18V. Adjust the separation of the sensor until the required output signal is present.



NOTE!

Use the characteristic curve U [GAP] to determine your minimum distance.



4.5 Electrical connection

Connect the driver with an electronic monitoring system (e.g. VC-6000) according to the drawing below. When setting up your measuring system you should observe the following behavior of the driver.

The heating effect of the driver electronics

During the warm-up phase the heating effect causes a drift in the static distance measurement.

Displacement sensor system	Operating time	Drift
5 m	≥ 1 h	≤1 μm
10 m	≥ 1 h	≤3 μm

Four wire connection

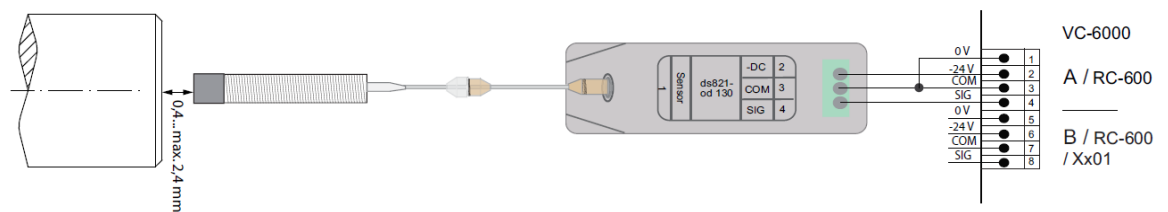


Figure 4-1) Connection of the driver to a monitoring system (VC-6000).

5 Explosion protection

Use in hazardous Ex-area according 2014/34/EU.

EC type examination certificate PTB 12 ATEX 2011 designation



II 1/2 G Ex ia IIC T6...T1 Ga/Gb or II 2G Ex ia IIC T6...T1 Gb
 II 2 D Ex ia IIIC T71 °C...168 °C Db

in compliance with EN IEC 60079-0:2018 and EN 60079-11:2012,
EN 60079-26:2015

IECEX- certificate: IECEX PTB 13.0010 mark
Ex ia IIC T6...T1Ga/Gb oder Ex ia IIC T6...T1 Gb
Ex ia IIIC T71 °C...168 °C Db

Standard: IEC 60079-0:2017
IEC 60079-11:2012 + Cor. 2012
IEC 60079-26:2014

Voltage supply: type of ignition protection, intrinsic safety (SELV) Ex ia,
only for protection to a certified, intrinsic safe electric circuit.

Maximum values: $U_i = 28 \text{ V}$ $L_i = \text{negligibly low}$
 $I_i = 140 \text{ mA}$ $C_i = 12 \text{ nF}$
 $P_i = 840 \text{ mW}$ $C_i = 76 \text{ nF (sensor side)}$
 $L_i = 3.8 \text{ mH (sensorside)}$

In Compliance with TR-TS 012/2011 (TP-TC 012/2011)



EAC Ex Certificate: RU-C-DE.AЖ58.B.02032/21

Ga/Gb Ex ia IIC T6...T1 X or 1Ex ia IIC T6...T1 Gb X
Ex ia IIIC T 168°C Db



5.1 Ambient temperature range

Temperature class	Permissible ambient temperature range category 1/2-G-device		Permissible surface temperature category 2-D-device	
	Sensor / Connection cable	Oscillator	Sensor / Connection cable	Oscillator
T6	-55 °C ... +53 °C	-55 °C ... +61 °C	+71 °C	+91 °C
T5	-55 °C ... +65 °C	-55 °C ... +76 °C	+83 °C	+106 °C
T4	-55 °C ... +93 °C	-55 °C ... +79 °C	+111 °C	+109 °C
T3	-55 °C ... +145 °C	-55 °C ... +79 °C	+163 °C	+109 °C
T2, T1	-55 °C ... +150 °C	-55 °C ... +79 °C	+168 °C	+109 °C

Table 5-1) Category 1/2 device

Temperature class	Permissible ambient temperature range category 2-G-device		Permissible surface temperature category 2-D-device	
	Sensor / Connection cable	Oscillator	Sensor / Connection cable	Oscillator
T6	-55 °C ... +67 °C	-55 °C ... +61 °C	+85 °C	+91 °C
T5	-55 °C ... +82 °C	-55 °C ... +76 °C	+100 °C	+106 °C
T4	-55 °C ... +117 °C	-55 °C ... +79 °C	+135 °C	+109 °C
T3, T2, T1	-55 °C ... +150 °C	-55 °C ... +79 °C	+168 °C	+109 °C

Table 5-2) Category 2 device

The ambient temperature contains the self-heating of the measuring chain and therefore cannot be exceeded by external sources the measuring chain is mounted on.

5.2 Responsibility of the plant operator

It is the sole responsibility of the plant operator to ensure the correct design of the system under explosion protection conditions and its proper commissioning. The applicable explosion protection regulations and safety regulations must be observed and, where appropriate, verified by an authorised expert.

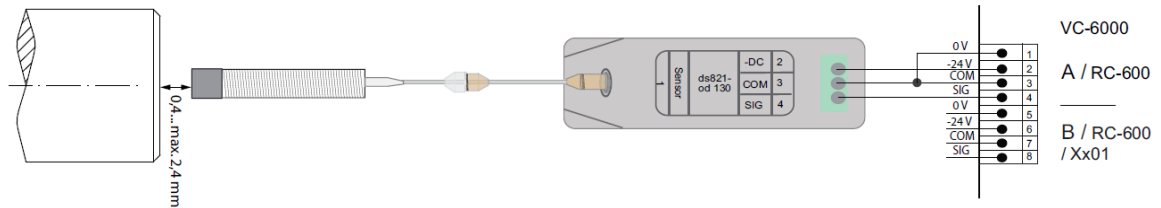
If the plant is constructed by a sub-contractor on behalf of the operator, the plant may be put into service only after the sub-contractor has produced a certificate to confirm that the installation has been carried out properly and professionally according to the applicable regulations.

The initial operation of explosion protected plants or plant components, as well as the recommissioning of plants after extensive changes or maintenance work, must be reported to the relevant authorities by the operator.

6 Functional check

Observe the safety information in chapter Safety!

6.1 Quick check



After installing the displacement sensor system, you can check the measured values using a digital multimeter ($R_i \geq 100 \text{ k}\Omega$). If the displacement sensor system is in correct operating condition, you will see the following values:

System length	Operating voltage U_B	Output signal U_{SIG}	Load resistance of the electronic diagnostic system R_L	Operating current I_B
5 m; 10 m	-24 V DC	-2 ... -18 V DC	>100 k Ω	-8.0 mA \pm 1 mA

6.2 Troubleshooting

If you the readings you receive deviate from these, proceed in accordance with the following recommended sequence:

Check the output signal

- The output signal $U_{SIG} < -18 \text{ V}$.
The distance between target and sensor tip lies outside the measuring range. Adjust the sensor so that it is nearer the target.
- The output signal $U_{SIG} > -2 \text{ V}$.
Possibly the distance between target and sensor tip is too small. Adjust the sensor to increase the distance to the target and re-check U_{SIG} . If the output signal does not change, the displacement sensor system is defective. Follow these additional steps.



Check the displacement sensor and the extension cable:

- Measure the supply voltage I_B (terminal 2) with extension cable and displacement sensor connected. Disconnect the cable connected to the driver (terminal 1) and measure supply voltage I_B again. If I_B changes by about 1.8 mA, the sensor cable and the displacement sensor are OK. Otherwise, there is a disruption in the displacement sensor or extension cable.
- Check the resistance of the extension cable and the displacement sensor:

$$\text{For a 5 m system:} \quad R_{\text{sensor}} + R_{\text{ext.}} = 8.7 \, \Omega \pm 0.5 \, \Omega$$

$$\text{For a 10 m system:} \quad R_{\text{sensor}} + R_{\text{ext.}} = 12.1 \, \Omega \pm 0.5 \, \Omega$$

Otherwise the displacement sensor or extension cable is defective.

Check the driver:

- Measure the voltage (terminal 2) at the driver without the displacement sensor connected and without cables.

$$\text{For a 5 m; 10 m system:} \quad I_B = -6.2 \, \text{mA} \pm 1 \, \text{mA}$$

Otherwise, the driver is defective.

