New for 2014

Compact and accurate
Sendix F36 encoders

Intelligent Scan Technology™. These optical absolute singleturn and multiturn encoders distinguish themselves particularly by their compact 36 mm size and the award-winning Intelligent Scan Technology™. This technology integrates all singleturn and multiturn functionalities on an OptoASIC and offers high resolution up to 41 bits, 100% magnetic field resistance and cost-efficiency. This construction allows a through hollow shaft up to 8 mm.

SSI IBiSS INTERFACE CANopen

Characteristics and advantages at a glance

- Robust: Safety-Lock™ bearing construction, high IP67 protection level
  - ► Installation errors do not lead to standstill, suitable for harsh environments
- Magnetic sensors used because of their low cost can now be replaced with cost-efficient and high-accuracy optical sensors
  - ► High performance, high efficiency
- Miniaturised: compact 36 mm construction, hollow shaft up to ø 8 mm, blind hollow shaft up to ø 10 mm
  - ► Ideal for restricted mounting spaces
- Speed: position update < 1 µm, clock frequencies up to 10 MHz
  - ► High-resolution real-time feedback, plant improvement and machine performance increase

Scan the QR code for further information

Applications

The Intelligent Scan Technology™ is the answer to fundamental trends in automation: cost-efficiency, miniaturisation and speed. The compact Sendix F36 encoders demonstrate their abilities in the following application examples:

general automation technology, packaging machines, drive technology - especially for small drives.




Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS-C 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 | Optical sensor | Seawater-resistant version on request

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

Optimised 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-C up to 10 MHz

Order code Shaft version

8.F3653	.	X	X	X	X	.	X	X	12
Type		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"]
4 = ø 3/8" x 5/8"

c *Interface / Power supply*
1 = SSI or BiSS-C / 5 V DC
2 = SSI or BiSS-C / 10 ... 30 V DC
3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

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

e *Code*
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

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

optional on request
- seawater-resistant
- special cable length

1) Only with output circuits 1 and 2

Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

Order code Hollow shaft

8.F3673 . X X X X . X X 12
Type
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 = with spring element short, IP65
3 = with spring element long, IP65
2 = with stator coupling, IP65, ø 46 mm [1.81"]

b *Hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"], blind hollow shaft
2 = ø 1/4"

c *Interface / Power supply*
1 = SSI or BiSS-C / 5 V DC
2 = SSI or BiSS-C / 10 ... 30 V DC
3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

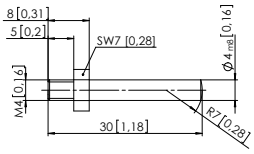
d *Type of connection*
1 = cable, tangential, 1 m [3.28'] PUR
3 = cable tangential, 5 m [16.40'] PUR
8 = M12 connector, 8-pin, axial [1)]

e *Code*
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

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

optional on request
- seawater-resistant
- special cable length

Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1101.0606**

Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	 With fixing thread	**8.0010.4700.0000**

Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut (suitable for connection type 8)	**05.CMB 8181-0**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable (suitable for connection type 8)	**05.00.6041.8211.002M**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics

Maximum speed		
Shaft- or blind hollow shaft version without shaft seal (IP65)		12 000 min^{-1} 10 000 min^{-1} (continuous)
Shaft version (IP67) or hollow shaft version (IP65) with shaft seal		10 000 min^{-1} 8 000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	without shaft seal with shaft seal (IP67)	< 0.007 Nm < 0.01 Nm
Load capacity of shaft	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]
Material	shaft / hollow shaft flange housing cable	stainless steel aluminium 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

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

Absolute Encoders - Singleturn

Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

Electrical characteristics

Power supply		5 V DC ± 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply		yes (only with 10 ...30 V DC)
Short-circuit proof outputs		yes [1]
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2011/65/EU

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, singleturn		10 ... 17 bit
Code		Binary or Gray
SSI clock rate		50 kHz ... 2 MHz
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Status and parity bit		on request

BiSS-C interface

Resolution, singleturn	10 ... 17 bit
Code	Binary
BiSS-C clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

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

Incremental outputs (A/B), 2048 ppr

	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]

SET input

Input		active HIGH
Input type		comparator
Signal level	HIGH	min. 60 % of +V, max: +V
(+V = power supply)	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 or BiSS-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

DIR 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.

Response time (DIR input)	1 ms

Status output

Output driver		Open Collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 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 power supply to the device.

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.

