

# Linear measuring technology

**Draw wire mechanics with redundant sensors**

**Draw wire encoder C100**

**Measuring length up to 5 m integrated inclinometer**



Thanks to its robust design and its high IP67 protection level, the draw wire encoder C100 reliably provides accurate length measurement. Its simple and optimal integration in the application is a particular highlight of this product. Many additional options, ranging from the integrated inclinometer up to the relay output, are available.

To increase plant availability, this draw wire encoder allows combining a redundant system in a very compact housing.



Analog output

CANopen



Wide temperature range



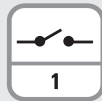
High protection level



Shock / vibration resistant



Redundancy



Relay output



Switching outputs

## Characteristics

- Measuring length up to 5 m.
- Integrated inclinometer.
- Redundant sensors.
- Different types of sensors (analog, incremental, CANopen, relay output, switch output).
- Linearity up to  $\pm 0.1\%$  of the measuring range.
- High protection level IP67 and wide temperature range from  $-40^\circ\text{C}$  ...  $+85^\circ\text{C}$ .

## Advantages

- The suitable measuring length for every application.
- Cost, space and installation work saving.
- For even higher plant availability.
- Simple selection and fast installation.
- High accuracy at economic prices.
- Reliability and long service life for outdoor applications.

### Order code with analog sensor

D8. C100 . XXXX . XXX 1 . X 000

**a** Measuring length

0100 = 1 m  
0200 = 2 m  
0300 = 3 m  
0400 = 4 m  
0500 = 5 m

**b** Sensor type

A22 = 0 ... 10 V<sup>1)</sup>  
A44 = 0.5 ... 4.5 V  
R22 = 0 ... 10 V, redundant<sup>1)</sup>  
R44 = 0.5 ... 4.5 V, redundant

**c** Type of connection

1 = M12 connector, 5-pin

**d** Power supply

1 = 9 ... 30 V DC  
2 = 5 V DC<sup>2)</sup>

### Order code with CANopen and inclinometer

D8. C100 . XXXX . RC1 1 . 1 X 00

**a** Measuring length

0100 = 1 m  
0200 = 2 m  
0300 = 3 m  
0400 = 4 m  
0500 = 5 m

**b** Sensor type

RC1 = CANopen redundant

**c** Type of connection

1 = M12 connector, 5-pin

**d** Power supply

1 = 9 ... 30 V DC

**e** Inclinometers

0 = none  
1 = 1 inclinometer  
2 = 2 inclinometers

1) Planned availability as from 09/2018.

2) Only in conjunction with type of sensor A44 and R44.

# Linear measuring technology

<b>Draw wire mechanics with redundant sensors</b>	<b>Draw wire encoder C100</b>	<b>Measuring length up to 5 m integrated inclinometer</b>
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<b>Order code with incremental output</b>	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">D8.</td> <td style="padding: 2px 5px;">C100.</td> <td style="padding: 2px 5px;">XXXX.</td> <td style="padding: 2px 5px;">XXX</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><b>a</b></td> <td style="text-align: center;"><b>b</b></td> <td style="text-align: center;"><b>c</b></td> <td></td> <td style="text-align: center;"><b>d</b></td> <td></td> </tr> </table>	D8.	C100.	XXXX.	XXX	X	.	1	000			<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>	
D8.	C100.	XXXX.	XXX	X	.	1	000										
		<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>											
<b>a</b> <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b</b> <i>Sensor type</i> I11 = incremental AB, 512 ppr I12 = incremental ABZ, 512 ppr I21 = incremental AB, 1024 ppr I22 = incremental ABZ, 1024 ppr	<b>c</b> <i>Type of connection</i> 1 = M12 connector, 5-pin 3 = radial cable, 2 m [6.56']  <b>d</b> <i>Output circuit / Power supply</i> 1 = TTL / 9 ... 30 V DC															

<b>Order code with relais output</b>	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">D8.</td> <td style="padding: 2px 5px;">C100.</td> <td style="padding: 2px 5px;">XXXX.</td> <td style="padding: 2px 5px;">RL1</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><b>a</b></td> <td style="text-align: center;"><b>b</b></td> <td style="text-align: center;"><b>c</b></td> <td></td> <td style="text-align: center;"><b>d</b></td> <td></td> </tr> </table>	D8.	C100.	XXXX.	RL1	1	.	1	000			<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>	
D8.	C100.	XXXX.	RL1	1	.	1	000										
		<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>											
<b>a</b> <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b</b> <i>Sensor type</i> RL1 = relay output	<b>c</b> <i>Type of connection</i> 1 = M12 connector, 5-pin  <b>d</b> <i>Power supply</i> 1 = 9 ... 30 V DC															

<b>Order code with switch output</b>	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">D8.</td> <td style="padding: 2px 5px;">C100.</td> <td style="padding: 2px 5px;">XXXX.</td> <td style="padding: 2px 5px;">SW3</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><b>a</b></td> <td style="text-align: center;"><b>b</b></td> <td style="text-align: center;"><b>c</b></td> <td></td> <td style="text-align: center;"><b>d</b></td> <td></td> </tr> </table>	D8.	C100.	XXXX.	SW3	4	.	1	000			<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>	
D8.	C100.	XXXX.	SW3	4	.	1	000										
		<b>a</b>	<b>b</b>	<b>c</b>		<b>d</b>											
<b>a</b> <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b</b> <i>Sensor type</i> SW3 = 3 switch outputs	<b>c</b> <i>Type of connection</i> 4 = M12 connector, 12-pin  <b>d</b> <i>Power supply</i> 1 = 9 ... 30 V DC															

Accessories relais output	Order no.
<b>Teach adapter</b> (for sensor type RL1)	M12 connector, 5-pin adapter with button <b>D8.C100.RL1.TEACH</b>
Accessories switch output	Order no.
<b>Visualization adapter</b> (for sensor type SW3)	M12 connector, 12-pin <b>D8.C100.SW3.VISUAL</b>
Connection technology for analog sensor	Order no.
<b>Cordset, pre-assembled</b>	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable <b>05.00.6081.2211.002M</b>
<b>Connector, self-assembly (straight)</b>	M12 female connector with coupling nut, 5-pin <b>8.0000.5116.0000</b>

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## Draw wire mechanics with redundant sensors

## Draw wire encoder C100

## Measuring length up to 5 m integrated inclinometer

### Technical data

#### Mechanical characteristics (draw wire mechanics)

<b>Measuring range</b>	1.0 ... 5.0 m
<b>Measuring wire</b>	material diameter AISI304 steel wire Nylon coated ø 0.9 mm ø 0.61 mm (ABZ Incremental)
<b>Wire fastening</b>	eyelet internal diameter outer diameter height ø 8 mm ø 15 mm 2 mm
<b>Wire pull-out speed max.</b>	max. 1 m/s
<b>Acceleration</b>	max. 10 m/s <sup>2</sup>
<b>Linearity (whole measuring range)</b>	analog ±0.8 % incremental (1 - 2 m) ±0.1 % incremental (3 - 5 m) ±0.3 % CANopen / relay ±0.5 %
<b>Repetition accuracy (whole measuring range)</b>	analog ±0.1 % incremental (1, 2 m) ±0.1 % incremental (3 - 5 m) ±0.15 % CANopen / relay ±0.1 %
<b>Pull-back force</b>	typ. 2 N <sup>1)</sup>
<b>Pull-out force</b>	typ. 8 N
<b>Drum circumference</b>	245 mm
<b>Type of connection</b>	M12 connector, 5-pin cable, 2 m [6.56'] (only incremental)
<b>Housing</b>	polycarbonate reinforced with glass fibers
<b>Protection</b>	IP67
<b>Temperature range</b>	-40°C ... +85°C [-40°F ... +185°F]
<b>Weight</b>	approx. 0.5 kg [17.67 oz]
<b>Shock resistance acc. to EN 60068-2-27</b>	300 m/s <sup>2</sup> , 11 ms
<b>Vibration resistance acc. to EN 60068-2-6</b>	100 m/s <sup>2</sup> , 10 ... 500 Hz

#### Analog sensor

<b>Output signal</b>	analog
<b>Resolution</b>	12 bit

#### Incremental output

<b>Output signal</b>	AB (Z optional)
<b>Resolution</b>	512 / 1024 ppr
<b>Current consumption (non load)</b>	max. 100 mA
<b>Output current</b>	max. 50 mA
<b>Circuit</b>	TTL

#### CANopen

<b>Output signal</b>	CANopen (DS301)
<b>Resolution</b>	14 bit
<b>Resolution inclinometer</b>	0.1°
<b>Accuracy inclinometer</b>	±0.6°
<b>Temperature drift inclinometer</b>	±0.01 % / °C

#### Electrical characteristics

<b>Power supply</b>	9 ... 30 V DC 5 V DC ±10 % <sup>2)</sup>
<b>Electromagnetic compatibility</b>	acc. to EN 61326-1, EN 61326-3-1
<b>CE compliant acc. to</b>	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

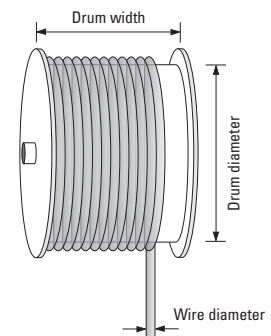
#### Operating principle

##### Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

##### Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



#### Relay output

<b>Output signal</b>	1x relay (Normally Open)
<b>Maximum current</b>	50 mA
<b>Hysteresis</b>	20 mm (factory setting)

#### Switch output

<b>Output signal</b>	switch
<b>Maximum current</b>	0.5 A
<b>Mechanical service life</b>	without load min. 1,000,000 switching operations (60 switching operations/ min.) under load min. 30,000 switching operations (30 switching operations/ min.)

1) May be lower at low temperatures.

2) Only in conjunction with type of sensor A44 and R44.

