Brüel & Kjær Vibro

Product specification

2 mm Measuring Range

Non-Contacting Displacement Sensor System Series ds821 / Ex Series ds822

Features

- Non-contacting displacement measurement based on the eddy-current principle
- System length: 5 m or 10 m
- Ex Series ds822 with ATEX approval
- Temperature range displacement sensor: -50 °C … +180 °C
- Frequency: DC … 10 kHz
- Compact design of the driver housing (oscillator / demodulator)
- Enhanced tip design
- One driver for both system lengths: system length detected automatically by the driver
- Reduction of spare parts storage
- Easy assembly due to
  - self-latching push-pull plug connections
  - one mounting adapter for hat-rail or drill-hole mounting
- Excellent precision and temperature stability
- When ordering a complete displacement sensor system, the delivery comes with an acceptance test certificate, including measurement report (factory calibration).

Use

Records the relative shaft vibration

Records the eccentricity

Records the axial shaft position

Records the speed

Records the radial shaft position

Reciprocating piston drop

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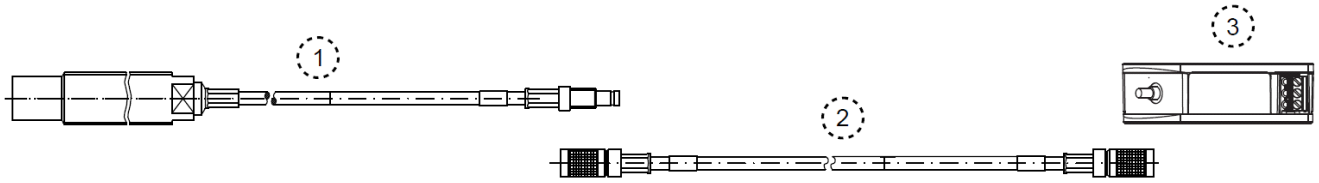
Product description

The displacement sensor systems of the ds820 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 monitoring system. In the application range of machine monitoring, this makes it possible to record the status of rotating shafts.

The ECDS system (**E**ddy **C**urrent **D**isplacement **S**ensor) consists of the components of displacement sensor with an integrated cable, an optional separate extension cable and the driver (oscillator/demodulator).
The displacement sensor is available as a forward as well as a reverse-side mountable version.
The ECDS system (**E**ddy **C**urrent **D**isplacement **S**ensor) is available as series ds821 Standard and ds822 ATEX.
Each series is available in system lengths of 5 m and 10 m.

The name of a component is a combination of the series name (ds821 or ds822 ATEX) and the component designation (**mc** = complete system, **ds** = displacement sensor, **ec** = connection cable or **od** = driver).



	Displacement sensor system	2 mm Series ds821 Standard:	2 mm Series ds822 ATEX:
	Complete system (mc)	**ds821.mc10x**	**ds822.mc10x**
①	Displacement sensor **(ds)**	ds821.ds10xx	ds822.ds10xx
②	Connection cable **(ec)**	ds821.ec10x	ds822.ec10x
③	Driver (oscillator/demodulator) **(od)**	ds821.od110	ds822.od110

Colour coding

The non-contacting displacement sensor systems series ds821 and ds822 are available with various measuring ranges. Each measuring range is identified by a coloured mark at the end of the integrated cable of the displacement sensor, at the ends of the extension cable and on the driver unit. This makes it easy to identify associated components during installation. The colour codes according to measuring range are as follows:

Colour code	Blue	Red
Measuring range	2 mm	4 mm

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Scope of delivery

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

Supplied components	Displacement sensor	Extension cable	Driver	Complete sensor system
Displacement sensor	X			X
Protection cap	X			X
2 nuts[1]	X			X
2 O-rings[2]	X			X
Extension cable[3]		X		X
Driver			X	X
Assembly adapter			X	X
Acceptance test certificate acc. to DIN EN 10204	X	X	X	X
Measurement protocol (works calibration)				X
User Manual	X	X	X	X

1. **not** available for ds1003 (reverse mount sensor)
2. **only** available for ds1003 (reverse mount sensor), operating temparature range for o-ring -40 °C to +180 °C, o-ring (silicone) for lower temperatures down to -50 °C on request
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

Technical data

These performance characteristics are valid under the following conditions unless specified otherwise:
+18 °C to +27 °C ambient temperature, -24 VDC supply voltage, 100 kΩ 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.

Non-Contacting Displacement Sensor System Series ds821 and Series ds822 ATEX

Measurand	Displacement
Measuring principle	Eddy-current measuring principle
Nominal system lengths	5 m and 10 m
Linear measuring range	2 mm (approx. 0.4 … 2.4 mm distance from the object to be measured corresponding to an output signal of approx. -2 VDC … -18 VDC)
Colour code	blue
Dynamic characteristics[1]:	
Sensitivity (ISF) in regard to B&K Vibro Reference material 42CrMo4 (material no. 1.7225) acc. to DIN 17 200, acc. to AISI/SAE 4140.	-8 mV/µm (-203 mV/mil)
Accuracy of the sensitivity (ISF error/%) within temperature range of:	
0 °C … +45 °C (total system)	
at a nominal system length of 5 m	±5.0%
at a nominal system length of 10 m	±7.5%
-35 °C … +120 °C (displacement sensor) and -35 °C … +85 °C (driver od130)	
at a nominal system length of 5 m	±10%
at a nominal system length of 10 m	±15%
Deviation from the reference line. (DSL/µm = Deviation from best fit straight line) the temperature range of:	
0 °C … +45 °C (total system)	
at a nominal system length of 5 m	±25 µm
at a nominal system length of 10 m	± 50 µm
-35 °C … +120 °C (displacement sensor) and -35 °C … +85 °C (driver od130)	
at a nominal system length of 5 m	±75 µm
at a nominal system length of 10 m	±150 µm
Operating frequency range	DC … 10 kHz (-3 dB damping of the output signal)
Electrical characteristics:	
Supply voltage (U_B)	-24 VDC (-18 VDC … -28 VDC)
Output range	0 V … (U_B +2 V)
Current consumption	max. 12 mA
Output impedance	50 Ω
Mechanical characteristics:	
Connector type	Coaxial connector (SAA), push-pull self-latching
Cable:	
Cable type	Coaxial
Cable jacket and colour	FEP, blue
Impedance	95 Ω
Diameter	Ø 3.5 mm (± 0.15 mm)

1. ISF (Incremental Scale Factor), DSL (Deviation from best fit straight line) and temperature ranges according to API 670

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Displacement sensor type ds82x.ds100S

