

# POSITAL

## FRABA

### ABSOLUTE ROTARY ENCODER SSI



#### Main Features

- Compact and Heavy-Duty Industrial Model
- Interface: Synchronous-Serial (RS 422)
- Housing: 58 mm Ø
- Shaft: 6 or 10 mm Ø
- Hollow Shaft 12 mm Ø
- Hub shaft 15 mm Ø
- Max. 65,536 Steps (0.005°) per Revolution (16 Bit)
- Max. 16,384 Revolutions (14 Bit)
- Optional Preset Input / Incremental Output
- Code: Gray or Binary
- EMC: EN 61000-6-2, EN 61000-6-4
- UL Listed (Except Hollow Shaft)

#### Mechanical Structure

- Aluminum Flange and Housing
- Stainless Steel Shaft
- Sealed Precision Ball Bearings
- Unbreakable and Durable Polycarbonate Code Disc

#### Suitable for Applications requiring:

- Sensing of: Angles, Distances, or Speeds of Rotating Shafts
- Straightforward Communication
- Simple Diagnostic Functions
- High Noise Immunity (Using Differential Data Transmission)
- Small Network Topology
- Minimum Wiring
- Fast Cycle Times

#### Electrical Features

- Temperature Insensitive IR-Opto-ASIC with Integrated Signal Conditioning
- Monitored Integrated IR-Illumination
- Reliable SMD and FPGA Technology
- Polarity Inversion Protection

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#### Technical Data

##### Electrical Data

Clock Input	via Opto-Coupler
Data Output	Line-Driver According to RS 422
Clock Frequency	100 kHz - 2 MHz
Step Frequency LSB	max. 800 kHz (Internal)
Accuracy of Division	$\pm \frac{1}{2}$ LSB (12 Bit), $\pm 2$ LSB (16 Bit)
Supply Voltage	10-30 V DC (Absolute Limits) *
Cycle Time (Preset-Versions)	< 30 $\mu$ s (only Interface S1,S4)
Turn on Time	< 1 s
Power Consumption	Interface SL / S1 / S4 max. 1 W; Interface S2 max. 1.5 W
Electrical Lifetime	> 10 <sup>5</sup> h
EMC	Emitted Interference: EN 61000-6-4
	Noise Immunity: EN 61000-6-2
Connection	Connector or Cable Exit 1m (~3ft)

\* Supply Voltage According to EN 50 178 (Safety Extra-Low Voltage)

##### Mechanical Data

Housing	Aluminum, Optional Stainless Steel				
Max. Shaft Load	Axial 40 N, Radial 110 N (9 lbs / 25 lbs)				
Moment of Inertia of Rotor	$\leq 30$ gcm <sup>2</sup> (0.16 oz-in <sup>2</sup> )				
Friction Torque	$\leq 3$ Ncm (4.2 oz-in) (without Shaft Sealing)				
RPM (Continuous Operation)	max. 12,000 RPM, Hollow Shaft (T): max. 3,000 RPM				
Shock (EN 60068-2-27)	$\leq 100$ g (Half Sine, 6 ms)				
Permanent Shock (EN 60028-2-29)	$\leq 10$ g (Half Sine, 16 ms)				
Vibration (EN 60068-2-6)	$\leq 10$ g (10 Hz ... 1,000 Hz)				
Weight (Standard Version)	Single-Turn: ~200 g (~0.5 lbs) , Hollow Shaft : ~300 g (~0.7 lbs)				
	Multi-Turn: ~300 g (~0.7 lbs)				
Weight (Stainless Steel Version)	Single-Turn: ~400 g (~0.9 lbs), Hollow Shaft: ~600 g (~1.3 Lbs)				
	Multi-Turn: ~600 g (~1.3 lbs)				
Flange	Synchro (S)		Clamp (C)	Hub Shaft (B)	Hollow Shaft (T)
Shaft Diameter	6 mm (~0.236 in)	10 mm (~0.394 in)	10 mm (~0.394 in)	15 mm (~0.591 in)	12 mm (~0.472 in)
Shaft Length	10 mm (~0.394 in)	20 mm (~0.787 in)	20 mm (~0.787 in)	*	**

\* Mating Shaft: min: 15 mm (~0.591 in) / max: 30 mm (~1.181 in)

\*\* Mating Shaft: min 15mm (~0.591 in)

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#### Minimum (Mechanical) Lifetime

Flange	Lifetime in 10 <sup>8</sup> Revolutions with F <sub>a</sub> / F <sub>r</sub>		
	40 N / 60 N 9 lbs / 13 lbs	40 N / 80 N 9 lbs / 18 lbs	40 N / 110 N 9 lbs / 25 lbs
C10 (Clamp Flange 10 x 20)	240	100	40
S10 (Synchro Flange 10 x 20)	210	90	30
S6 (Synchro Flange 6 x 10) without Shaft Sealing*	710	300	110

\* S6 (Synchro Flange 6 x 10) with Shaft Sealing: max. 20 N Axial, 80 N Radial (5 lbs / 18 lbs)

#### Environmental Conditions

Operating Temperature	- 40 ... + 85 °C ( - 40 ... + 185 °F)*
Storage Temperature	- 40 ... + 85 °C ( - 40 ... + 185 °F)*
Humidity	98 % (No Condensation)
Protection Class (EN 60529)	Casing Side: IP 65
	Shaft Side: IP 64 (Optional with Shaft Sealing: IP66)
Protection Class (EN 60529) Hollow Shaft	IP 64

\* Cable Exit: - 30 ... + 70 °C ( - 22 ... + 158 °F) (Stationary), - 5 ... + 70 °C ( 23 ... 158 °F) (Flexing)

#### Interface

##### Synchronous Serial Interface (SSI)

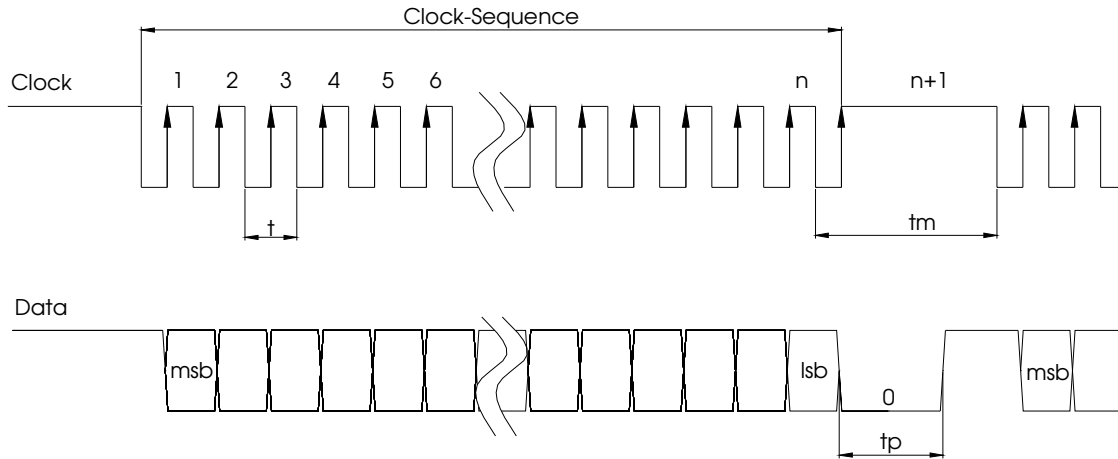
Driver	Driver Meets EIA Standard RS 422; Transmission Rates up to 10 MBit/s
Transfer	Transfer Distance up to 1,200 m (3,937 ft)
Transmission	Differential Transmission Provides High Noise Immunity
Pair Lines	Shielded and Twisted Pair Lines are Essential to Attain Extremely High Noise Immunity
Interface	For a Detailed Description of the Synchronous-Serial Interface (SSI) see below
Optional	Built-in RS 422 Interface for Bus Mode (Strobe-Function). Up to 10 Encoders can be used on the same data line.

Detailed Description for SSI-Interface under [www.posital.com](http://www.posital.com).

### ABSOLUTE ROTARY ENCODER SSI

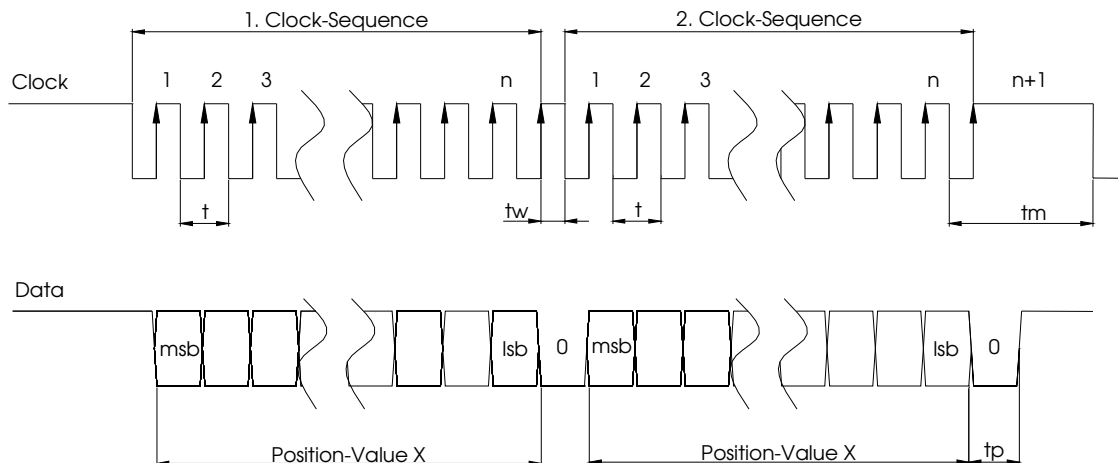
#### Reading Position Value (Single Transfer)

Behind the LSB two "0" follow, on 13 or 15 bit per revolution only one "0" follow.



#### Reading Position Value Multiple Times (Multiple Transfer)

FRABA SSI encoders use the "multiple transfer" to read a position value multiple times. If a pause does not come after the clock sequence, the encoder will repeat the position value. This will continue until the proper pause ( $t_m$ ) occurs. The multiple transfer of the same data allows the control system to recognize transfer errors.



### ABSOLUTE ROTARY ENCODER SSI

Some PLC's require a "0" after the last transmitted bit (LSB). For this reason, the "multiple transfer" feature on single turn encoders with more than 13 bits can be disabled (optional) for PLC's that provide only the SSI-formats 13, 21 and 25 bits. This feature is factory set and must be requested when ordering.

**Preset Function (only for interface S1 or S4)**

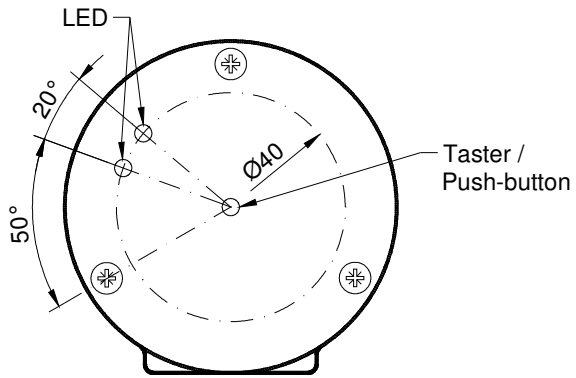
Preset value = 0 will be set after falling edge or end of pushing preset push-button (S4 version only). This function should be used only on a standstill shaft.

**Preset push-button (see sketch, S4 version only)**

LED Display	Function
Green	On = Power Supply is Connect to the Encoder. Turn off During Pressing of the Preset Push-Button.
Red	On = Alarm Message if LED Reaches a Lower Light Level (with Normal Data Output) or Memory Failure (Data Bits will Set Continuously to "High")

**Incremental Outputs (only in interface S2)**

Quadrature output of 1024 pulses per turn i.e. for velocity control use. Signal A and B are phase shifted to detect the rotary direction.



No. of increments	1024
Quadrature Signals	A, /A, B, /B
Driver	Line Driver RS 422
Quadrature Phasing	90° +/- 20°
Output Frequency	max 800 kHz

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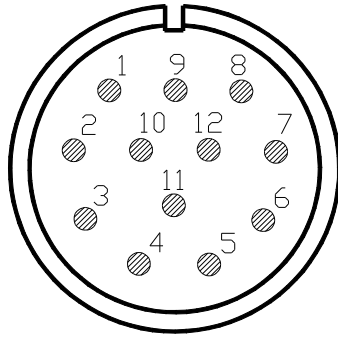
### ABSOLUTE ROTARY ENCODER SSI

#### Electrical Connection

Interface	12 Pol. Connector Pin-Nr.			Wire End*		
	SL	S1 / S4	S2	SL	S1	S2
Clock -	1	1	1	Yellow (3)	Yellow (3)	Yellow (3)
Clock +	2	2	2	Green (4)	Green (4)	Green (4)
Data +	3	3	3	Grey (1)	Grey (1)	Grey (1)
Data -	4	4	4	Pink (2)	Pink (2)	Pink (2)
Complement	8	8	8	Red (7)	Red (7)	Red (7)
+ U <sub>b</sub> = 10-30 V	11	11	11	Brown (8)	Brown (8)	Brown (8)
GND	12	12	12	White (9)	White (9)	White (9)
Preset	-	9	-	-	Black (6)	-
A	-	-	5	-	-	Black
/A	-	-	6	-	-	Violett
B	-	-	7	-	-	Grey/Pink
/B	-	-	10	-	-	Red/Blue
Shielding	-	-	-	Shielding		

\* Different Color Assignment for Connecting Cable with ST-K4P/G. With 9pin D-Sub Test Connector (Assignment in Parenthesis)

Pinning Encoder (male)



Complement Input		Encoder Counting Direction for Clockwise Rotation (Looking onto the Shaft)
Function	Level	
Direction of Rotation	0 (Input = N.C. * or GND)	Up
	1 (Input = + U <sub>b</sub> or ≥ 4,5 V)	Down

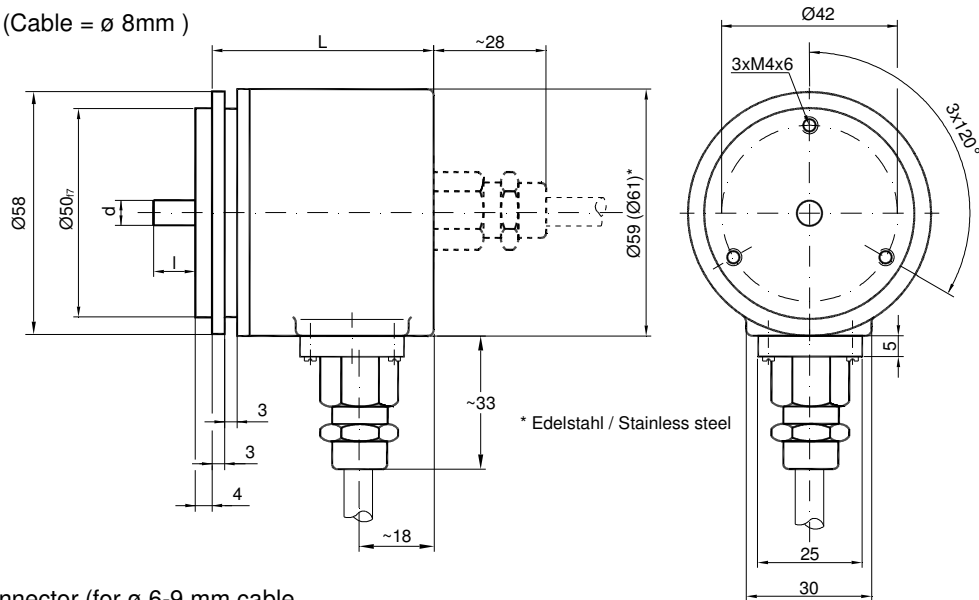
Preset Input (only for Interface S1, S4)		Output Position Value
Function	Level	
Preset Value = 0	0 (Input: N.C. or GND)	Output Position Value
	1 (Input = + U <sub>b</sub> or ≥ 4,5 V)	Set on Falling Edge (min. 100 ms)

### ABSOLUTE ROTARY ENCODER SSI

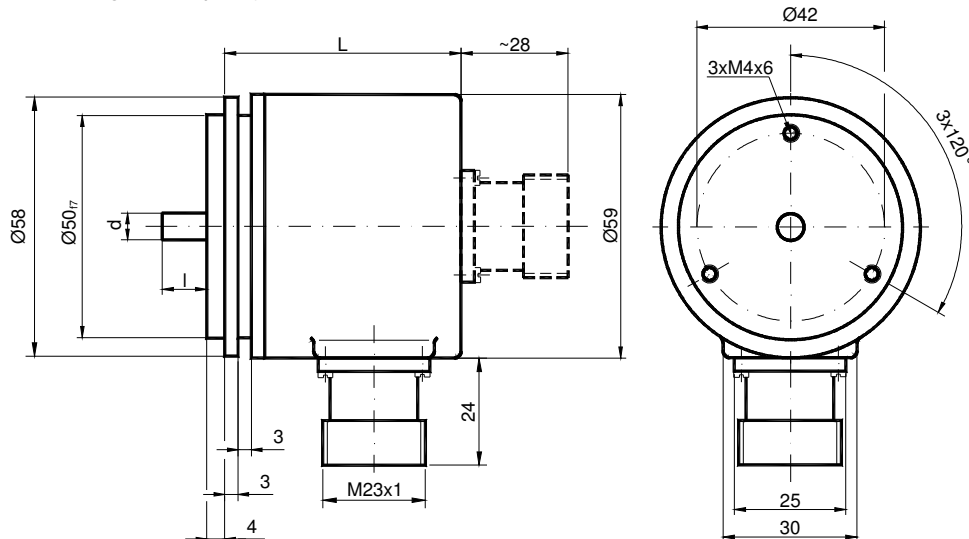
#### Mechanical Drawings (all dimensions in mm)

#### Synchro Flange (S)

Cable exit (Cable =  $\varnothing$  8mm )



12 pol. Connector (for  $\varnothing$  6-9 mm cable,  
stainless steel\* drawings on request)



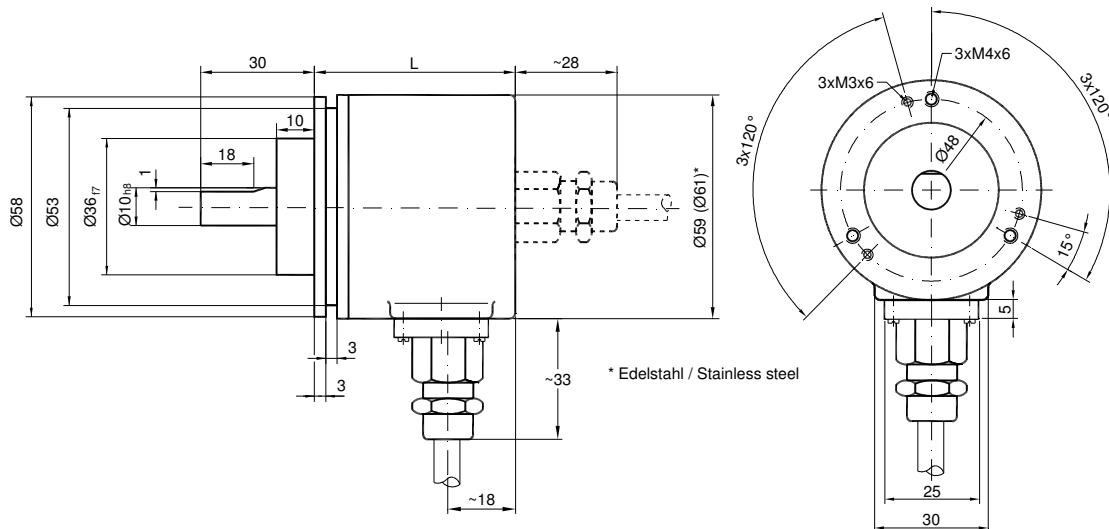
Synchro Flange	d / mm	l / mm
Version S06	6 <sub>f6</sub>	10
Version S10	10 <sub>h8</sub>	20

		L (mm)
Single-Turn	Axial	42
	Radial / Axial*	53
Multi-Turn	Axial	53
	Radial	53

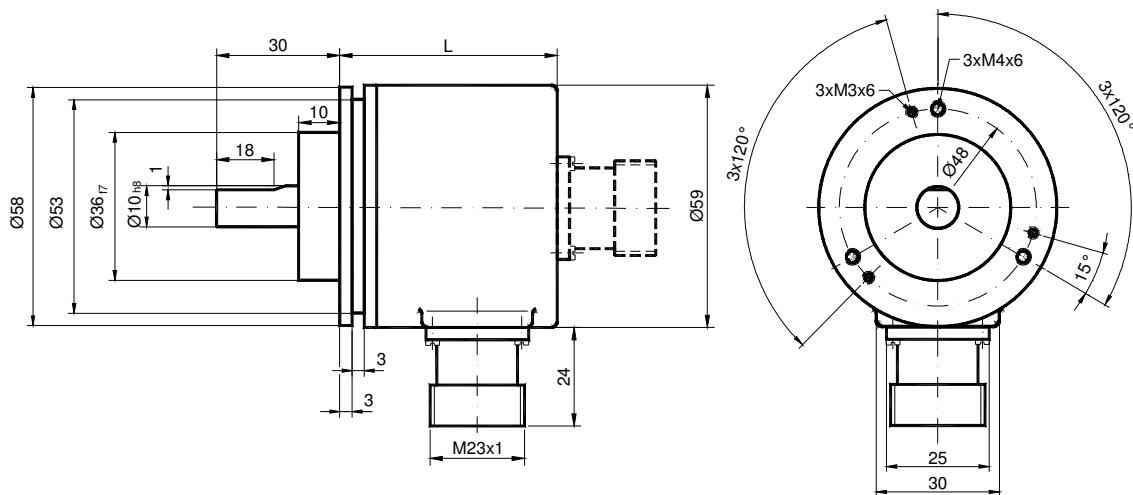
### ABSOLUTE ROTARY ENCODER SSI

#### Clamp flange (C)

Cable exit (Cable =  $\varnothing$  8 mm )



12 pol. Connector (for  $\varnothing$  6-9 mm cable,  
stainless steel\* drawings on request)

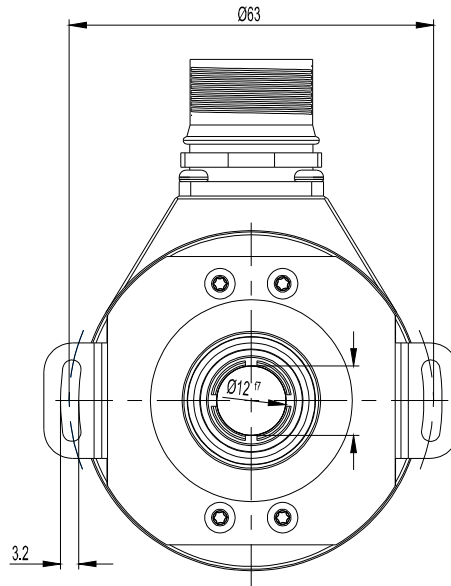
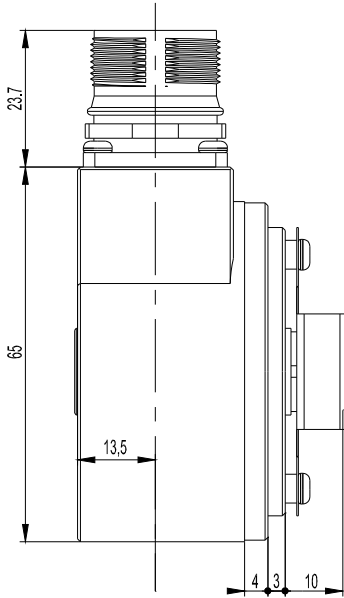


		L (mm)
Single-Turn	Axial	42
	Radial / Axial*	53
Multi-Turn	Axial	53
	Radial	53

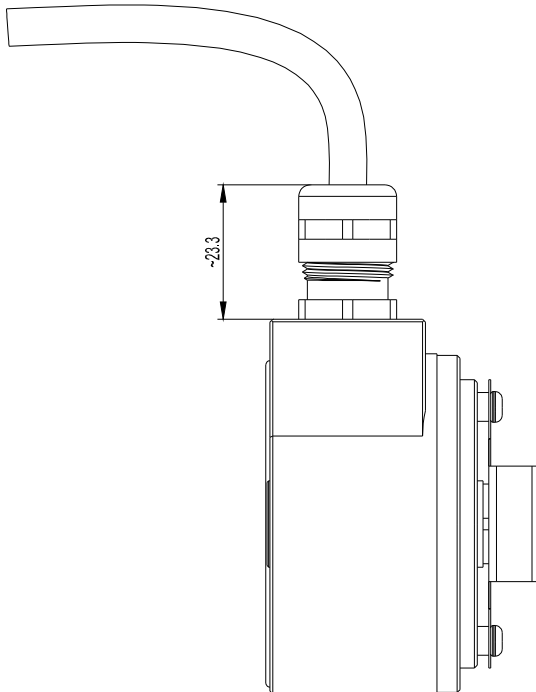
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### Hollow shaft (T)

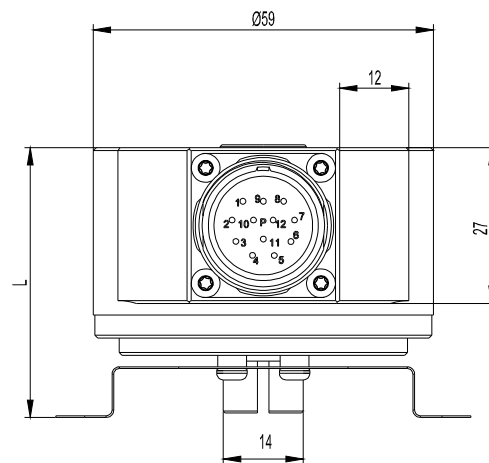
12 pol. Connector (for  $\varnothing$  6-9 mm cable)



Cable exit (Cable =  $\varnothing$  8 mm)



	L (mm)
Single-Turn	47
Multi-Turn	60



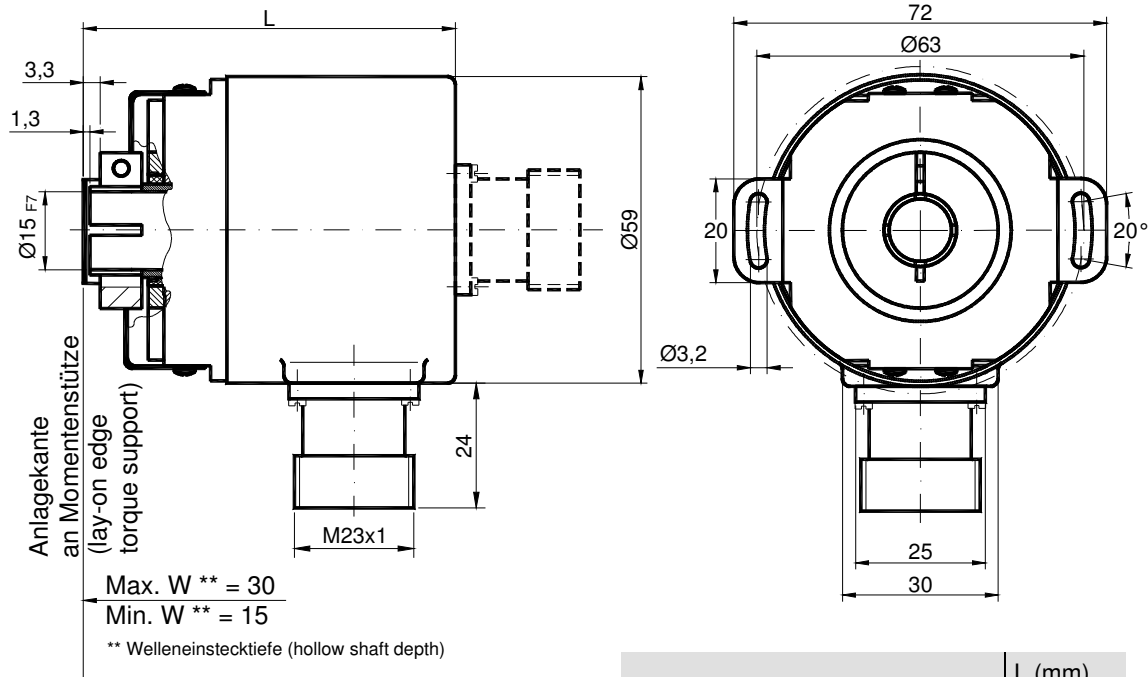
Mounting instruction see below

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#### Hub Shaft (B)

With cable exit available too. See drawing clamp flange.

(Stainless steel\* and cable exit drawings on request)



		L (mm)
Single-Turn	Axial	61
	Radial / Axial*	72
Multi-Turn	Axial	72
	Radial	72

#### Mounting Instructions

The clamp ring should only be tightened if the mating shaft is inserted into the hub / hollow shaft.

The diameter of the hub / hollow shaft can be reduced to different diameters (see accessories) by using an adapter (this reducing adapter can be pushed into the hollow shaft).

Maximum radial and axial misalignment of the drive shaft:

	Axial	Radial
Static	± 0.3 mm (~0.012 in)	± 0.5 mm (~0.020 in)
Dynamic	± 0.1 mm (~0.004 in)	± 0.2 mm (~0.008 in)

### ABSOLUTE ROTARY ENCODER SSI

#### Models / Ordering Description Full Shaft and Hub Shaft

Description	Type Key						
Optocode	<b>OCD-</b>	__	00	-	-	-	-
		<b>SL</b>					
Interface SSI	Preset	S1					
	Incr.	S2					
	Preset Button *	S4					
Version			<b>00</b>				
Code	Gray			<b>G</b>			
	Binary			B			
Bits for Revolutions	Single-Turn				<b>00</b>		
	Multi-Turn (4,096 Turns)				<b>12</b>		
	Multi-Turn (16,384 Turns)				14		
Steps per Revolution (Bits)	4,096 (0.09°)				<b>12</b>		
	8,192 (0.04°)				<b>13</b>		
	65,536 (0.005°)				16		
Flange	Clamp Flange, Full Shaft					<b>C</b>	
	Synchro Flange, Full Shaft					<b>S</b>	
	Hub Shaft					<b>B</b>	
Shaft Diameter	Ø 06 mm					<b>06</b>	
	Ø 10 mm					<b>10</b>	
	Ø 15 mm (only Hub Shaft)					<b>15</b>	
Mechanical Options	Without						<b>0</b>
	Shaft Sealing (IP66)						S
	Stainless Steel						V
	Customized						C
Connection	Connector, Axial **						PAL
	Connector, Radial						<b>PRL</b>
	1m Cable Exit, Axial **						CAW
	1m Cable Exit, Radial *						CRW

**Standard = Bold**, Further Models on Request

All types UL-listed

\* Not available in Stainless Steel

\*\* Not available with Interface S4

### ABSOLUTE ROTARY ENCODER SSI

#### Models / Ordering Description Hollow Shaft T12

Description	Type Key						
Optocode	<b>OCD-</b>	__	00	-	-	-	-
Interface SSI	<b>SL</b>						
	Preset	S1					
Version			<b>00</b>				
Code	Gray			<b>G</b>			
	Binary			B			
	Single-Turn				<b>00</b>		
Bits for Revolutions	Multi-Turn (4,096 Turns)				<b>12</b>		
	Multi-Turn (16,384 Turns)				14		
Steps per Revolution	4,096 (0.09°)				<b>12</b>		
(Bits)	8,192 (0.04°)				<b>13</b>		
	65,536 (0.005°)				16		
Flange	Hollow Shaft					<b>T</b>	
Shaft Diameter	Ø 12 mm (Hollow Shaft)					<b>12</b>	
Mechanical Options	Without						<b>0</b>
	Customized						C
Connection	1m Cable Exit, Axial						<b>CRW</b>
	Connector, Radial						PRL

**Standard = Bold**, Further Models on Request

Not UL-listed

### ABSOLUTE ROTARY ENCODER SSI

#### Accessories and Documentation

Description		Type
Female Cable Connector	Circular Connector, 12 Pins	PAL
Cable for PAL	3 x 2 x 0,14 mm <sup>2</sup> + 2 x 0,5 mm <sup>2</sup>	ST-K4P/G
Shaft Coupling *	Diameter: Ø 10 mm	GS 10
	Diameter: Ø 6 mm	GS 06
Clamp Disc *	Set = 4 pcs. / OCD	SP 15
Clamp Half-Ring *	Set = 2 pcs. / OCD	SP H
Reducing Adapter ** (Hub Shaft)	15 mm to 12 mm (to ~0.472 in)	RR12
	15 mm to 11 mm (to ~0.433 in)	RR11
	15 mm to 10 mm (to ~0.394 in)	RR10
	15 mm to 8 mm (to ~0.315 in)	RR8
Reducing Adapter ** (Hollow Shaft)	12 mm to 11 mm (to ~0.433 in)	RRT11
	12 mm to 10 mm (to ~0.394 in)	RRT10
	12 mm to 8 mm (to ~0.315 in)	RRT8

Note: All datasheets and manuals can be downloaded for free from our website [www.posital.com](http://www.posital.com)

\* Not for Hollow Shaft

\*\* Only for Hollow Shaft, in Stainless Steel Available too

We do not assume responsibility for technical inaccuracies or omissions. Specifications are subject to change without notice.