

**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



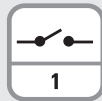
High protection level



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 . XXX1 . X 000

**a** Measuring length

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

**b** Sensor type

A11 = 4 ... 20 mA  
A22 = 0 ... 10 V  
A44 = 0.5 ... 4.5 V  
R11 = 4 ... 20 mA, redundant  
R22 = 0 ... 10 V, redundant  
R44 = 0.5 ... 4.5 V, redundant

**c** Type of connection

1 = M12 connector, 5-pin

**d** Power supply

1 = 12 ... 30 V DC  
2 = 5 V DC <sup>1)</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

Stock types

D8.C100.0500.RC11.1000

1) 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;">. XXXX</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">. 1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td style="text-align: center; font-size: 8px;">a</td> <td></td> <td style="text-align: center; font-size: 8px;">b</td> <td style="text-align: center; font-size: 8px;">c</td> <td style="text-align: center; font-size: 8px;">d</td> <td></td> <td></td> </tr> </table>	D8	. C100	. XXXX	. XXXX	X	. 1	000	a		b	c	d		
D8	. C100	. XXXX	. XXXX	X	. 1	000									
a		b	c	d											
<b>a Measuring length</b> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b Sensor type</b> I11 = incremental AB, 512 ppr I12 = incremental ABZ, 512 ppr I21 = incremental AB, 1024 ppr I22 = incremental ABZ, 1024 ppr	<b>c Type of connection</b> 1 = M12 connector, 5-pin 3 = radial cable, 2 m [6.56']  <b>d Output circuit / Power supply</b> 1 = TTL / 9 ... 30 V DC													

<b>Order code with relays 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;">. 1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td style="text-align: center; font-size: 8px;">a</td> <td></td> <td style="text-align: center; font-size: 8px;">b</td> <td style="text-align: center; font-size: 8px;">c</td> <td style="text-align: center; font-size: 8px;">d</td> <td></td> <td></td> </tr> </table>	D8	. C100	. XXXX	. RL1	1	. 1	000	a		b	c	d		
D8	. C100	. XXXX	. RL1	1	. 1	000									
a		b	c	d											
<b>a Measuring length</b> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b Sensor type</b> RL1 = relay output	<b>c Type of connection</b> 1 = M12 connector, 5-pin  <b>d Power supply</b> 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;">. 1</td> <td style="padding: 2px 5px;">000</td> </tr> <tr> <td style="text-align: center; font-size: 8px;">a</td> <td></td> <td style="text-align: center; font-size: 8px;">b</td> <td style="text-align: center; font-size: 8px;">c</td> <td style="text-align: center; font-size: 8px;">d</td> <td></td> <td></td> </tr> </table>	D8	. C100	. XXXX	. SW3	4	. 1	000	a		b	c	d		
D8	. C100	. XXXX	. SW3	4	. 1	000									
a		b	c	d											
<b>a Measuring length</b> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	<b>b Sensor type</b> SW3 = 3 switch outputs	<b>c Type of connection</b> 4 = M12 connector, 12-pin  <b>d Power supply</b> 1 = 9 ... 30 V DC													

Accessories relays 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> M12 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable <b>05.00.60B1.B211.002M</b>
<b>Connector, self-assembly (straight)</b>	M12 female connector with coupling nut, housing metal/plastic, 5-pin M12 female connector with coupling nut, housing metal, 12-pin <b>05.B-8151-0/9</b> <b>8.0000.5162.0000</b>
<b>Connector, self-assembly (right-angle)</b>	M12 female connector with coupling nut, housing plastic, 4-pin <b>05.B8241-0</b>

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## Draw-wire mechanics with redundant sensors

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### Technical data

#### Mechanical characteristics (draw-wire mechanics)

<b>Measuring range</b>	1.0 ... 5.0 m
<b>Measuring wire</b>	material AISI304 steel wire Nylon coated diameter $\varnothing$ 0.9 mm $\varnothing$ 0.61 mm (ABZ Incremental)
<b>Wire fastening</b>	eyelet internal diameter $\varnothing$ 8 mm outer diameter $\varnothing$ 15 mm height 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 $\pm$ 0.8 % incremental (1 - 2 m) $\pm$ 0.1 % incremental (3 - 5 m) $\pm$ 0.3 % CANopen / relay $\pm$ 0.5 %
<b>Repetition accuracy (whole measuring range)</b>	analog $\pm$ 0.3 % incremental (1, 2 m) $\pm$ 0.1 % incremental (3 - 5 m) $\pm$ 0.15 % CANopen / relay $\pm$ 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>	$\pm$ 0.6°
<b>Temperature drift inclinometer</b>	$\pm$ 0.01 % / °C

#### Electrical characteristics

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

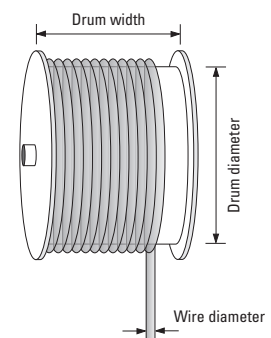
#### Operating principle

##### 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.

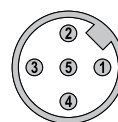
<b>Draw-wire mechanics with redundant sensors</b>	<b>Draw-wire encoder C100</b>	<b>Measuring length up to 5 m integrated inclinometer</b>
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### Terminal assignment

Sensor type	Interface	Type of connection	M12 connector, 5-pin												
A11, R11 (analog sensor)	current output	1	Signal:	+V	0 V	Iout 1	Iout 2 <sup>1)</sup>	n.c.							
			Pin:	1	2	3	4	5							
Sensor type	Interface	Type of connection	M12 connector, 5-pin												
A22, R22, A44, R44 (analog sensor)	voltage output	1	Signal:	+V	0 V	Uout 1	Uout 2 <sup>1)</sup>	n.c.							
			Pin:	1	2	3	4	5							
Sensor type	Interface	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	Interface	Type of connection	M12 connector, 5-pin												
RC1	CANopen	1	Signal:	+V	0 V	CAN-GND	CAN-H	CAN-L							
			Pin:	2	3	1	4	5							
Sensor type	Interface	Type of connection	M12 connector, 5-pin												
RL1	relay	1	Signal:	+V	0 V	Teach	CAN-H	NO							
			Pin:	2	3	1	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	Interface	Type of connection	Cable (isolate unused cores 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	Interface	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)
- Iout 1 : Current output 1
- Iout 2 : Current output 2
- Uout 1 : Voltage output 1
- Uout 2 : 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 R11, R22, R44 (otherwise n.c.).

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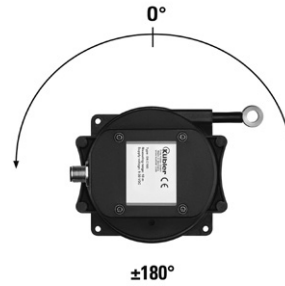
## Technology in detail

### Inclinometer with option RC1

Setting possibility 360°



Setting possibility ±180°



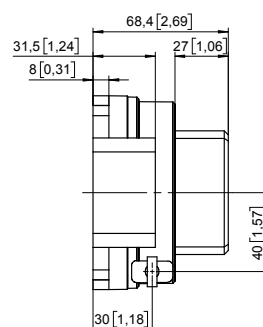
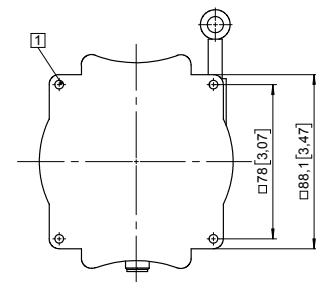
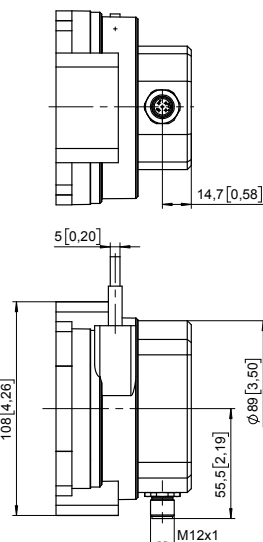
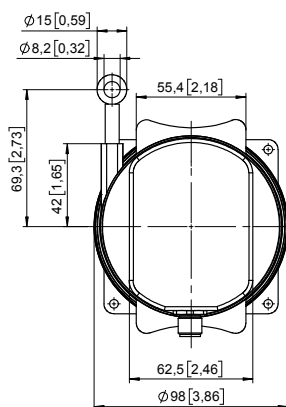
Redundant signals possible.

#### 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  $\varnothing 4.4 [0.17]$