



Brüel & Kjær Vibro

A member of the NSK Group

BK vibro

Product Specifications and Ordering Information

ds821

ds822

Non-Contacting Displacement Sensor Systems

Displacement measuring range 2 mm

ds821.mc101

ds822.mc101



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Subject to technical changes.

Product Specifications and Ordering Information - **ds82x (2 mm)**
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1 Features

- Non-contacting displacement measurement using the eddy current measurement principle
- Measuring range: 2 mm
- System lengths 5 m, 10 m or 25 m (25 m only ds821)
- ds822 with Ex approval
 -    
- Temperature range of displacement sensor: -55 °C ... +180 °C
- Frequency: DC ... 10 kHz
- Compact design of the driver housing (oscillator / demodulator)
- Improved head design
- A driver for both system lengths (automatic detection of the connected system length by the driver)
- Reduced spare parts stock
- Easy mounting with
 - self-locking push-pull plug connections
 - a mounting adapter for DIN rail or borehole mounting
- Excellent accuracy and temperature stability
- When a complete displacement sensor system is ordered, delivery includes approval test certificate with measurement protocol (factory calibration)

1.1 Application



Relative shaft vibration



Eccentricity



Axial shaft position



Rotation speed



Radial shaft position



Stroke lowering

1.2 Product Description

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. The status of rotating shafts can be measured within the scope of application of machine monitoring.

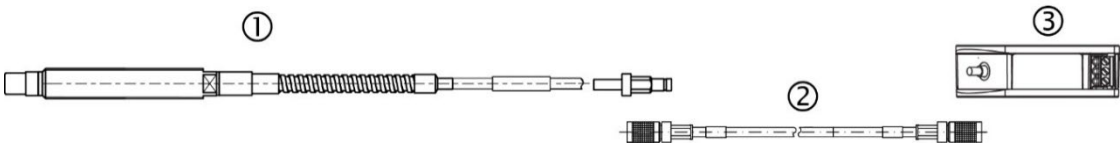
The eddy current displacement sensor system consists of the following components: displacement sensor (including integrated cable), optionally a separate connection cable and the driver electronics (oscillator / demodulator).

The displacement sensor is available in designs for mounting either on the front or on the rear.

The eddy current displacement sensor system is available as ds821 standard and ds822 Ex. Both models are available in system lengths of 5 m and 10 m (ds821 also in length of 25 m).

The name of a component is made up of the model name (ds821 or ds822 Ex) and the component designation:

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



Displacement sensor system		2 mm ds821 Standard	2 mm ds822 Ex
	Complete system (mc)	ds821.mc101	ds822.mc101
①	Displacement sensor (ds)	ds821.ds10xx	ds822.ds10xx
②	Connection cable (ec)	ds821.ec10x	ds822.ec10x
③	Driver (oscillation/demodulator) (od)	ds821.od11x	ds822.od11x



1.3 Color Coding

Non-contacting displacement sensor systems ds821 and ds822 Ex are available with different measuring ranges.

Each measuring range is defined by color coding on the respective cable ends of the integrated cable on the displacement sensor, on the ends of the connection cable and on the driver. This makes it easy to identify the components belonging to the system during installation.

The color codes are shown below with the corresponding displacement measuring range:

Color code	Blue	Red	Black
Measuring range	2 mm	4 mm	8 mm

1.4 Scope of Delivery

Depending on the scope of the order, the delivery includes the following components:

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
Mounting 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 1-1) Components included with delivery

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

^b Only present on ds1003, (rear-mountable sensor). Working temperature range of the sealing ring from -40 °C to +180 °C. O-ring (silicone) available on request for lower temperatures down to -55 °C.

^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.



Working frequency range	DC ... 10 kHz (-3 dB damping of the output signal)
Electrical properties:	
 The specified dynamic properties decrease further in the temperature range between -35 °C and -55 °C.	
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 (for 25 m: max. 20 mA)
Output impedance	50 Ω
Mechanical properties:	
Connector type	Coaxial connector (SAA), push-pull self-locking
Cable:	
Cable type	Coaxial
Cable sheath and color	FEP, blue
Impedance	95 Ω
Diameter	$\varnothing 3.5$ mm (± 0.15 mm)
Altitude	< 2000 m

2.2 Displacement Sensor Type ds82x.ds10xx

Sensor tip:	
Material	Ceramic
Diameter of the tip	$\varnothing 7.2$ mm (± 0.1 mm)
Sensor sleeve	
Material	High-grade stainless steel (material no. 1.4404 in accordance with DIN 17200)
Maximum tightening torque	5 Nm
Length	
Including integrated cable (measured from the sensor tip to the end of the integrated cable)	0.5 m (-0 m / +0.3 m) 1.0 m (-0 m / +0.3 m) 1.5 m (-0 m / +0.3 m) 5.0 m (-0 m / +1.0 m) 10.0 m (-0 m / +1.8 m)
Integrated cable	
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
Connection	Socket or connector for nominal system length
Environment	
Protection type for the tip in accordance with EN 60529	IP68 / 2 h at 10 bar ^b , IP69

^a The protective PTFE hose may only be used outside of the Ex area, or must be equipped with a protective steel conduit or steel pipe to prevent static charging.