7 Disassembly

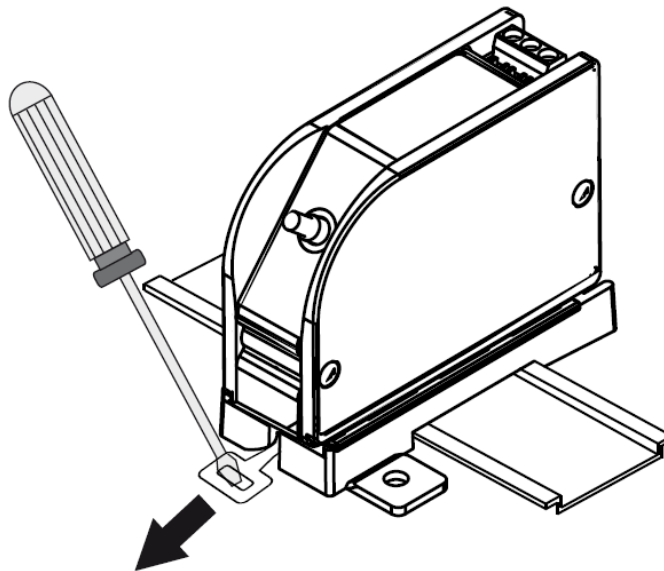
Observe the safety information in chapter Safety! Follow reverse order for disassembly:

7.1 Disconnecting the connecting plugs

see "Connection via extension cable" on page 18

7.2 Driver disassembly

7.2.1 Disassembling driver with assembly adapter on hat-rail



1. Use a screwdriver to pull the tab forward and vertically lift off the adapter containing the driver.
2. To remove the assembly adapter, push the adapter's tappet (opposite of mounting tab) downward and slide off the driver.

7.2.2 Disassembling driver with assembly adapter, screw-mounted

1. Remove screws.
2. Remove assembly adapter.

7.3 Replacing displacement sensor system components

1. Switch off voltage.
2. Replace the individual components with equivalent components.
3. Check that all parts of the displacement sensor system have been reconnected correctly.
4. Switch on voltage.



8 Disposal



The driver is subject to the Waste Disposal Act for Electrical and Electronic Equipment. Do not dispose of the device in the regular household waste and observe local waste disposal regulations. WEEE Reg. No. DE 69572330

9 Technical data

Observe the safety information in chapter "Safety"! For further technical specification we refer to our 2 mm series ds82x product specification BPS0138.

The following typical characteristics are valid under the following conditions unless otherwise specified: +18 °C to +27 °C ambient temperature, -24 V DC supply voltage, 100kΩ load at signal output, 42CrMo4 B&K Vibro reference material, -10 V Gap Voltage (approx. 1.4 mm measuring distance between sensor and measuring surface), all components are at their operating temperature.

9.1 Non-contacting displacement sensor system Series ds822 ATEX

Measuring dimension	Displacement
Measuring principle	Eddy-current process
Nominal system lengths	5 m, 10 m
Linear measuring range	2 mm (approx. 0.4 ... 2.4 mm separation from the object to be measured, corresponding to an output signal from ca. -2 VDC ... -18 VDC)
Colour code	blue
Electrical characteristics:	
Operating voltage (UB) The sensor must be connected to a SELV power supply with limited power that is secured with a current supply of < 2.5 A.	-24 VDC (-18 VDC ... -28 VDC)
Operating range	0 V ... (UB + 2 V)
Current consumption	max. 12 mA
Output impedance	50 Ω
Power Supply	max. 1A and short-circuit proof
Connector type	Coaxial Connector (SAA), push-pull self-latching
Sensor tip:	
Material	Ceramic
Diameter of the tip	Ø 7.2 mm (± 0.1 mm)
Cable:	
Cable type	Coaxial
Cable jacket and colour	FEP, blau
Impedance	95 Ω
Diameter	Ø 3,5 mm (± 0,15 mm)
Minimum bending radius	35 mm without cable protection 35 mm with steel protective conduit 75 mm with PTFE protective conduit ¹ 100 mm with corrugated tube protection

¹ The PTFE protective conduit may only be used outside the potentially explosive area or, to prevent static charging, must be fitted with a steel protective conduit or steel tube securely connected to the local potential equalisation (contact resistance = 1 MO). The steel protective conduit or steel tube must be galvanically connected to the sensor housing.



