

# Absolute encoders – multiturn

<b>Standard electronic multiturn, optical</b>	<b>Sendix F5868 / F5888 (shaft / hollow shaft)</b>	<b>CANopen</b>
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The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and CANopen functionalities according to up-to-date encoder profile.



16 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+80°C Temperature range	IP High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Intelligent Scan Technology™	Surface protection salt spray-tested optional

## Reliable and 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 +80 °C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.

## 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.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

<b>Order code</b>	<b>8.F5868</b>	<b>.XX2X</b>	<b>.212X</b>	If for each parameter of an encoder the <b>underlined preferred option</b> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.		
<b>Shaft version</b>	Type	<u>a</u>	<u>b</u>	<u>c</u>	<u>d</u>	<u>e</u>
<b>a Flange</b>	<b>1 = clamping flange, IP65 ø 58 mm [2.28"]</b> 3 = clamping flange, IP67 ø 58 mm [2.28"] <b>2 = synchro flange, IP65 ø 58 mm [2.28"]</b> 4 = synchro flange, IP67 ø 58 mm [2.28"] 5 = square flange, IP65 □ 63.5 mm [2.5"] 7 = square flange, IP67 □ 63.5 mm [2.5"]	<b>c Interface / supply voltage</b> <b>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</b>	<b>e Fieldbus profile</b> <b>21 = CANopen</b>	<b>d Type of connection</b> A = radial cable, 2 m [6.56'] PVC B = radial cable, special length PVC *) <b>E = 1 x radial M12 connector, 5-pin</b> F = 2 x radial M12 connector, 5-pin	<b>f Options (service)</b> 2 = no option <b>3 = SET button</b>	<b>Optional on request</b> - Ex 2/22 <sup>3)</sup> - surface protection salt spray tested
<b>b Shaft (ø x L), with flat</b>	<b>1 = 6 x 10 mm [0.24 x 0.39"]<sup>1)</sup></b> <b>2 = 10 x 20 mm [0.39 x 0.79"]<sup>2)</sup></b> 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	*) Available special lengths (connection type 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.F5868.122B.2123.0030 (for cable length 3 m)				

1) Preferred type only in conjunction with flange type 2.  
2) Preferred type only in conjunction with flange type 1.

3) For the cable connection type, cable material PUR.

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<b>Order code</b> <b>Hollow shaft</b>	<b>8.F5888</b> Type	<b>.XX2X</b> a b c d	<b>.212X</b> e f	<p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p>
<p><b>a Flange</b> 1 = with spring element, long, IP65 2 = with spring element, long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> <p><b>b Through hollow shaft</b> 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] <i>Blind hollow shaft</i> (insertion depth max. 30 mm [1.18"]) B = ø 12 mm <sup>1)</sup></p>	<p><b>c Interface / supply voltage</b> <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u></p> <p><b>d Type of connection</b> L = tangential cable, 2 m [6.56'] PVC M = tangential cable, special length PVC *) <u>E = 1 x radial M12 connector, 5-pin</u> F = 2 x radial M12 connector, 5-pin <sup>2)</sup></p> <p>*) Available special lengths (connection type M): 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.F5888.542M.2123.0030 (for cable length 3 m)</p>	<p><b>e Fieldbus profile</b> <u>21 = CANopen</u></p> <p><b>f Options (service)</b> 2 = no option <u>3 = SET button</u></p> <p><i>Optional on request</i> - Ex 2/22 <sup>3)</sup> (not for type of connection L, M) - surface protection salt spray tested</p>		

Mounting accessory for shaft encoders		Order no.
<b>Coupling</b>	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	<b>8.0000.1102.0606</b>
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	<b>8.0000.1102.1010</b>

Mounting accessory for hollow shaft encoders		Dimensions in mm [inch]	Order no.
<b>Torque pin, ø 4 mm</b> for flange with spring element (flange type 1)	with fixing thread		<b>8.0010.4700.0000</b>

Cables and connectors		Order no.
<b>Preassembled cables</b>	M12 female connector with coupling nut, 5-pin, A coded, straight – Bus in single-ended 5 m [16.40'] PVC cable	<b>05.00.6091.A211.005M</b>
	M12 male connector with external thread, 5-pin, A coded, straight – Bus out single-ended 5 m [16.40'] PVC cable	<b>05.00.6091.A411.005M</b>
<b>Connectors</b>	M12 female connector with coupling nut, 5-pin, A coded, straight (metal) – Bus in	<b>8.0000.5116.0000</b>
	M12 male connector with external thread, 5-pin, A coded, straight (metal) – Bus out	<b>8.0000.5111.0000</b>

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

1) Can be combined only with type of connection F.