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

Pressure tightness (expected due to the design):	
Sensor tip	25 bar
Sensor with corrugated pipe protection	25 bar (applies only to ds1002)
Temperature range:	
Working temperature range ^a	-55 °C ... +180 °C
Storage temperature range ^b	-20 °C ... +70 °C

2.3 Connection Cable Type ds82x.ec10x (Optional)

Length	3.5 m (-0 m / +0.8 m) 4.0 m (-0 m / +0.8 m) 4.5 m (-0 m / +0.8 m) 8.5 m (-0 m / +1.6 m) 9.0 m (-0 m / +1.6 m) 9.5 m (-0 m / +1.6 m) 24.0 m (-0 m / +3.4 m)
Minimum bending radius	35 mm without cable protection 35 mm with protective steel conduit 75 mm with PTFE protective hose ^c
Connection	Connector (male) on both sides
Ambient conditions	
Working temperature range ^a	-55 °C ... +180 °C
Storage temperature range ^b	-20 °C ... +70 °C

2.4 Driver ds82x.od11x

Electrical properties	
Operating voltage (U _B)	-24 VDC (-18 VDC ... -28 VDC)
Power consumption	max. 12 mA (with 25 m: max. 20 mA) (R _L ≥ 100 kΩ)
Power supply	max. 1A and short circuit-proof
Dynamic source resistance	50 Ω
Mechanical properties	
Housing material	Aluminum alloy (ADC 12)
Dimensions (WxHxD)	26.5 mm x 83 mm x 60 mm
Weight of the driver (oscillator/demodulator)	approx. 200 g
Connection	Socket (female)
Environment	
Protection class in accordance with EN 60529	IP20
Temperature	
Working temperature range ^a	-55 °C ... +85 °C
Storage temperature range ^b	-20 °C ... +70 °C
Humidity	98 % non-condensing for protection of plug connections and cable clamps

^a When used in potentially explosive atmospheres, the ambient temperatures for ds822 Ex must be observed, see page 26.

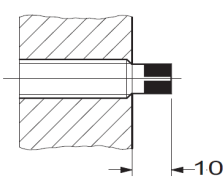
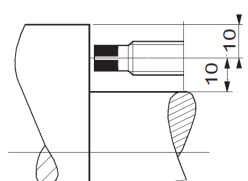
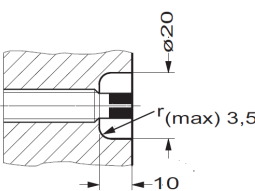
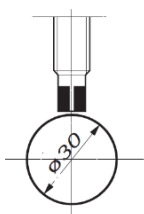
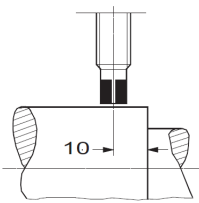
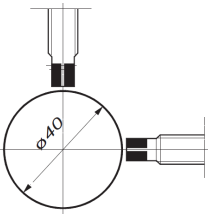
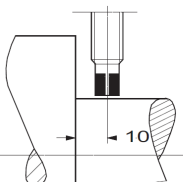
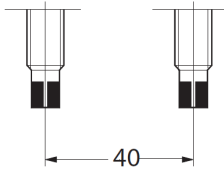
^b For storage in the original packaging.

^c The protective PTFE hose may only be used outside of the Ex area, or must be equipped with a protective steel conduit or steel pipe to prevent static charging.



2.5 Free Spaces and Minimum Distances

The free spaces and minimum distance specified below must be taken into consideration when mounting sensors.

	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

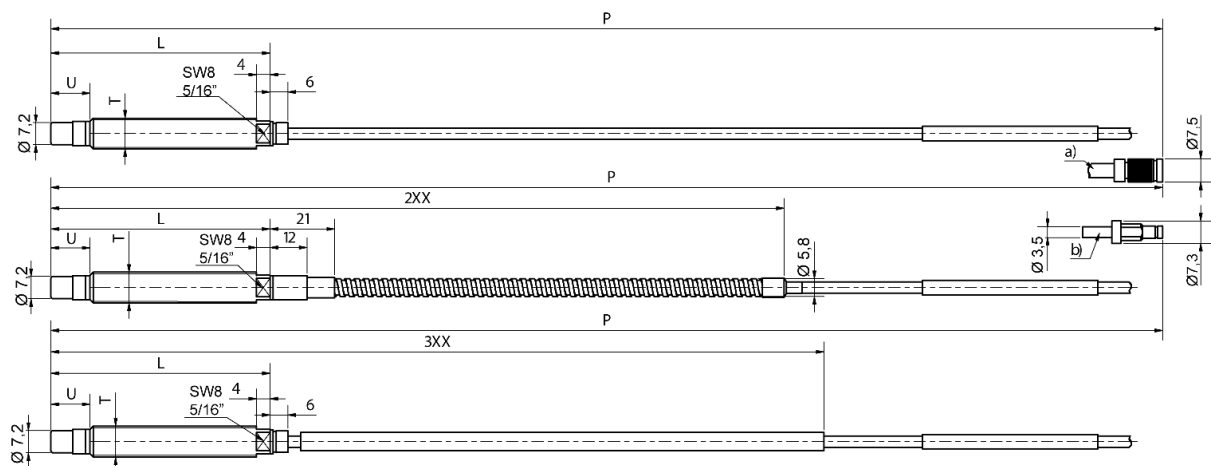
3 Designs and Order Codes

3.1 Drawings of Sensor Types (ds)

3.1.1 Displacement Sensor Type 1 with Continuous Thread (ds82x.ds1001)

From top to bottom:

- Displacement sensor **without cable protection**
(ds82x.ds1001/TT/LLL/UUU/PPP/000/R)
- Displacement sensor **with protective steel conduit** of length **XX**
(ds82x.ds1001/TT/LLL/UUU/PPP/2XX/R)
- Displacement sensor **with PTFE protective hose** of length **XX**
(ds82x.ds1001/TT/LLL/UUU/PPP/3XX/R)



All figures in [mm]

a) Connector (male) for direct connection to driver (nominal system length)

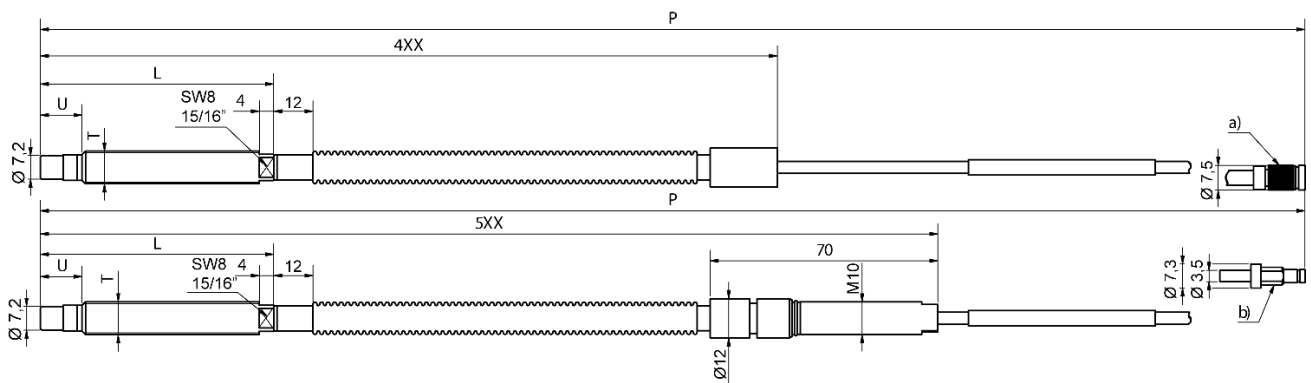
b) Socket (female) for use with separate connection cable



3.1.2 Displacement Sensor Type 2 with Continuous Thread and Corrugated Pipe (ds82x.ds1002)

From top to bottom:

- Displacement sensor with **corrugated pipe protection design A** of length **XX** (ds82x.ds1002/TT/LLL/UUU/PPP/4XX/R)
- Displacement sensor with **corrugated pipe protection design B** of length **XX** (ds82x.ds1002/TT/LLL/UUU/PPP/5XX/R)

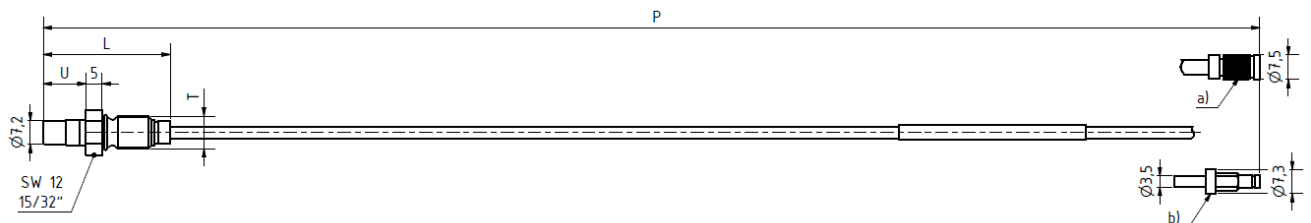


All figures in [mm]

- a) Connector (male) for direct connection to driver (nominal system length)
b) Socket (female) for use with separate connection cable

3.1.3 Displacement Sensor Type 3 for Rear Mounting (ds82x.ds1003)

- Displacement sensor for **rear mounting**
(ds82x.ds1003/TT/LL/VV/PP/000 (no protection) / R

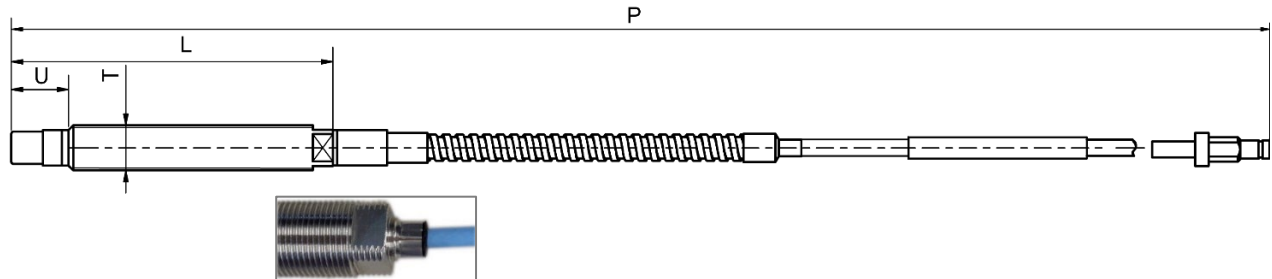


All figures in [mm]

- a) Connector (male) for direct connection to driver (nominal system length)
b) Socket (female) for use with separate connection cable



3.2 Order Code of Displacement Sensor (ds)



Displacement sensor	ds821	ds822
Standard	•	
Ex		•

x
1
2

Order code

ds82

Sensor type	ds1001	ds1002	ds1003	ds1004	S
Continuous thread	•				1
Continuous thread with corrugated pipe		•			2
Rear-mountable			•		3
90° angled sensor head				•	4

.ds100

Thread					TT
M10 x 1	•	•	•	•	10
3/8" – 24 UNF-2A	•	•	•	•	62

Length of the sensor body ^a					LLL
38 mm, minimum				•	038
45 mm	•	•		•	045
75 mm	•	•		•	075
105 mm	•	•		•	105
135 mm	•	•		•	135
39 mm fixed			•		039
Other lengths min ... max [in increments of 5 mm, 005 = 5 mm]	50 ... 255			40 ... 150	XXX

Threaded section ^b					UUU
12 mm				•	012
15 mm	•	•			015
13 mm fixed			•		013
Other lengths min ... max [in increments of 5 mm, 005 = 5 mm]	20 ... 230			15 ... 125	XXX

Length of sensor with integrated cable					PPP
0.5 m	•	•	•	•	005
1.0 m	•	•	•	•	010
1.5 m	•	•	•	•	015
5.0 m	•	•	•	•	050
10.0 m	•	•	•	•	100

^a Usable threaded length = LLL-UUU

^b U_{max} = L - 25 mm, measured from the sensor tip to the unthreaded end

Cable protection (C) and protected length for the integrated cable (XX) ^a	ds1001	ds1002	ds1003	ds1004	CXX
No protection	●		●	●	000
Protective steel conduit	●			●	299 or 2xx
PTFE protective hose	●			●	399 or 3xx
Corrugated pipe protective hose design A		●			499 or 4xx
Corrugated pipe protective hose design B		●			599 or 5xx

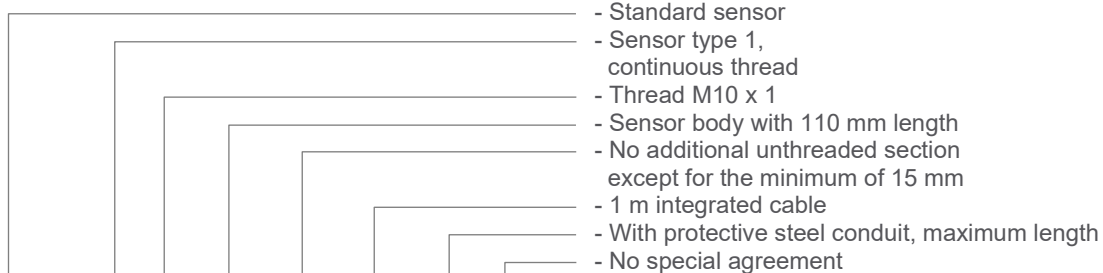
Special agreement - must be recorded in writing ^b					R
Without special agreement	●	●	●	●	0
With special agreement	On request				1

When placing an order, write the numbers of the selected option in the marked order fields on the right. This results in an order code in the following format, read from top to bottom:

ds82x.ds100S / TT / LLL / UUU / PPP / CXX / R

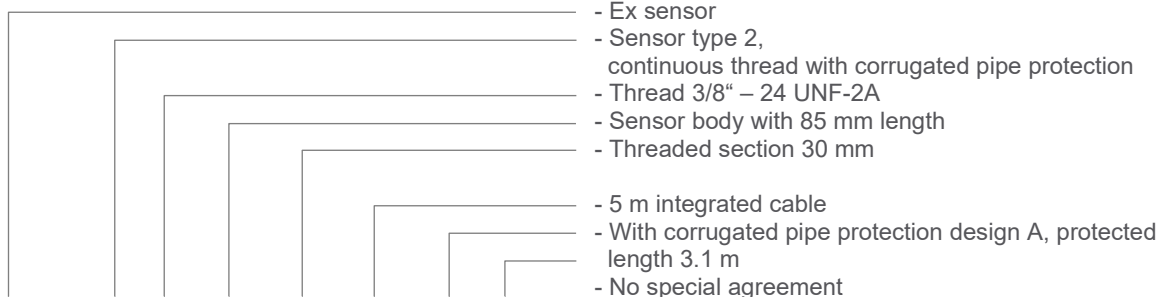
Example of an order:

ds821 standard



ds821.ds1001 / 10 / 110 / 015 / 010 / 299 / 0

ds822 Ex



ds822.ds1002 / 62 / 085 / 030 / 050 / 431 / 0

^a The first place C defines the type of cable protection, CXX = 000 stands for no protection. The second and third places XX indicate the length of the protection. XX = 99 is the standard setting and designates the maximum possible protected length for the selected length of sensor with integrated cable. The protection ends about 0.2 m before the end of the connector. The protected length is measured from the sensor tip to the end of the protective hose. The smallest length is 03 = 0.3 m. The step width is 01 = 0.1 m.

