

# Absolute encoders – singleturn

<b>Standard optical</b>	<b>Sendix F5858 / F5878 (shaft / hollow shaft)</b>	<b>PROFINET IO</b>
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The Sendix F58 singleturn is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity. 19 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified PROFINET functionality. A minimum cycle time of 250 µs, the PROFIdrive application profile and a web server for FW updates are supported.



Safety-Lock™



High rotational speed



Temperature range  
-40°... +80°C



High protection level  
IP67



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor

## Latest PROFINET functionality

- PROFINET IO, RT, IRT allows integration in applications with different performance requirements.
- Supports the Isochronous Mode, can thus be implemented in networks for hard real-time requirements with clock cycles up to 250 µs.
- Encoder profile V 4.2 with full support of various Profinet features.
- Ideal for highly synchronous applications, such as e. g. axis synchronization.
- Interoperability between many different control and drive manufacturers thanks to the PROFIdrive profile.

## Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Wide temperature range, -40 °C ... +80 °C.

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<b>Order code</b>	<b>8.F5858</b>	<b>.XXCN.</b>	<b>C1</b>	<b>2</b>	<b>2</b>
<b>Shaft version</b>	Type	a b c d	e		

**a Flange**

1 = clamping flange, IP65 ø 58 mm [2.28"]  
 3 = clamping flange, IP67 ø 58 mm [2.28"]  
 2 = synchro flange, IP65 ø 58 mm [2.28"]  
 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 Shaft (ø x L), with flat**

1 = 6 x 10 mm [0.24 x 0.39"]  
 2 = 10 x 20 mm [0.39 x 0.79"]  
 3 = 1/4" x 7/8"  
 4 = 3/8" x 7/8"

**c Interface / Supply voltage**

C = PROFINET IO / 10 ... 30 V DC

**d Type of connection**

N = 3 x axial M12 connector, 4-pin

**e Fieldbus profile**

C1 = PROFINET IO

*Options – Standard types (available from 1 piece)*

**V2A**  
DIN 1.4305  
AISI 303

Surface protection salt spray tested with clamping flange IP67 and shaft ø 10 mm:  
8.F5858.32CN.C122-C

**V4A**  
DIN 1.4404  
AISI 316L

Stainless steel V2A <sup>1)</sup>  
Order expansion:  
8.F5858.XXCN.C122-V2A

**V4A**  
DIN 1.4404  
AISI 316L

Stainless steel V4A <sup>1)</sup>  
Order expansion:  
8.F5858.XXCN.C122-V4A

*Options – on request (for other flange/shaft combinations)*

- Surface protection salt spray tested
- Stainless steel V2A
- Stainless steel V4A

<b>Order code</b>	<b>8.F5878</b>	<b>.XXCN.</b>	<b>C1</b>	<b>2</b>	<b>2</b>
<b>Hollow shaft</b>	Type	a b c d	e		

**a Flange**

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"]  
 5 = with stator coupling, IP65 ø 63 mm [2.48"]  
 6 = with stator coupling, IP67 ø 63 mm [2.48"]  
 9 = with torque stop, flexible, IP65  
 J = with torque stop, flexible, IP67

**b Blind hollow shaft (insertion depth max. 30 mm [1.18"])**

A = ø 10 mm [0.39"]  
 B = ø 12 mm [0.47"]  
 C = ø 14 mm [0.55"]  
 D = ø 15 mm [0.59"]  
 E = ø 3/8"  
 F = ø 1/2"

**c Interface / Supply voltage**

C = PROFINET IO / 10 ... 30 V DC

**d Type of connection**

N = 3 x axial M12 connector, 4-pin

**e Fieldbus profile**

C1 = PROFINET IO

*Options – Standard types (available from 1 piece)*

**V2A**  
DIN 1.4305  
AISI 303

Stainless steel V2A <sup>2)</sup>  
Order expansion:  
8.F5878.2XCN.C122-V2A

**V4A**  
DIN 1.4404  
AISI 316L

Stainless steel V4A <sup>2)</sup>  
Order expansion:  
8.F5878.2XCN.C122-V4A

*Options – on request (for other flange/hollow shaft combinations)*

- Surface protection salt spray tested
- Stainless steel V2A
- Stainless steel V4A

1) Only in conjunction with flange **a** = 3 or 4 and shaft **b** = 1 or 2.  
 2) Only in conjunction with flange **a** = 2 and hollow shaft **b** = B or D.

