Draw wire mechanics for outdoor applications

Draw wire encoder D120

Measuring length up to 10 m
Linearity up to ±0.1 %

Their extremely robust construction, their high IP69k protection level and their wide temperature range make these new draw wire encoders particularly reliable and durable. Their flexibility and adaptability reflects in the wide range of housing and wire types, the long measuring range and the various interfaces. The possibility of redundancy must be particularly pointed out.

RoHS

Analog output

CANopen

Long service life | Wide temperaturerange | High protection level | Redundancy | V4A

Robust

- Protection level up to IP69k and wide temperature range from -40°C ... +85°C.
- The titanium-anodized aluminum housing and the stainless steel wires allow using the mechanics even in harsh conditions.
- Wire diameter (stainless steel, V4A) up to ø 1.5 mm - ideal for outdoor applications.

Versatile

- Measuring length up to 10 m.
- Redundant outputs (mA, V, R).
- The right measuring wire and the right wire fastening for every application.
- Linearity up to ±0.1 % of the measuring range.
- Various constructions: open, closed housing or housing with perforated sheet steel cover.

Order code

D8.D120	.	X	X	X	X	.	XXX	X	.	0000
Type		a	b	c	d		e	f		

Standard variants are represented **bold underlined**

a *Measuring length*
3 = 3 m
4 = 4 m
5 = 5 m
6 = 6 m
7 = 7 m
8 = 8 m
9 = 9 m
A = 10 m

b *Wire types* [1]
1 = V4A, ø 0.5 mm
2 = V4A, ø 1.0 mm (measuring length 3 ... 8 m)
3 = V4A, ø 1.5 mm (measuring length 3 ... 6 m)

c *Linearity*
1 = 0.5 %
2 = 0.25 %
3 = 0.1 %

d *Housing*
1 = open housing, open wire guide
3 = housing with perforated sheet metal cover, open wire guide
4 = housing with perforated sheet metal cover, closed wire guide
6 = closed housing, closed wire guide

e *Sensor type*
A11 = 4 ... 20 mA / 12 ... 30 VDC
A22 = 0 ... 10 V / 12 ... 30 VDC
A33 = 1 kΩ / max. 30 VDC
CC1 = CANopen [2]
R11 = 2 x 4 ... 20 mA / 12 ... 30 VDC
R22 = 2 x 0 ... 10 V / 12 ... 30 VDC
R33 = 2 x 1 kΩ / max. 30 V

f *Type of connection / protection level sensor*
1 = radial cable, 2 m [6.56'] TPE / IP69k [3]
3 = radial M12 connector / IP67
4-pin for sensor type A11 ... A33
5-pin for sensor type CC1
8-pin for sensor type R11 ... R33

1) Wire type availability depends on the selected measuring range, refer to the technical data.
2) In preparation, series availability planed for Q1/2018.
3) Other cable length on request.

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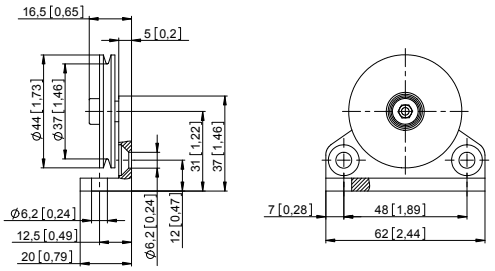
Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Technical data

General technical data

Linearity	±0.5 %
Improved linearity	±0.25 % or ±0.1 %
Resolution	see electrical characteristics
Sensor element	potentiometer
Output signal (others on request)	4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Redundant output signal	optional for: 4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Connection	radial M12 connector or radialer cable outlet (TPE cable), standard length 2 m
Protection	IP67, optional IP69k (only with cable outlet)
Humidity	max. 90 % relative, no condensing
Wire pull-out speed	max. 3.0 m/s
Acceleration	max. 50 m/s^2
Weight	1300 ... 1600 g [45.87 ... 56.44 oz] depending on measuring range
Housing	aluminum, spring housing PA6
Spring force	min. 7 N / max. 13 N [1)]

