

POSITAL

FRABA

ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE



Main Features

- Compact and Robust Industrial Model
- Synchronous Serial Interface – SSI (RS-422 / TTL)
- Optional Incremental Output RS-422 or Push-Pull (TTL, HTL compatible)
- Standard \varnothing 59 mm Housing
- Solid-, Hub- and Through Hollow Shaft Models
- Up to 65,536 Steps Per Revolution (16 bit)
- Up to 16,384 Revolutions (14 bit)
- Preset and DIR Inputs
- Gray or Binary Output Code

Mechanical Structure

- Aluminum or Stainless Steel Versions
- Stainless Steel Shaft
- Sealed / Shielded Precision Ball Bearings

Applications

- Angular Measurement
- Measurement of Differences Between Two or More Axes
- Distance Measurement
- Linear Movement Measurement
- Inclination Measurement
- Drive Control

Electrical Features

- Temperature Insensitive IR-Opto-Receiver-ASIC with Integrated Signal Conditioning
- Gear Based Optical Multi-Turn
- Reverse Voltage Protection
- Wide Supply Voltage Range of 4.5 to 30 V
- Overvoltage Protection

AMERICA
FRABA Inc.
1800 East State Street, Suite 148
Hamilton, NJ 08609-2020, USA
T +1-609-750-8705, F +1-609-750-8703
www.posita.com, info@posita.com

EUROPE
POSITAL GmbH
Carlswerkstrasse 13c
51063 Cologne, GERMANY
T +49 221 96213-0, F +49 221 96213-20
www.posita.com, info@posita.eu

ASIA
FRABA Pte.
20 Kallang Avenue
Singapore 33941, SINGAPORE
T +65 65148880, F +65 62711792
www.posita.com, info@posita.sg

ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE

Technical Data

Electrical Data

Clock Input	RS-422 Compatible via Optocoupler
Data Output	Line Driver RS-422
Clock Frequency	100 kHz to 2 MHz
Single-Turn Accuracy	$\pm \frac{1}{2}$ LSB (up to 12 Bit), ± 2 LSB (at 16 Bit)
Cycle Time	< 25 μ s
Turn On Time	< 1 s
Supply Voltage*	4.5 to 30 V DC (Absolute Maximum Rating) 10 V Min. for HTL Compatible Push-Pull Output
Power Consumption	Max. 1.5 W
EMC	Emission According to EN 61000-6-4:2007-09 Immunity According to EN 61000-6-2:2005
Connection	Connector or 1 m Cable Exit (Other Lengths on <u>Request</u>)
MTTF _d	20 Years at 40 °C

*Supply Voltage According to EN 50 178 (SELV)

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Mechanical Data

Housing	Aluminum or Stainless Steel
Max. Shaft Load	Axial 40 N, Radial 110 N*
Inertia of Rotor	≤ 30 g cm ²
Friction Torque	≤ 3 N cm (w/o Shaft Seal)
RPM (Continuous Operation)	Max. 12.000 rpm (Through Hollow Shaft Max. 3.000 rpm)
Shock	≤ 100 g (Half Sine, 6 ms) According to EN 60068-2-27
Vibration	≤ 20 g (10 Hz to 2000 Hz) According to EN 60068-2-6
Weight (Standard Version)	Single-Turn: ~ 200 g
	Multi-Turn: ~ 300 g
Weight (Stainless Steel Version)	Single-Turn: ~ 400 g
	Multi-Turn: ~ 600 g

*Max. 20 N / 80 N for Synchro Flange (∅ 6 mm Shaft) with Shaft Seal

Minimum Mechanical Lifetime

Flange assemblies	Lifetime for 10 ⁸ Revolutions at Shaft Load Axial / Radial			
	20 N / 40 N	40 N / 60 N	40 N / 80 N	40 N / 110 N
Clamp Flange (∅ 10 mm Shaft)	430	150	100	55
Synchro Flange (∅ 10 mm Shaft) w/o Shaft Seal	420	145	100	55
Synchro Flange (∅ 10 mm Shaft) with Shaft Seal	300	100	65	25
Synchro Flange (∅ 6 mm Shaft) w/o Shaft Seal	550	195	135	85
Synchro Flange (∅ 6 mm Shaft) with Shaft Seal*	400	Not Allowed	Not Allowed	Not Allowed

*Max. 20 N / 80 N

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Environmental Conditions

Operating Temperature	-40 to 85 °C*
Storage Temperature	-40 to 85 °C*
Humidity	98 % RH (Non-Condensing)
Protection Class (EN 60529)	Housing Side: IP65
	Flange / Shaft Side: IP64 (Optional IP66 with Shaft Seal)

*Cable Version: -30 to +70°C (Static); -5 to +70°C (Flexible)

Interface

Synchronous Serial Interface (SSI)

Driver	According to RS-422 Standard, up to 10 MBit/s
Transfer Distance	Up to 1,200 m
Strobe Function (Optional)	Allows to Connect Up to 10 Encoders to One Data Line
Alarm Function (Optional)	Internal Self-Diagnosis

For detailed description of SSI please visit www.posital.eu.

Incremental-Outputs

Driver	RS-422, TTL, Differential and Single-Ended Push-Pull HTL
Resolution	1024, 2048, 4096, 8192, 16384 PPR per Channel
Channels	A, /A, B, /B, Z, /Z (Index)
Quadrature Phasing	90° ± 4.5° electrical
Frequency Response	Min. 200 kHz

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SSI Preset Function

The Preset function allows to set the output value to zero at the present mechanical position.

0 (open or GND)	Inactive
1 (4.5 V to V_S)	The encoder value will be set to 0 after the preset input was active for 100 ms and changes to inactive again
Input Resistance	110 k Ω

DIR-Function (Complement)

The DIR-function allows to change the encoder counting direction.

0 (open or GND)	Increasing Values Turning Clockwise (Viewed from Flange Side)
1 (4.5 V to V_S)	Decreasing Values Turning Clockwise (Viewed from Flange Side)
Input Resistance	60 k Ω

Interface Versions

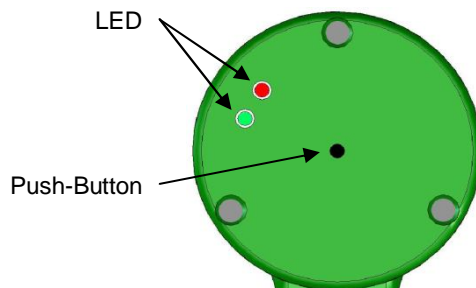
OCD-S1	SSI with Preset-Function (Basic Version)
OCD-S3	SSI with Preset-Function Incremental Outputs A, /A, B, /B (RS-422, TTL Compatible) 1024 to 16384 PPR Incremental
OCD-S4	SSI with Preset-Function Preset Push-Button Interface Two Diagnostics LEDs
OCD-S5	SSI with Preset-Function Incremental Outputs A, /A, B, /B, Z, /Z (RS-422, TTL Compatible) 1024 to 16384 PPR Incremental
OCD-S6	SSI with Preset-Function Incremental Outputs A, /A, B, /B, Z, /Z (Differential and Single-Ended Push-Pull HTL) 1024 to 16384 PPR Incremental

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Diagnostics LEDs (OCD-S4)

Green	<ul style="list-style-type: none">- Lights Up when Encoder Is Powered Up- Turns Off While Preset Button is pressed
Red	<p>Lights Up as Alarm Indicator:</p> <ul style="list-style-type: none">- Measurement System Degradation Critical (Encoder Still Working as Intended)- Memory Failure in EEPROM*- Incorrect Configuration Data of the Opto-ASIC*

*All Data bits are set to "high", so failure can also be detected by the control system.

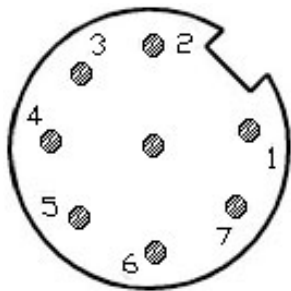


ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE

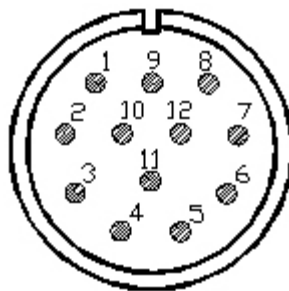
Electrical Connection

	Male M12 Connector	Male M23 Connector		Cable	
	8 Pin	12 Pin	16 Pin	Wires	Wires
Interface	S1 / S4	S1 / S3 / S4	S5 / S6	S1 / S4	S3 / S5 / S6
Clock –	4	1	1	Yellow	Yellow
Clock +	3	2	2	Green	Green
Data +	5	3	3	Grey	Grey
Data –	6	4	4	Pink	Pink
DIR	8	8	8	Red	Red
+ V _s	2	11	11	Brown	Brown
GND	1	12	12	White	White
Preset	7	9	9	Blue ¹⁾	Blue ¹⁾
A	–	5 (S3 Only)	5	–	Black ²⁾
/A	–	6 (S3 Only)	6	–	Violett
B	–	7 (S3 Only)	7	–	Grey-Pink
/B	–	10 (S3 Only)	10	–	Red-Blue
Z	–	–	13	–	White-Green (S5, S6 Only)
/Z	–	–	14	–	Brown-Green (S5, S6 Only)
Shielding	Shell	Connector	Connector	Shield	Shield