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

Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

Terminal assignment

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

Interface	Type of connection	Features	M12 connector									
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 wires individually before initial start-up)													
3, 4	1, 3	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	Shield

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)											
5	1, 3	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 Vsens	+Vsens	⏚
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	Shield

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

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

+V: Encoder power supply +V DC
0 V: Encoder power supply 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.
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
PH ⏚: Plug connector housing (Shield)

Top view of mating side, male contact base

M12 connector, 8-pin

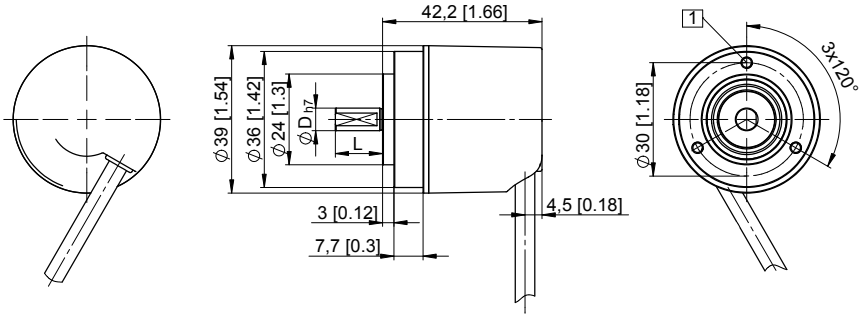
Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

Dimensions shaft version

Dimensions in mm [inch]

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

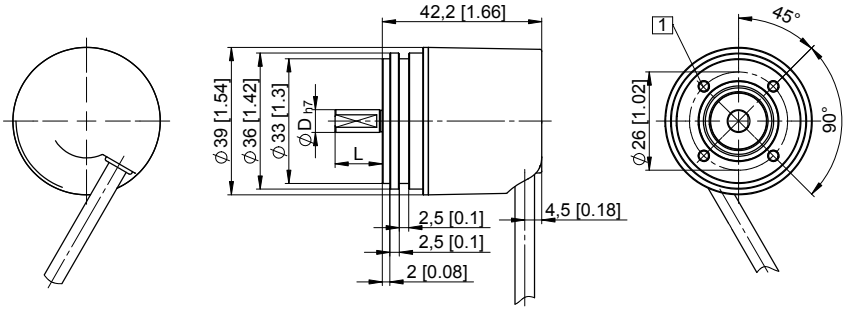
1 3 x M3, 6 [0.24] deep



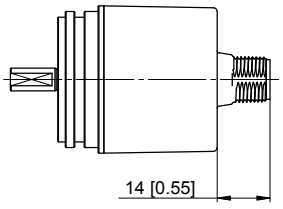
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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

1 3 x M3, 6 [0.24] deep



Drawing with M12 connector
Type of connection 8



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

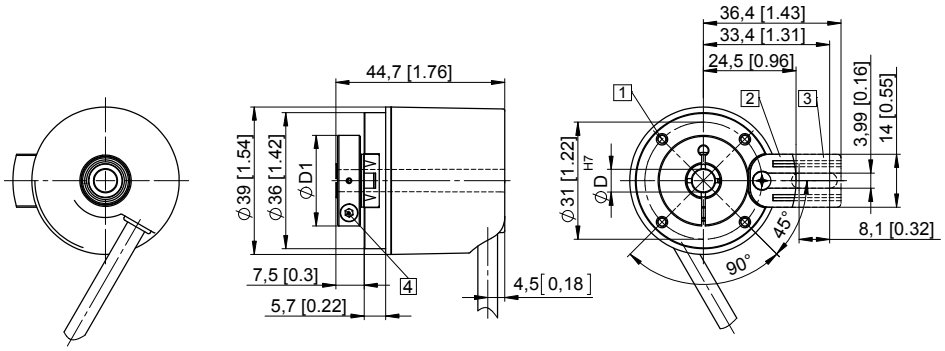
Compact Optical | **Sendix F3653 / F3673 (Shaft / Hollow shaft)** | **SSI / BiSS-C**

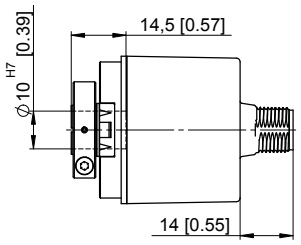
Dimensions hollow shaft version

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





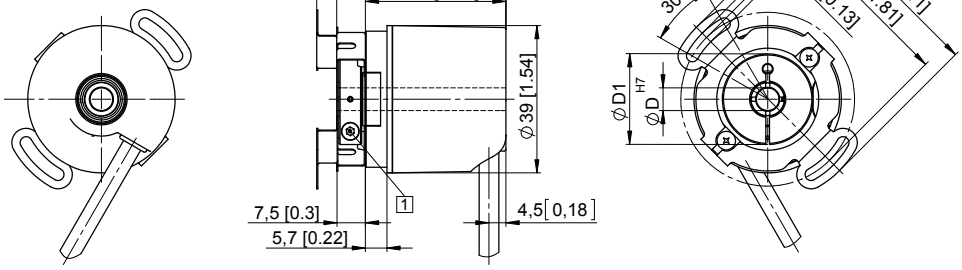
Drawing with M12 connector
Type of connection 8

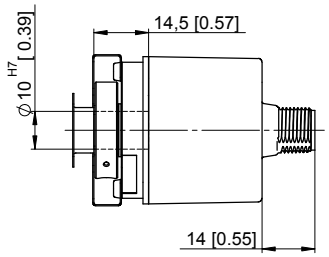
D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4“	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

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

1 Recommended torque for the clamping ring 0.7 Nm





Drawing with M12 connector
Type of connection 8

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

Insertion depth for blind hollow shaft 14.5 [0.57]