Ambient conditions:	
Sensor	
Degree of protection for the tip acc. to EN 60529	IP68 / 2 h at 10 bar ²
Pressure tightness (expected based on the design):	
Sensor tip	25 bar
Sensor and corrugated tube protection	25 bar (valid only for ds1002)
Driver	
Degree of protection for the driver acc. to EN 60529	IP20
Dimensions (WxHxD)	26.5 mm x 83 mm x 60 mm
Operating temperature ³	
Operating temperature range, sensor and cable	-55 °C ... +180 °C
Operating temperature range, driver	-55 °C ... +85 °C
Storage temperature ⁴	-20 °C ... +70 °C
Altitude	< 2000 m
Polution degree	3 used in the protection of the connections and cable clamps.
Humidity	98% non-condensing with protection of the plug connections and cable clamp

9.2 Dimensioning of assembly adapter

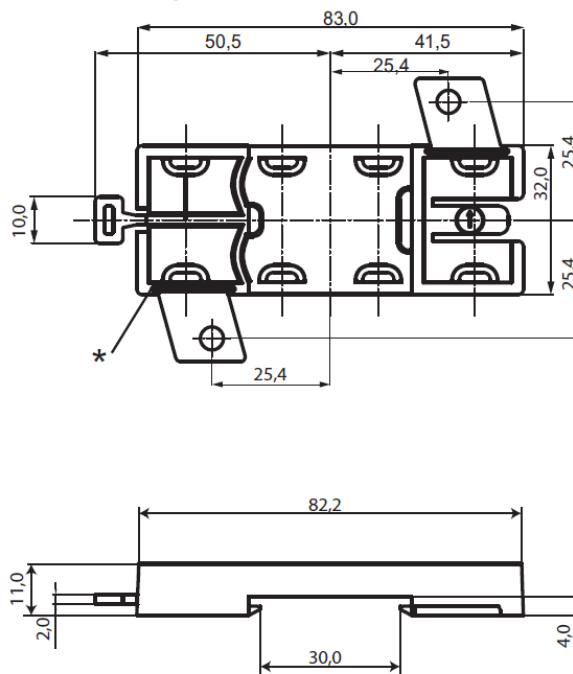


Figure 9-1) Dimensional drawing of assembly adapter

* Predetermined breaking point for separating the mounting tabs for mounting on hat-rails

² When stored or operated at a temperature of less than -30 °C, the protection class is reduced to IP65.

³ When used in hazardous areas, the ambient temperatures of the series ds822 ATEX must be observed, Responsibility of the plant operator.

⁴ When stored in original package

9.3 Environmental requirements

9.3.1 Reliability of the displacement sensor in different media



CAUTION!

Humidity or moisture inside the plug result in the displacement sensor system becoming defective. Seal the plug to prevent moisture from entering.

If the displacement sensor system is used in other media such as water, it can have an impact on the measurement results. For instance, an increase in the electrical conductivity of the surrounding medium will, as a matter of principle, cause an increase in the measurement error.



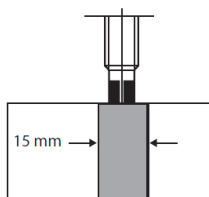
NOTE!

Without additional protective measures, the rear of the displacement sensor is not media proof. The values in the following table refer to the sensor tip only.

Material	Fraction	resistant	not resistant	Note	Test
Water		X			
Salt water	7.5 %	X		Suitable to a limited extent for the use of sea water; steel 1.4301	
Hexane		X			
Heptane		X			
Isopropanol		X			
Soap Solution		X			
Sulfuric acid	20%	-	X		70°C, 240 h
Ammonia	32%	X			25°C, 150 h
Nitric acid	15%	-	X		70°C, 240 h
Acetone		X			
Methylen Chloride			X ^a		
Methanol		X			
Salt spray test		X		Tested 28 days for conformance with DIN EN ISO 9227	
Hydrochloric acid			X		

9.3.2 Properties of the measuring track

The material characteristics of the object to be measured change the static and dynamic measurement recordings. In order to achieve reproducible measurements, we recommend to adjust the displacement sensor system to the respective shaft material.



The measuring track must be at least 15 mm wide and free of scratches and cavities. To achieve meaningful measurement results, the following values must be observed:

- Roughness Ra ≤ 3.6
- Roughness Rz, max < 5 µm^b

Please also consider the axial movement of the shaft.

^a in presence of moisture it can form a bond with hydrochloric acid. There is a risk of pitting corrosion.

^b for large areas of unevenness (2 x 2 mm)



9.3.3 Required clearances and minimum distances for displacement sensors

Non-contacting eddy-current displacement sensors produce a high frequency electromagnetic field. If electrically conductive material other than the object to be measured is located inside this field, the measurement result will be distorted.

When assembling your non-contacting displacement sensors, strictly observe the clearances and minimum distances illustrated in the following drawing.



NOTE!

If these clearances and minimum distances must be lowered for design purposes, please contact Brüel & Kjær Vibro.

	<p>Sensor tip extending</p>		<p>Distance to the shaft shoulder sensor, parallel to electrically conductive material</p>
	<p>Sensor tip flush</p>		<p>Required minimum diameter of the shaft for one sensor</p>
	<p>Distance to a shaft end > 100 % cover</p>		<p>Required minimum diameter of the shaft for two sensors</p>
	<p>Distance to the shaft shoulder sensor, parallel to electrically conductive material</p>		<p>Parallel arranged sensors</p>

9.4 Transfer characteristics

The characteristic curves shown in the measurement report are created under the stated environmental conditions and with the stated target material. When you order a complete displacement sensor system, you will receive an individual measurement report which may deviate from the illustrated typical transfer function.

9.4.1 Characteristic curve for distance measurement [GAP / V]

The transfer characteristic describes the interdependence of signal voltage and the distance between sensor tip and the object to be measured.

- Y-axis:GAP [V]X-axis : Displacement [mm]

9.4.2 Characteristic curve for vibration measurement [ISF / mV/μm]

The displacement sensor system has a sensitivity of -8 mV/μm (203 mV/mil) with reference to B&K Vibro reference material 42CrMo4 (Material-No. 1.7225) according to DIN 17 200, corresponding to AISI/SAE 4140.

The ISF (Incremental Scale Factor) describes the accuracy of the sensitivity (ISF error / %) in dependence on the separation.

- Y-axis:ISF [mV / μm]X-axis : Displacement [mm]

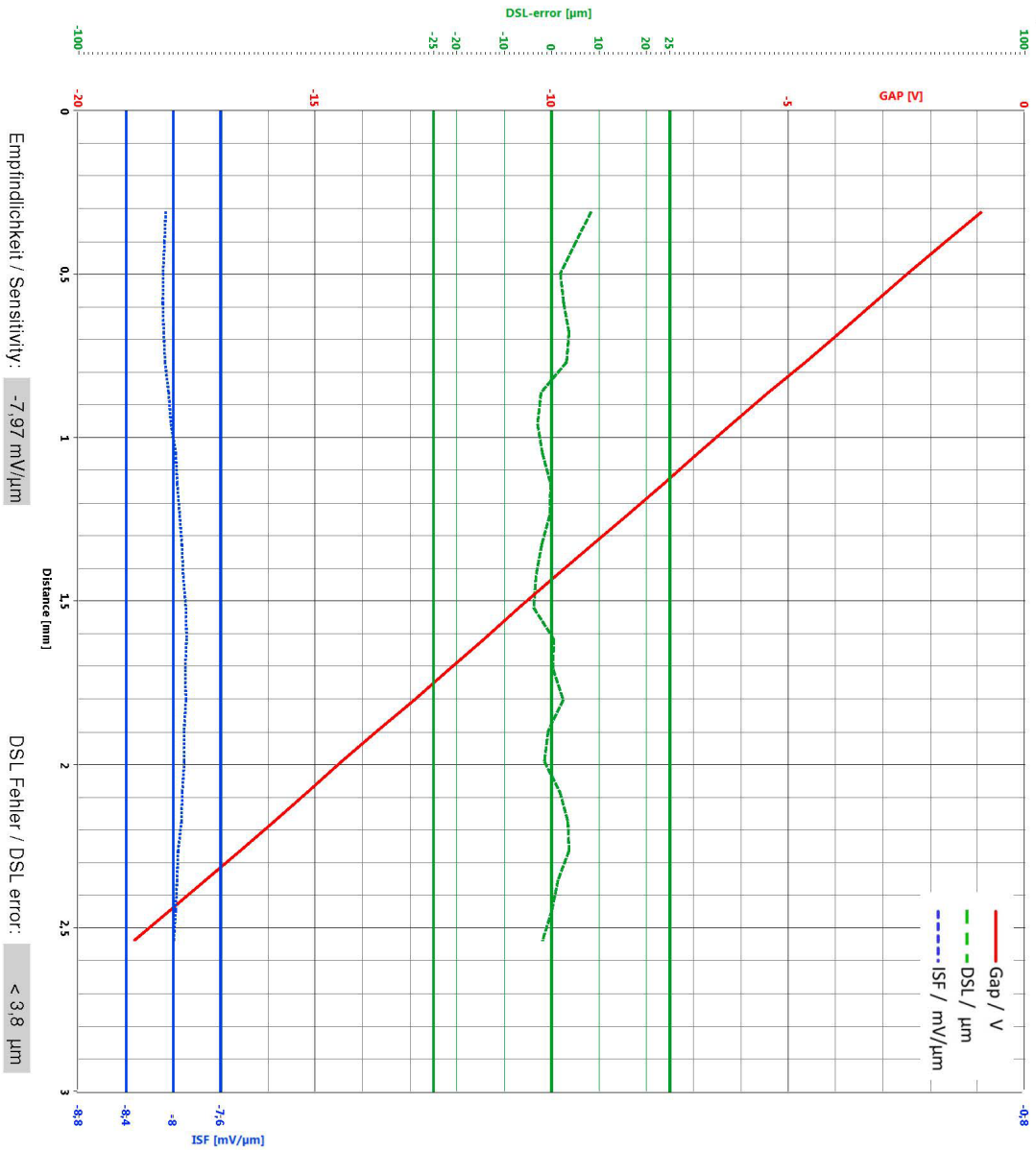
9.4.3 Deviation from best fit straight line [DSL / μm]

DSL (DSL/μm = Deviation from best fit Straight Line) describes the deviation from an ideal characteristic curve of the distance measurement.

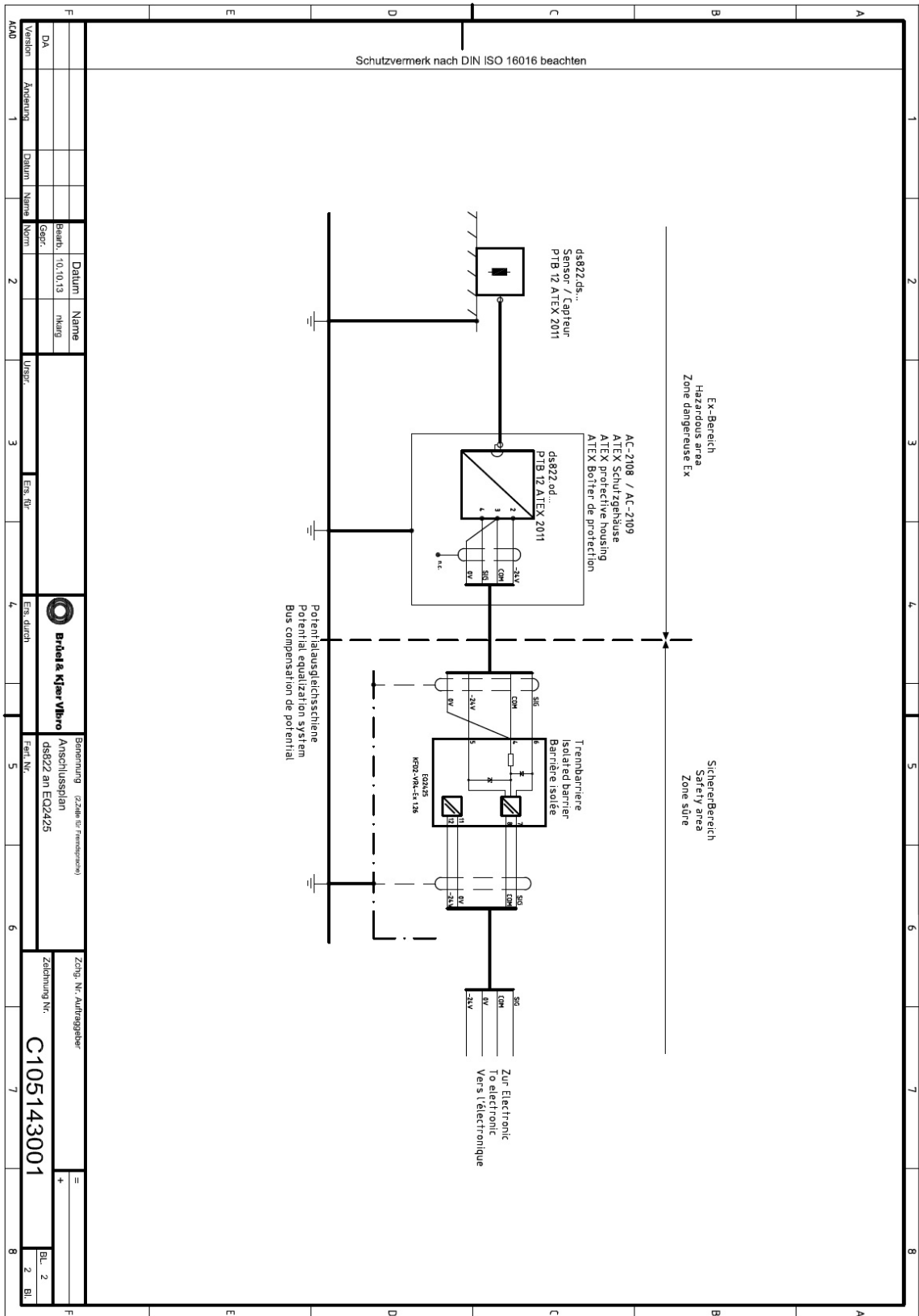
- Y-axis:DSL-error [μm]X-axis: Displacement [mm]



