

# Absolute encoders – multiturn

<b>Compact electronic multiturn, magnetic</b>	<b>Sendix M3668 / M3688 (shaft / hollow shaft)</b>	<b>SAE J1939</b>
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The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in a compact design, without gear and without battery.

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

**SAE J1939**

Safety-Lock™	High rotational speed	Temperature range -40°... +85°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Reverse polarity protection	Surface protection salt spray-tested optional	Energy Harvesting

### 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

- Up-to-the-minute fieldbus performance in the application: SAE J1939 with CAN-highspeed to ISO 11898.
- Universal Scaling Function.
- Fast determination of the operating status via two-color LED.

**Order code**      **8.M3668 . XX3X . 32 2 2**  
**Shaft version**      Type      a b c d e

**a Flange**

- 1 = clamping flange, IP67, ø 36 mm [1.42"]
- 3 = clamping flange, IP65, ø 36 mm [1.42"]
- 2 = synchro flange, IP67, ø 36 mm [1.42"]
- 4 = synchro flange, IP65, ø 36 mm [1.42"]**

**b Shaft (ø x L), with flat**

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

**c Interface / supply voltage**

- 3 = SAE J1939 / 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, 5-pin
- 4 = radial M12 connector, 5-pin**

\*) 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.M3668.433A.3222.0030 (for cable length 3 m)

**e Fieldbus profile**

- 32 = SAE J1939**

*Optional on request*

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

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<b>Order code</b>	<b>8.M3688</b>	<b>XX3X</b>	<b>3222</b>
<b>Hollow shaft</b>	Type	a b c d e	e

**a Flange**  
**2 = with stator coupling, IP65, ø 46 mm [1.81"]**  
 3 = with spring element, long, IP65  
 5 = with stator coupling, IP67, ø 46 mm [1.81"]  
 6 = with spring element, long, IP67

**b Blind hollow shaft (insertion depth max. 18.5 mm [0.73"])**  
 1 = ø 6 mm [0.24"]  
 3 = ø 8 mm [0.32"]  
**4 = ø 10 mm [0.39"]**  
 2 = ø 1/4"

**c Interface / supply voltage**  
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**e Fieldbus profile**  
**32 = SAE J1939**

*Optional on request*  
 - Ex 2/22 (only for connection types 3 and 4)  
 - surface protection salt spray tested

\*) 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.M3688.243A.3222.0030 (for cable length 3 m)

Mounting accessory for shaft encoders		Order no.
<b>Coupling</b>	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	<b>8.0000.1102.0808</b>

Mounting accessory for hollow shaft encoders		Dimensions in mm [inch]	Order no.
<b>Torque pin, ø 4 mm</b> for flange with spring element (flange type 3 + 6)	with fixing thread		<b>8.0010.4700.0000</b>

Connection technology			Order no.
<b>Cordset, pre-assembled</b>	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 5 m [16.40'] PVC cable	Bus in	<b>05.00.6091.A211.005M</b>
	M12 female connector with coupling nut, 5-pin, A coded, straight Deutsch connector DT04, Stift, 6-pin, straight 1 m [3.28'] PVC cable	Bus in	<b>05.00.6091.22C7.001M</b>
<b>Connector, self-assembly</b>	M12 female connector with coupling nut, 5-pin, A coded, straight (metal)	Bus in	<b>8.0000.5116.0000</b>

Further Kübler accessories can be found at: [kuebler.com/accessories](http://kuebler.com/accessories)  
 Further Kübler cables and connectors can be found at: [kuebler.com/connection-technology](http://kuebler.com/connection-technology)

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**SAE J1939**

## 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 or blind hollow shaft version with shaft seal (IP67)	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. 210 g [7.41 oz]
<b>Protection acc. to EN 60529</b>	IP65 or IP67
<b>Working temperature range</b>	-40°C ... +85°C [-40°F ... +185°F]
<b>Materials</b>	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC
<b>Shock resistance acc. to EN 60068-2-27</b>	2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance acc. to EN 60068-2-6</b>	300 m/s <sup>2</sup> , 10 ... 2000 Hz

### Electrical characteristics

<b>Supply voltage</b>	10 ... 30 V DC
<b>Current consumption (no load)</b>	max. 30 mA
<b>Reverse polarity protection of the supply voltage</b>	yes
<b>Short-circuit proof outputs</b>	yes <sup>1)</sup>

### Interface characteristics SAE J1939

<b>Resolution singleturn (MUR)</b>	
scalable	1 ... 16 384 (14 bit)
default	16 384 (14 bit)
<b>Number of revolutions (NDR)</b>	
	1 ... 536 870 912 (29 bit) scalable only via the total resolution
<b>Total resolution (TMR)</b>	
raw value	max. 8 796 093 022 208 (43 bit)
scalable	1 ... 4 294 967 296 (32 bit)
default	4 294 967 296 (32 bit)
<b>Angular measurement deviation <sup>2)</sup></b>	±0,5°
<b>Repeat accuracy</b>	±0.2°
<b>Interface</b>	CAN high-speed acc. to ISO 11898, CAN specification 2.0 B
<b>Protocol</b>	SAE J1939
<b>Power-ON time</b>	< 1200 ms
<b>Baud rate</b>	250 kbit/s switchable by software to 500 kbit/s
<b>Node address</b>	software configurable
<b>Termination</b>	software configurable

### Approvals

<b>E1 compliant</b> in accordance with	ECE guideline
<b>UL compliant</b> in accordance with	File no. E224618
<b>CE compliant</b> in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
ATEX Directive	2014/34/EU (for Ex 2/22 variants)

### General information concerning SAE J1939

The protocol J1939 originates from the international Society of Automotive Engineers (SAE) and operates on the physical layer with high speed CAN as per ISO11898. The application emphasis lies in the area of the power train and chassis of commercial vehicles. It serves to transfer diagnostic data (for example, motor speed, position, temperature) and control information. Type series M3658 and M3678 encoders support the total functionality of J1939.

This protocol is a multimaster system with decentralized network management that does not involve channel-based communication.

It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as parameters (signals) and combined on 4 memory pages (data pages) into parameter groups (PGs). Each parameter group can be identified via a unique number, the parameter group number (PGN). Independently of this, each signal is assigned a unique SPN (suspect parameter number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore the parameter groups are optimized to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol. If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (broadcast announce message) and CMDT (connection mode data transfer). With BAM TP the transfer of data occurs as a broadcast.

### Encoder implementation SAE J1939

- PGNs that are adaptable to the customer's application.
- Resolution of address conflicts -> Address Claiming (ACL).
- Continuous checking whether control addresses have been assigned twice within a network.
- Change of control device addresses during run-time.
- Unique identification of a control device with the help of a name that is unique worldwide. This name serves to identify the functionality of a control device in the network.
- Predefined PGs for position, speed and alarm.
- 250 kbit/s, 29 bit identifier.
- Watchdog controlled device.

A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

1) Short circuit proof to 0 V or to output when supply voltage correctly applied.

2) Over the whole temperature range.

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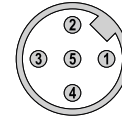
**SAE J1939**

## Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
3	1, 2, A, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Core color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
3	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

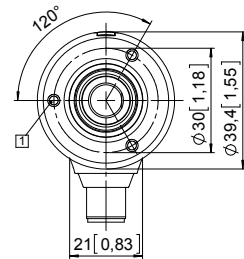
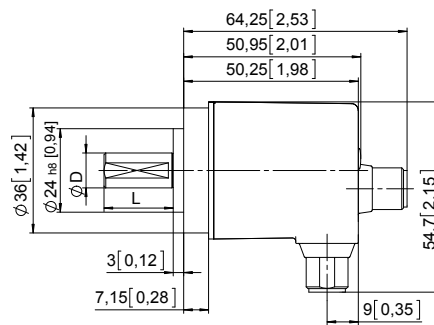
## Dimensions shaft version

Dimensions in mm [inch]

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

1 3 x M3, 6 [0.24] deep

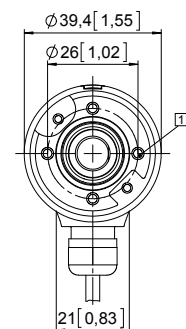
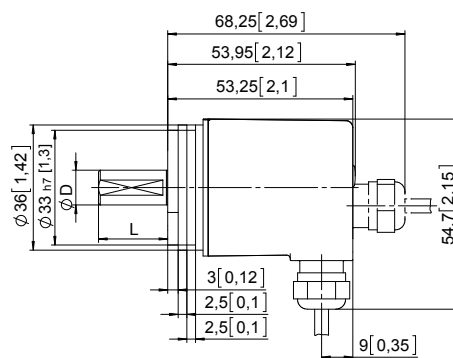
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



### Synchro flange, ø 36 [1.42] Flange type 2 and 4

1 4 x M3, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



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## Dimensions hollow shaft version

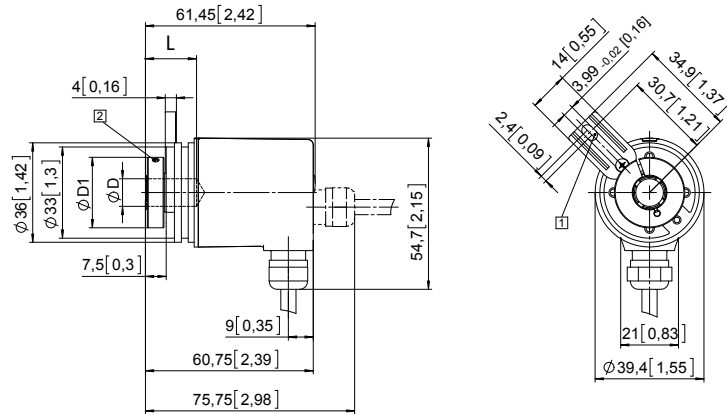
Dimensions in mm [inch]

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

- 1 Slot spring element, recommendation: torque pin DIN 7,  $\varnothing$  4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft



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

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft

