Абсолютные однооборотные энкодеры миниатюрные 2450, 2470, компактные Sendix

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Россия +7(495)268-04-70
Казахстан +7(727)345-47-04
Беларусь +(375)257-127-884
Узбекистан +998(71)205-18-59
Киргизия +996(312)96-26-47

эл.почта: kgu@nt-rt.ru || сайт: https://kubler.nt-rt.ru/

Absolute encoders - singleturn

Miniature magnetic | **2450 / 2470 (shaft / hollow shaft)** | **SSI**

The absolute singleturn encoders 2450 and 2470 with SSI interface and magnetic sensor technology are the specialists when space is tight.

Because of their high 12 bit resolution with 4096 different positions for 360° they offer exceptional repeat accuracy.

High rotational speed | Temperature range | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor

Minimal space requirement

- The outer diameter measures 24 mm; the shaft diameter up to max. 6 mm.
- Flexible connection with radial or axial cable outlet.

Durable and accurate

- Long service life and freedom from wear due to non-contact measuring system.
- Wide temperature range from -20 °C up to +85 °C.
- High 12 bit resolution with 4096 different positions for 360°.

Order code Shaft version

8.2450	.	X	X	1	X	.	G121
Type		a	b	c	d		e

a *Flange*
1 = ø 24 mm [0.94“]
3 = ø 28 mm [1.10“]
2 = ø 30 mm [1.18“]

b *Shaft (ø x L)*
1 = ø 4 x 10 mm [0.16 x 0.39“]
3 = ø 5 x 10 mm [0.20 x 0.39“], with flat
2 = ø 6 x 10 mm [0.24 x 0.39“]

c *Interface / supply voltage*
1 = SSI / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56‘] PUR
A = axial cable, special length PUR *)
2 = radial cable, 2 m [6.56‘] PUR
B = radial cable, special length PUR *)
*) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21‘]
order code expansion .XXXX = length in dm
ex.: 8.2450.111A.G121.0030 (for cable length 3 m)

e *Gray-code*
12 bit resolution

Order code Hollow shaft

8.2470	.	1	X	1	X	.	G121
Type		a	b	c	d		e

a *Flange*
1 = ø 24 mm [0.94“]

b *Blind hollow shaft*
(insertion depth max. 14 mm [0.55“])
1 = ø 4 mm [0.16“]
2 = ø 6 mm [0.24“]

c *Interface / supply voltage*
1 = SSI / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56‘] PUR
A = axial cable, special length PUR *)
2 = radial cable, 2 m [6.56‘] PUR
B = radial cable, special length PUR *)
*) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21‘]
order code expansion .XXXX = length in dm
ex.: 8.2470.111A.G121.0030 (for cable length 3 m)

e *Gray-code*
12 bit resolution

Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59“] for shaft 4 mm [0.16“]	**8.0000.1202.0404**

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Mass moment of inertia		approx. 0.1 x 10^{-6} kgm^2
Starting torque - at 20 °C [68 °F]		< 0.01 Nm
Shaft load capacity	radial	20 N
	axial	10 N
Weight		approx. 0.06 kg [2.11 oz]
Protection acc. to EN 60529		
	housing side	IP65
	flange side	IP50 (IP64 on request)
Working temperature range		-20 °C ... +85 °C [-4 °F ... +185 °F]
Material	shaft / hollow shaft	stainless steel
	clamping ring	MS58
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Supply voltage	5 (+0.4) V DC [1]
Power consumption (no load)	< 40 mA
Reverse polarity protection of the supply voltage	yes
Short circuit proof output	yes [2]
Measuring range	360°
Linearity, 25 °C [77 °F]	< 1.5°
Repeat accuracy	≤ 0.4°

SSI interface

Output driver		RS485
Permissible load / channel		typ. 60 Ohm (acc. to RS485)
Resolution		12 bit
Code		gray
SSI clock speed		100 kHz ... 750 kHz
Monoflop time	typ. / max.	16 µs / 20 µs
Data refresh rate		typ. 100 µs

Approvals

CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
UKCA compliant in accordance with	
EMC Regulations	S.I. 2016/1091
RoHS Regulations	S.I. 2012/3032

Terminal assignment

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

+V : Supply voltage encoder +V DC
0 V : Supply voltage encoder ground GND (0 V)
C+, C- : Clock signal
D+, D- : Data signal

1) The supply voltage at the encoder input must not be less than 4.75 V DC (5 V DC - 5 %).
2) Short circuit to 0 V or to output, only one channel at a time, supply voltage correctly applied.

Miniature magnetic | **2450 / 2470 (shaft / hollow shaft)** | **SSI**

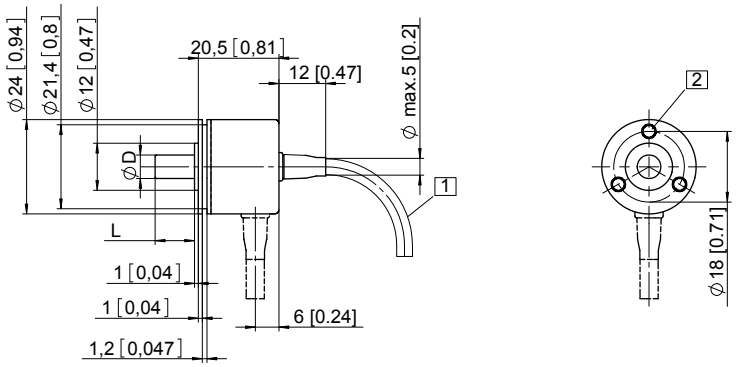
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 min. R50 [1.97]

2 3 x M3, 4 [0.16] deep

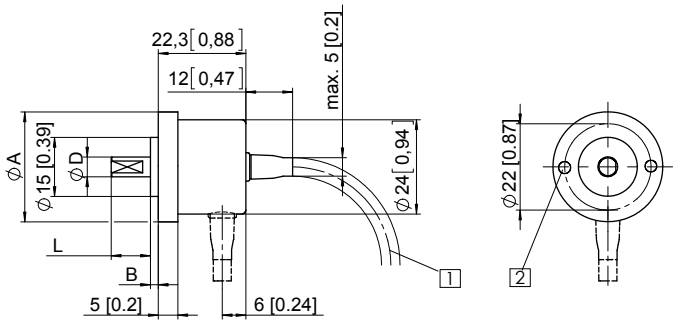


D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4"	f7	10 [0.39]

Flange type 2, ø 30 [1.18]
Flange type 3, ø 28 [1.10]

1 min. R50 [1.97]

2 2 x M3, 4 [0.16] deep



D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4"	f7	10 [0.39]

Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

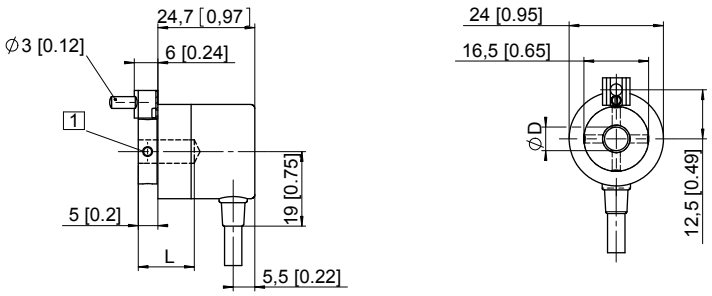
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5

Recommended torque for the set screw in the clamping ring 0.1 Nm.
To ensure optimal clamping by the clamping ring, the customer shaft should be without flat surface.



D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]
L = insertion depth max. blind hollow shaft		

Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

The Sendix M3651A and Sendix M3671A singleturn encoders with analog interface and magnetic sensor technology are particularly flexible in use due to their diverse interfaces and measuring ranges.

A green LED as reference point and a red LED as error indicator simplify both installation and error diagnosis.

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

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.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Different measuring ranges.
- SET input for easy start-up.

Order code Shaft version

8.M3651A . X X X X . X X X 2
Type — a b c d — e f g

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 *Output circuit* [1)]
3 = current output
4 = voltage output

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

Type of connection with changed terminal assignment (see page 5)
C = axial M12 connector, 5-pin
D = 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.M3651A.433A.3112.0030 (for cable length 3 m)

e *Interface / resolution / supply voltage*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

g *Counting direction*
1 = cw
2 = ccw

Optional on request
- Ex 2/22
- surface protection salt spray tested

Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

Order code Hollow shaft

8.M3671A . X X X X . X X X 2
Type — a b c d — e f g

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 *Output circuit* [1)]
3 = current output
4 = voltage output

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

Type of connection with changed terminal assignment (see page 5)
C = axial M12 connector, 5-pin
D = 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.M3671A.243A.3112.0030 (for cable length 3 m)

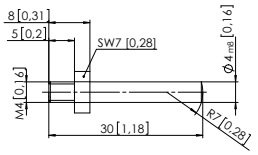
e *Interface / resolution / supply voltage*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

g *Counting direction*
1 = cw
2 = ccw

Optional on request
- Ex 2/22
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders Dimensions in mm [inch]		Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	**8.0010.4700.0000**

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 2 m [6.56‘] PVC cable	**05.00.6081.2211.002M**
Connectors	M12 female connector with coupling nut, 5-pin, A coded, straight (metal)	**8.0000.5116.0000**

1) Output circuit “3” only in conjunction with interface “3”, output circuit “4” only in conjunction with interface “4” or “5”.

Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

Technical data

Electrical characteristics current interface 4 ... 20 mA

Supply voltage		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the supply voltage		yes
Short-circuit proof outputs		yes [1]
Measuring range		45°, 90°, 180° or 360°
DA converter resolution		12 bit
Angular measurement deviation [2]		±0,5°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Output load	at 10 V DC at 24 V DC at 30 V DC	max. 200 Ohm max. 900 Ohm max. 1200 Ohm
Setting time		< 1 ms, R_{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1°
SET input		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

Supply voltage	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the supply voltage		yes
Short-circuit proof outputs		yes [1]
Measuring range		45°, 90°, 180° or 360°
DA converter resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Angular measurement deviation [2]		±0,5°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1°
SET input		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20 °C [68 °F]		
	without shaft seal with shaft seal (IP67	< 0.007 Nm < 0.01 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		approx. 210 g [7.41 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = supply voltage)	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Approvals

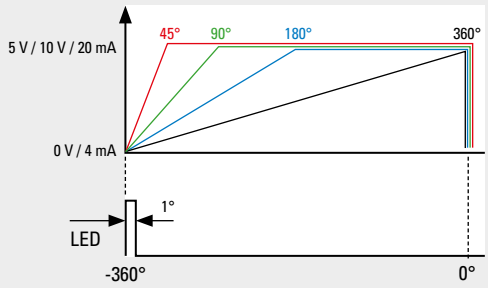
E1 compliant in accordance with		ECE guideline
UL compliant in accordance with		File no. E224618
CE compliant in accordance with		
	EMC Directive RoHS Directive ATEX Directive	2014/30/EU 2011/65/EU 2014/34/EU (for Ex 2/22 variants)

1) When the supply voltage is correctly applied.
But not output to +V. Supply voltage and sensor output signal are not galvanically isolated.
2) Over the whole temperature range.