10 Measurement report



Schwingwegaufnehmer / Displacement sensor:	ds822.ds1001
Seriennummer / Serial no.:	00000172
Treiber (Oscillator/Demodulator) / Driver (Oscillator/Demodulator):	ds822.od110
Seriennummer / Serial no.:	04000021
Anschlusskabel / Connection cable:	ds822.ec100/45
Seriennummer / Serial no.:	00000172
Temperatur / Temperature:	24 ± 3 °C
Luftfeuchtigkeit / Humidity:	<70% rel
Zielmaterial / Target material:	42CrMo4
Fertigungsantrag / Manufacturing order no.:	81030780
Geprüft von / Tested by:	hwondung
Datum / Date:	05.03.2015 13:48



12 EU Declaration of Conformity



Brüel & Kjær Vibro
A member of the NSK Group

EU-Konformitätserklärung / *EU- Declaration of conformity*

Hiermit bescheinigt das Unternehmen / *The company*

Brüel & Kjær Vibro GmbH
Wittichstraße 6
D-64295 Darmstadt



die Konformität des Produkts / *herewith declares conformity of the product*

Wegsensor -System / Displacement Sensor System

Typ / *Type*

ds822

mit folgenden einschlägigen Bestimmungen / *with applicable regulations below*
EU-Richtlinie / *EU-directive*

2014/30/EU EMV-Richtlinie / *EMC-Directive*

2014/34/EU ATEX-Richtlinie / *ATEX-Directive*

2011/65/EU + (EU) 2015/863 Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten/ *EU Directive for the restriction of the use of certain hazardous substances in electrical and electronic equipment*

Angewendete harmonisierte Normen / *Harmonized standards applied*

EN IEC 61326-1: 2021
EN IEC 60079-0:2018; EN 60079-11:2012 ; EN 60079-26:2015
EN IEC 63000:2018

EU-Baumusterprüfbescheinigung / *EU-Type Examination Certificate*
PTB 12 ATEX 2011 Ausgabe 3 / *Issue 3* erstellt von / *created from*
Physikalisch-Technische Bundesanstalt (Nummer / *Number 0102*)

Bereich / *Division*
Brüel & Kjær Vibro GmbH

Unterschrift / *Signature*
CE-Beauftragter / *CE-Coordinator*

Ort/Place **Darmstadt**
Datum / *Date* **20.03.2024**


(Niels Karg)

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