



Brüel & Kjær Vibro

A member of the NSK Group

B&K vibro

Instructions

ds822

Displacement Sensor System

Displacement measuring range 2 mm

ds822.mc101



Retain for subsequent use

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Instructions - **ds822 (2 mm)**

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BG Внимание!

Инструкциите за експлоатация трябва да бъдат прочетени и разбрани, преди продуктът да бъде пуснат в експлоатация. Ако е необходимо, инструкциите за експлоатация в липсващия езика на ЕС от следния адрес: www.bkvibro.com

CS Pozor!

Před uvedením výrobku do provozu je nutné přečíst si návod k provozu a porozumět mu. V případě potřeby si návod k provozu v chybějící řeči EU vyžádejte na následující adrese: www.bkvibro.com

DA Giv agt!

Før produktets ibrugtagning skal brugsanvisningen læses og forstås! Brugsanvisningen kan bestilles på et EU-sprog ved henvendelse til: www.bkvibro.com

DE Achtung!

Vor Inbetriebnahme des Produktes muss die Betriebsanleitung gelesen und verstanden werden. Bei Bedarf die Betriebsanleitung in fehlender EU-Sprache unter folgender Adresse anfordern: www.bkvibro.com

EL Προσοχή!

Προτού λειτουργήσετε την συσκευή, πρέπει να διαβάσετε και να καταλάβετε το εγχειρίδιο. Εάν χρειάζεσθε εγχειρίδιο σε κάποια άλλη Ευρωπαϊκή γλώσσα, αποτανθείται στην εξής διεύθυνση : www.bkvibro.com

EN Attention!

Before operating the product, the manual must be read and understood. If necessary, you may order the manual in the missing European Union language under the following address: www.bkvibro.com

ES ¡Atención!

Antes de utilizar este producto debe leer y comprender el manual. Si necesita el manual en otro idioma de la Unión Europea, puede pedirlo en la siguiente dirección: www.bkvibro.com

ET Tähelepanu!

Enne toote kasutuselevõtmist tuleb kasutusjuhend läbi lugeda ja sellest aru saada. Vajaduse korral on kasutusjuhend puuduvas ELi keeles järgmisest aadressist: www.bkvibro.com

FI Huomio!

Ennen käyttöönottoa tulee lukea ja ymmärtää käyttöohjeet. Kun tarvitset käyttöohjeita muilla EU-kielillä ota yhteys seuraavaan osoitteeseen: www.bkvibro.com

FR Attention !

Il faut avoir lu et assimilé le manuel avant d'utiliser le produit. Si nécessaire, vous pouvez commander le manuel dans la langue qui manque à l'adresse suivante : www.bkvibro.com

GA Contúirt!

Sula gcuirfear an táirge i bhfeidhm, ní mór na teoracha oibriúcháin a léamh agus a thuiscint. Más gá, iarr na teoracha oibriúcháin sa teanga AE atá ar iarraidh ón seoladh seo a leanas: www.bkvibro.com

HR Opasnost!

Prije puštanja proizvoda u rad potrebno je pročitati i razumjeti upute za uporabu. Ako je potrebno, zatražite upute za uporabu na EU jeziku koji nedostaje na sljedećoj adresi: www.bkvibro.com

HU Figyelem!

A termék üzembe helyezése előtt az üzemeltetési utasítást el kell olvasni, és meg kell érteni. Szükség esetén hiányzó EU-nyelven az üzemeltetési utasítást, az alábbi címen lehet igényelni: www.bkvibro.com

IT Attenzione!

Il manuale deve essere letto e compreso prima della messa in servizio del prodotto. Se necessario, il manuale mancante nella lingua Europea desiderata, è ordinabile al seguente indirizzo: www.bkvibro.com

LT Dėmesio!

Prieš pradėdant naudoti gaminį, būtina perskaityti ir suprasti naudojimo instrukciją. Jei reikia, naudojimo instrukcijas, esančias trūkstamos ES kalba iš šio adreso: www.bkvibro.com

LV Uzmanību!

Pirms izstrādājuma nodošanas ekspluatācijā ir jāizlasa un jāizprot lietošanas instrukcija. Vajadzības gadījumā lietošanas instrukcijas, kas nav iekļautas ES valodā no šādas adreses: www.bkvibro.com

MT Periklu!

Qabel ma jithaddem il-prodott, l-istruzzjonijiet tat-thaddim għandhom jinqraw u jinftiehm. Jekk meħtieġ, itlob l-istruzzjonijiet operattivi fil-lingwa nieqsa tal-UE mill-indirizz li ġej: www.bkvibro.com

NL Attentie!

Voor ingebruikname van het produkt dient de gebruiksaanwijzing gelezen en begrepen te zijn. Bij behoefte aan een gebruiksaanwijzing in een ontbrekende EU-taal is deze op onderstaand adres aan te vragen: www.bkvibro.com

PL Uwaga!

Przed rozpoczęciem użytkowania urządzenia prosimy o uważne zapoznanie się z instrukcją obsługi. Instrukcje obsługi dla naszych urządzeń dostępne są we wszystkich oficjalnych językach Unii Europejskiej. Brakujące egzemplarze można zamawiać pod wskazanym poniżej adresem: www.bkvibro.com

PT Atenção!

Antes de usar o produto é necessário ler a documentação e entendê-la. Se for necessário é favor pedir a documentação na língua europeia que necessita dirigindo-se a está direção: www.bkvibro.com

RO Atenție!

Instrucțiunile de utilizare trebuie citite și înțelese înainte de punerea în funcțiune a produsului. Dacă este necesar, instrucțiunile de utilizare din manualul de utilizare care lipsește limba UE de la următoarea adresă: www.bkvibro.com

RU Внимание!

Перед работой с изделием необходимо прочесть и усвоить инструкцию по эксплуатации. Если потребуется, инструкцию по эксплуатации на отсутствующем в комплекте языке можно заказать на следующем интернет-сайте: www.bkvibro.com

SK Pozor!

Pred uvedením zariadenia do prevádzky si treba dôkladne prečítať prevádzkový návod a treba jeho obsah správne pochopiť. V prípade potreby si prevádzkový návod vyžiadajte v príslušnom jazyku EÚ na nasledovnej adrese: www.bkvibro.com

SL Pozor!

Navodila za uporabo je treba prebrati in razumeti, preden izdelek začnete uporabljati. Če je potrebno, je treba navodila za uporabo v manjkajočem jeziku EU na naslednjem naslovu: www.bkvibro.com

SV Givakt!

Före idrifttagning av produkten måste bruksanvisningen läsas och förstås. Om nödvändigt kan bruksanvisningen beställas i det saknade EU-språket under följande adress: www.bkvibro.com

ZH 注意！

操作产品之前，必须阅读并理解本手册。如有必要，请通过以下网址预订所需语言版本的手册：www.bkvibro.com



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1 Safety

These instructions are part of the product. Read the instructions carefully before using the product and retain the manual for future use.

1.1 Pictograms and their Meaning



DANGER!

"DANGER" refers to a directly hazardous situation which, if not prevented, will lead to death or serious injuries.



WARNING!

"WARNING" refers to a potentially hazardous situation which, if not prevented, may lead to death or serious injuries.



CAUTION!

"CAUTION" refers to a potentially hazardous situation which, if not prevented, may lead to slight to moderate injuries.

NOTICE!

"NOTICE" refers to a situation which, if not prevented, may lead to material damage.



INFO

"INFO" contains general information about the product.