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Standard optical		Sendix F5858 / F5878 (shaft / hollow shaft)	PROFINET IO
<b>Mounting accessory for shaft encoders</b>			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>
<b>Mounting accessory for hollow shaft encoders</b> 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>
<b>Cables and connectors</b>			Order no.
<b>Preassembled cables</b>	M12 male connector with external thread, 4-pin, D coded, straight single-ended 2 m [6.56'] PUR cable	port 1 + port 2	<b>05.00.6031.4411.002M</b>
	M12 male connector with external thread, 4-pin, D coded, right-angle single-ended 2 m [6.56'] PUR cable	port 1 + port 2	<b>05.00.6031.4511.002M</b>
	M12 female connector with coupling nut, 4-pin, A coded, straight single-ended 2 m [6.56'] PUR cable	power supply	<b>05.00.6061.6211.002M</b>
	M12 female connector with coupling nut, 4-pin, A coded, right-angle single-ended 2 m [6.56'] PUR cable	power supply	<b>05.00.6061.6311.002M</b>
<b>Connectors</b>	M12 male connector with external thread, 4-pin, D coded, straight (metal)	port 1 + port 2	<b>05.WASCSY4S</b>
	M12 male connector with external thread, 4-pin, D coded, right-angle (metal)	port 1 + port 2	<b>8.0000.5128.0000</b>
	M12 female connector with coupling nut, 4-pin, A coded, straight (plastic)	power supply	<b>05.B8141-0</b>
	M12 female connector with coupling nut, 4-pin, A coded, right-angle (plastic)	power supply	<b>05.B8241-0</b>

Further Kübler accessories can be found at: [kuebler.com/accessories](http://kuebler.com/accessories)

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

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## Technical data

Mechanical characteristics	
<b>Max. speed</b>	9000 min <sup>-1</sup> (short-term – 10 min) 6000 min <sup>-1</sup> (continuous)
<b>Starting torque at 20 °C [68 °F]</b>	< 0.01 Nm
<b>Moment of inertia</b>	shaft version 3.0 x 10 <sup>-6</sup> kgm <sup>2</sup> blind hollow shaft version 4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Load capacity of shaft</b>	radial 80 N axial 40 N
<b>Weight</b>	approx. 0.45 kg [15.87 oz]
<b>Protection acc. to EN 60529</b>	IP65, IP67
<b>Working temperature range</b>	-40 °C ... +80 °C [-40 °F ... +176 °F]
<b>Material</b>	Standard V2A V4A DIN 1.4305 DIN 1.4404 AISI 303 AISI 316L shaft/hollow shaft V2A V2A V4A flange aluminum V2A V4A housing aluminum V2A V4A
<b>Shock resistance acc. EN 60068-2-27</b>	2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance acc. EN 60068-2-6</b>	100 m/s <sup>2</sup> , 55 ... 2000 Hz

Electrical characteristics	
<b>Power supply</b>	10 ... 30 V DC
<b>Current consumption (at 24 V DC)</b>	max. 45 mA
<b>Power consumption</b>	max. 1.5 W
<b>Reverse polarity protection of the power supply (V+)</b>	yes

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

## Interface characteristics PROFINET IO

General information	
<b>Protocol</b>	PROFINET IO
<b>Classifications</b>	RT Class 3 (IRT) Conformance Class C Application Class 6 Encoder Class 4 Netload Class III

Adjustable parameters	
<ul style="list-style-type: none"> <li>• Preset</li> <li>• Counting direction</li> <li>• Resolution per revolution - MUR</li> <li>• Unit speed</li> <li>• IP address</li> <li>• Total resolution - TMR</li> <li>• Position format</li> <li>• Speed reference value</li> </ul>	<ul style="list-style-type: none"> <li>• Scaling</li> <li>• Device name</li> <li>• F-Destination Address</li> <li>• I&amp;M 0...3 Parameter</li> <li>• Alarm behavior</li> <li>• Parameter write protection</li> <li>• Parameter initialization</li> </ul>

Resolution	
<b>Resolution Singleturn (MUR)</b>	scalable 1 ... 524 288 (19 bit) default 8 192 (13 bit)




PROFINET characteristics	
<ul style="list-style-type: none"> <li>• I&amp;M 0 ... 3</li> <li>• standard telegrams (81, 82, 83, 84, 86, 88)</li> <li>• IRT up to 250 µs</li> <li>• Isochronous Mode</li> </ul>	<ul style="list-style-type: none"> <li>• MRP</li> <li>• LLDP</li> <li>• PDEV</li> <li>• SNMP</li> <li>• FSU</li> </ul>

Process data	
<ul style="list-style-type: none"> <li>• Position</li> <li>• Speed</li> </ul>	<ul style="list-style-type: none"> <li>• Failure</li> <li>• Warnings</li> </ul>

# Absolute encoders – singleturn

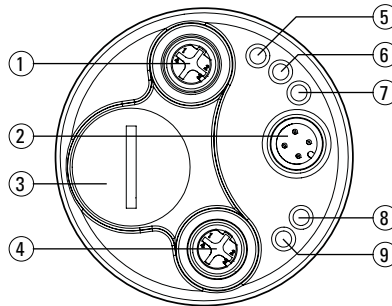
<b>Standard optical</b>	<b>Sendix F5858 / F5878 (shaft / hollow shaft)</b>	<b>PROFINET IO</b>
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## Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
C	N (3 x M12 connector)	Bus Port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	-	Voltage -	-	 D coded
			Abbreviation:	+ V	-	0 V	-	
			Pin:	1	2	3	4	
		Bus Port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	

## Rear side connections and display elements

①	Ethernet Port – Link 2	
②	Supply voltage	
③	Cover screw	
④	Ethernet Port – Link 1	
⑤	Link 2	flashes yellow when connected
⑥	BF – Bus Failure	displays network errors *)
⑦	SF – System Failure	displays system errors *)
⑧	ENC	shows status of encoder *)
⑨	Link 1	flashes yellow when connected



\*) see manual

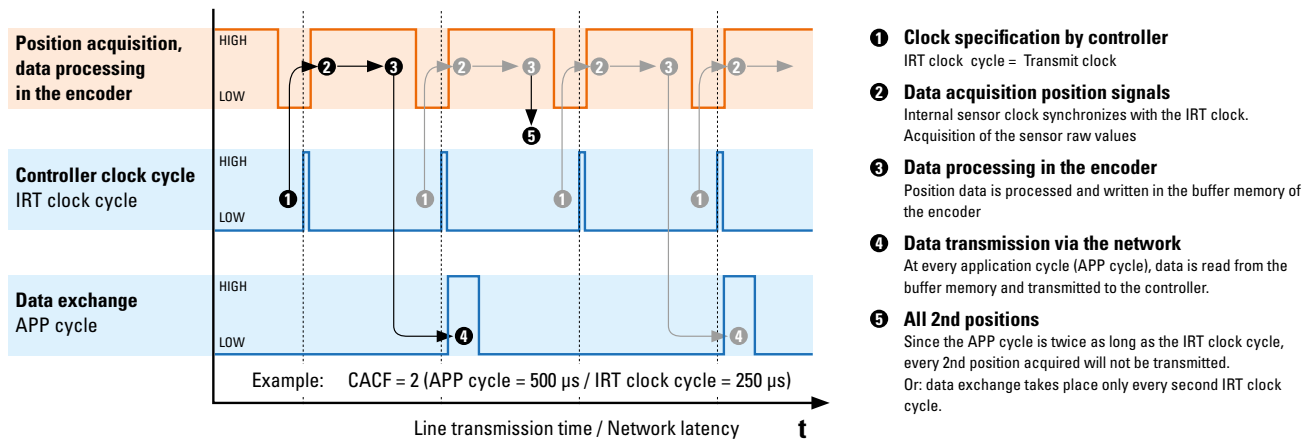
<b>Standard optical</b>	<b>Sendix F5858 / F5878 (shaft / hollow shaft)</b>	<b>PROFINET IO</b>
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## Technology in detail

### Clock synchronicity – Isochronous Real Time (IRT) in position sensor technology

In general, for time-critical applications, focus is set on very short sensor cycle times. However, in order to achieve high control performance, simply accelerating data acquisition and processing by shortest cycle times is not sufficient. All sensors and actuators are to operate according to the same clock.

This is achieved thanks to a clock used for the whole network, defined by the controller. This transmit clock cycle (IRT clock) is however not necessarily the clock cycle used for process data exchange. Another cycle (application cycle) is used for this purpose, which can also be defined by the customer controller. The illustration below represents the connection between the different clock cycles.



When receiving the IRT clock signal, the sensor starts reading its current measured point. This raw value is processed internally (e.g. scaling, speed calculation, etc.) and stored in a buffer memory.

