



### ABSOLUTE ROTARY ENCODER SINGLE-TURN BIT PARALLEL



#### Main Features

- Compact and heavy-duty industrial model
- Interface: Bit-parallel, push pull  
Short circuit proof
- Housing: 58 mm Ø
- Shaft: 6 or 10 mm Ø, hollow- 15 mm Ø
- Resolution: Max. 16 Bit = 65,536 steps per revolution
- Code: Gray / Binary
- EMC: EN61000-6-2, EN61000-6-4, CE

#### Applications

- Sensing of
- Angles
  - Distances
  - Tracks
  - Inclinations
  - Differences between two or more axes

#### Mechanical Structure

- Aluminum flange and housing
- Stainless steel shaft
- Precision ball bearings with sealing or cover rings
- Code disc made of unbreakable and durable plastic

#### Electrical Features

- Temperature insensitive IR-opto-receiver-ASIC with integrated signal conditioning
- Only one IR-transmitter-diode per opto-ASIC
- Highly integrated circuit in SMD-technology
- Polarity inversion protection
- Over-voltage-peak protection

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**Technical Data**

**Electrical Data**

Outputs	Bit-parallel, push pull
Output level "high"	~ supply voltage (load dependent)
Output current	Max. 20 mA each channel
Internal cycle time	< 3 $\mu$ s
Step frequency LSB	Max. 200 kHz
Turn on time	< 1 s
Accuracy of division	$\pm \frac{1}{2}$ LSB (12 bit), $\pm 2$ LSB (16 bit)
EMC	Emitted interference: EN 61000-6-4, Noise immunity: EN 61000-6-2
Supply voltage	10-30 V DC (absolute limits) *
Current consumption	max. 230 mA (10 V DC), max. 100 mA (24 V DC)
Electrical lifetime	> 10 <sup>5</sup> h
Connection	Connector or cable exit 1 meter

\* Supply voltage according to EN 50 178 (safety extra-low voltage)

**Mechanical Data**

Housing	Aluminum, optional stainless steel		
Lifetime	see next table		
Shaft loading	Axial 40 N, radial 110 N		
Inertia of rotor	$\approx 30 \text{ gcm}^2$		
Friction torque	$\leq 3 \text{ Ncm}$ (version without shaft sealing)		
RPM (continuously)	Max. 12,000		
Shock (EN 60068-2-27)	$\leq 100 \text{ g}$ (halfsine, 6 ms)		
Permanent shock (EN 60028-2-29)	$\leq 10 \text{ g}$ (halfsine, 16 ms)		
Vibration (EN 60068-2-6)	$\leq 10 \text{ g}$ (10 Hz ... 2,000 Hz)		
Weight, single-turn	$\approx 200 \text{ g}$ , $\approx 400 \text{ g}$ (stainless steel)		
<b>Flange</b>	<b>Synchro</b>	<b>Clamp</b>	<b>Hollow shaft</b>
Shaft diameter	$\varnothing 6 \text{ mm}$ / $\varnothing 10 \text{ mm}$	$\varnothing 10 \text{ mm}$	$\varnothing 15 \text{ mm}$
Shaft length or hollow shaft depth	10 mm / 20mm	20 mm	15 – 30 mm

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### Minimal live cycle mechanical

Flange group	Live cycle in $10^8$ turns on $F_a / F_r$		
	40 N / 60 N	40 N / 80 N	40 N / 110 N
C10 (Clamp flange $\varnothing 10 \times 20$ )	247	104	40
S10 (Synchro flange $\varnothing 10 \times 20$ )	262	110	42
S6 (Synchro flange $\varnothing 6 \times 10$ ) without shaft sealing	822	347	133

S6 (Synchro flange  $\varnothing 6 \times 10$ ) with shaft sealing: maximal 20 N axial, 80 N radial

### Environmental Conditions

Operating temperature	- 40 ... + 85 °C *
Storage temperature	- 40 ... + 85 °C *
Humidity	98 % (without liquid state)
Protection Class (EN 60529)	Casing side: IP 65
	Shaft side: IP 64 (optional with shaft sealing: IP66)

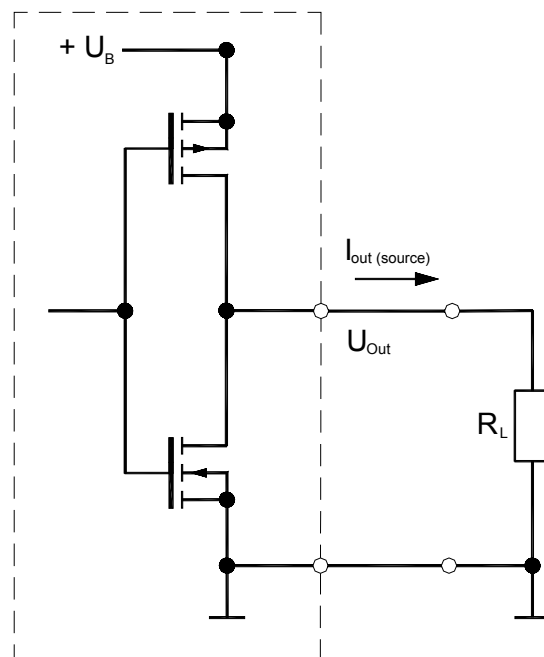
\* Cable exit: -30 ... + 70 °C (stationary cable), -5 ... + 70 °C (moving cable)

### Interface

Push pull

Transmission	Data transmission via two transistors in push-pull circuit
Transfer	Transfer distance up to 50 m
Shielded lines	Shielded lines are essential to attain extremely high noise immunity
Connectable	Connectable to all usual PLC concepts with digital I/Os
Optional	Binary code transmission with integrated latch function

Output Circuit



## ABSOLUTE ROTARY ENCODER SINGLE-TURN BIT PARALLEL

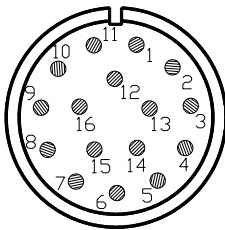
### Electrical Interface

Signal	cable	Round connector Pin
Bit 1	white	1
Bit 2	brown	2
Bit 3	green	3
Bit 4	yellow	4
Bit 5	grey	5
Bit 6	pink	6
Bit 7	blue	7
Bit 8	red	8
Bit 9	black	9
Bit 10	violet	10
Bit 11	grey-pink	11

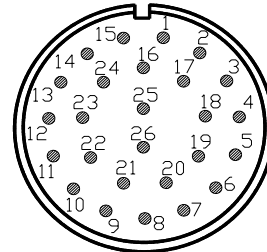
Signal	cable	16 / 16 / 26* pol. Connector Pin
Bit 12	blue-red	12
Bit 13	white-green	- / 13 / 13
Bit 14	brown-green	- / - / 14
Bit 15	white-yellow	- / - / 15
Bit 16	yellow-brown	- / - / 16
Preset (optional)	pink-brown	14** / - / 22
Latch ***	brown-blue	14 / - / 23
Complement	white-blue	13 / 14 / 24
+U <sub>b</sub> = 10-30 V	white-red	15 / 15 / 25
GND	brown-red	16 / 16 / 26

\* > 13 Bit \*\* only for Graycode, \*\*\*(only for binary or 26 pol. connector)

16 pin connector (male)



26 pin connector (male)



COMPLEMENT-Input		Encoder counting direction at clockwise rotation (as seen on shaft) Function
Function	Level	
Direction of rotation	0 (Input = N.C.* or GND)	Direction of rotation
Switch time < 3 μs	1 (Input to + U <sub>b</sub> or ≥ 4.5 V)	
Preset-Input (optional)		Function should not used during rotate the shaft
Function	Level	
Preset	0 (Input = N.C.* or GND)	
	1 (Input to + U <sub>b</sub> or ≥ 4.5 V)	Set preset value to 0 (after 100 ms)
Latch-Input (optional)		Latch-Input Function
Function	Level	
Latch	0 (Input = N.C.* or GND)	Latch
Latch time < 3 μs	1 (Input to + U <sub>b</sub> or ≥ 4.5 V)	Latch time < 3 μs

\* no ledge on connector disposed

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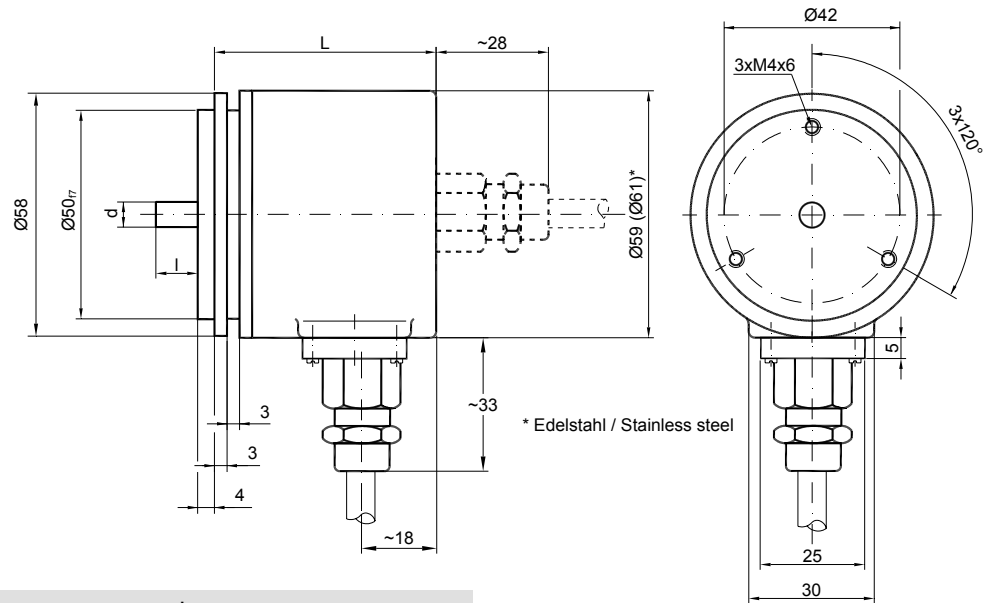
### Mechanical Drawings

#### Synchro Flange

Two versions available

Synchro flange	d [mm]	l [mm]
Version S06	$\varnothing 6_{f6}$	10
Version S10	$\varnothing 10_{h8}$	20

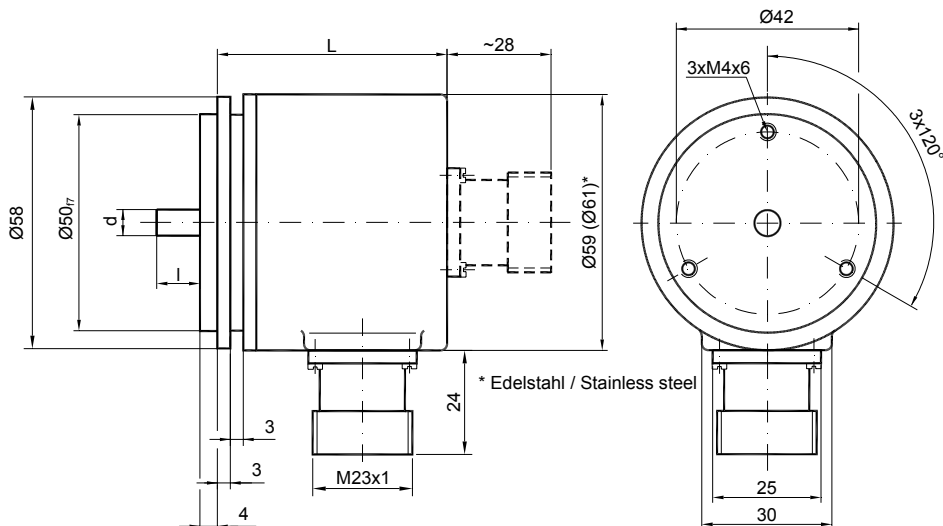
Cable Exit (~  $\varnothing 10$  mm)



		L	
		Parallel	Parallel Preset
Single-Turn	axial	42	53
	radial	53	53

#### Connector exit

(for > 13 Bit only with M27x1 connector axial)

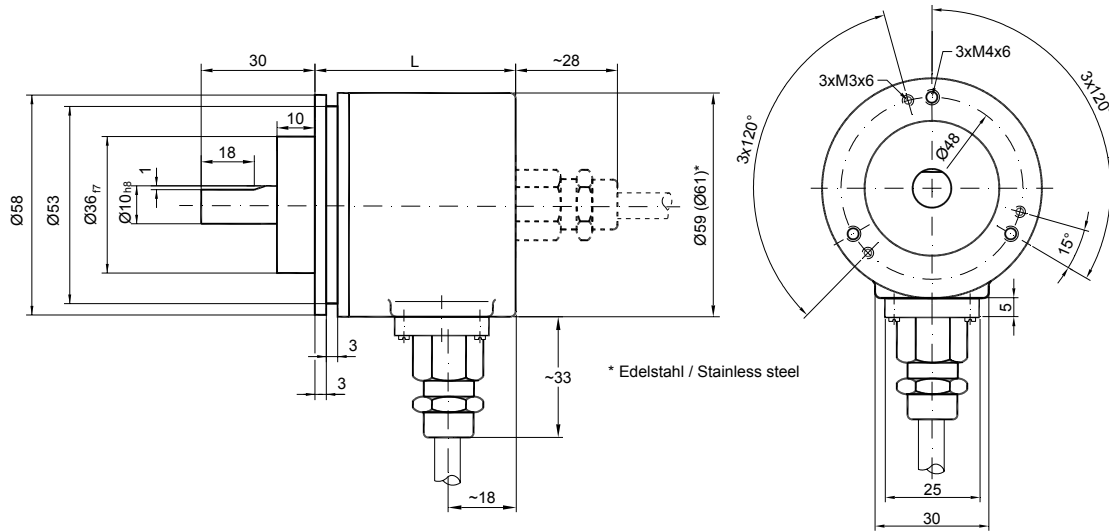


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Mechanical Drawings

Clamp flange

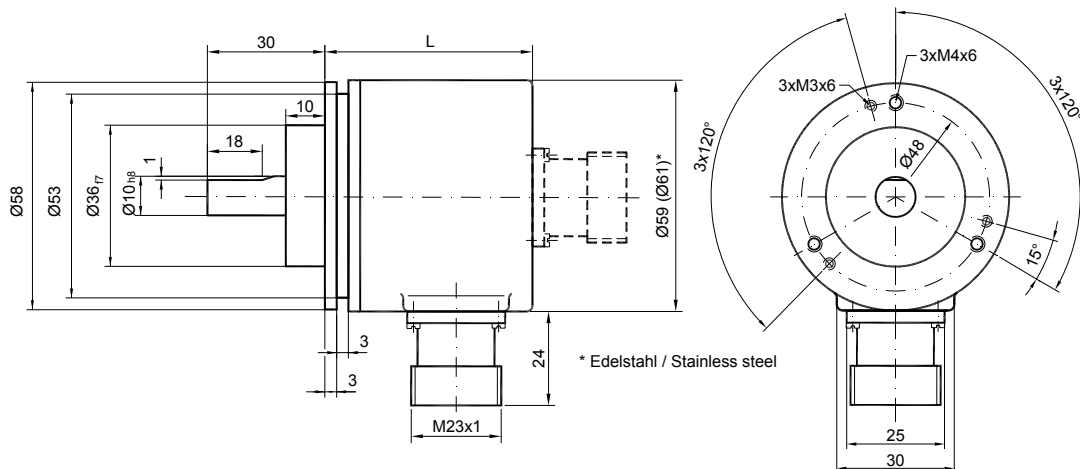
Cable Exit (~ ø 10 mm)



		L	
		Parallel	Parallel Preset
Single-Turn	axial	42	53
	radial	53	53

Connector exit

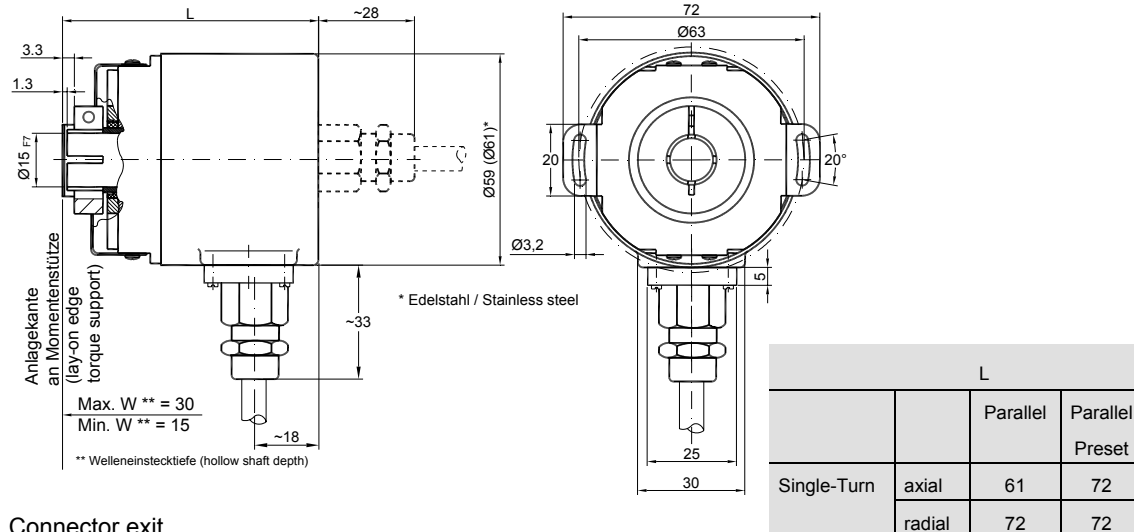
(for > 13 Bit only with M27x1 axial connector)



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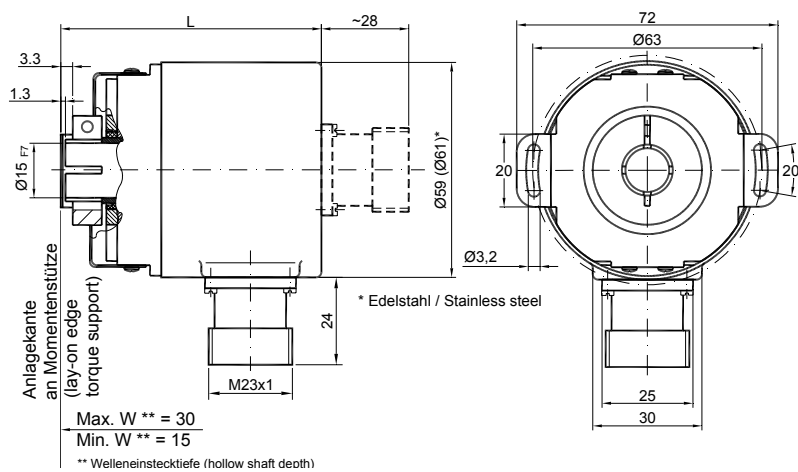
### Hollow Shaft (H)

Cable Exit (~  $\varnothing$  10 mm)



### Connector exit

(for > 13 Bit only with M27x1 axial connector)



### Mounting instructions

Do not tighten the clamp ring unless the machine shaft is properly inserted into the bore of the hollow shaft.

The diameter of the hollow shaft can be reduced to 12 mm, 10 mm or 8 mm by using an adapter (this reducing adapter can be pushed into the hollow shaft).

Allowed shaft movements of the drive element are listed in the table.

	axial	radial
static	$\pm 0.3$ mm	$\pm 0.5$ mm
dynamic	$\pm 0.1$ mm	$\pm 0.2$ mm

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**Models / Ordering Description**

Description	Type Key								
Optocode	<b>SAG</b>	-	A1	-	00	-	-	-	-
Interface push pull	<b>PP</b>								
push pull preset	P1								
Version			A1						
Code	Gray			<b>G</b>					
	Binary			B					
Bits for revolutions	Singleturn				<b>00</b>				
Steps per revolution	360**					AA			
	4,096 (0.09°)					<b>12</b>			
	8,192 (0.04°)					13			
	65,536 (0.005°)					16			
Flange	Clamp flange						<b>C</b>		
	Synchro flange						<b>S</b>		
	Blind hollow shaft						<b>B</b>		
Shaft	ø10 mm						<b>10</b>		
	ø06 mm						<b>06</b>		
	ø15 mm (only for hollow shaft)						<b>15</b>		
Mechanical options	Without							<b>0</b>	
	Shaft sealing							S	
	Stainless steel (only axial exit possible)							V	
	Customized							C	
Connection	Connector axial, < 14 bit								PAP
	Connector axial, > 13 bit								PAT
	Connector radial, max. 13 bit *								PRP
	1m cable exit, axial								CAW
	1m cable exit, radial *								CRW
Options	number for special options								

**Standard = bold**, further models on request

\* not in stainless version possible

\*\* encoder length like Preset version

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**Accessories**

Description		Type
Connector, counterpart	Circular connector, 16 pins	PAP
Connector, counterpart	Circular connector, 26 pins	PAT
Cable for PAP	12 x 2 x 0,14 mm <sup>2</sup>	STK-24
Cable for PAT	28 x 0,14 mm <sup>2</sup> + 2 x 1,5 mm <sup>2</sup>	STK-30
Shaft coupling *	Drilling: 10 mm	GS 10
	Drilling: 6 mm	GS 06
Clamp disc *	4 pcs. / AWC	SP 15
Clamp ring *	2 pcs. / AWC	SP H
Reducing adapter **	15 mm to 12 mm	RR12
Reducing adapter **	15 mm to 10 mm	RR10
Reducing adapter **	15 mm to 8 mm	RR8

\* not for hollow shaft

\*\* only for hollow shaft

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