1.2 Qualifications of the Operating Company

Only competent and authorized personnel are approved for any work related to our devices (for ATEX devices in accordance with EN 60079-14). This includes the following tasks among others:

Installation and setup

Installation and setup involve mainly work on the electrical equipment. These tasks may only be carried out by qualified electricians or by trained persons under the direction and supervision of a qualified electrician in accordance with electrical engineering rules and regulations.

Change to the device specification

A change in the device specification affects the monitoring process for stationary systems as well as the metrological sequence for portable measuring devices.

1.3 Designated Use

The eddy current displacement sensor system is designed exclusively for measuring mechanical distances and vibrations and is used mainly to monitor the status of slide bearings or rotating shafts indoors and outdoors. The measurement chain can be used indoors and outdoors if the driver is installed in a suitable protective housing.

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

- The sensor must only be used for the purpose specified in the data sheet. Any use beyond this is considered non-designated use. Brüel & Kjær Vibro shall not be liable for damage resulting from non-designated use.
The risk shall be borne solely by the user.
- Mounted sensors must not be used as a climbing aid (step).
- The device must only be exposed to the permitted ambient conditions. These are stated in the technical specification.
- The electrical equipment must be maintained regularly. Deficiencies such as loose connections and faulty plug connectors, etc. must be remedied immediately.

Hot surfaces

- Sensors or cables can be operated within wide ambient temperature ranges as specified in the instructions. This may result in them becoming hot due to heat transferred from adjacent housing walls and causing burns.
- Devices, sensors or cables can take on dangerous temperatures due to assembly on external sources of heat or cold (machine parts, etc.). Among other hazards, this may result in burns upon contact.

1.3.1 Recommendation to the Operating Company

If use of the device in combination with machines or system parts could result in hazards for which Brüel & Kjær Vibro is not responsible, safety instructions or warnings must be issued and circulated, understood and confirmed by the affected personnel.



WARNING!

If the device is installed in a machine or is intended to work together with a machine, setup is prohibited until such time as the machine in which the device is installed meets the provisions of the relevant EU directives.

Personnel must be trained in accordance with IEC 60079-14. Furthermore, personnel must be familiar with the general provisions for the installation of electrical systems and the relevant national regulations for setting up systems with explosion protection.

1.3.2 Prohibition against Unauthorized Changes

No changes may be made to the device or accessories either in terms of design or safety without our explicit consent. Any change shall exclude us from liability for resulting damage.



1.4 Restrictions

The eddy current displacement sensor system may only be used within the specifications defined in the technical data.

Restrictions in the instructions

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

1.5 Exclusion of Liability

Compliance with this technical documentation is a fundamental precondition for proper and safe operation of the product. We assume no liability for personal injury or property and financial damage incurred as a result of failure to observe this technical documentation. Liability for material defects is also excluded in this case.

1.6 Explosion Protection

The measurement chain is suitable for use in a potentially explosive environment.
For details see section 2 Explosion Protection.

1.7 Information Related to Delivery and Transport

NOTICE!

Protect the displacement sensor system during storage and transport from possible impact, dust and dirt. Use the protective rubber cap included with delivery to protect the sensor tip.

1.8 Information Related to Assembly and Disassembly



WARNING!

Danger of injury due to moving machine parts. Switch off your system before installing the displacement sensor.



CAUTION!

Never put damaged products in operation. Please report damage immediately.

NOTICE!

To ensure that the displacement sensor system functions properly, do not modify the physical length of any of the cable components of the system.
Note in addition that the components used (displacement sensor and connection cable) are added to a nominal system length of 5 m or 10 m.

NOTICE!

The driver housings must not come in contact with each other or any other conductive parts.

NOTICE!

Contact with live components can damage the driver. Do not establish an electrical connection or turn on the voltage until all parts of the displacement sensor system are correctly connected to each other.

Assembly of the sensor

NOTICE!

The ceramic sensor tip is sensitive to impact. The displacement sensor may only be transported and stored with the protective rubber cap included with delivery. Always keep the protective rubber cap so you will be able to use it again at a later time.
To prevent damage make certain, especially during assembly and operation of the machine, that the sensor tip does not come in contact with other objects.
Loose ceramic particles can lead to damage inside the machine.
Check the tip of the sensor for damage every time before assembly. Faulty sensors must not be mounted.

Assembly, disassembly or replacement of components

NOTICE!

Never pull on the cable to open the connection. This can cause the cable and ends of the connector to be damaged.



2 Explosion Protection



CAUTION!

1. The equipment shall only be used in the "increased safety" 'ec' version in an area of at least pollution degree 2, as defined in IEC 60664-1.
2. The equipment shall be installed in the "increased safety" 'ec' version in an enclosure that provides a minimum ingress protection of IP54 in accordance with IEC 60079-0.
3. Transient protection shall be provided that is set at a level not exceeding 140 % of the peak rated voltage value at the supply terminals to the equipment in the "increased safety" 'ec' version.

Use in a potentially explosive environment in accordance with directive 2014/34/EU
EU type examination certificate (www.bkvibro.com)

Supply in ignition protection type	Intrinsic safety (SELV) Ex ia only for connection to a certified intrinsic safety circuit.	
Maximum values Ex i	$U_i = 28 \text{ V}$ $I_i = 140 \text{ mA}$ $P_i = 840 \text{ mW}$	$L_i = \text{Negligibly small}$ $L_i = 3.8 \text{ mH (sensor side)}$ $C_i = 12 \text{ nF}$ $C_i = 76 \text{ nF (sensor side)}$
Maximum values Ex ec	$U_N = 24 \text{ V DC}$ $U_M = 253 \text{ V DC}$ $I_N = 12 \text{ mA}$	

ATEX



Marking	II 1/2 G Ex ia IIC T6...T1 Ga/Gb II 2 G Ex ia IIC T6...T1 Gb II 2 D Ex ia IIIC T71 °C...T168 °C Db II 3 G Ex ec IIC T6...T1 Gc
Reference to standards	EN IEC 60079-0:2018 EN IEC 60079-7:2015 / A1:2018 EN 60079-11:2012 EN 60079-26:2015
EU type examination certificate	PTB 12 ATEX 2011 X

IECEx

Marking	Ex ia IIC T6...T1Ga/Gb Ex ia IIC T6...T1 Gb Ex ia IIIC T71 °C...T168 °C Db Ex ec IIC T6...T1 Gc
Reference to standards	IEC 60079-0:2017 IEC 60079-7:2015 + AMD1:2017 IEC 60079-11:2012 + Cor. 2012 IEC 60079-26:2014
Certificate	IECEx PTB 13.0010

Applies only to the ds822 variant identified for EAC!

EAC Ex



Marking	Ga/Gb Ex ia IIC T6...T1 X 1Ex ia IIC T6...T1 Gb X Ex ia IIIC T168 °C Db
Reference to standards	TP TC 012/2011
Certificate	RU-C-DE.AX58.B.02032/21

Applies only to the ds822 variant identified for CCC!

CCC Ex



Marking	Ex ia IIC T1...T6 Ga/Gb Ex ia IIC T1...T6 Gb Ex ia IIIC T71 °C...T168 °C Db
Reference to standards	GB/T 3836.1-2021 GB/T 3836.4-2021
Certificate	2022322315004674

Applies only to the ds822 variant identified for UL!

UL HazLoc



Marking	Class I, Division 1, Groups A-D Class II, Division 1, Groups E-G
Reference to standards	UL 913 CAN/CSA C22.2 No. 157-92
File number	E470442



2.1 Ambient Spaces

Temperature class	Permitted ambient temperature range for category 1/2 G Ex i device		Permitted surface temperature for category 2 D Ex i device	
	Sensor / extension cable	Oscillator	Sensor / extension 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 2-1) Category 1/2 device

Temperature class	Permitted ambient temperature range for category 2 G Ex i device; for category 3 G Ex ec device		Permitted surface temperature for category 2 D Ex i device	
	Sensor / extension cable	Oscillator	Sensor / extension 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 2-2) Category 2 device

The ambient temperature includes self-warming of the measurement chain and must not be exceeded by external sources on which the measurement chain is mounted.

2.2 Responsibility of the Company Operating the System

The company operating the system is solely responsible for the correct design of the electrical system under explosion protection conditions and for correct setup. The applicable explosion protection regulations and safety requirements must be observed and if appropriate verified by a technical expert.

If the system is set up by a sub-contractor acting on behalf of the operating company, the system must not be placed in operation until after the sub-contractor has confirmed proper installation in accordance with applicable requirements by way of an installation certificate.

The initial setup of explosion-protected systems or system parts as well as a return to service after major modifications or maintenance work must be reported to the relevant responsible regulatory authorities by the operating company.

3 Product Description

3.1 General Function

The displacement sensor systems of the ds82x family are based on the non-contacting eddy current measurement method. The distance between the tip of the displacement sensor and an electrically conductive surface is measured and forwarded to a subsequent monitoring electronics system by a proportional voltage signal.

This makes it possible, within the scope of application of machine monitoring, to measure the status of rotating shafts.

3.2 Components of the Displacement Sensor System

The eddy current displacement sensor system consists of the following components: displacement sensor (including integrated cable), optionally a separate connection cable and the driver (oscillator / demodulator).

The name of a component is made up of the sensor name ds822 and the component designation:

mc	= complete system
ds	= displacement sensor
ec	= connection cable
od	= driver

The series is available in system lengths of 5 m and 10 m.

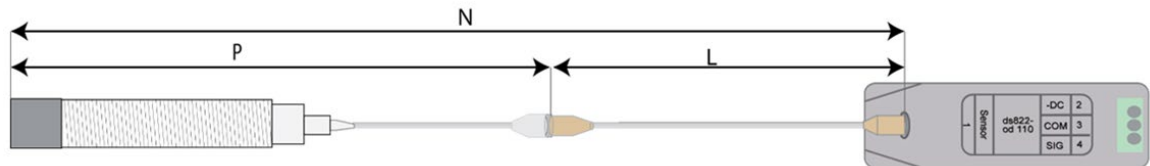


- 1 ds822.od11x driver
- 2 ds822.ec10x connection cable
- 3 Color coding: blue designates a measuring range of 2 mm
- 4 Assembly adapter
- 5 Displacement sensor ds822.ds100x

Figure 3-1) Example of non-contacting displacement sensor system series ds822



3.3 Total Nominal Length of the Displacement Sensor System



The nominal system length (N) refers to the length of the displacement sensor components (P) and the connection cable (L). The optional connection cable is always needed when the length of the displacement sensor is 0.5 m or 1.0 m and has to be completed by means of the additional connection cable to reach the nominal system length of 5 m or 10 m.

If the displacement sensor already has the nominal system length, no additional connection cable is needed. Then the displacement sensor system will consist of only the displacement sensor and driver as components.

This example shows correct installation for a nominal length N of 5 m:

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

This example shows incorrect installation for a nominal length N of 5 m:

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

N should be = 5.0 m. The total nominal length is not observed.

4 Delivery, Storage and Transport

4.1 Delivery

When the packaging is delivered, check for damage and make certain that your delivery is complete.

Delivery components	Displacement sensor	Connection cable	Driver	Complete displacement sensor system
Displacement sensor	X			X
2 protective caps	X			X
2 nuts ^a	X			X
1 sealing ring ^b	X			X
Connection cable ^c		X		X
2 protective caps		X		X
Driver			X	X
Assembly adapter			X	X
Acceptance inspection certificate in accordance with DIN EN 10204	X	X	X	X
Measurement protocol (factory calibration)				X
Instructions	X	X	X	X

Table 4-1) Components included with delivery

4.2 Storage and Transport

We recommend storage in the original packaging. The following conditions apply:

- Stacking height: max. 6 packages one on top of the other
- Storage temperature: -20 °C to +70 °C
- Relative humidity: max. 75 %

Packaging dimensions

Complete displacement sensor system (max. 3 parts):

- Inner dimension (WxDxH): 235 x 165 x 180 mm

With individual parts (only 1 or 2 parts):

- Inner dimension (WxDxH): 235 x 165 x 125 mm

^a Not present on ds1003 (rear-mountable sensor).

^b Only present on ds1003, (rear-mountable sensor).

^c Not present if the length of the displacement sensor with integrated cable is equivalent to the nominal system length of 5 m or 10 m.



5 Installation

Follow the sequence below for assembly of the displacement sensor system:

- 5.1 Displacement Sensor Assembly
- 5.2 Mounting the Driver (Oscillator/Demodulator)
- 5.3 Connecting the Components Together
- 5.4 Setup of the Measurement Chain and Displacement Sensor
- 5.5 Electrical Connection

Preconditions

- The displacement sensor system is complete (see "**Table 4-1**) Components included with delivery" on page 15).
- The total nominal length of the measurement system is not underrun or exceeded.
- The necessary free spaces and the width of the measuring track are taken into consideration (9.3.2 Characteristics of the Measuring Track and 9.3.3 Necessary Free Spaces and Minimum Distances for Displacement Sensors).
- The sensitivity of the target materials is known.

Use as category 1/2 device



CAUTION!

If the measurement chain is used as a category 1/2 device (sensor in zone 0 and driver in zone 1), the line routing between zone 0 and zone 1 must be designed to be gas-tight (gas-tight partition wall!) with protection type IP67 (EN 60529).

If an isolating transducer is used, the Com path with which the driver housing is connected must be grounded with a resistance of $10^9 \Omega$.

- For use as IIC operating equipment, the driver must be installed in an ATEX protective housing and only a moist cloth may be used for cleaning to prevent static charging on the nameplate.



CAUTION!

To prevent static charging, all sensor lines within zone 0 must be equipped with a protective steel conduit or steel pipe, which must be securely connected with the local equipotential bonding (contact resistance $\leq 1 \text{ M}\Omega$). If static charging on the driver is possible and the measurement chain is operated simultaneously as an isolating transducer, the driver must be protected against static charging by an additional housing or the driver must be grounded with a resistance of $\leq 10^9 \Omega$.

- The protective steel conduit or steel pipe must be electrically connected with the sensor housing.

Use as category 2 device



CAUTION!

If the sensor cable is used in zone 1 and the requirements of explosion group IIC must be fulfilled, it must be protected against electrostatic charging with a protective steel conduit or steel pipe.

- The protective steel conduit or steel pipe must be electrically connected with the sensor housing.

If the sensor cable is used in zone 1 and the requirements of explosion group IIB or IIA must be fulfilled, mounting is permitted without an additional protective steel conduit or steel pipe.

Recommended accessories for problem-free operation

- Install the driver in a housing/control cabinet. Protective driver housing AC-2108 for up to 3 drivers and AC-2109 for up to 6 drivers are recommended for this purpose.
- Use a shielded signal line (preferably AC-1114) between driver and downstream electronics. The connection cable must be heat-resistant up to at least +85 °C.
- Lay the sensor line from the machine housing up to the protective driver housing in the protective steel conduit.
- Lay the signal line and sensor line so they are at least 1 m away from other energy or control lines.



5.1 Displacement Sensor Assembly

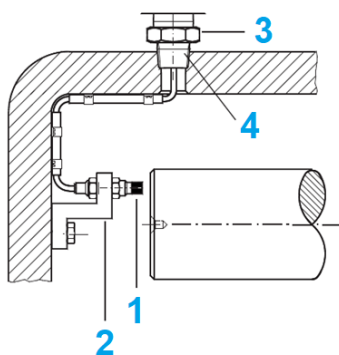
5.1.1 Forward-Mountable Displacement Sensor

Forward-mountable displacement sensors come with two nuts. These nuts can be used to fix the displacement sensor in place after adjustment (5.4 Setup of the Measurement Chain and Displacement Sensor). Depending on the application, forward mounting can be done within a machine, outside of a machine or through the machine housing. To prevent measuring errors, we recommend assembly with the aid of a suitable sensor holder in all cases.

Mount the sensor holder in a place where it will not be moved relative to the measurement object while the machine is in operation.

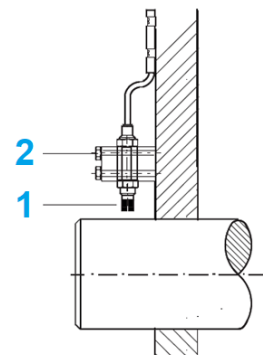
1. Remove the protective cap on the sensor tip.
2. Use a sensor holder suitable for the relevant type of mounting to fasten the displacement sensor in place.
3. Position the sensor so that it is vertical to the measuring track.
4. To prevent damage, make sure that the sensor tip does not come in contact with the measurement object. Adjust the sensor by displaying the measured Gap voltage.
5. Lay the connection cable. We recommend using a suitable protective house to fix the cable clamps in place.
6. For mounting within the machine:
Seal the housing opening by means of an enclosure feed-through so that the medium (e.g. gas or oil) cannot penetrate out from inside the machine.
We assume no liability for improper installation.

Sensor mounting within the machine housing



- 1 Displacement sensor
- 2 Sensor holder
- 3 Enclosure feed-through
- 4 Seal threads

Sensor mounting outside of the machine housing



5.1.2 Reverse-Mountable Displacement Sensor

The reverse-mountable displacement sensor is mounted with the aid of a sensor holder, preferably with integrated enclosure feed-through.

- Use a sensor holder suitable for the relevant type of mounting to fasten the displacement sensor in place. We recommend using holder AC-3101.

5.2 Mounting the Driver (Oscillator/Demodulator)

Mounting optionally:

- with assembly adapter on a DIN rail
- with assembly adapter using screw mounting on a fixed surface

The driver must be mounted so it is electrically isolated in a protective housing using the mounting foot because the driver housing is part of the intrinsically safe circuit. A distance of more than 2 mm must be maintained between the driver housing and the neighboring drivers or other conductive housing parts. This can be achieved by using the mounting foot.



CAUTION!

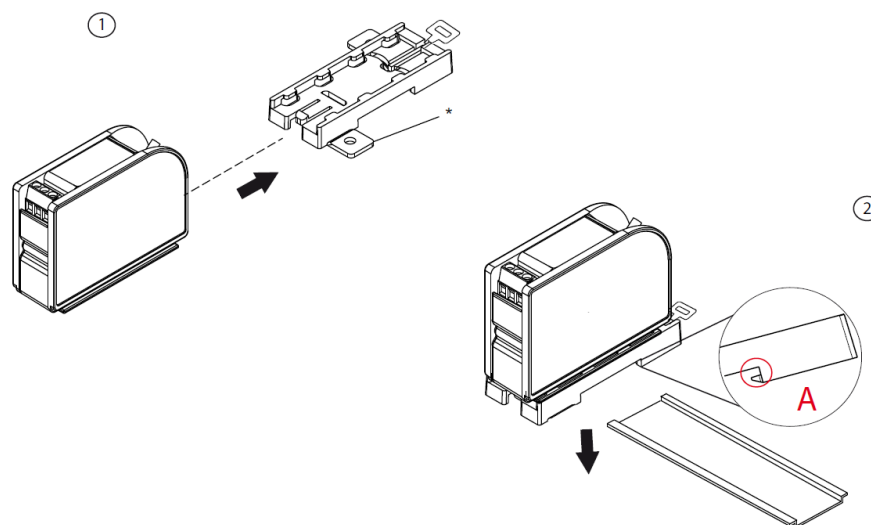
The oscillation/driver may only be used in areas with at least contamination level 2 in accordance IEC 60664-1.
The oscillation/driver must be installed in a protective housing with at least ingress protection IP54 in conformity with IEC 60079-0.



CAUTION!

The driver is category 2 and category 3 operating equipment.
As category 2, the driver must always be set up outside of zone 0. In a potentially explosive environment, it may only be connected to an intrinsically safe supply current (Ex ia IIC).
As a category 3 G device in ignition protection type Ex ec, the entire measuring chain may only be operated in zone 2.

5.2.1 DIN Rail Mounting



*Mounting tabs for screw mounting can be detached at the predetermined breaking point for DIN rail mounting.



1. Snap off the two tabs for screw mounting and slide on the driver with assembly adapter for fastening (Figure ①).
2. To fasten the assembly adapter onto a DIN rail (DIN EN 60715 TH35):
Place the rear part of the assembly adapter (see upper Figure, item A) on the DIN rail guide and press down the driver with the adapter until the adapter locks in place (Figure ②).

After the driver is installed, secure it against slipping with DIN rail holders at each end. The DIN rail holders are included with delivery of our recommended protective housings AC-2108 for up to 3 drivers and AC-2109 for up to 6 drivers.

5.2.2 Screw Mounting

**INFO**

The screws for mounting are not included in the scope of delivery.

A suitable surface measuring at least 7 cm x 10 cm is required for mounting:

- Solid metal: 2 screws M4x12 A2-70
..... 2 washers A2, internal diameter: 4.5 mm
..... thread depth: 12 mm
- Steel: 2 sheet-metal screws A2
..... 2 washers A2, internal diameter: 4.5 mm
..... core diameter: 3.3 mm
..... steel thickness: 1.2 ... 1.4 mm
- Aluminum: 2 sheet-metal screws A2
..... 2 washers A2, internal diameter: 4.5 mm
..... core diameter: 3.2 mm
..... aluminum thickness: 1.2 ... 1.4 mm

1. Mark the spots for the two boreholes (section 9.2 Dimensioning of Assembly Adapter).
2. Drill two mounting holes.
3. Connect the assembly adapter to the driver.
4. Using two screws and washers, screw the assembly adapter into the mounting surface with the mounting tabs and secure it
(e.g. LOCTITE® 243 medium-strength, LOCTITE® 270 high-strength).
5. Cross-tighten the screws.

5.3 Connecting the Components Together

Connection options:

- Connection via connection cable
- Direct connection

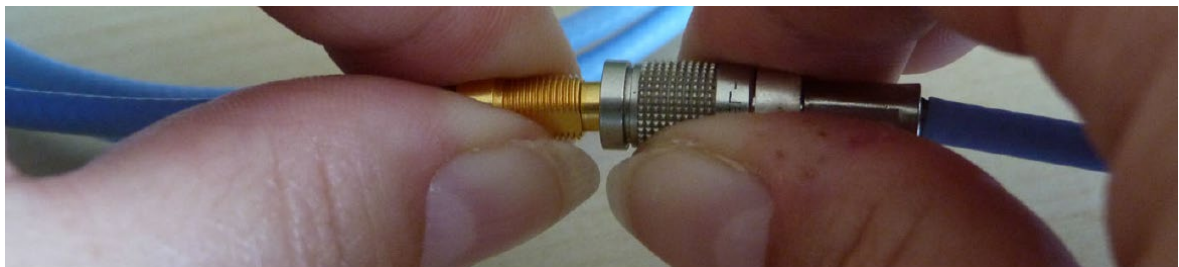


CAUTION!

The intrinsically safe measuring circuit is applied to the connector housings. Before setup, the plug connection to the extension cable must be suitably insulated. If cables are routed in narrow protective hose or pipe systems, the plug connector can also be insulated with a suitable kit AC-108.

5.3.1 Joining and Disconnecting the Plug Connection

The connector ends of the displacement sensor and connection cable consist of a self-locking plug connection. They are connected by pushing them together rather than screwing them together.



Follow the steps below to join the plug connection together:

1. Hold one of the two connector ends firmly in each hand.
2. Push the two plug connections into each other until you hear them lock together.

Follow the steps below to release the plug connection:

1. Hold one of the two connector ends firmly in each hand.
2. To release the plug connection, pull on the silver ribbed part of the connector.

5.3.2 Connection via Connection Cable

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

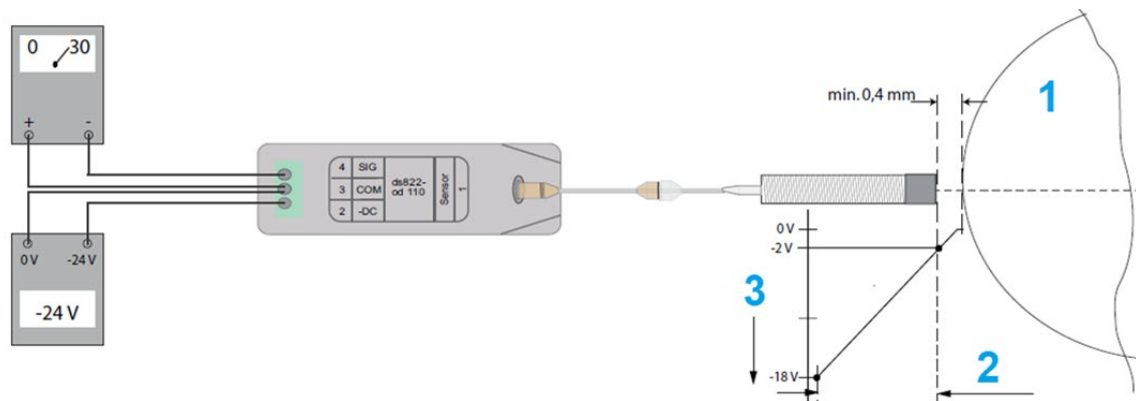
5.3.3 Direct Connection

→ Connect the displacement sensor directly with the driver.

5.4 Setup of the Measurement Chain and Displacement Sensor

The displacement sensor must be adjusted with the rotor stationary.

5.4.1 Measurement Setup



- 1 Rotor
- 2 Operating range
- 3 GAP voltage

The displacement measurement chain is usually adjusted with the aid of a voltmeter and the "operating voltage."

The adjustment of the measurement system is made by the position of the sensor type relative to the measurement object. The displacement sensor is guided and fixed in place by positioning in the linear measuring range (see diagram). To prevent damage to the sensor tip, observe the minimum distance from the shaft (max. deflection).

The minimum distance from the target must be selected so that when the deflection of the shaft reaches its maximum extent (axially or relative to the shaft) the distance is not less than 0.4 mm. In the case of an axial measurement, the axial bearing play design and the current position of the shaft must also be considered to prevent damage to the sensor tip.

- The displacement sensor system is completely mounted and connected with a power supply and monitoring system.
- The mechanical distance lies in the range of min. 0.4 mm to max. 2.4 mm.

→ Switch on the voltage for the driver.

You see an output signal proportional to the measurement distance and in the range of -2 V ... -18 V. Adjust the distance of the sensor until the desired output signal is reached.



INFO

Use the characteristic curve U [GAP] for orientation as you determine the minimum distance.

5.5 Electrical Connection

Connect the driver with an electronic monitoring system as shown in the drawing below.

The clamping range of the terminal clamp is 0.25 mm² ... 1.5 mm² for one flexible stranded wire per terminal with wire end ferrule with plastic sleeve.
The tightening torque of the terminal clamp is 0.5 Nm ... 0.6 Nm.

As you are setting up your measurement system, you should pay attention to the following driver behavior:

Warming up effects of the driver electronics

During the warm-up phase there is a drift in the static distance measurement due to warming up effects.

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

Four-wire connection

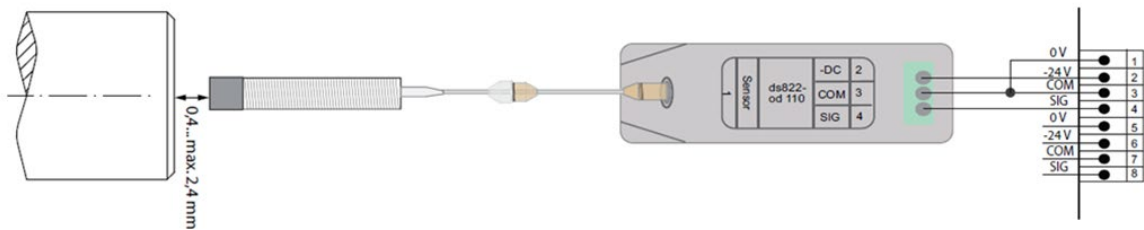


Figure 5-1) Connection of the driver to a monitoring system



6 Function Check

6.1 Quick Test

After you have installed your 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 proper working conditions, you will obtain the following values:

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

6.2 Troubleshooting

If the measurement results deviate, follow the steps we recommend in order:

Check the output signal

- The output signal $U_{SIG} < -18 \text{ V}$
The distance between target and sensor tip is outside of the measuring range.
Adjust the sensor by moving it closer to the target.
- The output signal $U_{SIG} > -2 \text{ V}$
The distance between target and sensor tip is possibly too small.
Adjust the sensor by increasing the distance to the target and check U_{SIG} again. If the output signal does not change, there is a defect in the displacement sensor system.
Work through the rest of the steps.

Check the displacement sensor and connection cable

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

for a 5 m system:

$$R_{\text{sensor}} + R_{\text{ext.}} = 8.7 \text{ } \Omega \pm 0.5 \text{ } \Omega$$

for a 10 m system:

$$R_{\text{sensor}} + R_{\text{ext.}} = 12.1 \text{ } \Omega \pm 0.5 \text{ } \Omega$$

Otherwise there is a defect in the displacement sensor or connection cable.

Check the driver

- Measure the current (terminal 2) on the driver without the displacement sensor connected and without any cable. The result should be as follows:

for a 5 m; 10 m system:

$$I_B = -6.2 \text{ mA } \pm 1 \text{ mA}$$

Otherwise there is a defect in the displacement sensor.

7 Disassembly

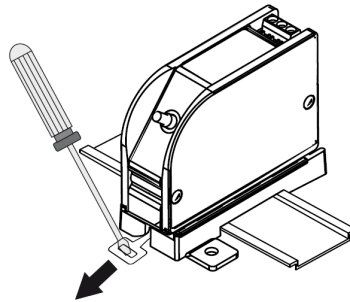
Follow the steps in reverse order for disassembly:

7.1 Disconnecting the Plug Connection

See "Connection via Connection Cable" on page 21.

7.2 Disassembly of the Driver

7.2.1 Disassembly of Driver with Assembly Adapter on DIN Rail



1. Use a screwdriver to pull the tab forward and remove the adapter together with the driver upward.
2. To remove the assembly adapter, push the tip of the adapter (opposite the mounting tab) down and then slide the driver down.

7.2.2 Disassembly of Driver with Assembly Adapter Using Screw Mounting

1. Remove the screws.
2. Remove the assembly adapter.

7.3 Replacing Displacement Sensor System Components

1. Switch off the voltage.
2. Replace the individual components with components identical in design.
3. Check to ensure all parts of the displacement sensor system are correctly connected together.
4. Switch on the voltage.

8 Disposal



Dispose of devices, cables or sensors after use in an environmentally responsible manner and in compliance with applicable national regulations.

WEEE Reg. No. DE 69572330



9 Technical Data

Complete technical data can be found in the corresponding 2 mm series ds82x specification BPS0138.

The following typical data applies unless otherwise indicated, under the following conditions:

- +18 °C to +27 °C ambient temperature
- -24 VDC operating voltage
- 100 kΩ load at the signal output
- 42CrMo4 B&K Vibro reference material
- -10 V GAP voltage (approx. 1.4 mm measurement distance between sensor and measurement surface)
- All components are at operating temperature

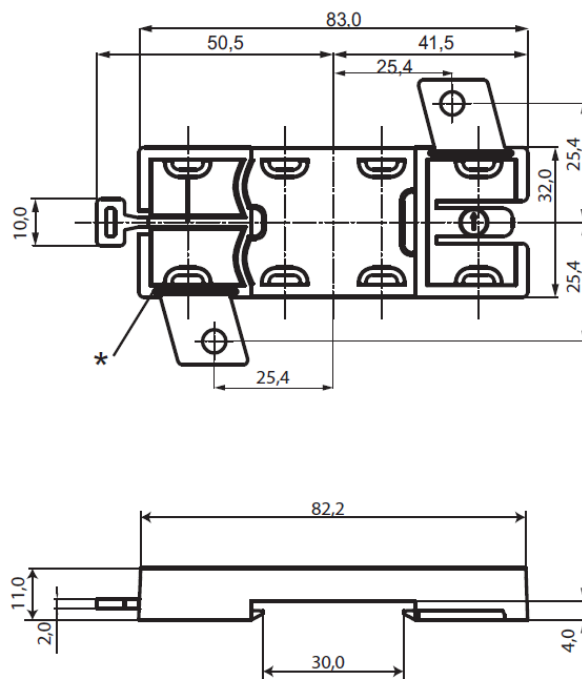
9.1 Non-Contacting Displacement Sensor System Series ds822

Measurement variable	Distance
Measurement principle	Eddy current method
Nominal system lengths	5 m, 10 m
Linear displacement measuring range	2 mm (approx. 0.4 ... 2.4 mm distance from the measurement object, measured according to an output signal of approx. -2 VDC ... -18 VDC)
Color coding	blue
Electrical properties:	
Operating voltage (U_B) The sensor system must be connected to a SELV supply with limited energy that is protected with a current of ≤ 2.5 A.	-24 VDC (-18 VDC ... -28 VDC)
Output signal	0 V ... ($U_B + 2$ V)
Power consumption	max. 12 mA
Output impedance	50 Ω
Power supply	max. 1A and short circuit-proof
Connector type	Coaxial connector (SAA), push-pull self-locking
Sensor tip:	
Material	Ceramic
Diameter of the tip	Ø 7.2 mm (± 0.1 mm)
Cable:	
Cable type	Coaxial
Cable sheath and color	FEP, blue
Impedance	95 Ω
Diameter	Ø 3.5 mm (± 0.15 mm)
Minimum bending radius	35 mm without cable protection 35 mm with protective steel conduit 75 mm with PTFE protective hose ^a 100 mm with corrugated pipe protection

^a The protective PTFE hose may only be used outside of the Ex area, or when used to prevent static charging must be equipped with a protective steel conduit or steel pipe that is securely connected with the local equipotential bonding (contact resistance ≤ 1 MΩ). The protective steel conduit or steel pipe must be electrically connected with the sensor housing.

Environment:	
Sensor	
Protection type for the tip in accordance with EN 60529	IP68 / 2 h at 10 bar ^a , IP69
Pressure tightness (expected due to the design):	
Sensor tip	25 bar
Sensor with corrugated pipe protection	25 bar (applies only to ds1002)
Driver	
Protection type for driver in accordance with EN 60529	IP20
Dimensions (WxHxD)	26.5 mm x 83 mm x 60 mm
Working temperature range ^b	
Working temperature range, sensor and cable	-55 °C ... +180 °C
Working temperature range, driver	-55 °C ... +85 °C
Storage temperature range ^c	-20 °C ... +70 °C
Altitude	< 2000 m
Pollution degree	3 for protection of plug connections and cable clamps
Humidity	98 % non-condensing for protection of plug connections and cable clamps

9.2 Dimensioning of Assembly Adapter



* Predetermined breaking point for detaching the mounting tabs for DIN rail mounting

Figure 9-1) Dimensional drawing of assembly adapter

^a During storage or operation below a temperature of -30 °C, the protection type is reduced to IP65.

^b For use in potentially explosive environments, ATEX must be considered for the ambient temperatures of series ds822. The company operating the system is responsible for ensuring this.

^c For storage in the original packaging.



9.3 Requirements for the Surrounding Area

9.3.1 Resistance of the Displacement Sensor in Various Media

NOTICE!

Humidity or moisture in the connector will lead to a defect in the displacement sensor system. Seal the connector to prevent the ingress of moisture.

If the displacement sensor system is used in other media, such as water, the measurement result may be affected. For example, an increase in the electrical conductivity of the ambient medium will result in a greater error in the measurement result.



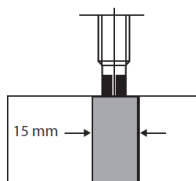
INFO

The displacement sensor is not resistant to media in the back without further protective measures. The data in the table below applies only to the sensor tip.

Medium	Pro-portion	Resistant	Not resistant	Comment	Test
Water		X			
Salt water	7.5 %	X		Suitable under certain conditions for sea water use; steel 1.4301	
Salt spray mist test		X		Tested 28 days as per DIN EN ISO 9227	
Soap solution		X			
Hexane		X			
Heptane		X			
Isopropanol		X			
Methanol		X			
Acetone		X			+25 °C, 150 h
Ammonia	32 %	X			
Sulfuric acid	20 %		X		
Nitric acid	15 %		X		+70 °C, 240 h
Hydrochloric acid			X		
Methylene chloride			X ^a		+70 °C, 240 h

9.3.2 Characteristics of the Measuring Track

The material characteristics of the measurement object change static and dynamic measurement recording. To ensure plausible measurement results, we recommend matching your displacement sensor system to the corresponding shaft material.



The measuring track must be at least 15 mm wide and free of scratches and cavities. The following values must be observed to ensure reliable measurement results:

- Roughness $R_a \leq 3.6$
- Roughness $R_{z, \max} < 5 \mu\text{m}$ ^b

Consider also the axial offset of the shaft.

^a Can combine with moisture that enters to form hydrochloric acid. There is a danger of pitting corrosion.

^b For large-scale unevenness (2 x 2 mm).

9.3.3 Necessary Free Spaces and Minimum Distances for Displacement Sensors

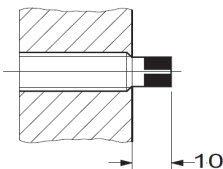
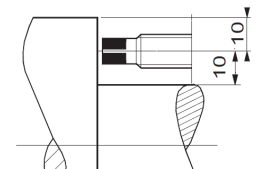
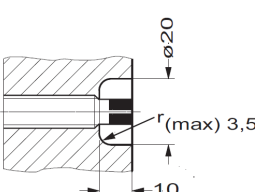
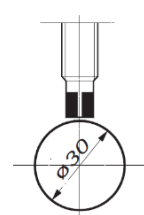
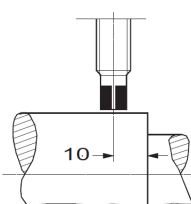
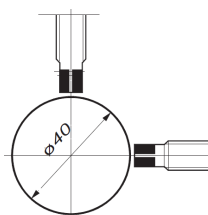
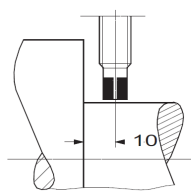
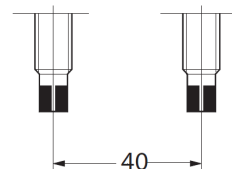
Non-contacting eddy current displacement sensors generate a high-frequency electromagnetic field. If there is conductive material other than the measurement object in this field, the measurement result will be falsified.

Before installing your non-contacting displacement sensor, always comply with the free spaces and minimum distances shown in the drawing below.



INFO

If the free spaces and minimum distances must be less than the specified ones for structural reasons, consult previously with Brüel & Kjær Vibro.

 Sensor tip protruding	 Distance to the shaft shoulder - sensor parallel to electrically conductive material
 Sensor tip flush	 Required minimum diameter of the shaft with one sensor
 Distance to the shaft end > 100 % coverage	 Required minimum diameter of the shaft with two sensors
 Distance to the shaft shoulder - sensor parallel to electrically conductive material	 Sensors arranged in parallel



9.4 Transfer Characteristic Curves

The characteristic curves in the measurement protocol shown here are created with the specified ambient conditions and target material. If a complete displacement sensor system is ordered you will receive an individual measurement protocol, which may deviate from the typical transfer function shown here.

9.4.1 Characteristic Curve for Distance Measurement [GAP / V]

The transfer characteristic curve describes the dependency of the signal voltage on the distance between the sensor tip and measurement object.

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

9.4.2 Characteristic Curve for the Vibration Measurement [ISF / mV/ μm]

The displacement sensor system has a sensitivity of -8 mV/ μm (-203 mV/mil) relative to B&K Vibro reference material 42CrMo4 (material no. 1.7225) as per DIN 17 200, in accordance with AISI/SAE 4140.

The ISF (Incremental Scale Factor) describes the accuracy of the sensitivity (ISF error / %) as a function of the distance.

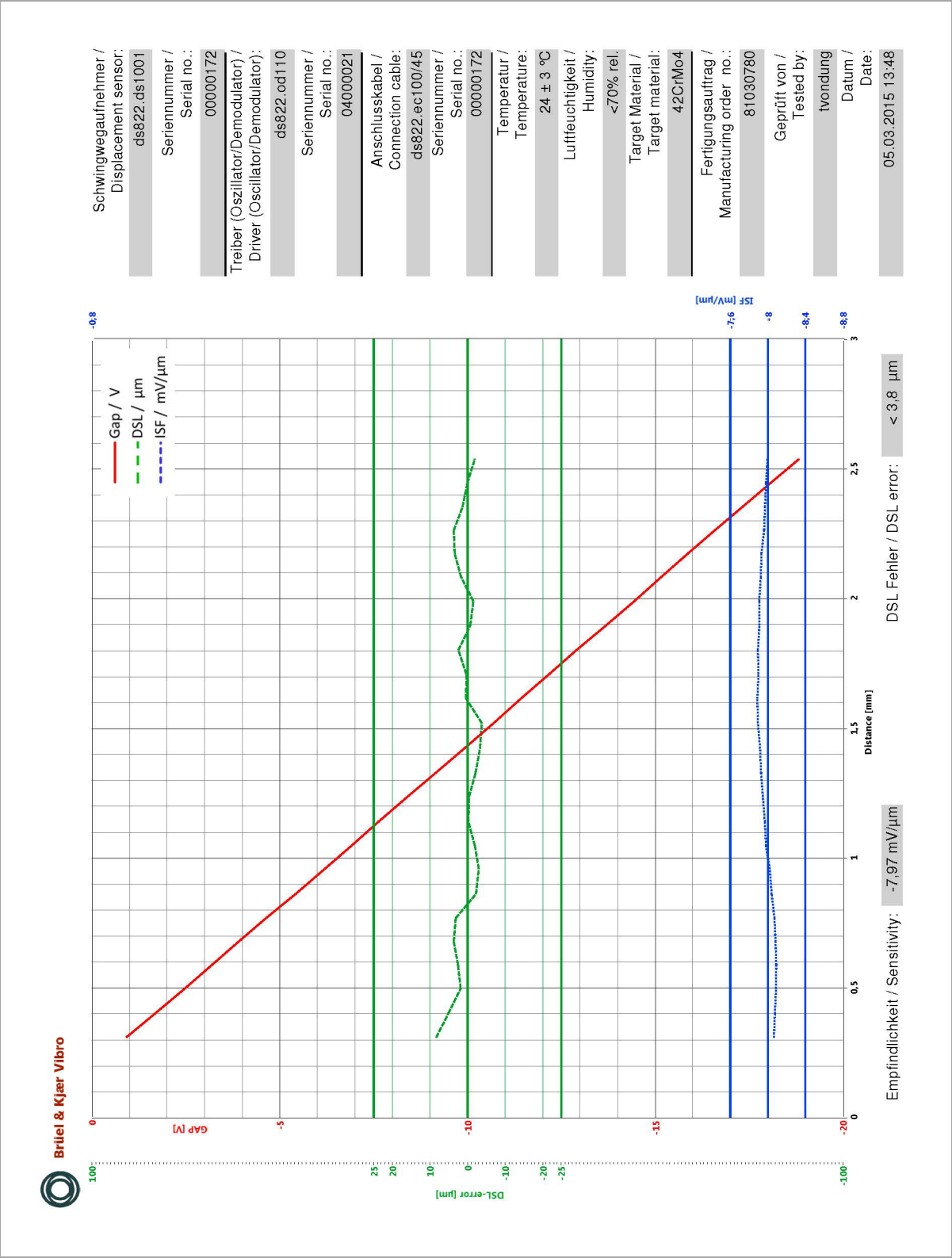
- Y axis: ISF [mV/ μm]
X axis: Distance [mm]

9.4.3 Deviation from the Reference Straight Lines [DSL / μm]

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

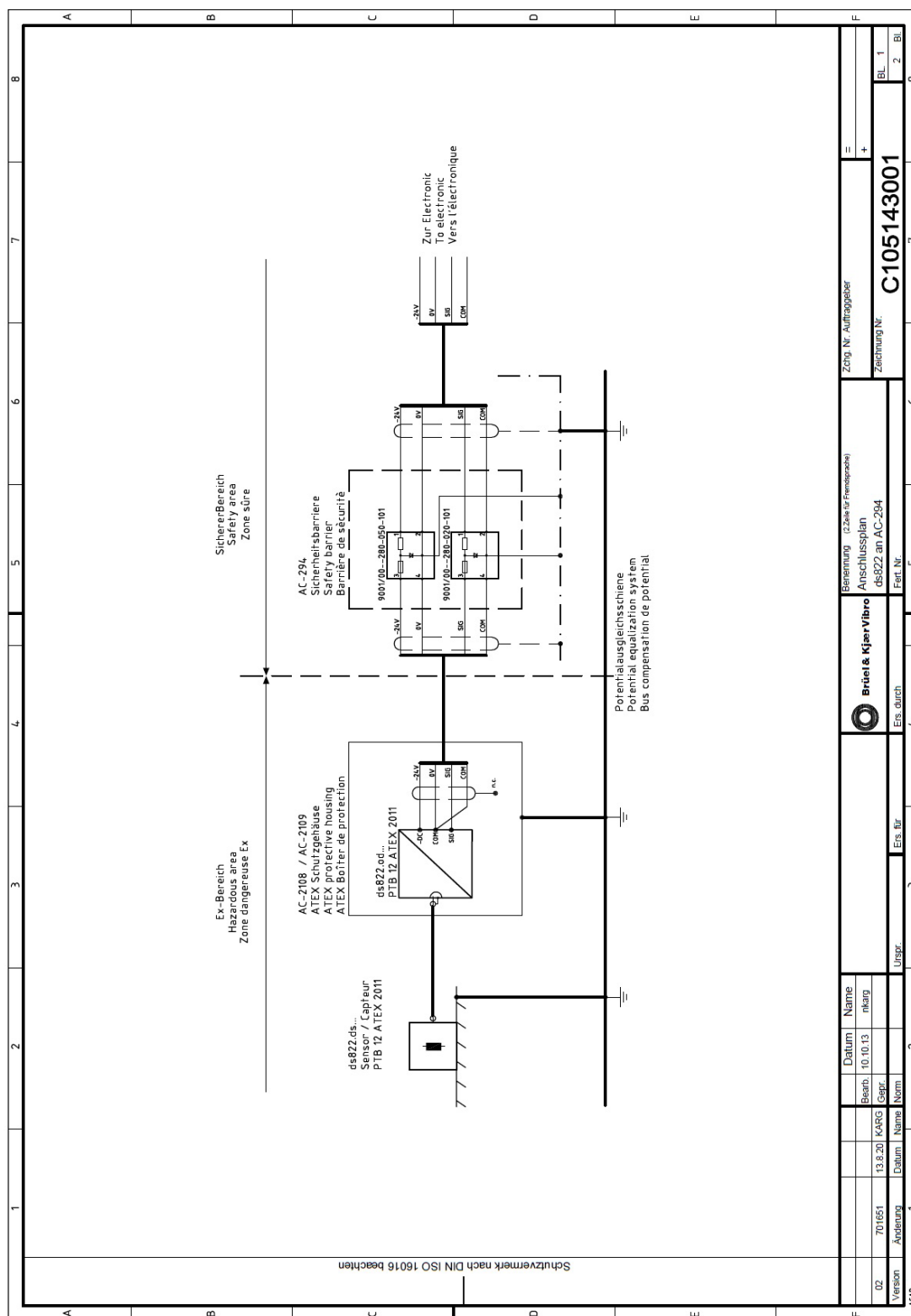
- Y axis: DSL error [μm]
X axis: Distance [mm]

10 Measurement Protocol



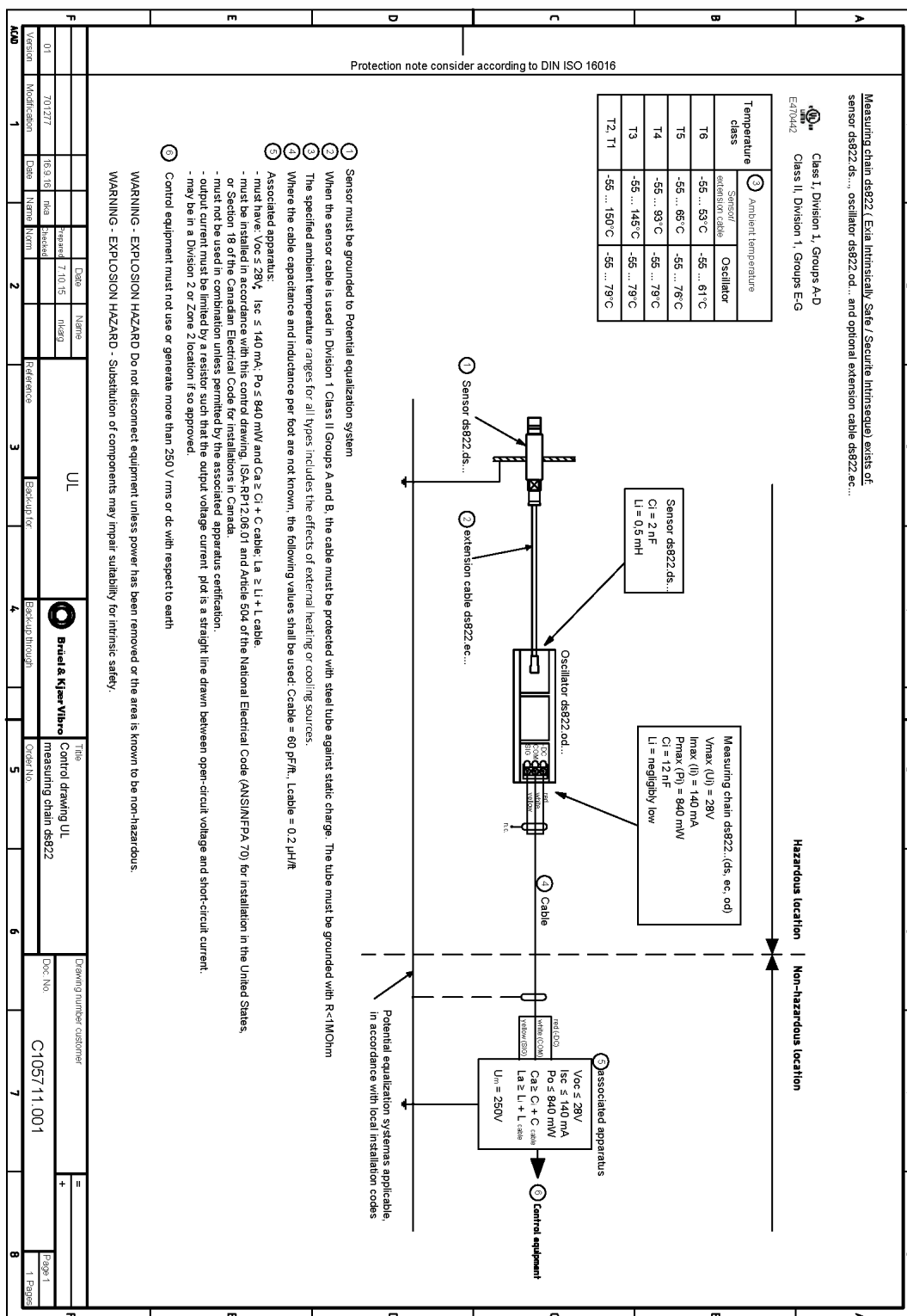


11 Circuit Diagram





12 UL Control Drawing



13 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
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 60079-7:2015 / A1:2018
EN IEC 63000:2018

EU-Baumusterprüfbescheinigung / EU-Type Examination Certificate
PTB 12 ATEX 2011X Ausgabe 4 / Issue 4 erstellt von /created by
Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig

Mitteilungsnummer der Qualitätssicherung / Notification number of quality assurance
DEKRA 24ATEXQ0126 erstellt von DEKRA als notifizierte Stelle (0344) / created by DEKRA as notified body (0344)

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller. / This declaration of conformity is issued under the sole responsibility of the manufacturer.

Bereich / Division
Brüel & Kjær Vibro GmbH

Unterschrift / Signature
CE-Beauftragter / CE-Coordinator

Ort/Place **Darmstadt**
Datum / Date **27.03.2025**


(Niels Karg)

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