The buffer memory is read at every application cycle. If it contains a value, this value is transmitted to the controller via the network.

If the application cycle is a multiple of the IRT clock cycle, it may happen that the buffered process data is not sent directly, but is overwritten, because, even though this data is acquired with every IRT clock cycle, it is sent only with every application cycle.

The ratio between application cycle and IRT clock cycle represents the CACF (Controller Application Cycle Factor).

In this example, the CACF = 2. This indicates that only every 2nd acquired position will be transmitted to the controller.

The described methodology guarantees a determinism: since the controller defines a clock cycle for the whole network, this allows ensuring that all measured values transmitted by the sensors to the controller are never older than the selected IRT cycle! Therefore, all downstream actuators can always be regulated on the basis of the latest available measured values.

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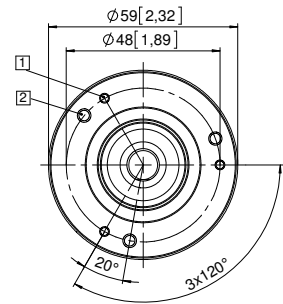
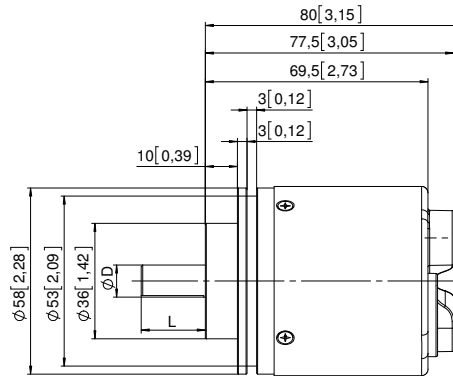
## Dimensions shaft version

Dimensions in mm [inch]

### Clamping flange, ø 58 [2.28]

#### Flange type 1 + 3

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

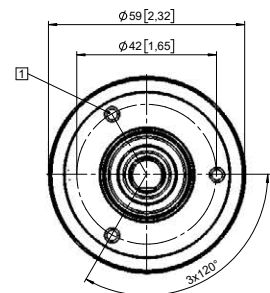
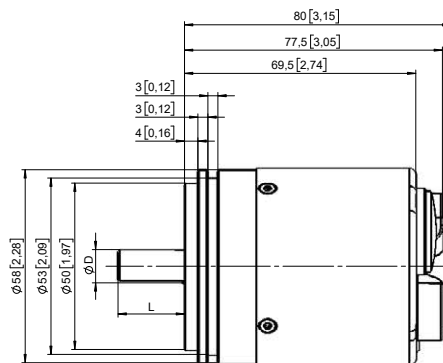


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

### Synchro flange, ø 58 [2.28]

#### Flange type 2 + 4

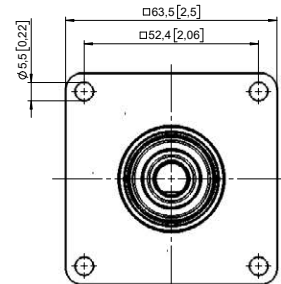
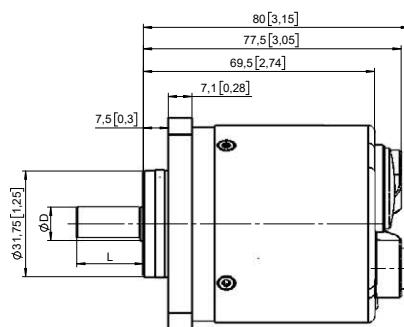
- 1 3 x M3, 6 [0.24] deep



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"

### Square flange, □ 63.5 [2.5]

#### Flange type 5 + 7



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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## Standard optical

## Sendix F5858 / F5878 (shaft / hollow shaft)

## PROFINET IO

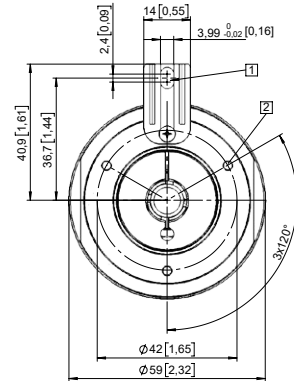
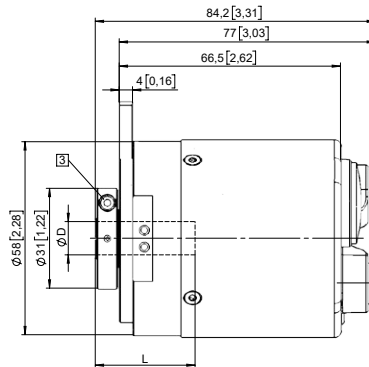
### Dimensions hollow shaft version

Dimensions in mm [inch]

#### Flange with spring element, long

##### Flange type 1 + 2

- 1 Slot spring element, recommendation: torque pin DIN 7,  $\phi$  4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



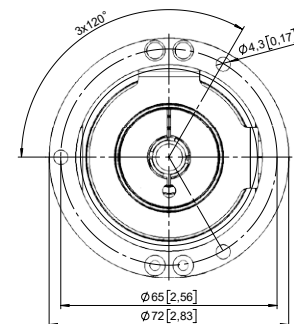
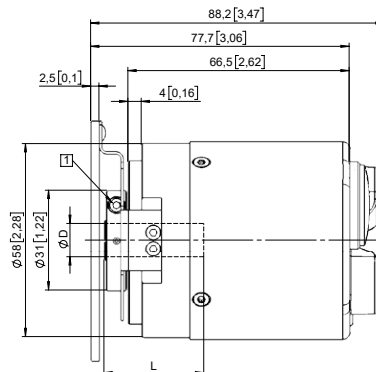
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

#### Flange with stator coupling, $\phi$ 65 [2.56]

##### Flange type 3 + 4

- 1 Recommended torque for the clamping ring 0.6 Nm



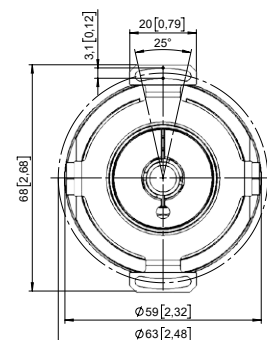
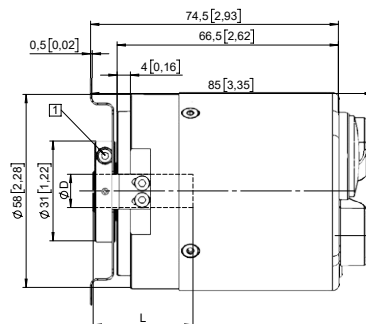
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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

##### Flange type 5 + 6

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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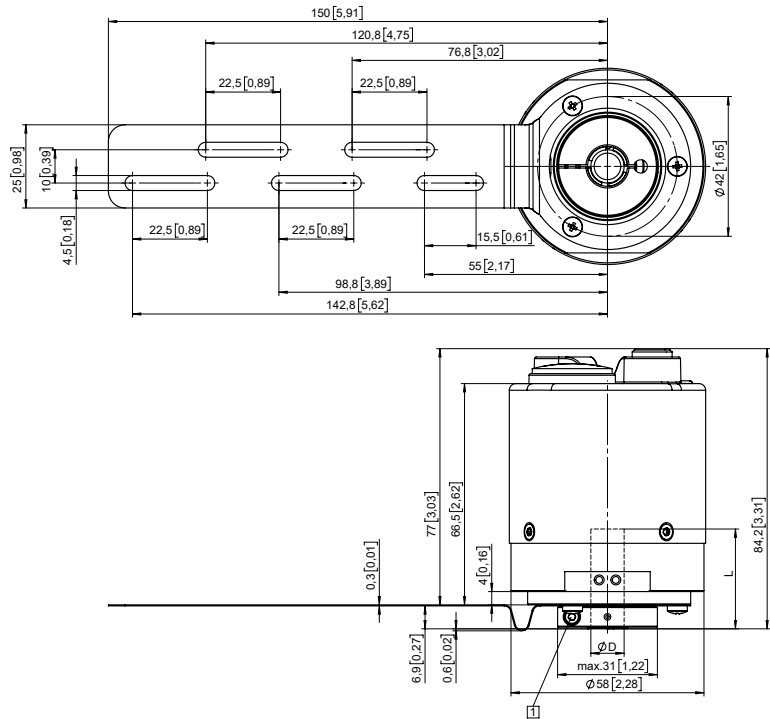
<b>Standard optical</b>	<b>Sendix F5858 / F5878 (shaft / hollow shaft)</b>	<b>PROFINET IO</b>
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## Dimensions hollow shaft version

Dimensions in mm [inch]

**Flange with torque stop, flexible  
Flange type 9 + J**

**1** Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft