

# Absolute encoders – multiturn

**Compact electronic multiturn, magnetic**

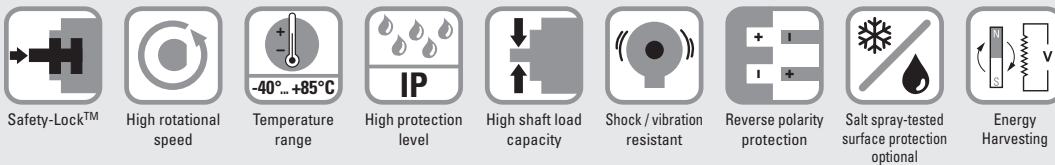
**Sendix M3668 / M3688 (shaft / hollow shaft)**

**CANopen**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

It is characterized by robustness, reliability and cost-efficiency.



## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

## Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

### Order code

Shaft version <sup>1)</sup>

**8.M3668** . **XX** **2** **X** . **21** **2** **2**

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



#### a Flange

- 1 = clamping flange, IP67,  $\varnothing$  36 mm [1.42"]
- 3 = clamping flange, IP65,  $\varnothing$  36 mm [1.42"]
- 2 = synchro flange, IP67,  $\varnothing$  36 mm [1.42"]
- 4 = synchro flange, IP65,  $\varnothing$  36 mm [1.42"]

#### b Shaft ( $\varnothing$ x L), with flat

- 1 =  $\varnothing$  6 x 12.5 mm [0.24 x 0.49"]
- 3 =  $\varnothing$  8 x 15 mm [0.32 x 0.59"]
- 5 =  $\varnothing$  10 x 20 mm [0.39 x 0.79"]
- 2 =  $\varnothing$  1/4" x 12.5 mm [0.49"]

#### c Interface / power supply

- 2 = CANopen DS301 V4.2 / 10 ... 30 V DC

#### d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC \*)
- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC \*)
- 3 = axial M12 connector
- 4 = radial M12 connector

\*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.M3668.432A.2122.0030 (for cable length 3 m)

#### e Fieldbus profile

- 21 = CANopen encoder profil DS406 V4.0

#### Optional on request

- Ex 2/22 (only for connection types 3 and 4)
- Surface protection salt spray tested

1) Series availability as from March 2015.

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<b>Order code</b> Hollow shaft <sup>1)</sup>	<b>8.M3688</b> Type	<b>.XX2X</b> a b c d	<b>.21</b> e	<b>22</b>	If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	<b>10 By 10</b>
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<b>a Flange</b> <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u> 3 = with spring element, long, IP65 5 = with stator coupling, IP67, ø 46 mm [1.81"] 6 = with spring element, long, IP67  <b>b Blind hollow shaft</b> 1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"]</u> 2 = ø 1/4"	<b>c Interface / power supply</b> <u>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</u>  <b>d Type of connection</b> <u>1 = axial cable, 1 m [3.28'] PVC</u> A = axial cable, special length PVC *) 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) 3 = axial M12 connector 4 = radial M12 connector  *) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3688.242A.2122.0030 (for cable length 3 m)	<b>e Fieldbus profile</b> <u>21 = CANopen encoder profil DS406 V4.0</u>  <i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - Surface protection salt spray tested
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<b>Mounting accessory for shaft encoders</b>	Order no.
<b>Coupling</b> Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	<b>8.0000.1102.0808</b>

<b>Mounting accessory for hollow shaft encoders with spring element</b>	Order no.
<b>Cylindrical pin, long</b> for torque stops 	With fixing thread <b>8.0010.4700.0000</b>

<b>Connection technology</b>	Order no.
<b>Connector, self-assembly (straight)</b> M12 female connector with coupling nut	<b>8.0000.5116.0000</b>
<b>Cordset, pre-assembled</b> M12 female connector with coupling nut, 6 m [19.69'] PVC cable	<b>05.00.6091.A211.006M</b>

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories)  
 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)

## Technical data

Mechanical characteristics	
<b>Maximum speed</b>	
shaft- or blind hollow shaft version without shaft seal (IP65)	6000 min <sup>-1</sup> 3000 min <sup>-1</sup> (continuous)
Shaft version (IP67) or blind hollow shaft version (IP65) with shaft seal	4000 min <sup>-1</sup> 2000 min <sup>-1</sup> (continuous)
<b>Starting torque at 20°C [68°F]</b>	
without shaft seal	< 0.007 Nm
with shaft seal (IP67)	< 0.01 Nm
<b>Shaft load capacity</b>	radial 40 N axial 20 N
<b>Weight</b>	approx. 0.2 kg [7.06 oz]
<b>Protection</b>	housing side IP67 acc. to EN 60529 shaft side IP65 (solid shaft version opt. IP67)
<b>Working temperature range</b>	-40°C ... +85°C [-40°F ... +185°F]

<b>Materials</b>	shaft / hollow shaft stainless steel flange aluminium housing aluminium cable PVC
<b>Shock resistance</b> acc. to EN 60068-2-27	2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance</b> acc. to EN 60068-2-6	100 m/s <sup>2</sup> , 55 ... 2000 Hz

Electrical characteristics	
<b>Power supply</b>	10 ... 30 V DC
<b>Current consumption</b> (no load)	max. 30 mA
<b>Reverse polarity protection of the power supply</b>	yes
<b>Short-circuit proof outputs</b>	yes <sup>2)</sup>
<b>e1 compliant</b> acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
<b>UL approval</b>	pending
<b>CE compliant</b> acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

1) Series availability as from March 2015.  
 2) Short circuit proof to 0 V or to output when power supply correctly applied.