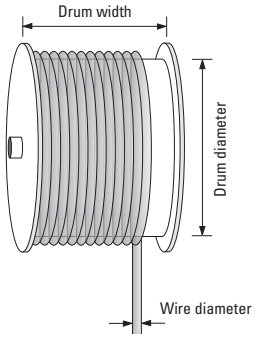
Characteristics measuring wire

V4A, ø 0.5 mm	measuring range	3 ... 10 m
	no.	1.4401
	breaking force	280 N
	TK	16 x 10^{-6} K^{-1}
V4A, ø 1.0 mm	measuring range	3 ... 8 m
	no.	1.4401
	breaking force	942 N
	TK	16 x 10^{-6} K^{-1}
V4A, ø 1.5 mm	measuring range	3 ... 6 m
	no.	1.4401
	breaking force	1.890 N
	TK	16 x 10^{-6} K^{-1}

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. The single-layer wire winding ensuring the best linearity possible is a specific feature of Kübler draw wire encoders.

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



1) Depends on the measuring length.

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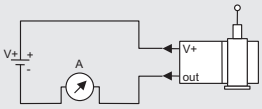
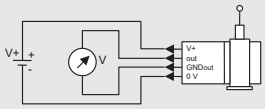
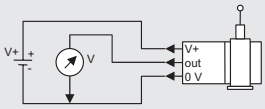
Linearity up to ±0.1 %

Electrical characteristics (analog sensor, scaled to measuring range)			
Version	**A11 / R11**	**A22 / R22**	**A33 / R33**
Output	4 ... 20 mA	0 ... 10 V	1 kΩ, potentiometer
Output current	max. 50 mA in case of a failure	max. 10 mA, min. load 10 kΩ	–
Max. current consumption	–	22.5 mA (non load)	–
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Response time	< 1 ms from 0 ... 100 % and 100 ... 0 %	< 3 ms from 0 ... 100 % and 100 ... 0 %	–
Resolution	limited by the noise	limited by the noise	theoretically unlimited
Noise	0.03 mA_{pp} = 6 mV_{pp} at 200 Ω	typ. 3 mV_{pp}, max. 37 mV_{pp}	depending on the supply voltage
Recommended slider current	–	–	< 1 µA
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]
Short circuit proof	–	yes, sustained short-circuit proof	–
Temperature coefficient	0.0079 %/K	0.0037 %/K	±0.0025 %/K
Connection diagrams			
Electromagnetic compatibility	acc. to EN 61326-1:2006	acc. to EN 61326-1:2006	–
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Options	
Protection class IP69k	All relevant sensor components are entirely encapsulated. Suitable for steam and high-pressure cleaning (only in connection with cable outlet).
Extended temperature range	The use of special components allows an operating temperature of -40°C ... +85°C [-40°F ... +185°F]
Redundant output signal	The use of a double potentiometer allows the sensor to provide two independent output signals: • 2 x 4 ... 20 mA • 2 x 0 ... 10 V • 2 x 1 kΩ • 2 x CANopen (in preparation)
Wire fastening (with swivel, on ball bearing)	• eyelet, internal diameter 20 mm (standard) • M4 thread, length 22 mm • wire clip
Wire cleaner	In preparation

Order code – extensions for the following options	
Wire fastening M4 [1]	D8.D120.xxxx.xxxx.xxxx.**S001**
Wire fastening clip	D8.D120.xxxx.xxxx.xxxx.**S002**
Extended temperature range -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S003**
Wire fastening M4 and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S004**
Wire fastening clip and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S005**

1) Not available with wire type V4A, ø 1,5 mm – order option ⓑ = 3.

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Terminal assignment

Type of connection	Sensor type	M12 connector, 4-pin					
3	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⏚
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⏚
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⏚
		Pin:	1	2	3	4	PH

Type of connection	Sensor type	M12 connector, 5-pin					
3	CC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Pin:	2	3	1	4	5

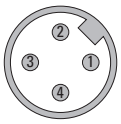
Type of connection	Sensor type	M12 connector, 8-pin								
3	R11 (4 ... 20 mA)	Signal:	$+V_1$	n.c.	Signal 1	n.c.	$+V_2$	n.c.	Signal 2	n.c.	⏚
	R22 (0 ... 10 V)	Signal:	$+V_1$	Signal 1	$0\ V_1$	0 V Signal 1	$+V_2$	Signal 2	$0\ V_2$	0 V Signal 2	⏚
	R33 (1 kΩ)	Signal:	$+V_1$	Slider 1	$0\ V_1$	n.c.	$+V_2$	Slider 2	$0\ V_2$	n.c.	⏚
		Pin:	1	2	3	4	5	6	7	8	PH

Type of connection	Sensor type	Cable (isolate unused wires individually before initial start-up)					
1	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⏚
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⏚
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⏚
		Core color:	BN	WH	BU	SW	shield

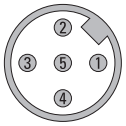
Type of connection	Sensor type	Cable (isolate unused wires individually before initial start-up)					
1	CC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Core color:	BN	WH	GY	GN	YE

Type of connection	Sensor type	Cable (isolate unused wires individually before initial start-up)								
1	R11 (4 ... 20 mA)	Signal:	$+V_1$	n.c.	Signal 1	n.c.	$+V_2$	n.c.	Signal 2	n.c.	⏚
	R22 (0 ... 10 V)	Signal:	$+V_1$	Signal 1	$0\ V_1$	0 V Signal 1	$+V_2$	Signal 2	$0\ V_2$	0 V Signal 2	⏚
	R33 (1 kΩ)	Signal:	$+V_1$	Slider 1	$0\ V_1$	n.c.	$+V_2$	Slider 2	$0\ V_2$	n.c.	⏚
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Top view of mating side, male contact base



M12 connector, 4-pin



M12 connector, 5-pin

M12 connector, 8-pin

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Technology in detail

Various wire types and wire fastenings

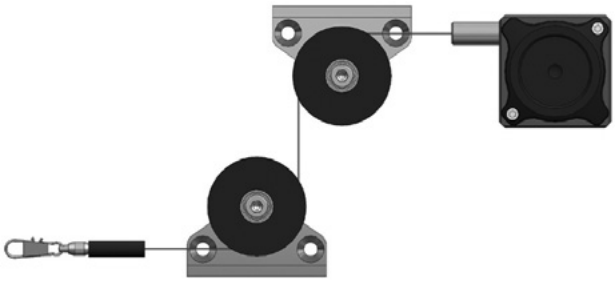
Wire types:
- ø 0.5 mm (V4A) [1)]
- ø 1.0 mm (V4A)
- ø 1.5 mm (V4A)

Wire fastenings:
Clip | M4 thread | Eyelet [1)]

Extension wire

available on request with clip or M4 cable fastening

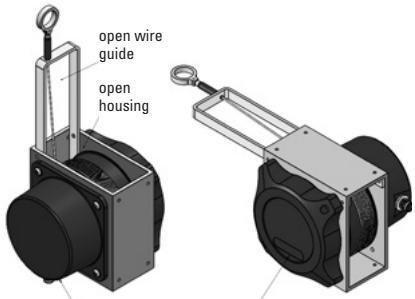
Application-specific installation possibilities



Housing types (the suitable housing type for every application)

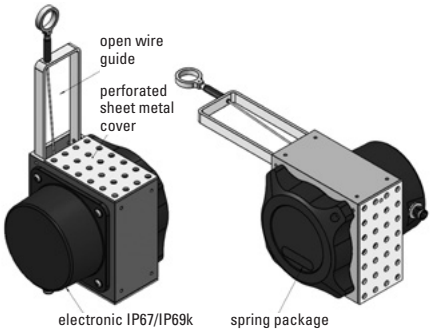
Open housing,
open wire guide

For use in the presence of fine dust and liquids.



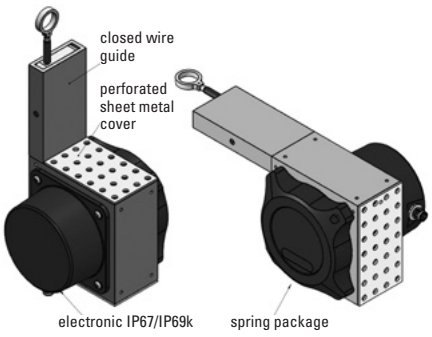
Housing with perforated sheet metal cover,
open wire guide

For use in the presence of dirt, particles size > 2mm and liquids



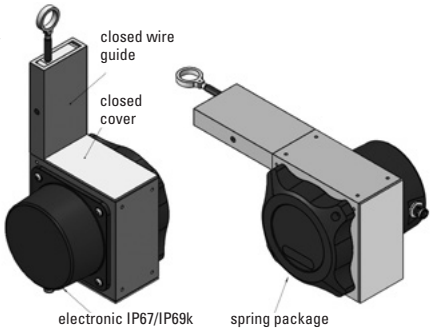
Housing with perforated sheet metal cover,
closed wire guide

For use in the presence of dirt, particles size > 2mm and liquids.
Shock protection,
wire cleaning device
(in preparation).



Closed housing ,
closed wire guide

For use in the presence of sticky dust, cement, concrete, clay.
Shock protection,
wire cleaning device
(in preparation).



1) Standard.

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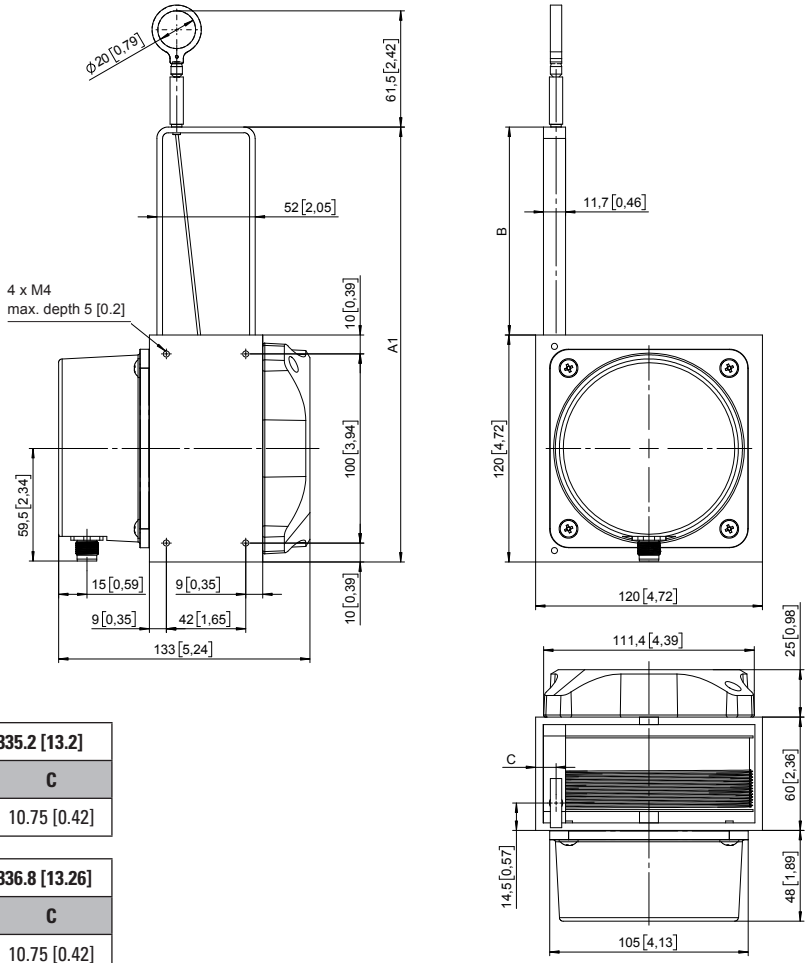
Dimensions

Dimensions in mm [inch]

Open housing, open wire guide



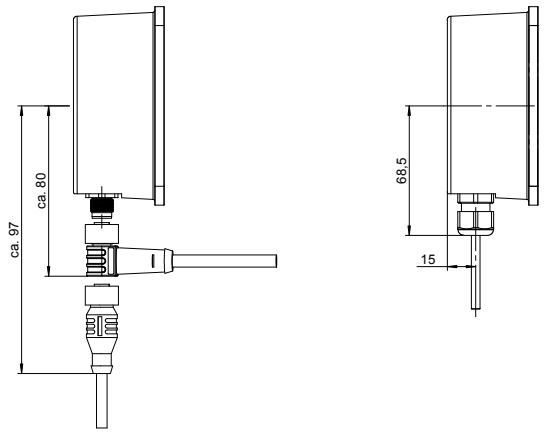
Wire diameter ø 0.5 mm – drum pitch circumference: 335.2 [13.2]			
Measuring length	**A1**	**B**	**C**
3 ... 10 m	230 [9.06]	110 [4.33]	10.75 [0.42]

Wire diameter ø 1.0 mm – drum pitch circumference: 336.8 [13.26]			
Measuring length	**A1**	**B**	**C**
3 ... 5 m	230 [9.06]	110 [4.33]	10.75 [0.42]
6 ... 8 m	320 [12.6]	200 [7.87]	12.25 [0.48]

Wire diameter ø 1.5 mm – drum pitch circumference: 338.3 [13.32]			
Measuring length	**A1**	**B**	**C**
3 ... 4 m	230 [9.06]	110 [4.33]	10.75 [0.42]
5 ... 6 m	320 [12.6]	200 [7.87]	12.25 [0.48]

Connector output / Cable outlet

The cable must be protected in case of steam and high-pressure cleaning.



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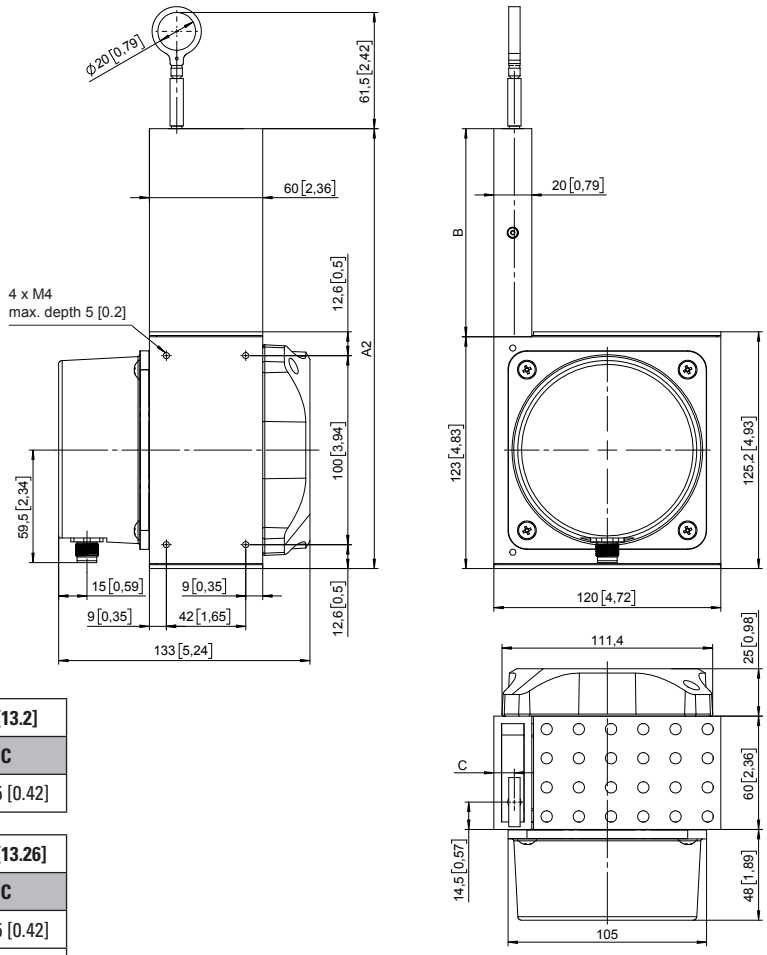
Dimensions

Dimensions in mm [inch]

Housing with perforated sheet metal cover, closed wire guide



Wire diameter ø 0.5 mm – drum pitch circumference: 335.2 [13.2]			
Measuring length	**A2**	**B**	**C**
3 ... 10 m	233 [9.17]	110 [4.33]	10.75 [0.42]

Wire diameter ø 1.0 mm – drum pitch circumference: 336.8 [13.26]			
Measuring length	**A2**	**B**	**C**
3 ... 5 m	233 [9.17]	110 [4.33]	10.75 [0.42]
6 ... 8 m	323 [12.7]	200 [7.87]	12.25 [0.48]

Wire diameter ø 1.5 mm – drum pitch circumference: 338.3 [13.32]			
Measuring length	**A2**	**B**	**C**
3 ... 4 m	233 [9.17]	110 [4.33]	10.75 [0.42]
5 ... 6 m	323 [12.7]	200 [7.87]	12.25 [0.48]