Sensor tip:	
Material	Ceramic
Tip diameter	Ø 7,2 mm (± 0.1 mm)
Sensor housing	
Material	Stainless steel (material no. 1.4301 acc. to DIN 17200)
Length	
Including integral cable (measured from the sensor´s tip to the end of the integral cable)	0.5 m (-0 m / +0.3 m) 1.0 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 steel protective conduit 75 mm with PTFE protective conduit[2] 100 mm with corrugated tube protection
Connector	Socket (female) or Plug (male) with nominal system length
Ambient conditions:	
Degree of protection for the tip acc. to EN 60529	IP 68 / 2 h at 10 bar
Pressure tightness (expected as based on the design):	
Sensor tip	25 bar
Sensor and corrugated tube protection	25 bar (valid only for ds1002)
Temperature range	
Operating temperature range[3]	-50 °C … +180 °C
Storage temperature range[4]	-20 °C ... +70 °C

Connection cable type ds82x.ec10x (optional)

Length	4.0 m (-0 m / +0.8 m) 4.5 m (-0 m / +0.8 m) 9.0 m (-0 m / +1.6 m) 9.5 m (-0 m / +1.6 m)
Minimum bending radius	35 mm without cable protection 35 mm with steel protective conduit 75 mm with PTFE protective conduit[2]
Connection	Plug (male) at each end
Ambient conditions	
Operating temperature range[3]	-50 °C … +180 °C
Storage temperature range[4]	-20 °C … +70 °C

2. 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.
3. When used in hazardous areas, the ambient temperatures of the series ds822 ATEX must be observed, see page 18.
4. When stored in original package

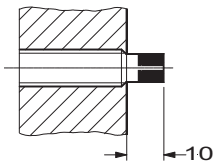
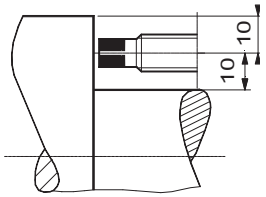
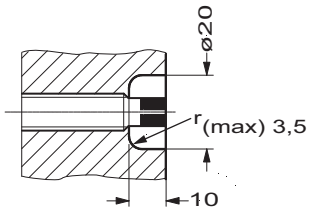
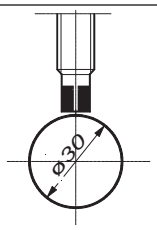
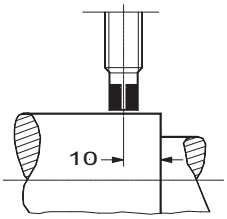
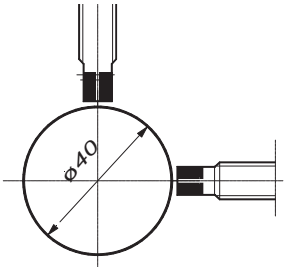
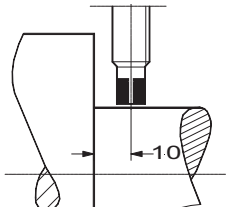
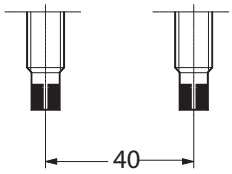
Driver ds82x.od110

Electric characteristics	
Supply voltage (U_B)	-24 VDC (-18 VDC … -28 VDC)
Current consumption	max. 12 mA (R_L >= 100 kΩ)
Power supply	max. 1A and short-circuit proof
Source resistance dynamic	50 Ω
Mechanical characteristics	
Housing material	Aluminium alloy (ADC 12)
Dimensions (WxHxD)	26,5 mm x 83 mm x 60 mm
Weight of the driver	approx. 200 g
Connection	Socket (female)
Ambient conditions	
Degree of protection according to EN 60529	IP 20
Temperature	
Operating temperature range[5]	-35 °C … +85 °C
Storage temperature range[6]	-20 °C ... +70 °C
Humidity	100 % non-condensing with protection of the plug connections and cable clamp

5. When used in hazardous areas, the ambient temperatures of the series ds822 ATEX must be observed, see page 18.
6. When stored in original package

Clearances and minimum distances

The clearances and minimum distances specified below must be observed 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 for one sensor
	Distance to a shaft end		Required minimum diameter of the shaft with two sensors
	Distance to the shaft shoulder, sensor parallel to electrically conductive material		Parallel arranged sensors

Notes on the diagrams:
All specifications in [mm]

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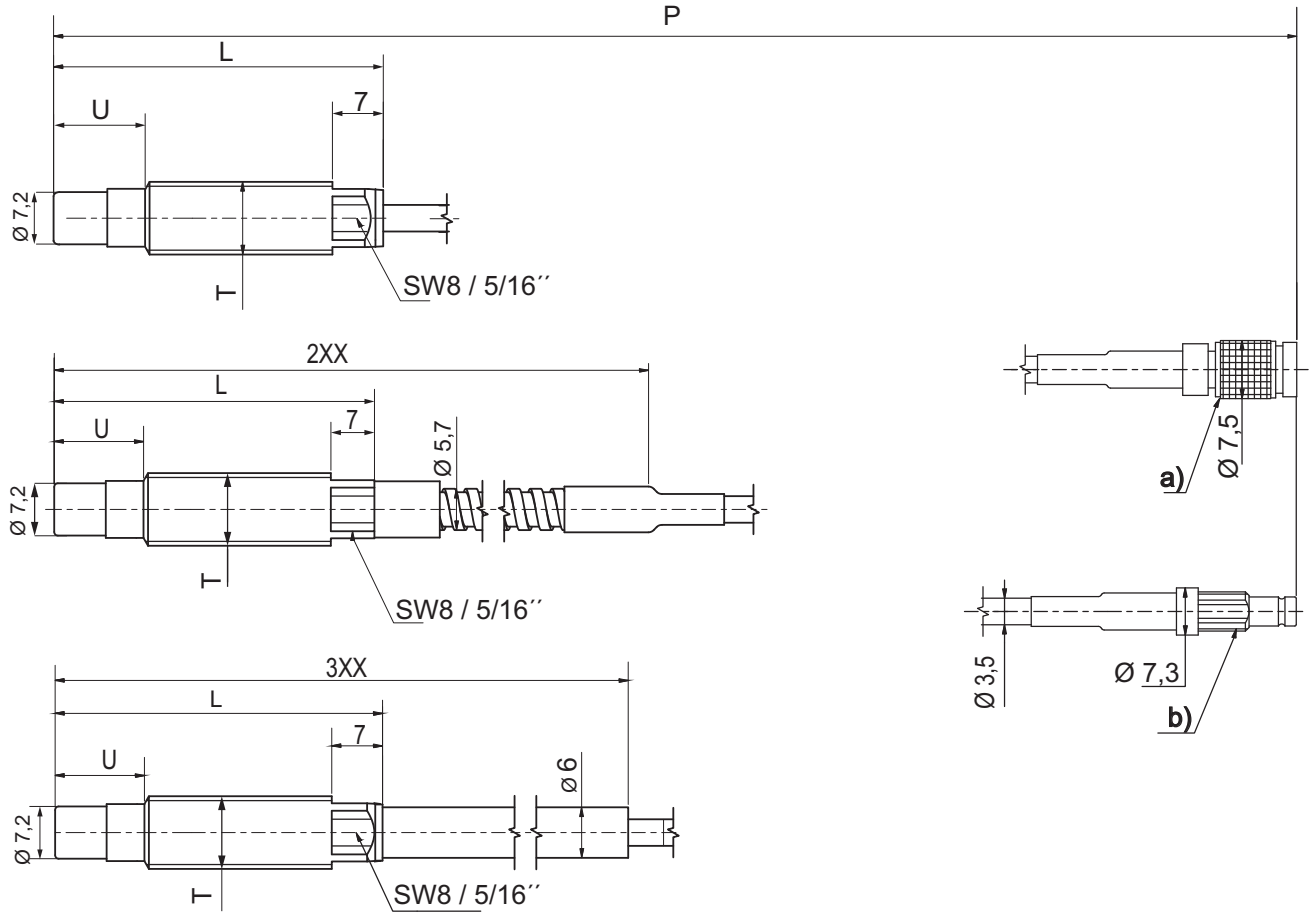
Versions and order codes

Diagrams of sensor types (ds)

Design of the displacement sensor type 1 with full-length thread (ds82x.ds1001/ …)

top down:

- *Displacement sensor* ***without cable protection*** *(ds82x.ds100**1**/TT/LLL/UUU/PPP/**000**/R)*
- *Displacement sensor* ***with steel protective conduit,*** *length XX (ds82x.ds100**1**/TT/LLL/UUU/PPP/**2XX**/R)*
- *Displacement sensor* ***with PTFE protective conduit,*** *length XX (ds82x.ds100**1**/TT/LLL/UUU/PPP/**3XX**/R)*



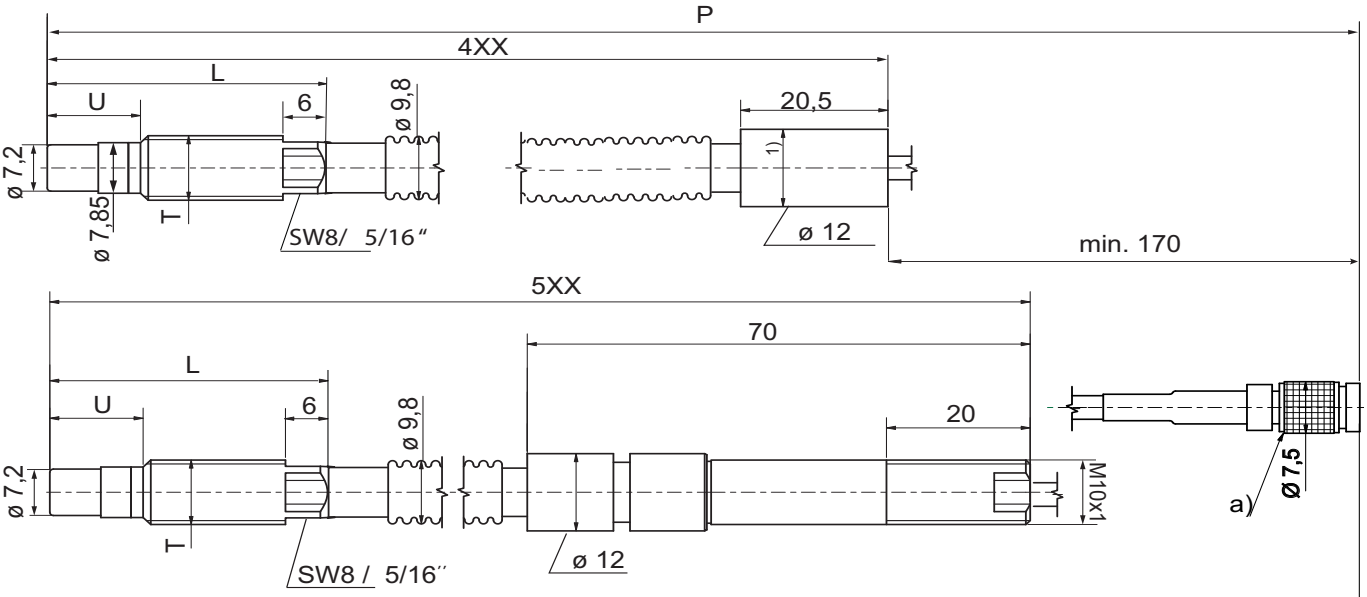
a) Plug (male) for straight connect to driver (nominal system length)
b) Socket (female) for the use of an extra connection cable

Notes on the diagrams:
All specifications in [mm]

Design of the displacement sensor type 2 with full-length thread and corrugated tube (ds82x.ds1002)

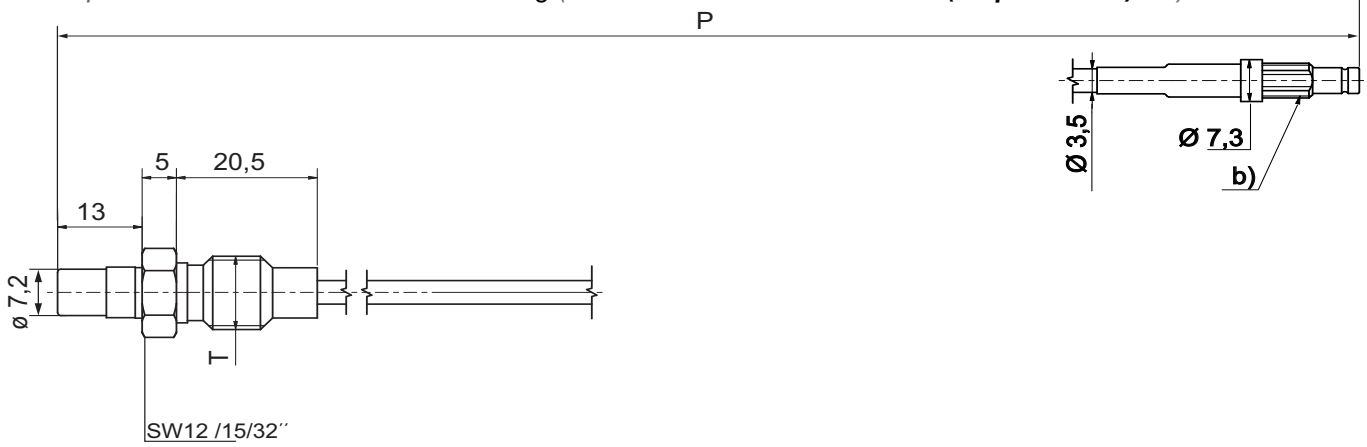
top down:

- *Displacement sensor* ***with corrugated tube protection design A,*** *length* ***XX*** *(ds82x.ds100**2**/TT/LLL/UUU/PPP/**4XX**/R)*
- *Displacement sensor* ***with corrugated tube protection design B,*** *length* ***XX*** *(ds82x.ds100**2**/TT/LLL/UUU/PPP/**5XX**/R)*



Displacement sensor type 3 for reverse mounted probe (ds82x.ds1003)

- *Displacement sensor for* ***reverse mounting*** *(ds82xds100**3**/TT/LL/VV/PP/**000 (no protection)** / R)*



a) Plug (male) for straight connect to driver (nominal system length)
b) Socket (female) for the use of an extra connection cable

1) Special design with 10 mm diameter on request

Notes on the diagrams:
All specifications in [mm]

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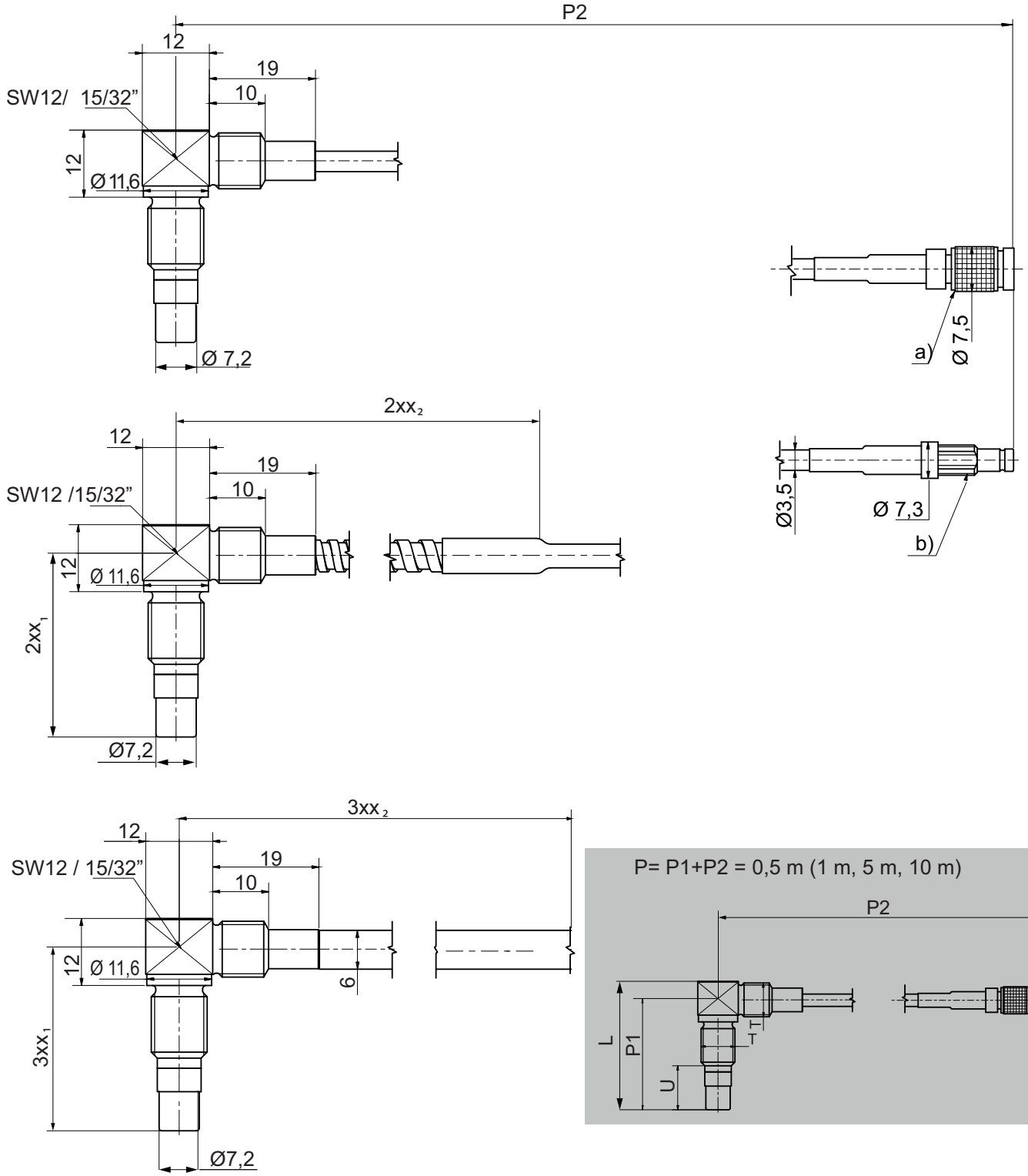
Displacement sensor type 4 for right angled probe (ds82x.ds1004)

- *Displacement sensor* ***without cable protection*** *(ds82x.ds100**4**/TT/LLL/UUU/PPP/**000**/R)*
- *Displacement sensor* ***with steel protective conduit****, length XX (ds82x.ds100**4**/TT/LLL/UUU/PPP/**2XX**/R)*
- *Displacement sensor* ***with PTFE protective conduit****, length XX (ds82x.ds100**4**/TT/LLL/UUU/PPP/**3XX**/R)*



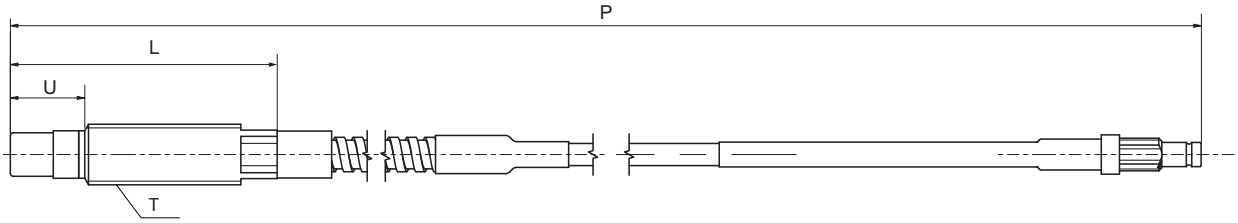
a) Plug (male) for straight connect to driver (nominal system length)
b) Socket (female) for the use of an extra connection cable

Notes on the diagrams:
All specifications in [mm]

2 mm Measuring Range

Non-Contacting Displacement Sensor System Series ds821 / Ex Series ds822

Order code for displacement sensor (ds) ds82x.ds100S / TT / LLL / UUU / PPP / CXX / R



Displacement sensor	ds821	ds822
Standard	●	
ATEX		●

x	Order code
1	ds82
2	

Sensor type	ds1001	ds1002	ds1003	ds1004	/ S
Full-length thread	●				1
Full-length thread with corrugated tube		●			2
Reverse mounted probe			●		3
Right - angled head				●	4

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

Length of the sensor body					/ LLL
38 mm, minimal				●	038
45 mm	●	●		●	045
75 mm	●	●		●	075
105 mm	●	●		●	105
135 mm	●	●		●	135
39 mm fixed			●		039
Other lengths min …max [step size 5mm]	50...255		39	40 ... 150	xxx

Unthreaded section					/ UUU
12 mm				●	012
15 mm	●	●			015
13 mm fixed			●		013
Other lengths min …max [step size 5 mm][1]	20 …230		13	15 ... 125	xxx

Length sensor with integrated cable					/ PPP
0.5 m	●	●	●	●	005
1.0 m	●	●	●	●	010
5.0 m	●	●	●	●	050
10.0 m	●	●	●	●	100

Cable protection (C) and protection length (XX) for integrated cable[2]					/ CXX
No protection	●		●	●	000
Steel protective conduit	●			●	299 or 2xx
PTFE protective conduit	●			●	399 or 3xx
Corrugated tube protective conduit, design A		●			499 or 4xx
Corrugated tube protective conduit, design B		●			599 or 5xx

Special requirements - need to be put in writing					/ R
No	●	●	●	●	0
Yes	upon request				1

1. Umax = L - 25 mm, measured from the sensor tip to the threadless end
2. The first position C defines the type of the cable protection, CXX = 000 stands for no protection. The second and third positions XX specify the length of the protection. XX = 99 is standard setting and specifies the maximum possible protection length for the selected length sensor with integrated cable. The protection ends about 0.2 m before the end of the plug. The protection length is measured from the sensors tip to the end of the protective conduit. The shortest length is 03 = 0.3 m. The step size is 01 = 0.1 m.

Notes on the diagrams:
All specifications in [mm]

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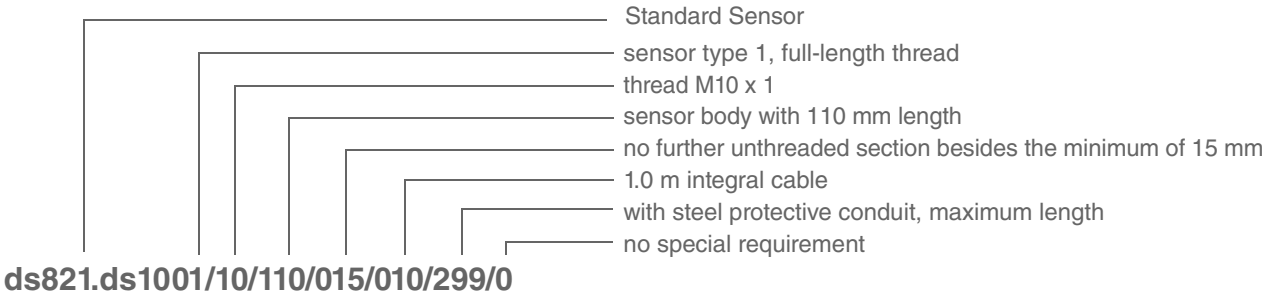
2 mm Measuring Range
Non-Contacting Displacement Sensor System Series ds821 / Ex Series ds822

For an order, write the number of the selected option in the corresponding boxes on the right. Read from top to bottom, an order code has the following form:

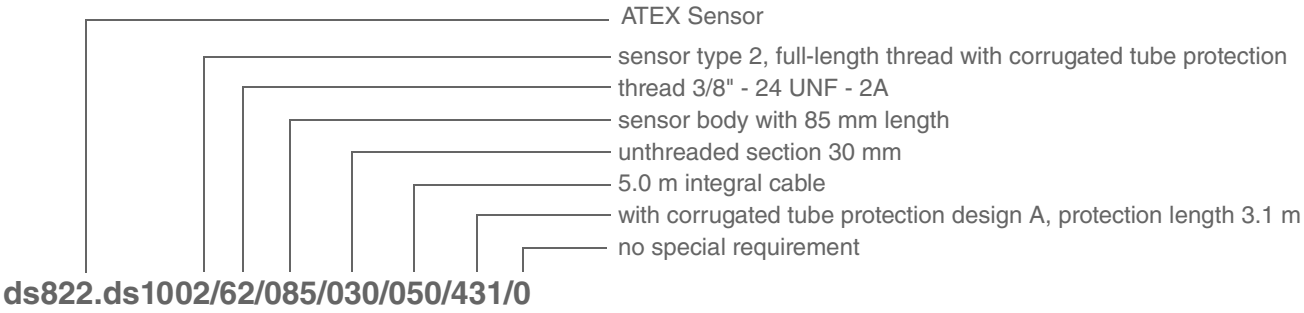
ds82x.ds100S / TT / LLL / UUU / PPP / CXX / R

Order examples ds82x.ds100S:

Series ds821 Standard



Series ds822 ATEX



Notes on the diagrams:
All specifications in [mm]

Diagrams of connection cable (ec)

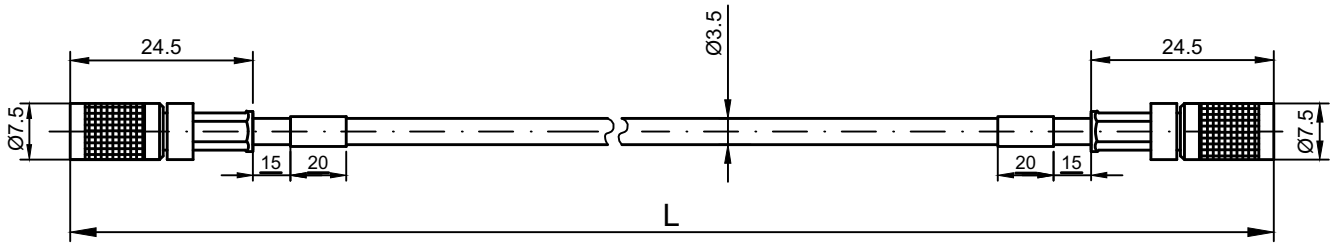


*Figure 1 Dimensions of connection cable ds82x.**ec100 (no protection)***

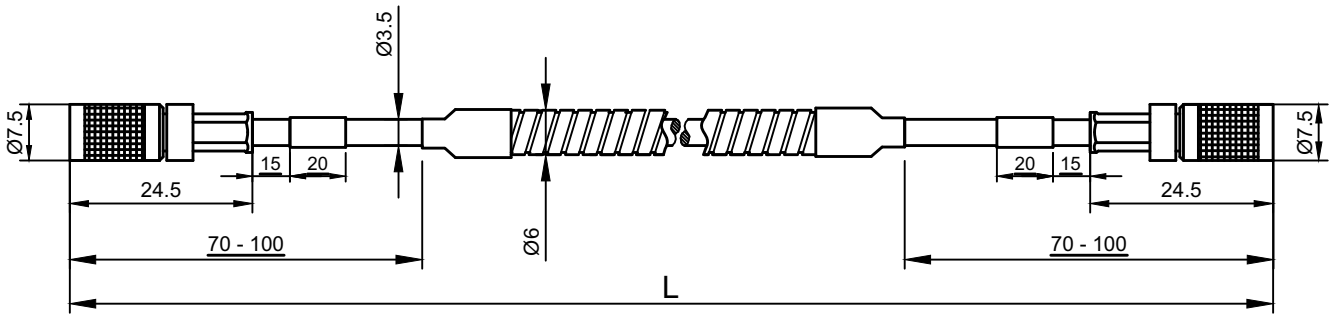


*Figure 2 Dimensions of connection cable ds82x.**ec102 (steel protection)** mechanical reinforcement*

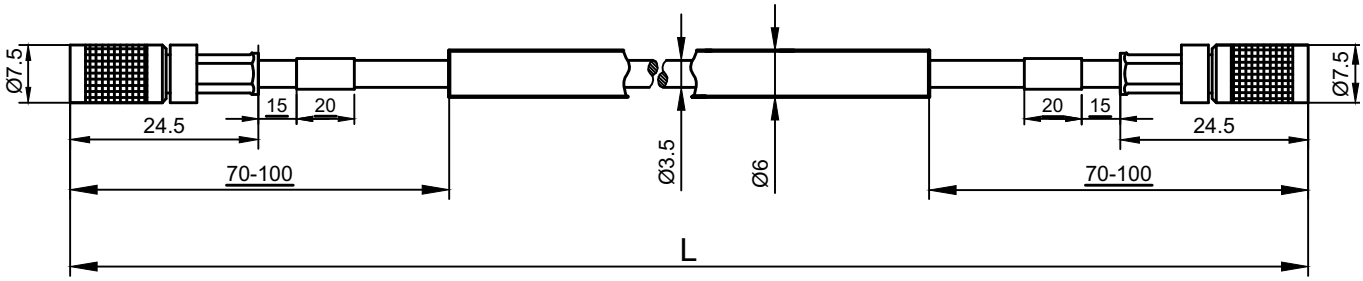


*Figure 3 Dimensions of connection cable de82x.**ec103 (PTFE tube)***

Notes on the diagrams:
All specifications in [mm]

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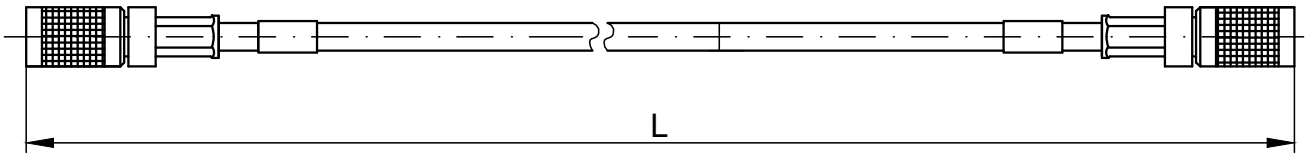
Order code for connection cable (ec) ds82x.ec10E / LL / R



connection cable for displacement sensor series	ds821	ds822				X		Order code
Standard	●					1	➢	ds82
ATEX		●				2		
Cable protection			**ec100**	**ec102**	**ec103**	**E**		
No protection			●			0	➢	.ec10
Steel protective conduit				●		2		
PTFE protective conduit					●	3		
Length of the connection cable						**/ LL**		
4.0 m			●	●	●	40	➢	/
4.5 m			●	●	●	45		
9.0 m			●	●	●	90		
9.5 m			●	●	●	95		
Special requirements - need to be put in writing						**/ R**		
No			●	●	●	0	➢	/
Yes			upon request			1		

For an order, write the number of the selected option in the corresponding boxes on the right. Read from top to bottom, an order code has the following form:

ds82x.ec10E / LL / R

Order examples ds82x.ec10E:

Series ds821 Standard

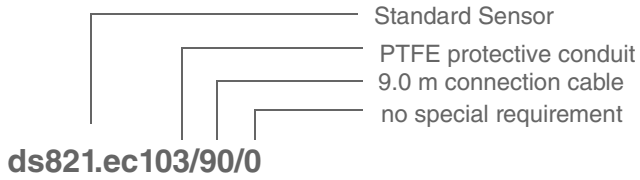


Diagram of driver (od)

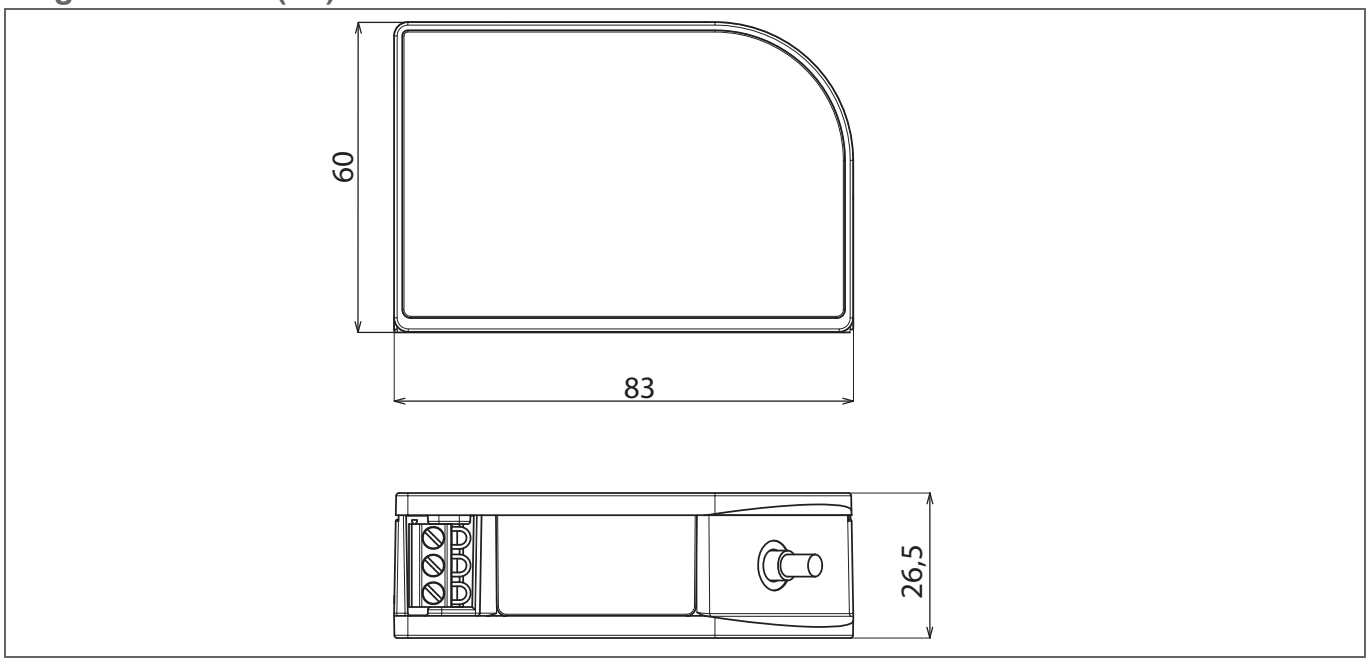


Figure 4 Dimensions of driver ds82x.od110

Order code for driver (od) ds82x.od110 / R

Displacement sensor series	ds821	ds822
Standard	●	
ATEX		●

X
1
2

Order code

ds82 [ ] .od110

Special requirements - need to be put in writing		/ R
No	●	0
Yes	upon request	1

/ [ ]

For an order, write the number of the selected option in the corresponding boxes on the right. Read from top to bottom, an order code has the following form:

ds82x.od110 / R

Order examples ds82x.od110:

Serie ds821 Standard

Standard Sensor
no special requirements

ds821.od110/0

Notes on the diagrams:
All specifications in [mm]

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Mounting adapter for hat-rail or drill-hole mounting

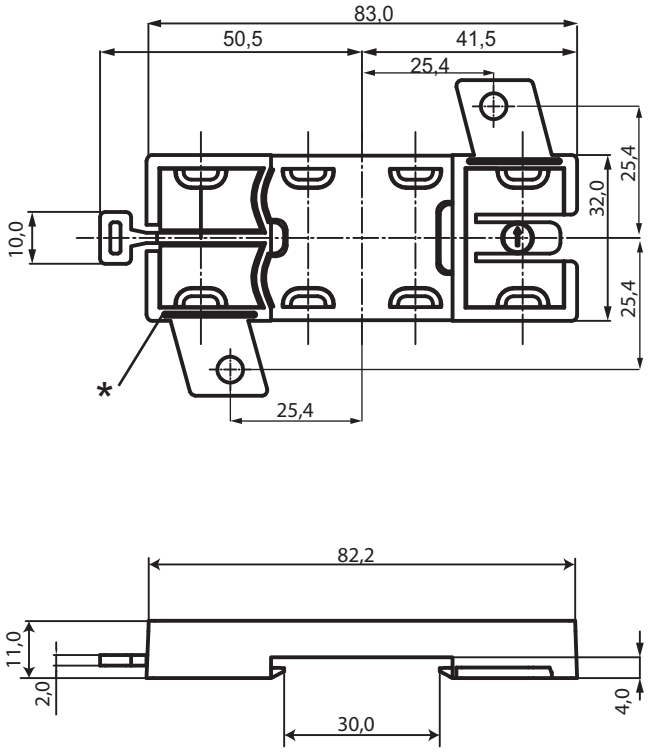

Figure 5 Dimensional diagram of mounting adapter

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

The driver (od) can be mounted from both sides on the mounting adapter

Notes on the diagrams:
All specifications in [mm]

Order code for complete displacement sensor system (mc)

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

Displacement	ds821	ds822	X
Standard	●		1
ATEX		●	2

Order code: ➢ ds82 ☐ .mc101

Sensor type					/ S
Full-length thread	●				1
Full-length thread with corrugated tube		●			2
Reverse mounted probe			●		3
Right - angled head				●	4
Thread					**/ TT**
M10 x 1	●	●	●	●	10
3/8 – 24 UNF-2A	●	●	●	●	62
Length of the sensor body					**/ LLL**
38 mm, minimal				●	038
45 mm	●	●		●	045
75 mm	●	●		●	075
105 mm	●	●		●	105
135 mm	●	●		●	135
39 mm fixed			●		039
Other lengths min … max [step size 5 mm]	50... 255		39	40 ... 150	xxx
Unthreaded section					**/ UUU**
12 mm				●	012
15 mm	●	●			015
13 mm fixed			●		013
Other lengths min…max [step size 5 mm][1]	20 ... 230		13	15 ... 125	xxx
Nominal ECDS system length					**/ NN**
5 m	●	●	●	●	05
10 m	●	●	●	●	10
Length of sensor with integrated cable					**/ PP**
Complete nominal system length, no additional connection cable	●	●	●	●	00
0.5 m	●	●	●	●	05
1.0 m	●	●	●	●	10
Cable protection (C) and protection length for integrated cable (XX)[2]					**/ CXX**
No protection	●		●	●	000
Steel protective conduit	●			●	299 or 2xx
PTFE protective conduit	●			●	399 or 3xx
Corrugated tube protective conduit, design A		●			499 or 4xx
Corrugated tube protective conduit, design B		●			599 or 5xx
E cable protection of connection cable (if available)[3]					**/ E**
No protection	●	●	●	●	0
Steel protective conduit	●	●	●	●	2
PTFE protective conduit	●	●	●	●	3
R special requirements - need to be put in writing					**/ R**
No	●	●	●		0
Yes	upon request				1

1. U_{max} = L-25 m, measured from the sensor tip to the threadless end
2. The first position C defines the type of the cable protection, CXX = 000 stands for no protection. The second and third positions XX specify the length of the protection. XX = 99 is standard setting and specifies the maximum possible protection length for the selected length sensor with integrated cable. The protection ends about 0.2 m before the end of the plug. The protection length is measured from the sensors tip to the end of the protective.
3. If there is no connection cable (PP = 00), then enter the value "**0**".

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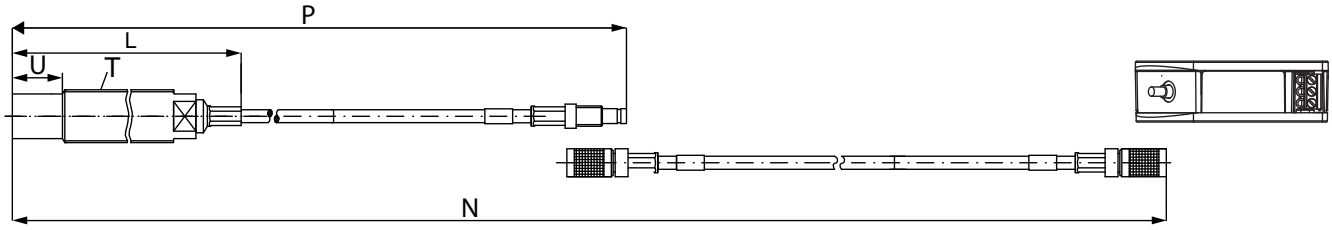
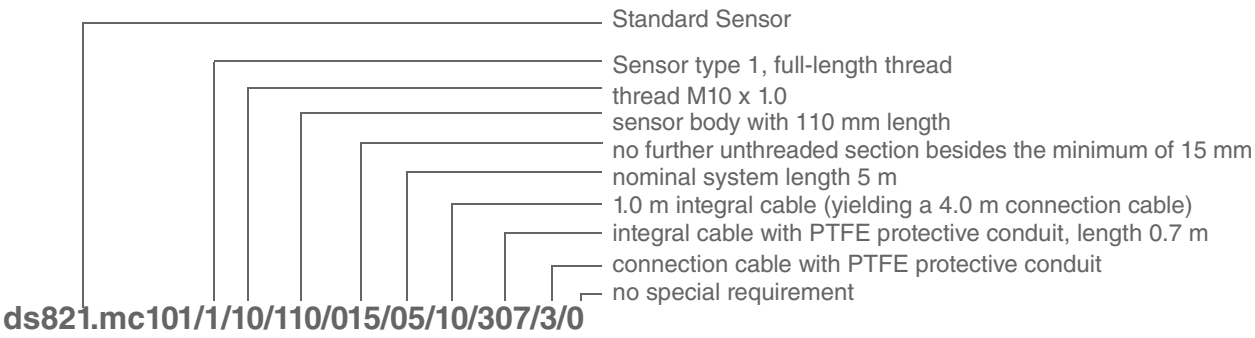


For an order, write the number of the selected option in the corresponding boxes on the right. Read from top to bottom, an order code has the following form:

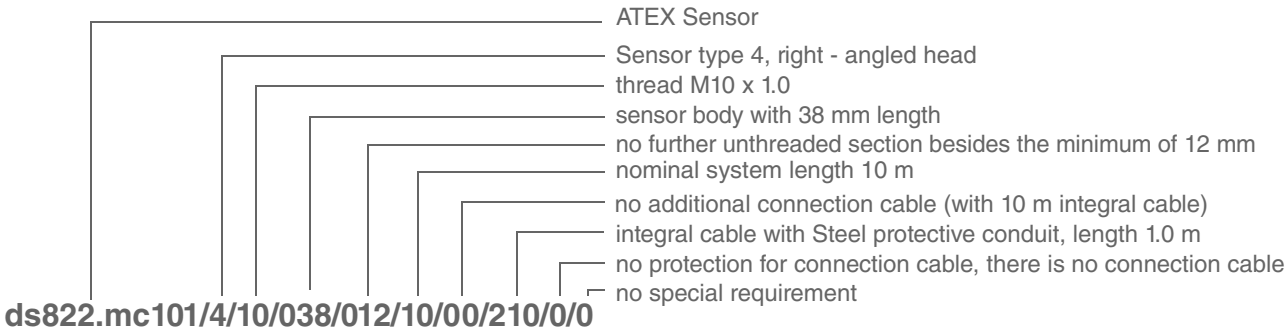
ds82x.mc101 / S / TT / LLL / UUU / NN / PP / CXX / E / R

Order examples ds82x.mc101:

Series ds821 Standard



Series ds822 ATEX



Remark:

The length of the possible connection cable is derived automatically from the length of the integral cable and the nominal system length. The delivery contents of a complete measuring system always include a driver of the corresponding series.

Approvals

Displacement sensor systems of the series ds822 and series ds821 are:

CE compliant acc. to EMC Directive and

RoHS Directive

C-Tick for Australia and New Zeeland

EN 1618

Displacement sensor system series ds822 ATEX is additionally approved for:

use in hazardous Ex-area according 94/9EG.

EC type examination certificate PTB 12 ATEX 2011 designation
Ex II 1/2 G Ex ia IIC T6 Ga/Gb or Ex II 2G Ex ia IIC T6 Gb Ex II 2 D Ex ia IIIC T168 °C Db

in compliance with EN 60079-0, EN 60079-26 and EN 60079-11.

IECEx certificate: IECEx PTB 13.0010 mark
Ex ia IIC T6 Ga/Gb or Ex ia IIC T6 Gb
Ex ia IIIC T168 °C Db

Voltage supply: type of protection Intrinsic Safety EX ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I_i = 140 mA
P_i = 840 mW

L_i = negligibly low
C_i = 12 nF

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Ambient temperature range

Category 1/2 equipment

Temperature class	Permissible ambient temperature range category 1/2-G-equipment		Permissible surface temperature category 2-D-equipment	
	Sensor / Connection cable	Oscillator	Sensor / Connection cable	Oscillator
T6	-50 °C … +53 °C	-35 °C … +67 °C	+71 °C	+85 °C
T5	-50 °C … +65 °C	-35 °C … +82 °C	+83 °C	+100° C
T4	-50° C … +93 °C	-35 °C … +85 °C	+111 °C	+103 °C
T3	-50 °C … +145 °C	-35 °C … +85 °C	+163 °C	+103 °C
T2, T1	-50 °C … +150 °C	-35 °C … +85 °C	+168 °C	+103 °C

Category 2 equipment

Temperature class	Permissible ambient temperature range category 2-G-equipment		Permissible surface temperature category 2-D-equipment	
	Sensor / Connection cable	Oscillator	Sensor / Connection cable	Oscillator
T6	-50 °C … +67 °C	-35 °C … +67 °C	+85 °C	+85 °C
T5	-50 °C … +82 °C	-35 °C … +82 °C	+100 °C	+100 °C
T4	-50 °C … +117 °C	-35 °C … +85 °C	+135 °C	+103 °C
T3,T2, T1	-50 °C … +150 °C	-35 °C … +85 °C	+168 °C	+103 °C

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