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### Terminal assignment

Sensor type	Type of connection	M12 connector, 5-pin					
A22, A44, R22, R44 (analog sensor)	1	Signal:	+V	0 V	U <sub>out 1</sub>	U <sub>out 2</sub> <sup>1)</sup>	AGND
		Pin:	1	2	3	4	5

Sensor type	Type of connection	M12 connector, 5-pin					
I11, I12, I21, I22 (incremental output)	1	Signal:	+V	0 V	A	B	0
		Pin:	1	2	3	4	5

Sensor type	Type of connection	Cable (isolate unused wires individually before initial start-up)					
I11, I12, I21, I22 (incremental output)	3	Signal:	+V	0 V	A	B	0
		Core color:	WH	YE	BN	GN	GY

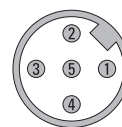
Sensor type	Type of connection	M12 connector, 5-pin					
RC1 (CANopen)	1	Signal:	0 V	+V	CAN-GND	CAN-H	CAN-L
		Pin:	3	2	1	4	5

Sensor type	Type of connection	M12 connector, 5-pin					
RL1 (relay)	1	Signal:	Teach	+V	0 V	C	NO
		Pin:	1	2	3	4	5
		<p>The switching point of the relay can be set by means of a button connected to pin 1 (Teach). To do so, position the draw wire mechanic at the desired switching point and then press the button once.</p>					

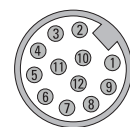
Sensor type	Type of connection	M12 connector, 12-pin												
SW3 (switching output)	4	Signal:	NC 1	NO 1	C 1	NC 2	NO 2	C 2	NC 3	NO 3	C 3	n.c.	n.c.	n.c.
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

- +V : Power supply +V DC
- 0 V : Power supply GND (0V)
- U<sub>out 1</sub> : Voltage output 1
- U<sub>out 2</sub> : Voltage output 2
- A : Incremental output channel A
- B : Incremental output channel B
- 0 : Reference signal
- Teach : Teach function input
- C : Relay contact C
- NO : Relay contact N.O.
- C 1 : Switching contact C.1
- C 2 : Switching contact C.2
- C 3 : Switching contact C.3
- NO 1 : Switching contact N.O.1
- NO 2 : Switching contact N.O.2
- NO 3 : Switching contact N.O.3
- NC 1 : Switching contact N.C.1
- NC 2 : Switching contact N.C.2
- NC 3 : Switching contact N.C.3
- n.c. : not connected
- AGND : Analog Ground

#### Top view of mating side, male contact base



M12 connector, 5-pin



M12 connector, 12-pin

1) Only in case of redundant ordering option sensor type R22 and R44 (otherwise n.c.).

**Draw wire mechanics  
with redundant sensors**

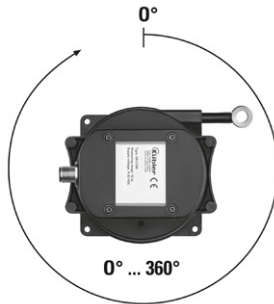
**Draw wire encoder C100**

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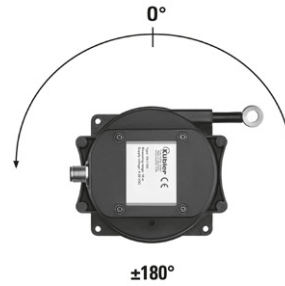
## Technology in detail

### Inclinometer with option RC1

Setting possibility 360°



Setting possibility ±180°



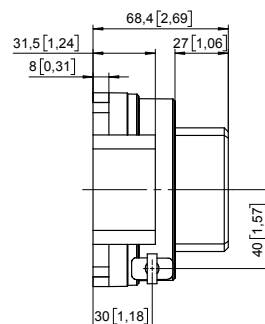
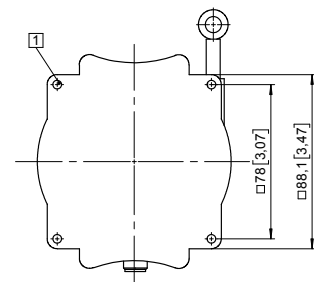
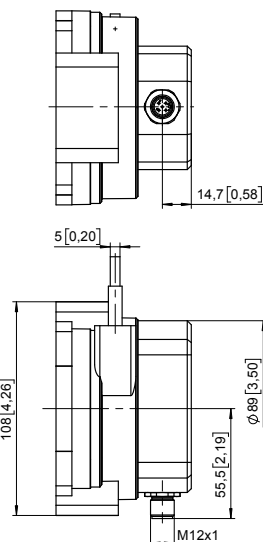
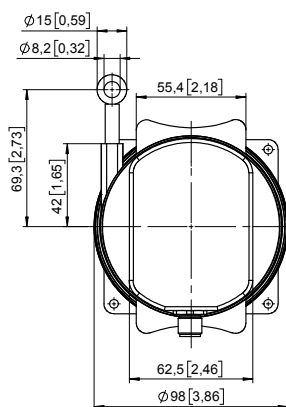
Redundant signals possible.

#### Setting possibilities:

- Switching between setting possibilities 180° and 360°.
- Switching between synchronous and asynchronous output.
- Change of direction of rotation (cw/ccw).
- Setting and resetting an offset.

## Dimensions

Dimensions in mm [inch]



1 4 x Ø 4.4 [0.17]