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Interface characteristics CANopen	
<b>Resolution singleturn</b>	1 ... 16.384 (14 bit), scalable default: 8.192 (13 bit)
<b>Number of revolutions (multiturn)</b>	max. 16.777.216 (24 bit) scalable only via the total resolution
<b>Total resolution</b>	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
<b>Code</b>	binary
<b>Interface</b>	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
<b>Protocol</b>	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader

<b>Baud rate</b>	10 ... 1000 kbit/s software configurable
<b>Node address</b>	1 ... 127 software configurable
<b>Termination</b>	software configurable
<b>LSS protocol</b>	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
<b>Bootloader</b>	configuration management CIA DS 302-3

### General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-colour LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

### CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length  $L_u$ .

$L_u < 5$  m [16.40'] cable length for 125 Kbit

$L_u < 2$  m [6.56'] cable length for 250 Kbit

$L_u < 1$  m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/encoder must not exceed 70 cm.

### Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP\_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

### LSS layer setting services DS305 V2.0

- Global support of node-ID and baud rate.
- Selective protocol via identity object (1018h).

### CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

- NMT Slave.
- Heartbeat Protocol.
- Identity Object.
- Error Behaviour Object.
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus / programmable termination.

### CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colours.
- Customer-specific protocol.
- "Watchdog controlled" device.

### Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.

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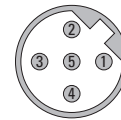
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## Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	1, 2, A, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable colour:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5 pin					
2	3, 4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

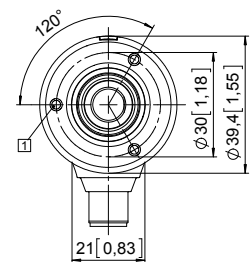
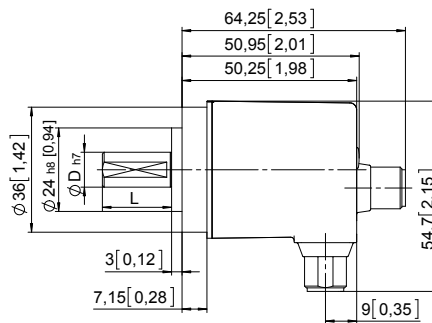
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 36 [1.42] Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7

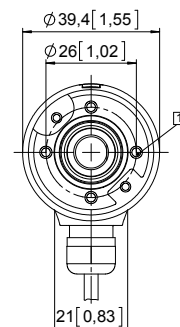
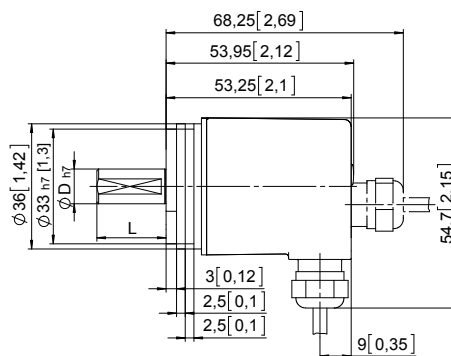


### Synchro flange, ø 36 [1.42]

#### Flange type 2 and 4

1 4 x M3, 6 [0.24] deep

D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7



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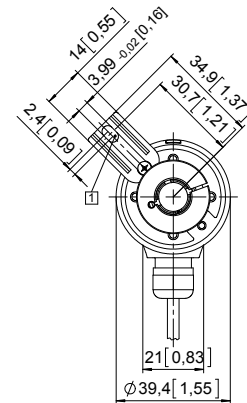
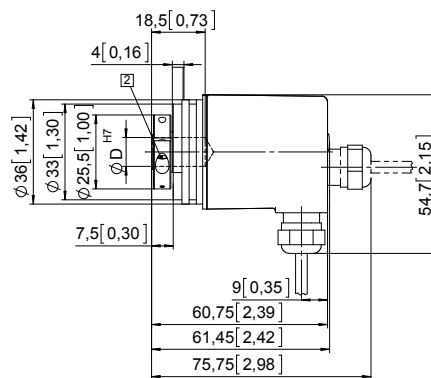
**CANopen**

## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with spring element, long Flange type 3 and 6

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7,  $\varnothing 4$  [0.16]
- 2 Recommended torque for the clamping ring 0,7 Nm

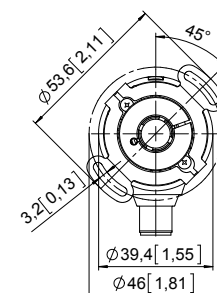
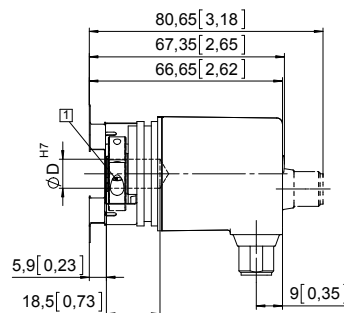


D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

### Flange with stator coupling, $\varnothing 46$ [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0,7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]