^b For a total system length of 25 m, the sensor must be ordered with the special requirement Yes (/R=1) and the text "Sensor for 25-m system length." The only available options for cable protection are: "No protection" and "Protective steel conduit".

3.3 Drawings of Connection Cable (ec)

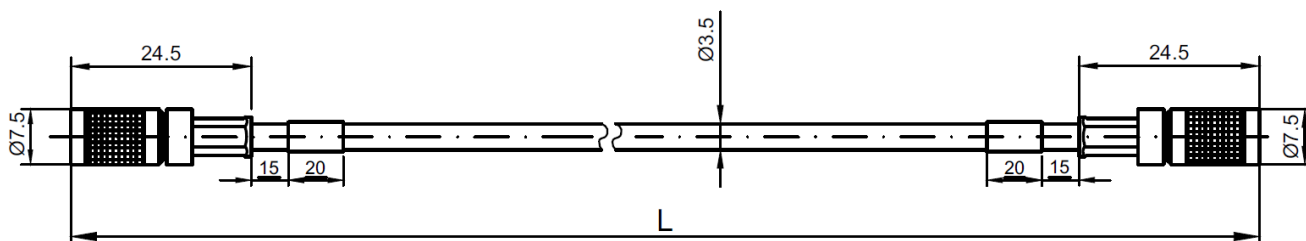


Figure 3-1) Dimensions of connection cable ds82x.ec100 (no protection)

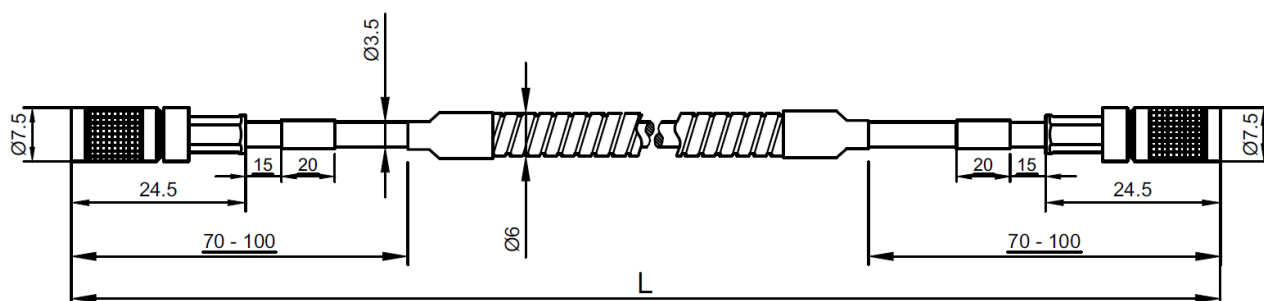


Figure 3-2) Dimensions of connection cable ds82x.ec102 (protective steel) mechanical reinforcement

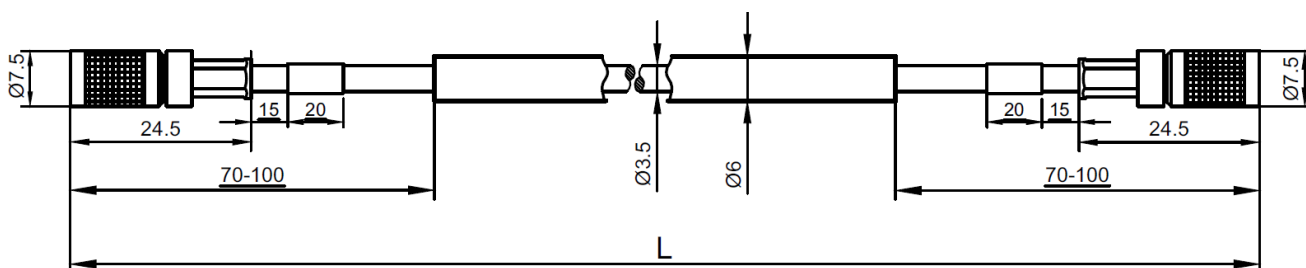
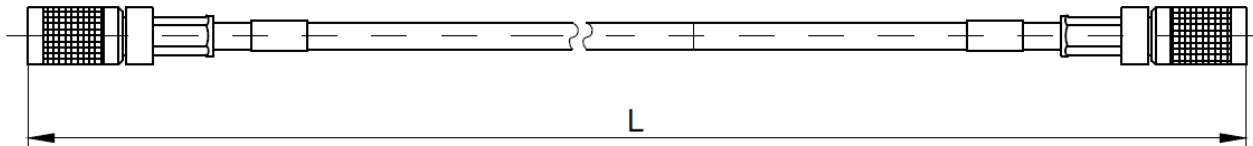


Figure 3-3) Dimensions of connection cable de82x.ec103 (PTFE)

All figures in [mm]

3.4 Order Code of Connection Cable (ec)



Connection cable for displacement sensor	ds821	ds822
Standard	●	
Ex		●

x
1
2

Order code
ds82

Cable protection	ec100	ec102	ec103	E
No protection	●			0
Protective steel conduit		●		2
PTFE protective hose			●	3

.ec10

Length of connection cable				LLL
3.5 m	●	●	●	035
4.0 m	●	●	●	040
4.5 m	●	●	●	045
8.5 m	●	●	●	085
9.0 m	●	●	●	090
9.5 m	●	●	●	095
24.0 m	●	●		240

/

Special agreement - must be recorded in writing				R
Without special agreement	●	●	●	0
With special agreement	On request			1

/

When placing an order, write the numbers of the selected option in the marked order fields on the right. This results in an order code in the following format, read from top to bottom:

ds82x.ec10E / LLL / R

Example of an order:

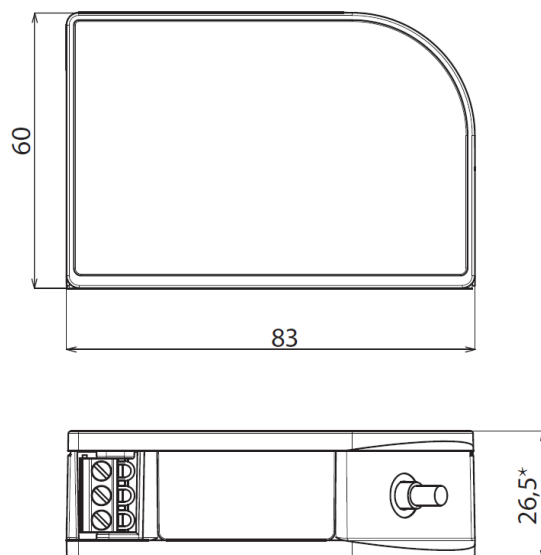
ds821 standard

- Standard sensor
- PTFE protective hose
- 9 m connection cable
- No special agreement

ds821.ec103 / 090 / 0



3.5 Drawing of Driver (od)



All figures in [mm]

Figure 3-4) Dimensioning of driver ds82x.od11Y

3.6 Order Code of Driver (od)

Driver for displacement sensor	ds821	ds822			Order code
Standard	●		x	➤	ds82
Ex ^a		●	1		
			2		
Driver for system length	od110	od111	Y	➤	.od11
5 m, 10 m	●		0		
25 m (only ds821)		●	1		
Special agreement - must be recorded in writing			R	➤	/
Without special agreement	●	●	0		
With special agreement	On request		1		
CCC Ex approval ^b	CCC	●	2		
Without special agreement	CCC		3		
CCC Ex approval ^b	CCC	On request	4		
With special agreement	CCC		5		
UL HazLoc approval ^b	UL LISTED	●			
Without special agreement	UL LISTED	On request			
UL HazLoc approval ^b	UL LISTED				
With special agreement	UL LISTED				



INFO

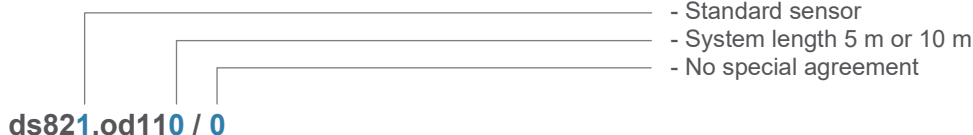
For a system length of 25 m, please order ds821.od111/0.

When placing an order, write the numbers of the selected option in the marked order fields on the right. This results in an order code in the following format, read from top to bottom:

ds82x.od11Y / R

Example of an order:

ds821 standard



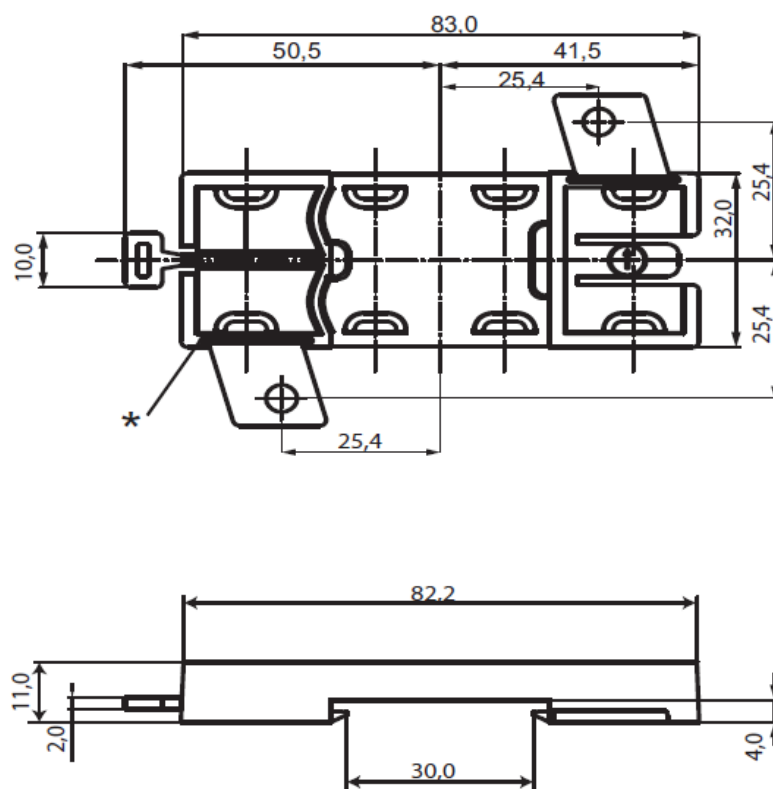
ds821 standard, 25 m cable



^a Including ATEX / IECEx / EAC Ex

^b Including ATEX / IECEx, excluding EAC Ex. Only ds822.

3.6.1 Mounting Adapter for DIN Rail or Borehole Attachment



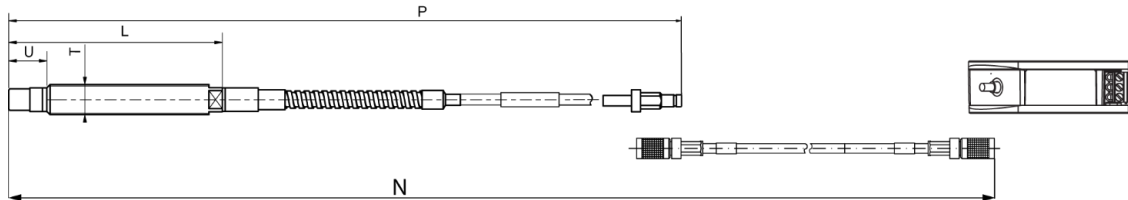
All figures in [mm]

Figure 3-5) Dimensional drawing of mounting adapter

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

The driver (od) can be mounted from either side.

3.7 Order Code for Complete Displacement Sensor System (mc)



Displacement sensor	ds821	ds822
Standard	●	
Ex ^a		●

x
1
2

Order code
ds82 .mc101

Sensor type	ds1001	ds1002	ds1003	ds1004	S
Continuous thread	●				1
Continuous thread with corrugated pipe		●			2
Rear-mountable			●		3
90° angled sensor head				●	4

/

Thread					TT
M10 x 1	●	●	●	●	10
3/8" – 24 UNF-2A	●	●	●	●	62

/

Length of the sensor body ^b					LLL
38 mm, minimum				●	038
45 mm	●	●		●	045
75 mm	●	●		●	075
105 mm	●	●		●	105
135 mm	●	●		●	135
39 mm fixed			●		039
Other lengths min ... max [in increments of 5 mm, 005 = 5 mm]	50 ... 255			40 ... 150	XXX

/

Threaded section ^c					UUU
12 mm				●	012
15 mm	●	●			015
13 mm fixed			●		013
Other lengths min ... max [in increments of 5 mm, 005 = 5 mm]	20 ... 230			15 ... 125	XXX

/

Nominal system length ^d					NN
5 m	●	●	●	●	05
10 m	●	●	●	●	10
25 m (only ds821)	●		●		25

/

^a Including ATEX / IECEx / EAC Ex

^b Usable threaded length = LLL-UUU

^c U_{max} = L - 25 mm, measured from the sensor tip to the unthreaded end

^d With a system length of 25 m: The only available cable protection options are: "No protection" and "Protective steel conduit".



Length of sensor with integrated cable	ds1001	ds1002	ds1003	ds1004	PP
Complete nominal system length, no additional connection cable	●	●	●	●	00
0.5 m	●	●	●	●	05
1.0 m	●	●	●	●	10
1.5 m	●	●	●	●	15

Cable protection (C) and protected length for the integrated cable (XX) ^a					CXX
No protection	●		●	●	000
Protective steel conduit	●			●	299 or 2xx
PTFE protective hose	●			●	399 or 3xx
Corrugated pipe protective hose design A		●			499 or 4xx
Corrugated pipe protective hose design B		●			599 or 5xx

Cable protection for connection cable (if present) ^b					E
No protection (ec100)	●	●	●	●	0
Protective steel conduit (ec102)	●	●	●	●	2
PTFE protective hose (ec103)	●	●	●	●	3

Special agreement - must be recorded in writing					R
Without special agreement	●	●	●	●	0
With special agreement	On request				1
CCC Ex approval ^c	CCC	●	●	●	2
Without special agreement	CCC				
CCC Ex approval ^c	CCC	On request			3
With special agreement	CCC				
UL HazLoc approval ^c	UL LISTED	●	●	●	4
Without special agreement	UL LISTED				
UL HazLoc approval ^c	UL LISTED	On request			5
With special agreement	UL LISTED				

When placing an order, write the numbers of the selected option in the marked order fields on the right. This results in an order code in the following format, read from top to bottom:

ds82x.mc101 / S / TT / LLL / UUU / NN / PP / CXX / E / R

^a The first place C defines the type of cable protection, CXX = 000 stands for no protection. The second and third places XX indicate the length of the protection. XX = 99 is the standard setting and designates the maximum possible protected length for the selected length of sensor with integrated cable.

The protection ends about 0.2 m before the end of the connector. The protected length is measured from the sensor tip to the end of the protective hose.

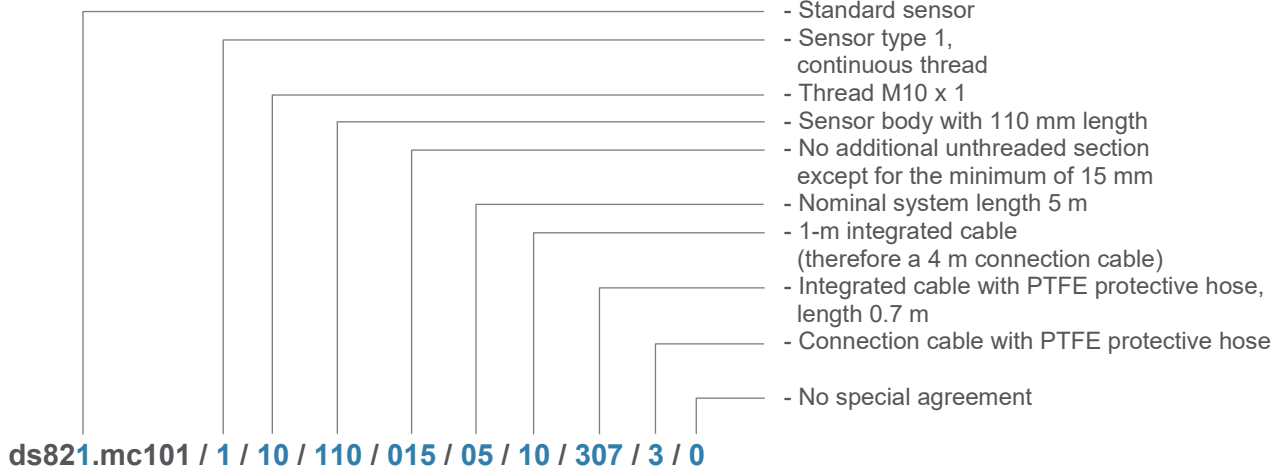
The smallest length is 03 = 0.3 m. The step width is 01 = 0.1 m.

^b If there is no connection cable present (PP = 00), enter a value of "0" in this place.

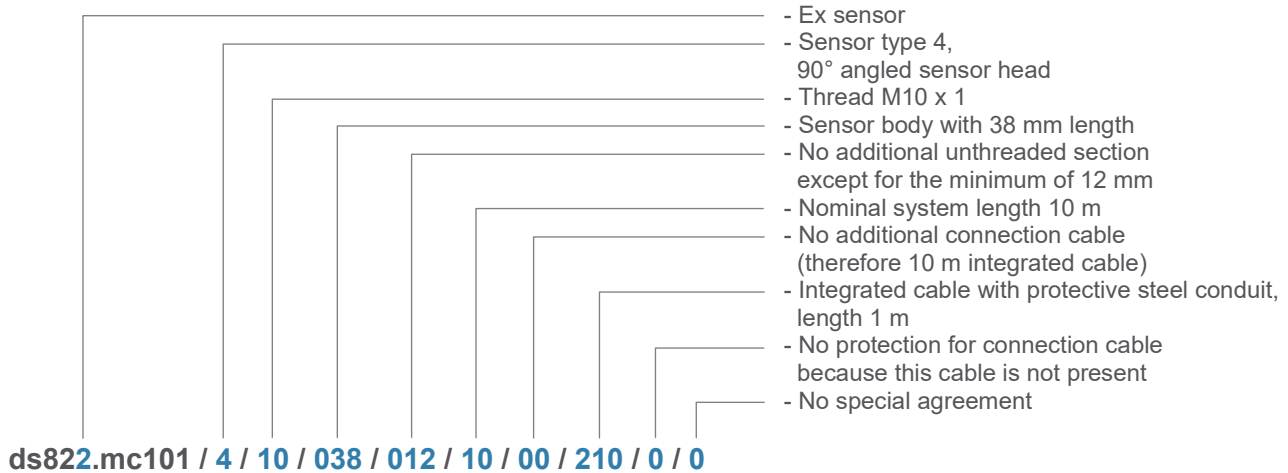
^c Including ATEX / IECEx, excluding EAC Ex. Only ds822 in 5 m, 10 m.

Example of an order:

ds821 standard



ds822 Ex



Comment:

The length of the possible connection cable is determined automatically by specifying the length of the integrated cable and the nominal system length. The scope of delivery of a complete measurement system always includes a driver for the corresponding model.



4 Approvals/Conformity

4.1 Displacement Sensor Systems ds821 and ds822 Ex

- CE-compliant in accordance with EMC, ROHS and ATEX directives
- RCM for Australia and New Zealand



4.2 In Addition for Displacement Sensor System ds822 Ex

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



4.3 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 4-1) 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 4-2) Category 2 device

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