2) Can be combined only with blind hollow shaft ø12 mm [0.47"].

3) For the cable connection type, cable material PUR.

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## Technical data

Mechanical characteristics		
<b>Maximum speed shaft version</b>		
IP65 up to 70 °C	12000 min <sup>-1</sup> , 10000 min <sup>-1</sup> (continuous)	
IP65 up to T <sub>max</sub>	8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)	
IP67 up to 70 °C	11000 min <sup>-1</sup> , 9000 min <sup>-1</sup> (continuous)	
IP67 up to T <sub>max</sub>	8000 min <sup>-1</sup> , 5000 min <sup>-1</sup> (continuous)	
<b>Maximum speed hollow shaft version</b>		
IP65 up to 70 °C	9000 min <sup>-1</sup> , 6000 min <sup>-1</sup> (continuous)	
IP65 up to T <sub>max</sub>	6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous)	
IP67 up to 70 °C	8000 min <sup>-1</sup> , 4000 min <sup>-1</sup> (continuous)	
IP67 up to T <sub>max</sub>	4000 min <sup>-1</sup> , 2000 min <sup>-1</sup> (continuous)	
<b>Starting torque at 20 °C [68 °F]</b>	IP65 < 0.01 Nm	
	IP67 < 0.05 Nm	
<b>Load capacity of shaft</b>	radial 80 N	
	axial 40 N	
<b>Mass moment of inertia</b>	shaft version 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup>	
	hollow shaft version 6.0 x 10 <sup>-6</sup> kgm <sup>2</sup>	
<b>Weight</b>	approx. 0.45 kg [15.87 oz]	
<b>Protection acc. to EN 60529</b>	housing side IP67	
	shaft side IP65, opt. IP67	
<b>Working temperature range</b>	-40 °C ... +80 °C [-40 °F ... +176 °F] <sup>1)</sup>	
<b>Material</b>	shaft/hollow shaft stainless steel	
	flange aluminum	
	housing zinc die-cast	
	cable PVC (PUR for Ex 2/22)	
<b>Shock resistance acc. to EN 60068-2-27</b>	2500 m/s <sup>2</sup> , 6 ms	
<b>Vibration resistance acc. to EN 60068-2-6</b>	100 m/s <sup>2</sup> , 55 ... 2000 Hz	

Electrical characteristics	
<b>Supply voltage</b>	10 ... 30 V DC
<b>Power consumption (no load)</b>	max. 100 mA
<b>Reverse polarity protection of the supply voltage</b>	yes

Diagnostic LED (two-color, red/green)		
<b>LED ON or blinking</b>	red	error display
	green	status display
	combination red / green	error code

Interface characteristics CANopen		
<b>Resolution singleturn (MUR)</b>	scalable	1 ... 65 536 (16 bit)
	default	65 536 (16 bit)
<b>Number of revolutions (NDR)</b>	1 ... 65 536 (16 bit) scalable only via the total resolution	
<b>Total resolution (TMR)</b>	scalable	1 ... 4 294 967 296 (32 bit)
	default	268 435 456 (28 bit)
<b>Interface</b>	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B	
<b>Protocol</b>	CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0	
<b>Baud rate</b>	10 ... 1000 kbit/s software configurable	
<b>Node address</b>	1 ... 127 software configurable	
<b>Termination</b>	software configurable	
<b>LSS protocol</b>	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object	

Approvals		
<b>UL compliant</b> in accordance with		File no. E224618
<b>CE compliant</b> in accordance with		
	EMC Directive	2014/30/EU
	RoHS Directive	2011/65/EU
	ATEX Directive	2014/34/EU (for Ex 2/22 variants)
<b>UKCA compliant</b> in accordance with		
	EMC Regulations	S.I. 2016/1091
	RoHS Regulations	S.I. 2012/3032
	UKEX Regulations	S.I. 2016/1107 (for Ex 2/22 variants)

1) Cable version: -30 °C ... +75 °C [-22 °F ... +167 °F].

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**CANopen**

## General information about CANopen

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

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters, which have been saved on an EEPROM 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, temperature** 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.

## Universal scaling function

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

The universal scaling function remedies this problem.

## CANopen Communication Profile DS301 V4.2

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

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

## CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

## LSS layer setting services DS305 V2.0

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

## Terminal assignment

Interface	Type of connection	Function	Cable (isolate unused cores individually before initial start-up)					
2	A, B, L, M	Bus IN	Signal:	0 V supply voltage	+V supply voltage	CAN_L	CAN_H	CAN_GND
			Core color:	WH	BN	YE	GN	GY

Interface	Type of connection	Function	2 x M12 connector, 5-pin						
2	F	Bus IN	Signal:	0 V supply voltage	+V supply voltage	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	
		Bus OUT	Signal:	0 V supply voltage	+V supply voltage	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	

Interface	Type of connection	Function	1 x M12 connector, 5-pin						
2	E	Bus IN	Signal:	0 V supply voltage	+V supply voltage	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	

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## Dimensions shaft version

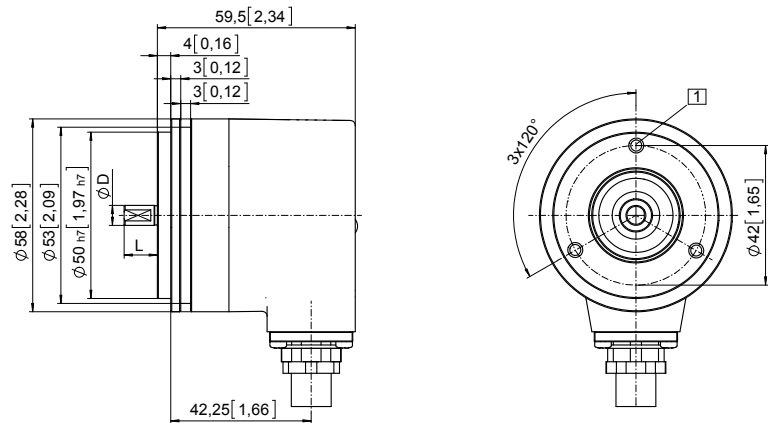
Dimensions in mm [inch]

### Synchro flange, $\varnothing 58$ [2.28]

#### Flange type 2 and 4

(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

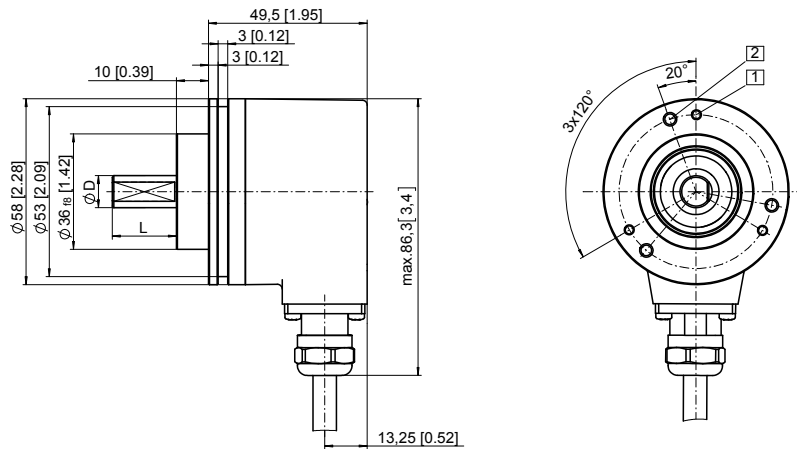
### Clamping flange, $\varnothing 58$ [2.28]

#### Flange type 1 and 3

(drawing with cable)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

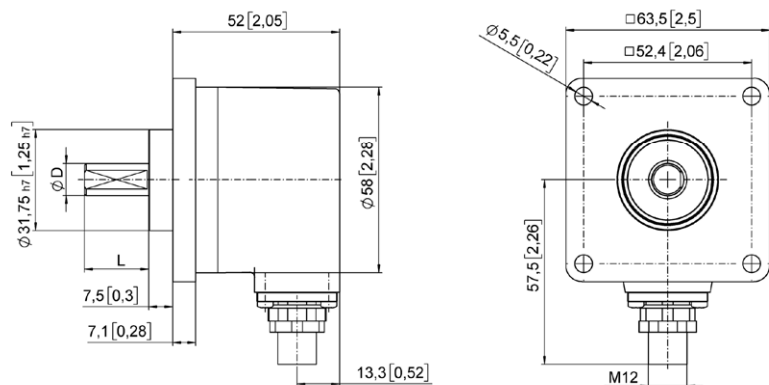


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

### Square flange, $\square 63.5$ [2.5]

#### Flange type 5 and 7

(drawing with M12 connector)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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## CANopen

### Dimensions hollow shaft version

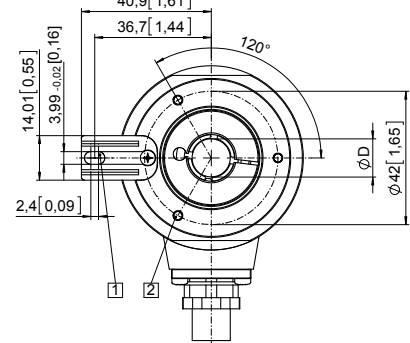
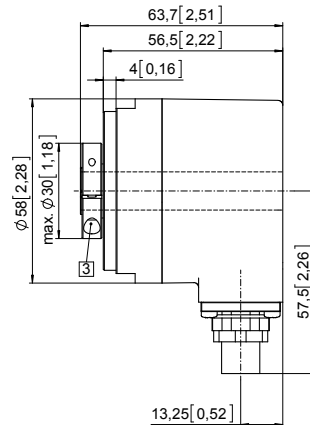
Dimensions in mm [inch]

#### Flange with spring element, long

##### Flange type 1 and 2

(drawing with cable)

- 1 Slot spring element, recommendation: torque pin DIN 7,  $\varnothing$  4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

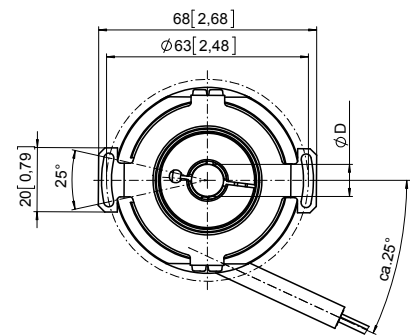
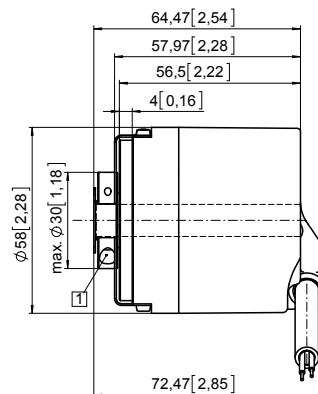
#### Flange with stator coupling, $\varnothing$ 63 [2.48]

##### Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(drawing with tangential cable)

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

\*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

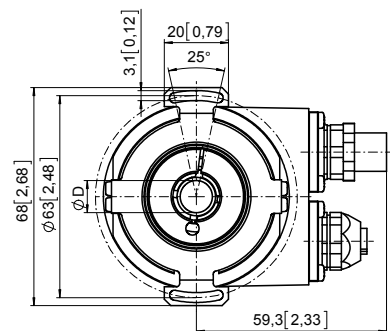
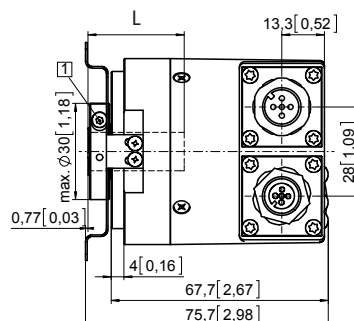
#### Flange with stator coupling, $\varnothing$ 63 [2.48]

##### Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(drawing with 2 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

\*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]