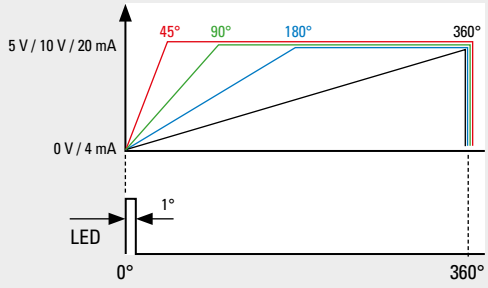
Compact magnetic	Sendix M3651A / M3671A (shaft / hollow shaft)	Analog

Example (output signal evolution)
Variante counting direction cw

Direction of rotation left

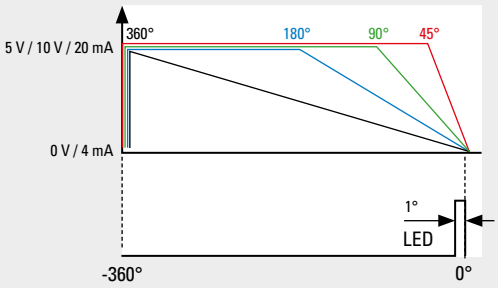


Direction of rotation right

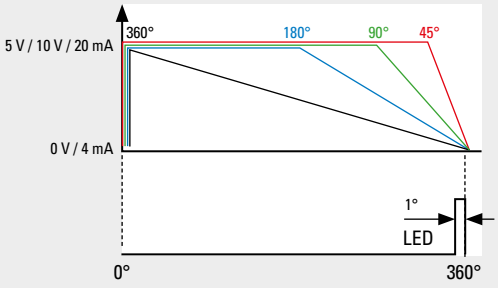


Example (output signal evolution)
Variante counting direction ccw

Direction of rotation left



Direction of rotation right



Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

Terminal assignment

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

Interface	Type of connection	M12 connector, 5 pin					
3 (current)	3, 4	Signal:	0 V	+V	+I	SET	–
		Pin:	3	2	1	5	4

Interface	Type of connection	M12 connector, 5 pin					
3 (current)	C, D	Signal:	0 V	+V	+I	SET	–
		Pin:	3	1	2	4	5

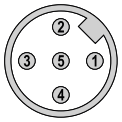
Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
4, 5 (voltage)	1, 2, A, B	Signal:	0 V	+V	+U	SET	
		Core color:	WH	BN	GN	GY	

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (voltage)	3, 4	Signal:	0 V	+V	+U	SET	–
		Pin:	3	2	1	5	4

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (voltage)	C, D	Signal:	0 V	+V	+U	SET	–
		Pin:	3	1	2	4	5

+V : Supply voltage encoder +V DC
0 V : Supply voltage encoder ground GND (0 V)
+U : Voltage
+I : Current
SET : SET input

Top view of mating side, male contact base



M12 connector, 5-pin

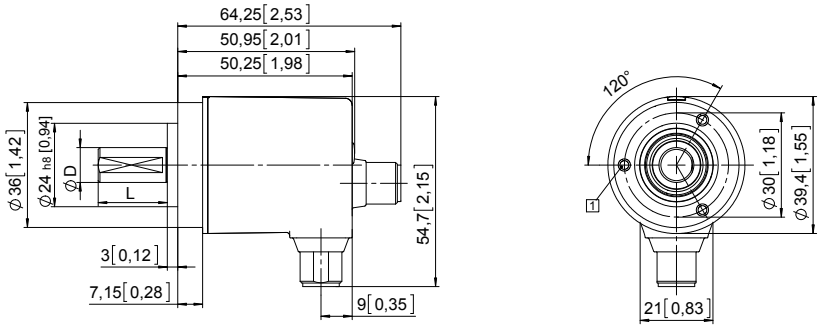
Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

Dimensions shaft version

Dimensions in mm [inch]

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

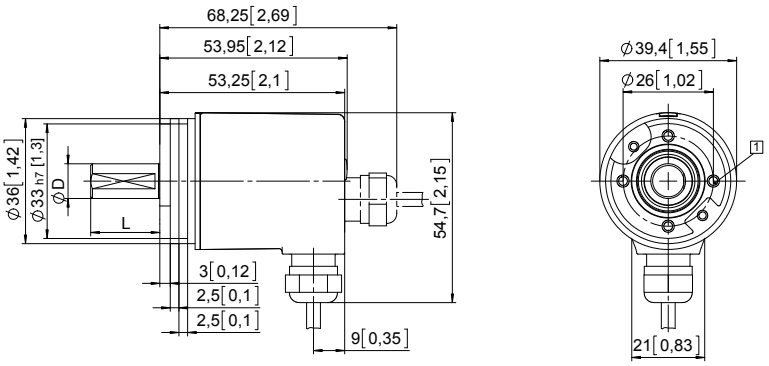
1 3 x M3, 6 [0.24] deep



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]

Compact magnetic | **Sendix M3651A / M3671A (shaft / hollow shaft)** | **Analog**

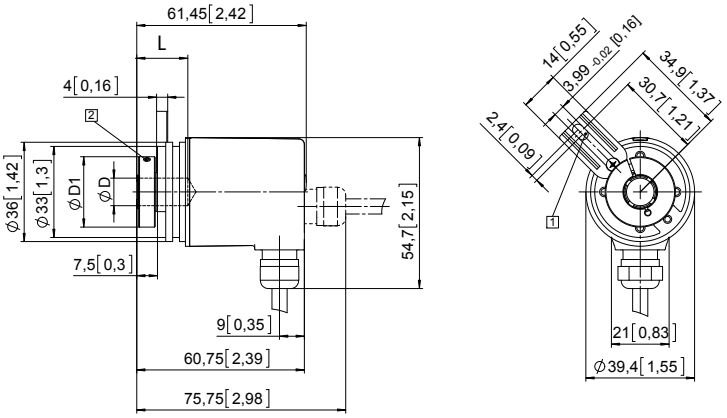
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

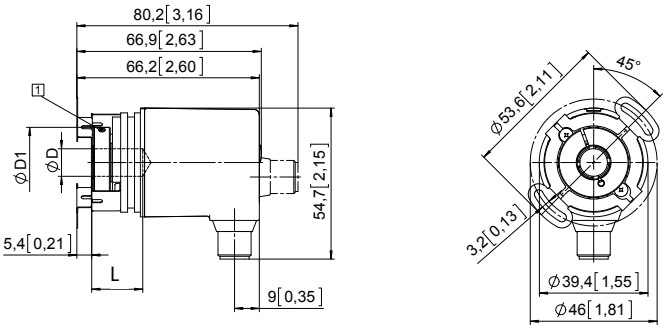
2 Recommended torque for the clamping ring 0.7 Nm



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, ø 46 [1.81]
Flange type 2 and 5

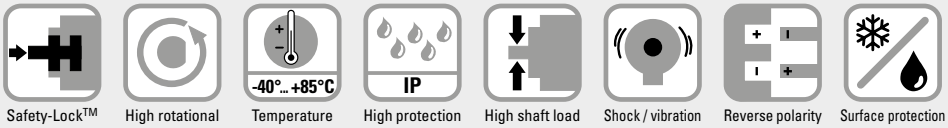
1 Recommended torque for the clamping ring 0.7 Nm



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			

Compact magnetic	Sendix M3653A / M3673A (shaft / hollow shaft)	SSI

The Sendix M36 is a magnetic singleturn encoder in compact design. It is characterized by robustness, reliability and cost-efficiency.



Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection salt spray tested optional

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.

Application oriented

- Angular measurement deviation ±0,5°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 14 bit.

Order code Shaft version

8.M3653A	.	X	X	2	X	.	X	X	1	2
Type		a	b	c	d		e	f		

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*
2 = SSI / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-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.M3653A.432A.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit

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

Compact magnetic	Sendix M3653A / M3673A (shaft / hollow shaft)	SSI

Order code Hollow shaft

8.M3673A . X X 2 X . X X 1 2
Type
a b c d e f

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*
2 = SSI / 10 ... 30 V DC

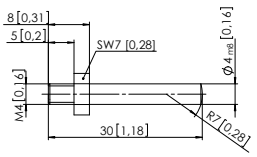
d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin
*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3673A.242A.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit

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

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

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

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight open ended 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**
Connectors	M12 female connector with coupling nut, 8-pin, A coded, straight (metal)	**05.CMB 8181-0**

Compact magnetic | **Sendix M3653A / M3673A (shaft / hollow shaft)** | **SSI**

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 210 g [7.41 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Supply voltage	10 ... 30 V DC
Current consumption (no load)	max. 40 mA
Reverse polarity protection of the supply voltage	yes
Short-circuit proof outputs	yes [1]

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW with I_{Load} = 20 mA	typ 1.3 V
Resolution		10 ... 14 bit
Angular measurement deviation [2]		±0,5°
Repeat accuracy		±0.2°
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = supply voltage)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Hot plugging of the encoder should be avoided.

Approvals

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

1) Short circuit proof to 0 V or to output when supply voltage correctly applied.
2) Over the whole temperature range.

Compact magnetic	Sendix M3653A / M3673A (shaft / hollow shaft)	SSI

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
2	3, 4	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Supply voltage encoder +V DC
0 V: Supply voltage encoder ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

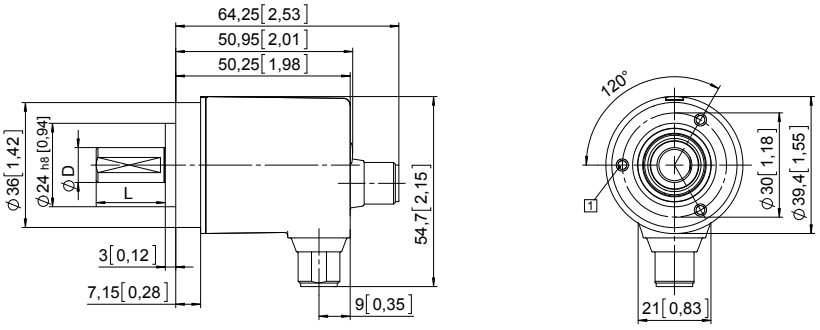
M12 connector, 8-pin

Dimensions shaft version

Dimensions in mm [inch]

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

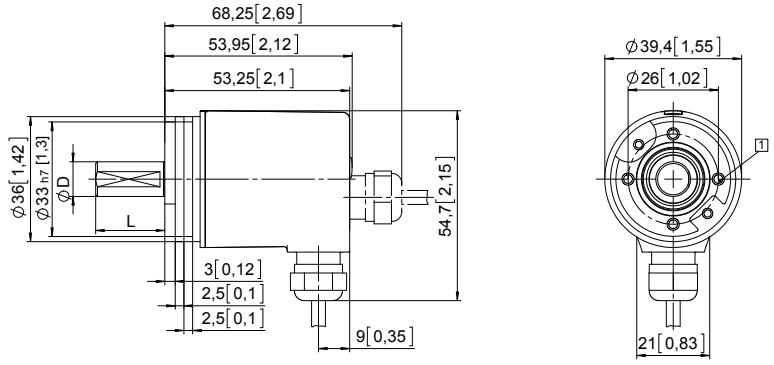
1 3 x M3, 6 [0.24] deep



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]

Compact magnetic	Sendix M3653A / M3673A (shaft / hollow shaft)	SSI

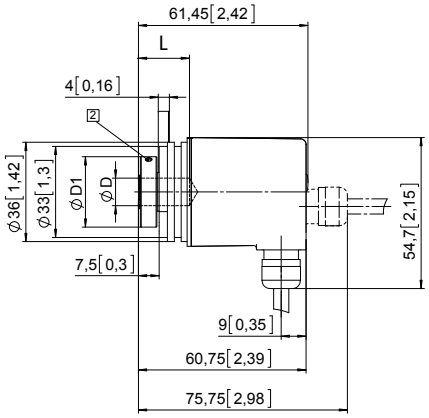
Dimensions hollow shaft version

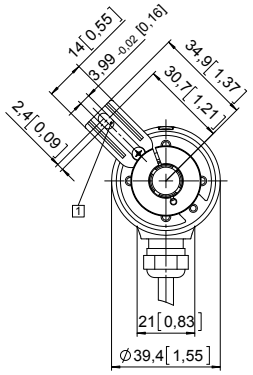
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: torque pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

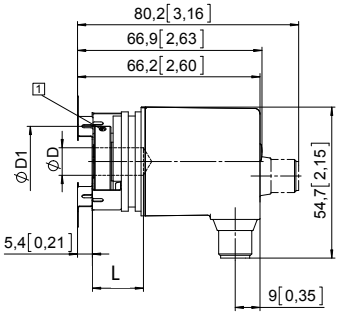


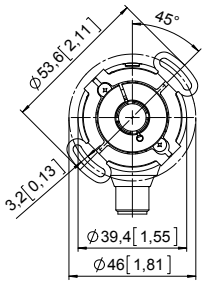


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm





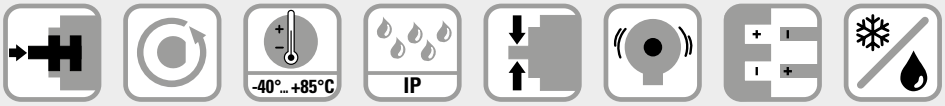
D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **SAE J1939**

The absolute encoders Singleturn Sendix M3658A / M3678A with SAE J1939 interface support all common requirements of the special protocol for commercial vehicles and make a significant contribution to comprehensive system diagnostics or fast fault localization.

The encoders can be put into operation quickly and error-free without having to set any switches; the addresses are assigned automatically by Address Claiming (ACL).

SAE J1939



Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection salt spray-tested optional

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.

Up-to-the-minute fieldbus performance

- Up-to-the-minute fieldbus performance in the application: SAE J1939 with CAN-highspeed to ISO 11898.
- Fast determination of the operating status via two-color LED.
- Fast and error-free commissioning without setting switches with automatic address assignment (ACL).

Order code Shaft version

8.M3658A	.	X	X	3	X	.	32	2	2
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.M3658A.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

Compact magnetic	Sendix M3658A / M3678A (shaft / hollow shaft)	SAE J1939

Order code Hollow shaft

8.M3678A	.	X	X	3	X	.	32	2	2
Type		a	b	c	d		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*
3 = SAE J1939 / 10 ... 30 V DC

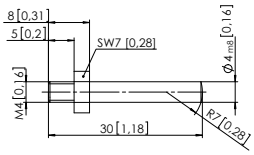
d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin

*) 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.M3678A.243A.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

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

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

Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 5 m [16.40'] PVC cable	Bus in	**05.00.6091.A211.005M**
	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	**05.00.6091.22C7.001M**
Connector	M12 female connector with coupling nut, 5-pin, A coded, straight (metal)	Bus in	**8.0000.5116.0000**

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **SAE J1939**

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 210 g [7.41 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

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

Interface characteristics SAE J1939

Resolution	1 ... 16.384 (14 bit), scalable default: 16.384 (14 bit)
Angular measurement deviation [2]	±0,5°
Repeat accuracy	±0.2°
Interface	CAN high-speed acc. to ISO 11898, CAN specification 2.0 B
Protocol	SAE J1939
Power-ON time	< 1200 ms
Baud rate	250 kbit/s switchable by software to 500 kbit/s
Node address	software configurable
Termination	software configurable

Approvals

E1 compliant in accordance with	ECE guideline
UL compliant in accordance with	File no. E224618
CE compliant 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.

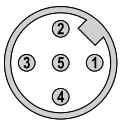
Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **SAE J1939**

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



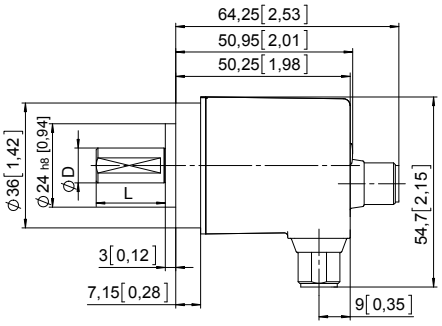
M12 connector, 5-pin

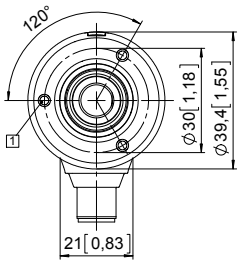
Dimensions shaft version

Dimensions in mm [inch]

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

1 3 x M3, 6 [0.24] deep

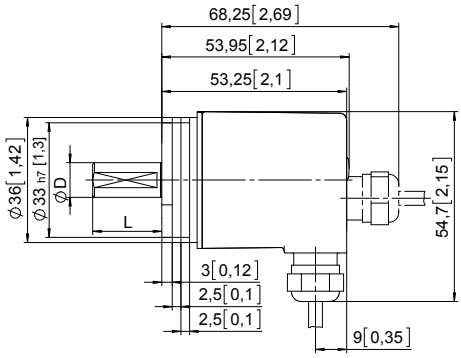


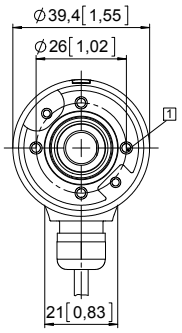


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]

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]

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **SAE J1939**

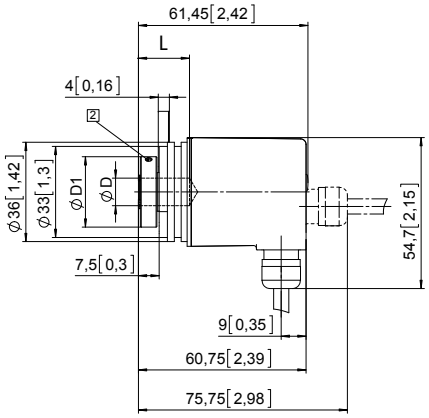
Dimensions hollow shaft version

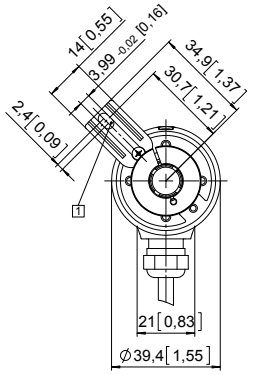
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: torque pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

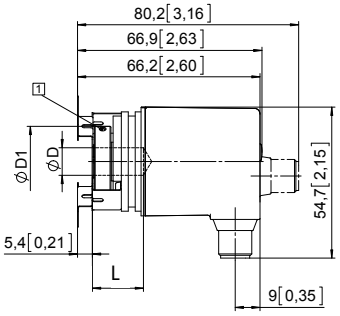


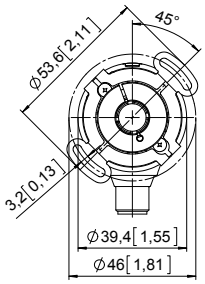


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm



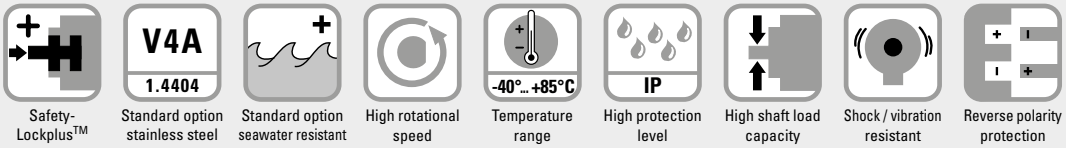


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Compact, robust magnetic | **Sendix M3651AR (shaft)** | **Analog**

The Sendix M3651AR singleturn encoders with analog interface and magnetic sensor technology are particularly flexible in use due to their diverse interfaces and measuring ranges.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoders are suitable even for demanding outdoor applications.



Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Different measuring ranges.
- SET input for easy start-up.

Order code Shaft version

8.M3651AR . X X X X . X X X 2
Type — a b c d — e f g

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

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"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Output circuit* [3]
3 = current output
4 = voltage output

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin

Type of connection with changed terminal assignment (see page 5)
D = radial M12 connector, 5-pin

*) Available special lengths (connection types 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.M3651AR.133B.3112.0030 (for cable length 3 m)

e *Interface / resolution / supply voltage*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

g *Counting direction*
1 = cw
2 = ccw

Optional on request
- Ex 2/22
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" or "D".
3) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

Compact, robust magnetic	Sendix M3651AR (shaft)	Analog

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808** [1]

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight single ended 2 m [6.56‘] PVC cable	**05.00.6081.2211.002M** [1]
Connectors	M12 female connector with coupling nut, 5-pin, A coded, straight (metal)	**8.0000.5116.0000** [1]
	M12 female connector with coupling nut, 5-pin, A coded, straight (stainless steel V4A)	**8.0000.5116.0000.V4A**

Technical data

Electrical characteristics current interface 4 ... 20 mA

Supply voltage		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the supply voltage		yes
Short-circuit proof outputs		yes [2]
Measuring range		45°, 90°, 180° or 360°
DA converter resolution		12 bit
Angular measurement deviation [3]		±0,5°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Output load	at 10 V DC at 24 V DC at 30 V DC	max. 200 Ohm max. 900 Ohm max. 1200 Ohm
Setting time		< 1 ms, R_{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1°
SET input		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

Supply voltage	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the supply voltage		yes
Short-circuit proof outputs		yes [2]
Measuring range		45°, 90°, 180° or 360°
DA converter resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Angular measurement deviation [3]		±0,5°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1°
SET input		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms

1) Not for version “7” (V4A stainless steel)
2) When the supply voltage is correctly applied.
But not output to +V. Supply voltage and sensor output signal are not galvanically isolated.
3) Over the whole temperature range.

Compact, robust magnetic | **Sendix M3651AR (shaft)** | **Analog**

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20 °C [68 °F]		< 0.01 Nm	
Shaft load capacity	radial axial	80 N 40 N	
Weight		approx. 250 g [8.82 oz]	
Protection acc. to EN 60529		IP66, IP67, IP69k	
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]	
Materials		**version "1"** (standard)	**version "7"** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PVC	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = supply voltage)	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

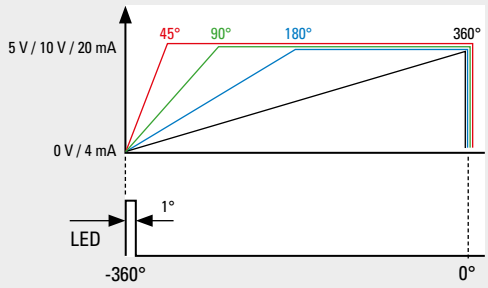
Approvals

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

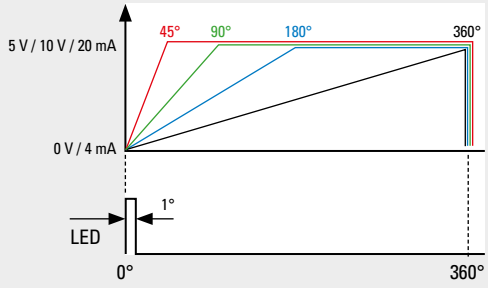
Compact, robust magnetic	Sendix M3651AR (shaft)	Analog

Example (output signal evolution)
Variante counting direction cw

Direction of rotation left

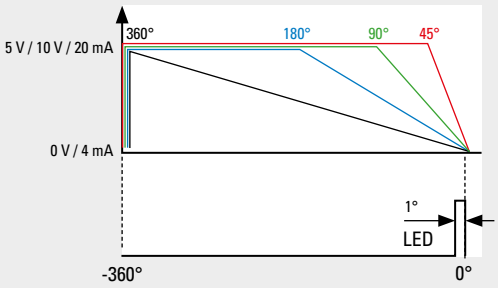


Direction of rotation right

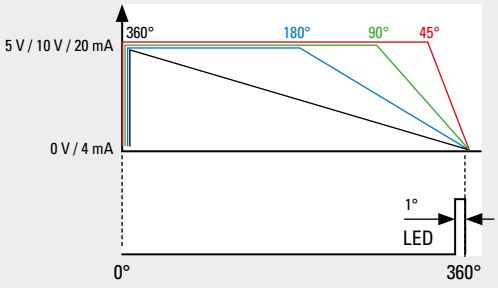


Example (output signal evolution)
Variante counting direction ccw

Direction of rotation left



Direction of rotation right



Compact, robust magnetic | **Sendix M3651AR (shaft)** | **Analog**

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
3 (current)	2, B	Signal:	0 V	+V	+I	SET	
		Core color:	WH	BN	GN	GY	

Interface	Type of connection	M12 connector, 5 pin					
3 (current)	4	Signal:	0 V	+V	+I	SET	–
		Pin:	3	2	1	5	4

Interface	Type of connection	M12 connector, 5 pin					
3 (current)	D	Signal:	0 V	+V	+I	SET	–
		Pin:	3	1	2	4	5

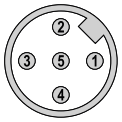
Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
4, 5 (voltage)	2, B	Signal:	0 V	+V	+U	SET	
		Core color:	WH	BN	GN	GY	

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (voltage)	4	Signal:	0 V	+V	+U	SET	–
		Pin:	3	2	1	5	4

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (voltage)	D	Signal:	0 V	+V	+U	SET	–
		Pin:	3	1	2	4	5

+V : Supply voltage encoder +V DC
0 V : Supply voltage encoder ground GND (0 V)
+U : Voltage
+I : Current
SET : SET input

Top view of mating side, male contact base



M12 connector, 5-pin

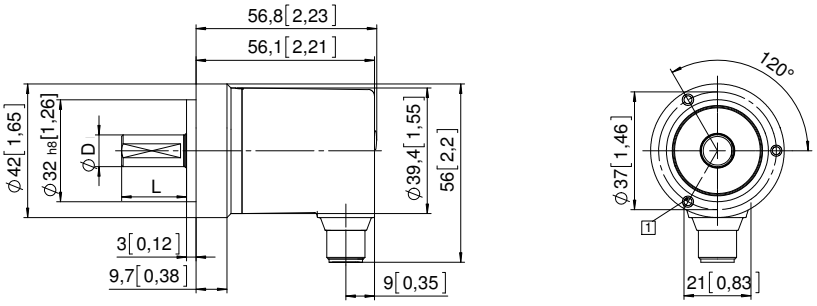
Compact, robust magnetic | **Sendix M3651AR (shaft)** | **Analog**

Dimensions

Dimensions in mm [inch]

Aluminum
clamping flange, ø 42 [1.65]
version 1

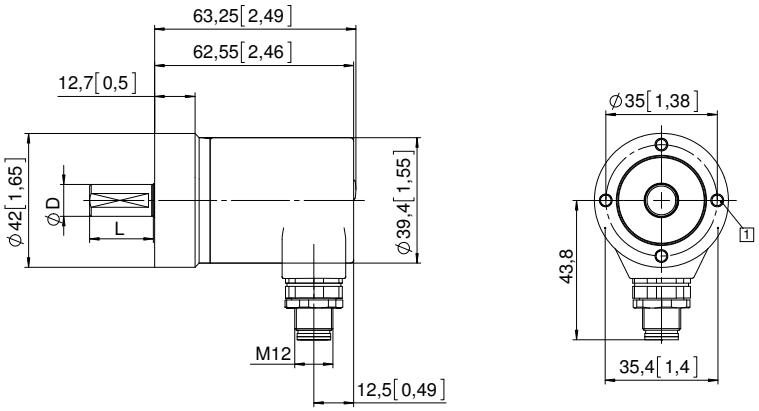
1 3 x M3, 6 [0.24] deep



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]

Stainless steel V4A
clamping flange, ø 42 [1.65]
version 7

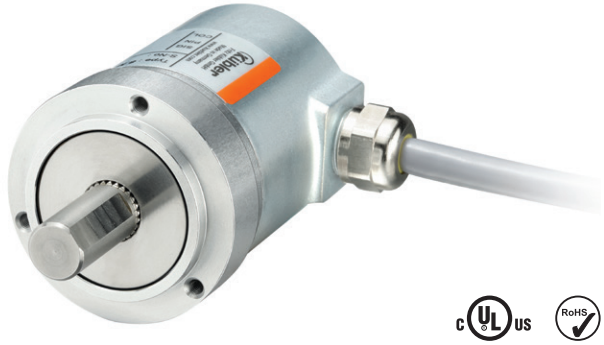
1 4 x M4, 8 [0.31] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Absolute encoders – singleturn

Compact, robust magnetic | **Sendix M3653AR (shaft)** | **SSI**



The Sendix M3653AR are magnetic singleturn encoders in compact design. They are characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoders are suitable even for demanding outdoor applications.

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.

Application oriented

- Angular measurement deviation ±0,5°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 14 bit.

Order code Shaft version

8.M3653AR	.	X	X	2	X	.	X	X	1	2
Type		a	b	c	d		e	f		

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

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"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Interface / supply voltage*
2 = SSI / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 8-pin

*) Available special lengths (connection type 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.M3653AR.132B.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .

Compact, robust magnetic	Sendix M3653AR (shaft)	SSI

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808** [1]

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight single ended 2 m [6.56‘] PUR cable	**05.00.6051.8211.002M** [1]
Connectors	M12 female connector with coupling nut, 8-pin, A coded, straight (metal)	**05.CMB 8181-0** [1]
	M12 female connector with coupling nut, 8-pin, A coded, straight (stainless steel V4A)	**8.0000.5136.0000.V4A**

1) Not for version “7” (V4A stainless steel)

Compact, robust magnetic | **Sendix M3653AR (shaft)** | **SSI**

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20°C [68°F]		< 0.01 Nm	
Shaft load capacity	radial	80 N	
	axial	40 N	
Weight		approx. 250 g [8.82 oz]	
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k	
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]	
Materials		**version "1"** (standard)	**version "7"** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PUR	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

Electrical characteristics

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

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW with I_{Load} = 20 mA	typ 1.3 V
Resolution		10 ... 14 bit
Angular measurement deviation [2]		±0,5°
Repeat accuracy		±0.2°
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level	HIGH	min. 60 % of +V, max: +V
(+V = supply voltage)	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.

The SET function should be carried out whilst the encoder is at rest.
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Hot plugging of the encoder should be avoided.

Approvals

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

1) Short circuit proof to 0 V or to output when supply voltage correctly applied.
2) Over the whole temperature range.

Compact, robust magnetic	Sendix M3653AR (shaft)	SSI

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
2	2, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
2	4	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Supply voltage encoder +V DC
0 V: Supply voltage encoder ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

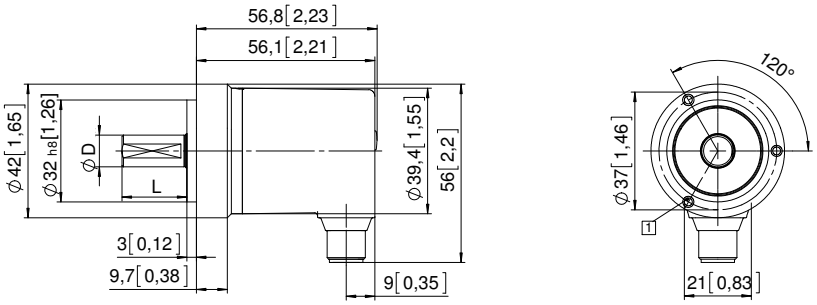
Dimensions

Dimensions in mm [inch]

Aluminum,
clamping flange, ø 42 [1.65]
version 1

1 3 x M3, 6 [0.24] deep

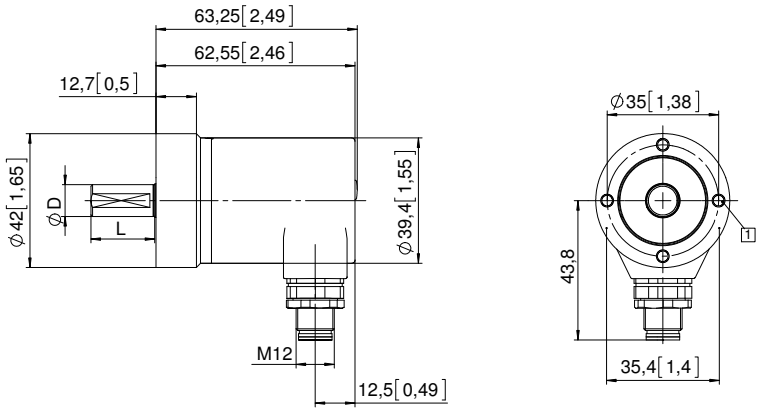
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



Stainless steel V4A
clamping flange, ø 42 [1.65]
version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
10 [0.39]	f7	20 [0.79]



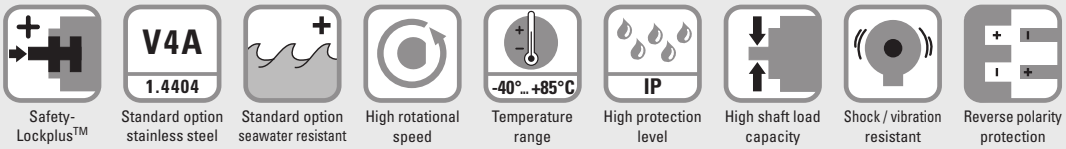
Absolute encoders – singleturn

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **SAE J1939**

The Sendix M3658AR are magnetic singleturn encoders in compact design. They are characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoders are suitable even for demanding outdoor applications.

SAE J1939



Safety-Lockplus™ | Standard option stainless steel | Standard option seawater resistant | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40 °C ... +85 °C.

Up-to-the-minute fieldbus performance

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

Order code Shaft version

8.M3658AR.	X	X	3	X	.	32	2	2
Type	ⓐ	ⓑ	ⓒ	ⓓ		ⓔ		

ⓐ *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

ⓑ *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"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

ⓒ *Interface / supply voltage*
3 = SAE J1939 / 10 ... 30 V DC

ⓓ *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection type 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.M3658AR.133B.3222.0030 (for cable length 3 m)

ⓔ *Fieldbus profile*
32 = SAE J1939

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .

Compact, robust magnetic	Sendix M3658AR (shaft)	SAE J1939

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808** [1]

Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 5 m [16.40‘] PVC cable	Bus in	**05.00.6091.A211.005M** [1]
	M12 female connector with coupling nut, 5-pin, A coded, straight Deutsch connector DT04, male contacts, 6-pin, straight 1 m [3.28‘] PVC cable	Bus in	**05.00.6091.22C7.001M** [1]
Connectors	M12 female conn. with coupling nut, 5-pin, A coded, straight (metal)	Bus in	**8.0000.5116.0000** [1]
	M12 female conn. with coupling nut, 5-pin, A coded, straight (stainless steel V4A)	Bus in	**8.0000.5116.0000.V4A**

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20°C [68°F]		< 0.01 Nm	
Shaft load capacity	radial	80 N	
	axial	40 N	
Weight		approx. 250 g [8.82 oz]	
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k	
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]	
Materials		**version “1“** (standard)	**version “7“** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PVC	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

Electrical characteristics

Supply voltage	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the supply voltage	yes
Short-circuit proof outputs	yes [2]

Interface characteristics SAE J1939

Resolution	1 ... 16.384 (14 bit), scalable default: 16.384 (14 bit)
Angular measurement deviation [3]	±0,5°
Repeat accuracy	±0.2°
Interface	CAN high-speed acc. to ISO 11898, CAN specification 2.0 B
Protocol	SAE J1939
Power-ON time	< 1200 ms
Baud rate	250 kbit/s switchable by software to 500 kbit/s
Node address	software configurable
Termination	software configurable

Approvals

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

1) Not for version “7” (V4A stainless steel)
2) Short circuit proof to 0 V or to output when supply voltage correctly applied.
3) Over the whole temperature range.

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **SAE J1939**

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.

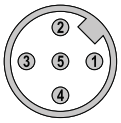
A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
2	2, 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					
2	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

1) Over the whole temperature range.

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **SAE J1939**

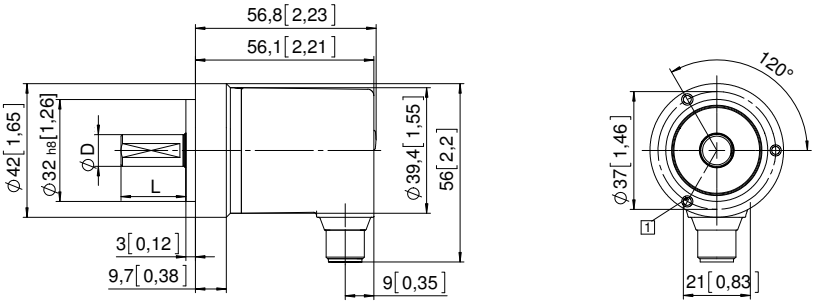
Dimensions

Dimensions in mm [inch]

Aluminum,
clamping flange, ø 42 [1.65]
version 1

1 3 x M3, 6 [0.24] deep

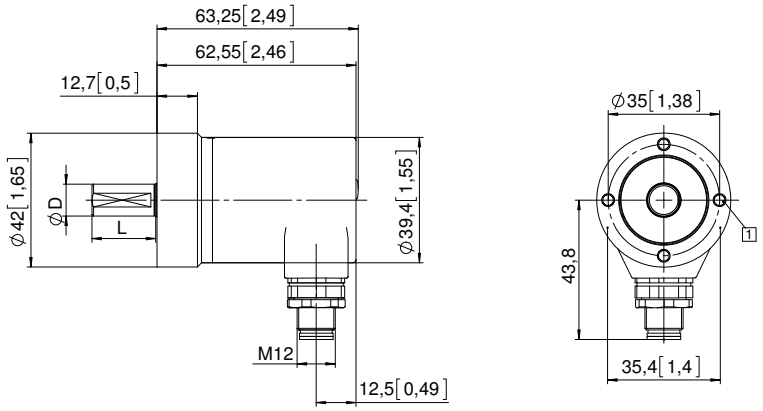
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



Stainless steel V4A
clamping flange, ø 42 [1.65]
version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
10 [0.39]	f7	20 [0.79]



Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **CANopen**

The Sendix M36 is a magnetic singleturn encoder in compact design. It is characterized by robustness, reliability and cost-efficiency.

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

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.

Up-to-the-minute fieldbus performance

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

Order code Shaft version

8.M3658A	.	X	X	2	X	.	21	2	2
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*
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, 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.M3658A.432A.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

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

Compact magnetic	Sendix M3658A / M3678A (shaft / hollow shaft)	CANopen

Order code Hollow shaft

8.M3678A	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		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*
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, 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.M3678A.242A.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

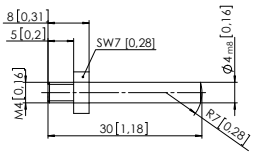
Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders

		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders

Dimensions in mm [inch]

		Order no.
Torque pin, ø 4 mm for flange with spring element (flange type 3 + 6)	with fixing thread 	**8.0010.4700.0000**

Cables and connectors

			Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 5 m [16.40'] PVC cable	Bus in	**05.00.6091.A211.005M**
	M12 female connector with coupling nut, 5-pin, A coded, straight Deutsch connector DT04, male contacts , 6-pin, straight 1 m [3.28'] PVC cable	Bus in	**05.00.6091.22C7.001M**
Connector	M12 female connector with coupling nut, 5-pin, A coded, straight (metal)	Bus in	**8.0000.5116.0000**

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **CANopen**

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20 °C [68 °F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 210 g [7.41 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

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

Interface characteristics CANopen

Resolution	1 ... 16.384 (14 bit), scalable default: 16.384 (14 bit)
Angular measurement deviation [2]	±0,5°
Repeat accuracy	±0.2°
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
Bootloader	configuration management CIA DS 302-3

Approvals

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

1) Short circuit proof to 0 V or to output when supply voltage correctly applied.
2) Over the whole temperature range.

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **CANopen**

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, acceleration** 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-color 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 or a M12 connector 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.

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 Behavior 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 colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

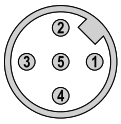
- Program download.
- Program start.
- Program erase.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
2	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					
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

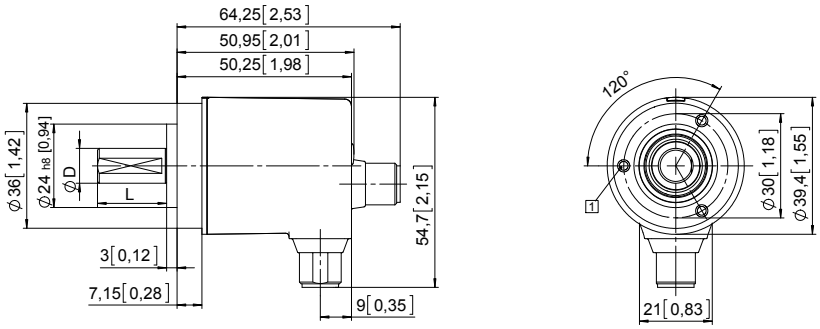
Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

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

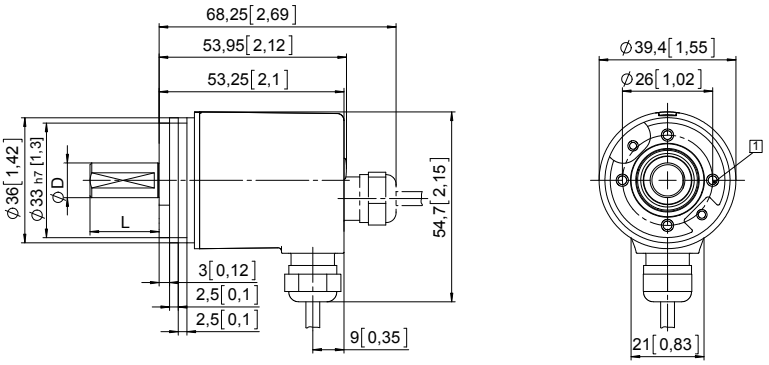
1 3 x M3, 6 [0.24] deep



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]

Compact magnetic | **Sendix M3658A / M3678A (shaft / hollow shaft)** | **CANopen**

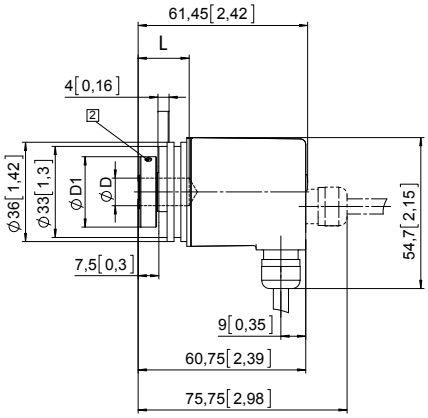
Dimensions hollow shaft version

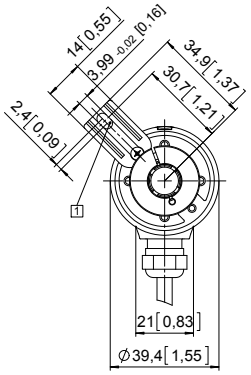
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: torque pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

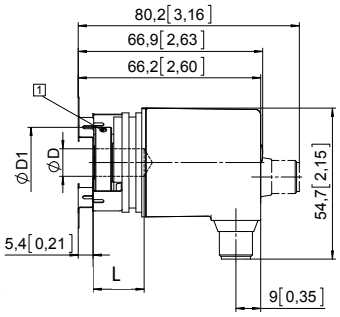


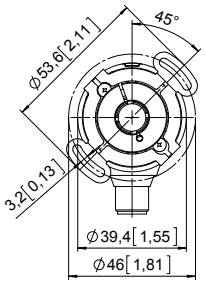


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm

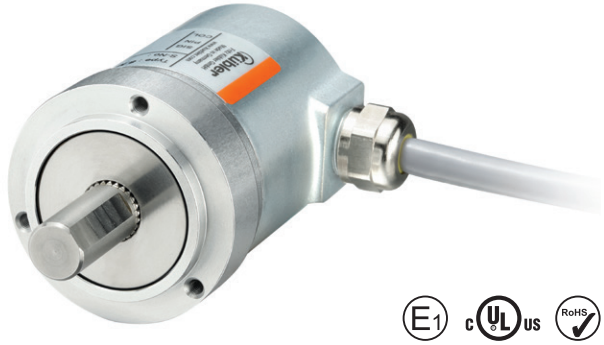




D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Absolute encoders – singleturn

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **CANopen**



The Sendix M3658AR are magnetic singleturn encoders in compact design. They are characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoders are suitable even for demanding outdoor applications.

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40 °C ... +85 °C.

Up-to-the-minute fieldbus performance

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

Order code Shaft version

8.M3658AR	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		e		

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

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"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Interface / supply voltage*
2 = CANopen DS301 V4.2 / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection type 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.M3658AR.132B.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .

Compact, robust magnetic	Sendix M3658AR (shaft)	CANopen

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808** [1]

Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 5-pin, A coded, straight open ended 5 m [16.40‘] PVC cable	Bus in	**05.00.6091.A211.005M** [1]
	M12 female connector with coupling nut, 5-pin, A coded, straight Deutsch connector DT04, male contacts, 6-pin, straight 1 m [3.28‘] PVC cable	Bus in	**05.00.6091.22C7.001M** [1]
Connectors	M12 female conn. with coupling nut, 5-pin, A coded, straight (metal)	Bus in	**8.0000.5116.0000** [1]
	M12 female conn. with coupling nut, 5-pin, A coded, straight (stainless steel V4A)	Bus in	**8.0000.5116.0000.V4A**

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20°C [68°F]		< 0.01 Nm	
Shaft load capacity	radial axial	80 N 40 N	
Weight		approx. 250 g [8.82 oz]	
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k	
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]	
Materials		**version “1“** (standard)	**version “7“** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PVC	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

Electrical characteristics

Supply voltage	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the supply voltage	yes
Short-circuit proof outputs	yes [2]

Interface characteristics CANopen

Resolution	1 ... 16.384 (14 bit), scalable default: 16.384 (14 bit)
Angular measurement deviation [3]	±0,5°
Repeat accuracy	±0.2°
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
Bootloader	configuration management CIA DS 302-3

Approvals

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

1) Not for version “7” (V4A stainless steel)
2) Short circuit proof to 0 V or to output when supply voltage correctly applied.
3) Over the whole temperature range.

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **CANopen**

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, acceleration** 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-color 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 or a M12 connector 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.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- 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 Behavior 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 colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

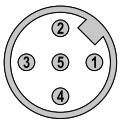
- Program download.
- Program start.
- Program erase.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
2	2, 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					
2	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

1) Over the whole temperature range.

Compact, robust magnetic | **Sendix M3658AR (shaft)** | **CANopen**

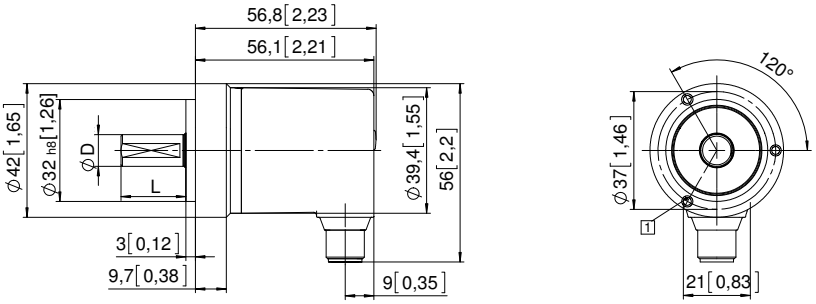
Dimensions

Dimensions in mm [inch]

**Aluminum,
clamping flange, ø 42 [1.65]
version 1**

1 3 x M3, 6 [0.24] deep

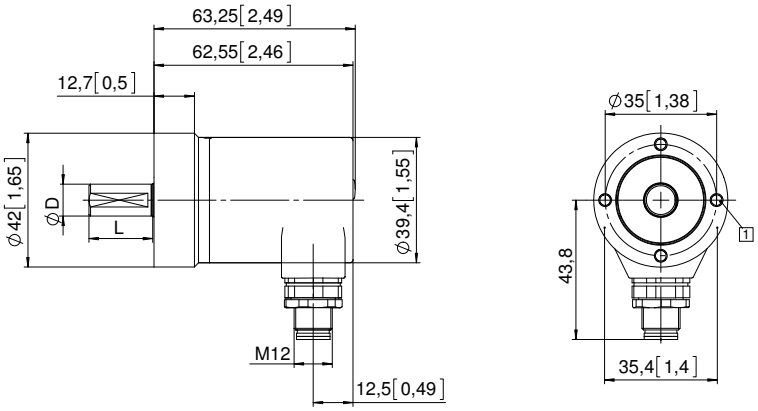
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



**Stainless steel V4A
clamping flange, ø 42 [1.65]
version 7**

1 4 x M4, 8 [0.31] deep

D	Fit	L
10 [0.39]	f7	20 [0.79]



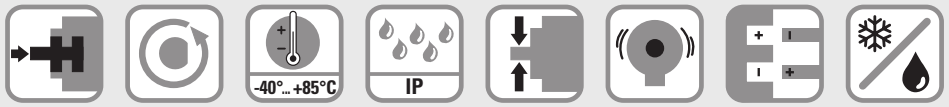
Compact magnetic | **Sendix M3658A/M3678A (shaft / hollow shaft)** | **IO-Link**

INDUSTRIE 4.0 IIoT READY
Connectivity · Identification · Diagnostics · Adaptability

The Sendix M36 is a magnetic singleturn encoder in compact design. It is characterized by robustness, reliability and cost-efficiency.

With Smart Sensor Profile for easy and fast integration into the application.

cULus · RoHS · IO-Link



Safety-Lock™ · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Reverse polarity protection · Surface protection salt spray-tested optional

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.

Up-to-the-minute performance

- Operation possible with any IO-Link master.
- Point-to-point communication in automation networks.
- Use of cost-effective unshielded cables possible.
- Automatic saving of device parameters.
- Firmware update via IO-Link.

Order code Shaft version

8.M3658A . X X 4 X . 41 X 2
Typ — a b c d — e — f

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. 10 by 10

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 / power supply*
4 = IO-Link / 18 ... 30 V DC

d *Type of connection*
3 = axial M12 connector, 4-pin
4 = radial M12 connector, 4-pin

e *Fieldbus profile*
41 = IO-Link

f *Profile*
2 = Standard Profile [1]
3 = Smart Sensor Profile [2]

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.M3678A . X X 4 X . 41 X 2
Typ — a b c d — e — f

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. 10 by 10

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 / power supply*
4 = IO-Link / 18 ... 30 V DC

d *Type of connection*
3 = axial M12 connector, 4-pin
4 = radial M12 connector, 4-pin

e *Fieldbus profile*
41 = IO-Link

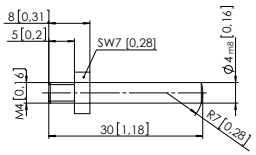
f *Profile*
2 = Standard Profile [1]
3 = Smart Sensor Profile [2]

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Delivered with default setting for Standard Profile (switchable to Smart Sensor Profile).
2) Delivered with default setting for Smart Sensor Profile (switchable to Standard Profile).

Compact magnetic	Sendix M3658A/M3678A (shaft / hollow shaft)	IO-Link

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

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

Cables and connectors		Order no.	Bestell-Nr.
Preassembled cables	M12 female connector with coupling nut, 4-pin, A coded, straight single-ended 2 m [6.56'] PUR cable		**05.00.6061.6211.002M**
Connectors	M12 female connector with coupling nut, 4-pin, A coded, straight		**05.B8141-0**

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20 °C [68 °F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 210 g [7.41 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply	18 ... 30 V DC
Current consumption (no load)	max. 40 mA
Reverse polarity protection of the power supply	ja

Interface characteristics IO-Link

Resolution singleturn	1 ... 16.384 (14 bit), scalable default: 16.384 (14 bit)
Angular measurement deviation 1)	±0,5°
Repeat accuracy	±0,2°
Interface	IO-Link version 1.1 acc. to IEC 61131-9
Profile (details see manual)	Kübler Standard Profile or Smart Sensor Profile
Port classe	Type A

Approvals

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

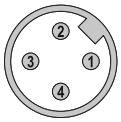
1) Over the whole temperature range.

Compact magnetic | **Sendix M3658A/M3678A (shaft / hollow shaft)** | **IO-Link**

Terminal assignment

Interface	Type of connection	M12 connector, 4-pin				
4	3, 4	Signal:	Power supply +V DC	Reserved (no function)	Power supply 0 V (GND)	IO-Link communication (Data line)
		Abbreviation:	L+	res.	L-	C/Q
		Pin:	1	2	3	4

Top view of mating side, male contact base



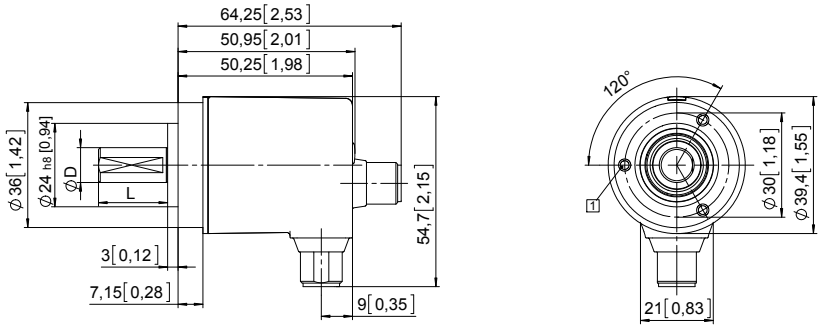
M12 connector, 4-pin

Dimensions shaft version

Dimensions in mm [inch]

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

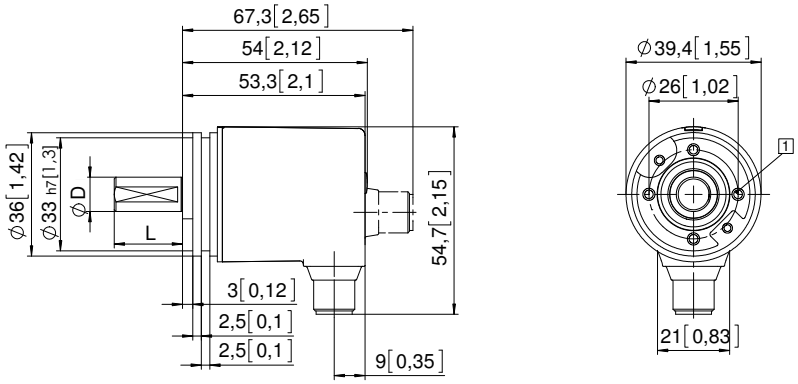
1 3 x M3, 6 [0.24] deep



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]

Compact magnetic | **Sendix M3658A/M3678A (shaft / hollow shaft)** | **IO-Link**

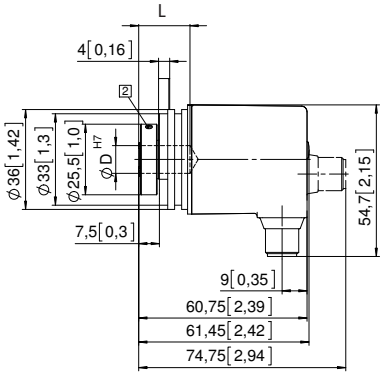
Dimensions hollow shaft version

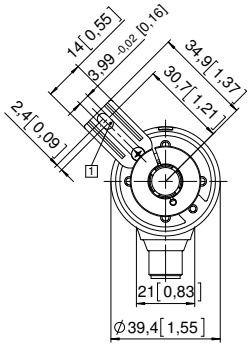
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: torque pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

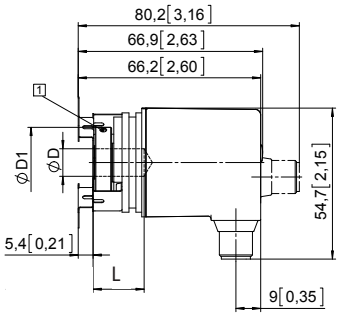


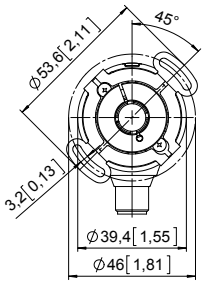


D	Fit	L	D1
6 [0.24]	H7	18,5 [0.73]	24 [0.94]
8 [0.32]	H7	18,5 [0.73]	25,5 [1.00]
10 [0.39]	H7	18,5 [0.73]	25,5 [1.00]
1/4"	H7	18,5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm





D	Passung	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			

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.

Safety-Lock™ | Temperature range (-40°... +90°C) | High protection level (IP) | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SinCos | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40 °C up to +90 °C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 17 bits and 100 % magnetic field insensitiveness.

Optimized performance

- High-precision with a data refresh rate of the position value ≤ 1µs.
- High-resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F3653	.	X	X	X	X	.	X	X	12
Type		a	b	c	d		e	f	

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“]
4 = ø 3/8“ x 5/8“

c *Interface / supply voltage*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28] PUR
3 = tangential cable, 5 m [16.40] PUR
F = tangential cable, special length PUR *)
8 = axial M12 connector, 8-pin [1)]

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3653.432F.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

Optional on request
- surface protection salt spray tested
- other resolutions

1) Only with output circuits 1 and 2.

Compact optical	Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS + incremental

Order code Hollow shaft

8.F3673 . X X X X . X X 12
Type
a b c d e f

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

b *Through hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
2 = ø 1/4"
Blind hollow shaft
(insertion depth max. 14.5 mm [0.57"])
4 = ø 10 mm [0.39"]

c *Interface / supply voltage*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28] PUR
3 = tangential cable, 5 m [16.40] PUR
F = tangential cable, special length PUR *)
8 = axial M12 connector, 8-pin [1)]

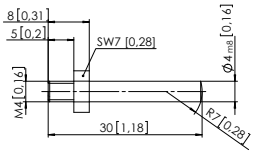
*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3673.242F.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

Optional on request
- surface protection salt spray tested
- other resolutions

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

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

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight open ended 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**
Connectors	M12 female connector with coupling nut, 8-pin, A coded, straight (metal)	**05.CMB 8181-0**

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"].

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Technical data

Mechanical characteristics

Maximum speed shaft version without shaft seal (IP65) or blind hollow shaft version		12000 min^{-1} 10000 min^{-1} (continuous)
shaft version with shaft seal (IP67) or hollow shaft version		10000 min^{-1} 8000 min^{-1} (continuous)
Starting torque at 20 °C [68 °F]	without shaft seal with shaft seal (IP67	< 0.007 Nm < 0.01 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	housing side shaft side	IP67 IP65 (solid shaft version opt. IP67)
Working temperature range		-40 °C ... +90 °C [-40 °F ... +194 °F]
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Supply voltage		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC 10 ... 30 V DC	max. 60 mA max. 30 mA
Reverse polarity protection of the supply voltage		yes (only with 10 ... 30 V DC)
Short-circuit proof outputs		yes [1]

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH LOW with I_{Load} = 20 mA	typ. 3.8 V typ. 1.3 V
Resolution		10 ... 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ST resolution ≥ 15 bit	≤ 1 µs 4 µs
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

BiSS interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH LOW with I_{Load} = 20 mA	typ. 3.8 V typ. 1.3 V
Resolution		10 ... 17 bit
Code		binary
BiSS clock rate		50 kHz ... 10 MHz
Max. update rate		< 10 µs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ST resolution 17 bit	≤ 1 µs 2.4 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Incremental outputs (A/B)

	SinCos	**RS422 TTL compatible**
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes [1]	yes [1]
Pulse rate	2048 ppr	2048 ppr

Status output

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH LOW	+V < 1 V
Active		LOW

The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).

An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage In the SSI mode, the fault indication can only be reset by switching off the supply voltage to the device.

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

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = supply voltage)	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the supply voltage must not be switched off.
The SET function should be carried out whilst the encoder is at rest.
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Hot plugging of the encoder should be avoided.

Approvals

UL compliant in accordance with	File no. E224618
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
1, 2	1, 3, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	shield

Interface	Type of connection	Features	M12 connector, 8-pin								
1, 2	8	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)												
3, 4	1, 3, F	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)											
5	1, 3, F	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V_{sens}	+V_{sens}	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)													
6	1, 3, F	2048 SinCos, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)											
7, 8	1, 3, F	2048 incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	⏚
			Core color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield

+V: Supply voltage encoder +V DC
0 V: Supply voltage encoder ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

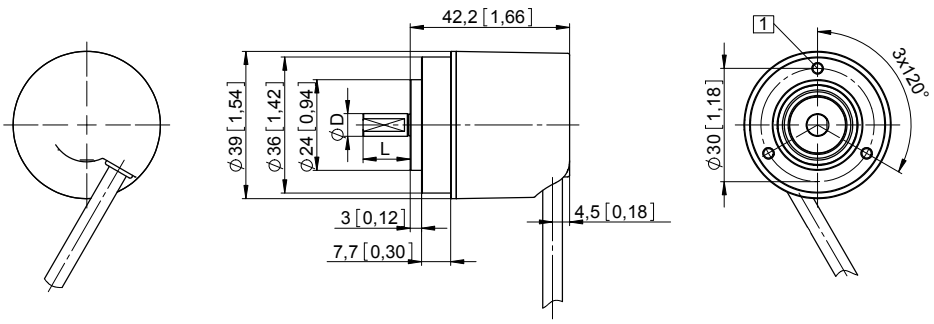
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions shaft version

Dimensions in mm [inch]

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

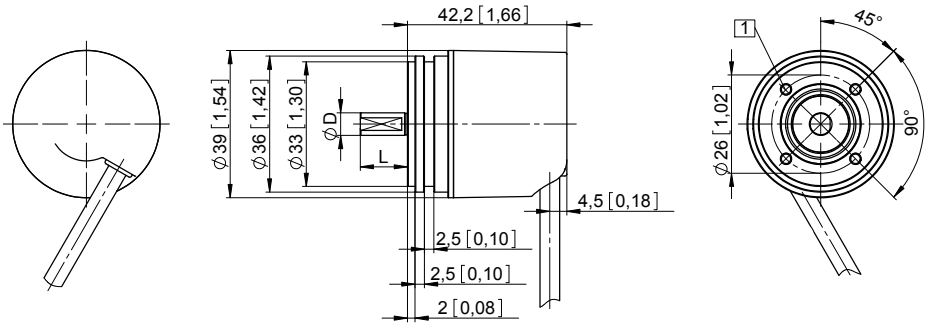
1 3 x M3, 6 [0.24] deep



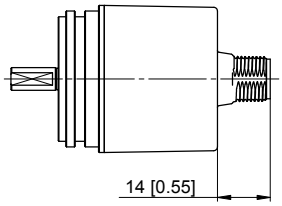
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Synchro flange, ø 36 [1.42]
Flange type 2 and 4
(drawing with cable)

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]
3/8"	h7	5/8"



Drawing with M12 connector and type of connection 8

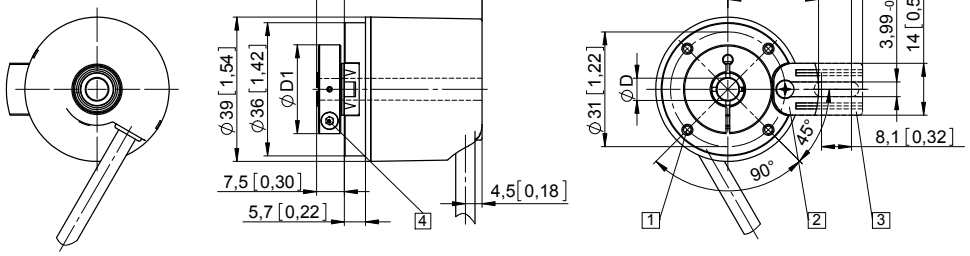
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

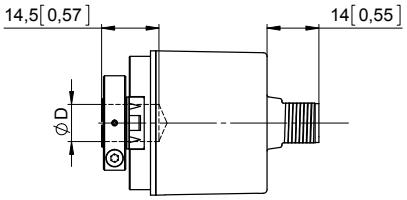
Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

1 4 x M2.5, 5 [0.2] deep
2 Spring element, short recommendation: torque pin DIN 7, ø 4 [0.16]
3 Spring element, long recommendation: torque pin DIN 7, ø 4 [0.16]
4 Recommended torque for the clamping ring 0.7 Nm



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

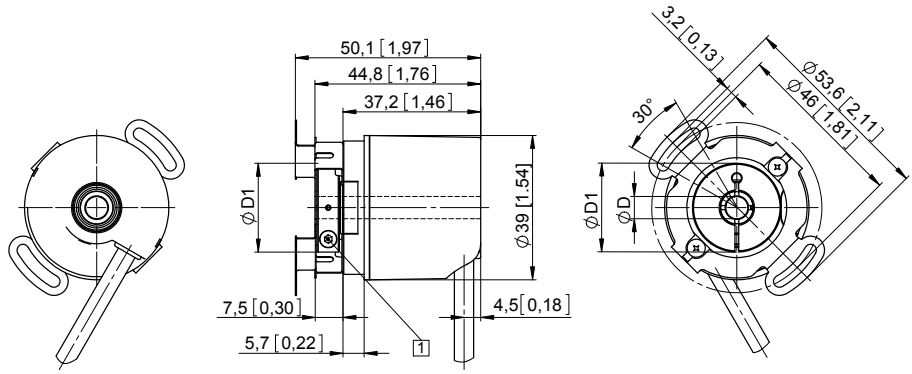
*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]



Blind hollow shaft for D = ø 10
drawing with M12 connector and type of connection 8

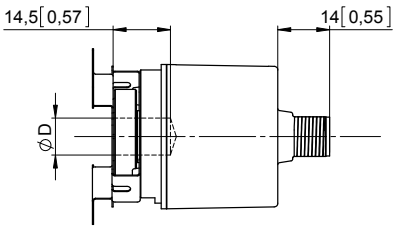
Flange with stator coupling, ø 46 [1.81"]
Flange type 2

1 Recommended torque for the clamping ring 0.7 Nm



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

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]



Blind hollow shaft for D = ø 10
drawing with M12 connector and type of connection 8

Absolute encoders - singleturn

Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and CANopen interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 16 bits.

Safety-Lock™ | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40 °C up to +85 °C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 16 bits and 100 % magnetic field insensitiveness.

Up-to-the-minute fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.

Order code Shaft version

8.F3658 . X X 2 X . 21 1 2
Type — a b c d — e

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.

10 by 10

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 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c *Interface / supply voltage*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
F = tangential cable, special length PUR *)

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3658.432F.2112.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

Order code Hollow shaft

8.F3678 . X X 2 X . 21 1 2
Type — a b c d — e

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.

10 by 10

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

b *Blind hollow shaft*
(insertion depth max. 14.5 mm [0.57"])
5 = ø 6 mm [0.24"]
7 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"]
6 = ø 1/4"

c *Interface / supply voltage*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
F = tangential cable, special length PUR *)

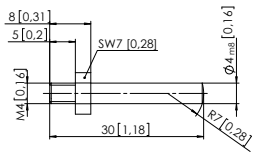
*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3678.242F.2112.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

Compact optical	Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen

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

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

Cables and connectors		Order no.
Connectors	M12 male connector with external thread, 5-pin, A coded, straight (metal)	**8.0000.5111.0000**

Technical data

Mechanical characteristics

Maximum speed		
shaft version without shaft seal (IP65) or blind hollow shaft version		12000 min^{-1} 10000 min^{-1} (continuous)
shaft version with shaft seal (IP67)		10000 min^{-1} 8000 min^{-1} (continuous)
Starting torque at 20 °C [68 °F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67)	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65 (solid shaft version opt. IP67)
Working temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Supply voltage	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the supply voltage	ja

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display

Interface characteristics CANopen

Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object

Approvals

UL compliant in accordance with	File no. E224618
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

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 and DS305 (LSS) 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-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

CANopen communication profile DS301 V4.02

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

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior 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 V3.2

The following parameters can be programmed:

- Event mode.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status – 1 LED two colors.
- Customer-specific memory 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

LSS layer setting services DS305 V2.0

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

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 Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit
Lu < 2 m [6.56'] cable length for 250 Kbit
Lu < 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.

Terminal assignment

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

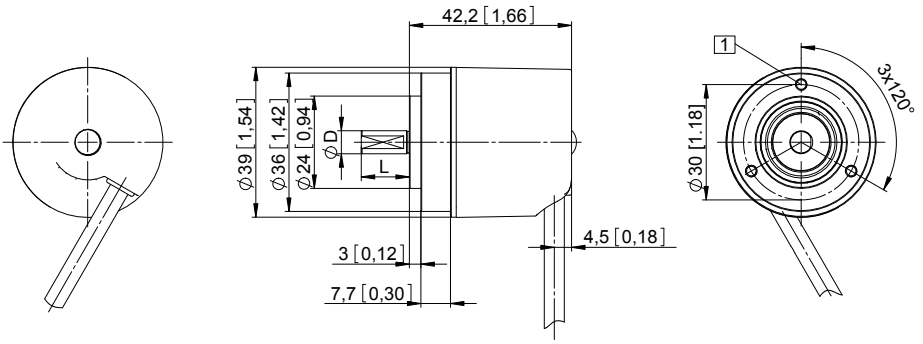
Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

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

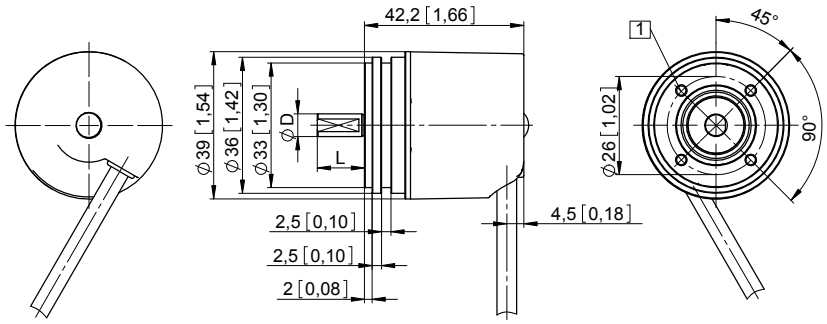
1 3 x M3, 6 [0.24] deep



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]
3/8"	h7	5/8"

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]
3/8"	h7	5/8"

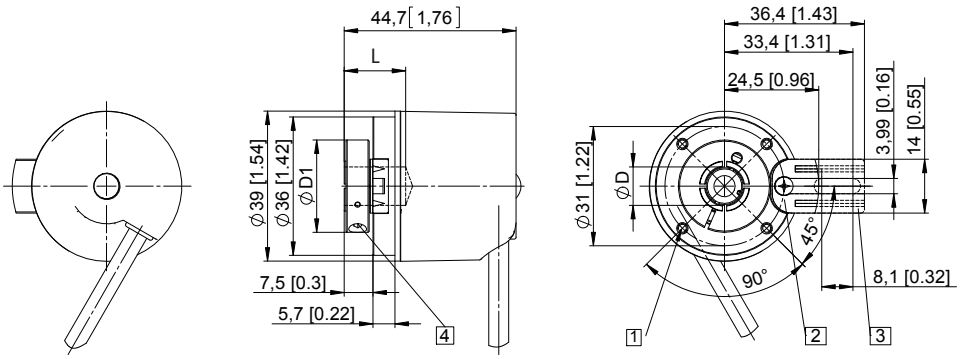
Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

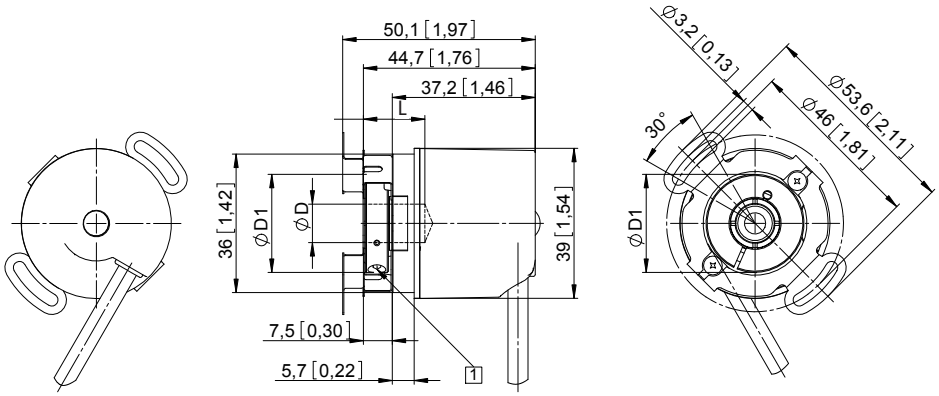
1 4 x M2.5, 5 [0.2] deep
2 Slot spring element, short recommendation: torque pin DIN 7, ø 4 [0.16]
3 Slot spring element, long recommendation: torque pin DIN 7, ø 4 [0.16]
4 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81"]
Flange type 2

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

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Россия +7(495)268-04-70
Казахстан +7(727)345-47-04
Беларусь +(375)257-127-884
Узбекистан +998(71)205-18-59
Киргизия +996(312)96-26-47

эл.почта: kgu@nt-rt.ru || сайт: https://kubler.nt-rt.ru/