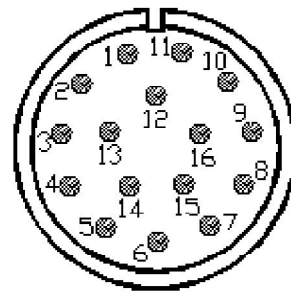
8 Pin M12 Connector (Front)



12 Pin M23 Connector (Front)



16 Pin M23 Connector (Front)



1) Changed from „ Black“ to „ Blue“ in April 2014


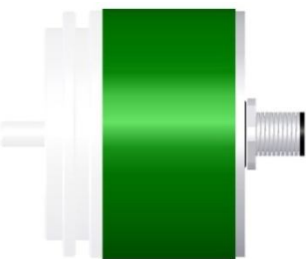



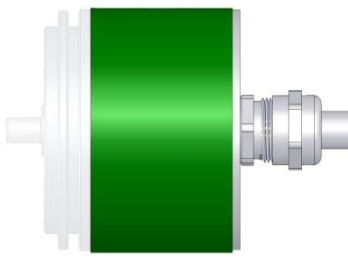
2) Changed from „ Blue“ to „Black“ in April 2014

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Mechanical Drawings

Connection Types for Solid and Hub Shaft

Each connection type can be combined with any flange type. For technical drawings and 3D-models please visit www.posita1.eu.

<p>Radial and Axial M12 Connector</p>	<p>OCD-SXXX-XXXX-XXXX-PRQ</p> 	<p>OCD-SXXX-XXXX-XXXX-PAQ</p> 
<p>Radial and Axial M23 Connector</p>	<p>OCD-SXXX-XXXX-XXXX-PRL</p> 	<p>OCD-SXXX-XXXX-XXXX-PAL</p> 
<p>Radial and Axial Cable</p>	<p>OCD-SXXX-XXXX-XXXX-CRW</p> 	<p>OCD-SXXX-XXXX-XXXX-CAW</p> 

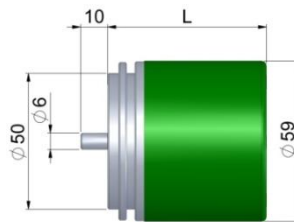
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Flange Types for Solid and Hub Shaft

Each flange type can be combined with any connection type. For technical drawings and 3D-models please visit www.posita1.eu.

Synchro Flange

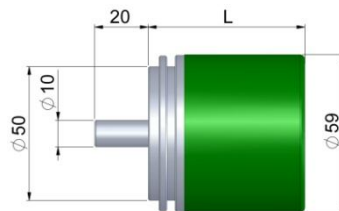
OCD-SXXX-XXXX-S06X-XXX



	CAW	CRW	PAL	PRL
L (Single-Turn)	46	59	46	59
L (Multi-Turn)	57	59	57	59

Synchro Flange

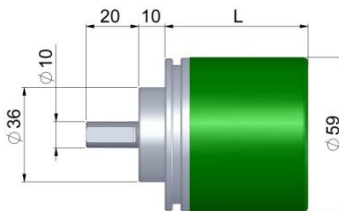
OCD-SXXX-XXXX-S10X-XXX



	CAW	CRW	PAL	PRL
L (Single-Turn)	46	59	46	59
L (Multi-Turn)	57	59	57	59

Clamp Flange

OCD-SXXX-XXXX-C10X-XXX



	CAW	CRW	PAL	PRL
L (Single-Turn)	42	55	42	55
L (Multi-Turn)	53	55	53	55

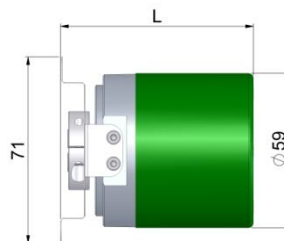
Hub Shaft

OCD-SXXX-XXXX-B15X-XXX

OCD-SXXX-XXXX-B12X-XXX

OCD-SXXX-XXXX-B10X-XXX

OCD-SXXX-XXXX-B06X-XXX



	CAW	CRW	PAL	PRL
L (Single-Turn)	61	74	61	74
L (Multi-Turn)	72	74	72	74

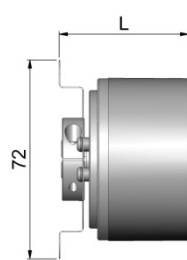
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Connection and Flange Types for Hollow Shaft

The flange can be combined with both connection types. For technical drawings and 3D-models please visit www.posital.eu.

Hollow Shaft

OCD-SXXX-XXXX-T12X-XXX
OCD-SXXX-XXXX-T10X-XXX
OCD-SXXX-XXXX-T08X-XXX



	CRW	PRL
L (Single-Turn)	47	47
L (Multi-Turn)	59	59

Radial M12 Connector

OCD-SXXX-XXXX-TXXX-PRQ



Radial M23 Connector

OCD-SXXX-XXXX-TXXX-PRL



Radial Cabel

OCD-SXXX-XXXX-TXXX-CRW



ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE

Ordering Code for Solid Shaft and Hub Shaft Models

Description	Ordering Code	OCD-	XX	XX	X-	XX	XX-	X	XX	X-	XXX
Interface SSI	Preset	S1									
	Preset + Incr. w/o Index (RS-422)	S3									
	Preset Button and Status LEDs*	S4									
	Preset + Incr. + Index (RS-422)	S5									
	Preset + Incr. + Index (Push-Pull)	S6									
Version	S1, S4	01									
	S3, S5, S6: 1024 PPR Incr.	A1									
	S3, S5, S6: 2048 PPR Incr.	B1									
	S3, S5, S6: 4096 PPR Incr.	C1									
	S3, S5, S6: 8192 PPR Incr.	D1									
	S3, S5, S6: 16384 PPR Incr.	E1									
Code	Gray	G									
	Binary	B									
Revolution (Bits)	Singleturn	00									
	Multiturn (4,096 Revolutions)	12									
	Multiturn (16,384 Revolutions)	14									
Steps per revolution (Bits)	4,096 (0.09°)	12									
	8,192 (0.04°)	13									
	65,536 (0.005°)	16									
Flange	Clamp Flange	C									
	Synchro Flange	S									
	Hub Shaft	B									
Shaft diameter	Ø 06 mm	06									
	Ø 10 mm	10									
	Ø 12 mm (Hub Shaft Only)	12									
	Ø 15 mm (Hub Shaft Only)	15									
Mechanical Options	Without	0									
	Shaft Seal (IP66)	S									
	Stainless Steel	V									
	Customized	C									
Connection	Axial M12 Connector 8 Pin Male (S1 / S4 Only)										PAQ
	Radial M12 Connector 8 Pin Male (S1 / S4 Only)										PRQ
	Axial M23 Connector 12 Pin Male (S1 / S3 Only)										PAL
	Radial M23 Connector 12 Pin Male (S1 / S3 / S4 Only)*										PRL
	Axial Cable, 1m										CAW
	Radial Cable, 1m										CRW
	Axial Male M23 Connector 16 Pin Male (S5 / S6 Only)										PAP
Radial Male M23 Connector 16 Pin (S5 / S6 Only)											PRP

Standard Models = Bold; Further Models on Request

*Interface S4 not available in stainless steel.

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Ordering Code for Through Hollow Shaft (T12) Models

Description	Ordering Code	XX	XX	X-	XX	XX-	X	XX	X-	XXX
	OCD-									
Interface SSI	Preset	S1								
	Preset + Incr. w/o Index-Pulse (RS-422)	S3								
	Preset + Incr. + Index-Pulse (RS-422)	S5								
	Preset + Incr. + Index-Pulse (Push Pull)	S6								
Version	S1	01								
	S3 / S5 / S6: 1024 ppr Incr.	A1								
	S3 / S5 / S6: 2048 ppr Incr.	B1								
	S3 / S5 / S6: 4096 ppr Incr.	C1								
	S3 / S5 / S6: 8192 ppr Incr.	D1								
	S3 / S5 / S6: 16384 ppr Incr.	E1								
Code	Gray	G								
	Binary	B								
Revolution (Bits)	Singleturn	00								
	Multiturn (4,096 Revolutions)	12								
	Multiturn (16,384 Revolutions)	14								
Steps per revolution	4,096 Bit (0.09°)				12					
	8,192 Bit(0.04°)				13					
	65,536 Bit (0.005°)				16					
Flange	Though Hollow Shaft						T			
Shaft Diameter	Ø 12 mm							12		
	Ø 10 mm							10		
	Ø 8 mm							08		
Mechanical Options	Without								0	
	Customized								C	
Connection	Cable, 1m									CRW
	M12 Connector 8 Pin Male (S1 / S3 / S4 Only)									PRQ
	M23 Connector 12 Pin Male (S1 / S3 / S4 Only)									PRL
	M23 Connector 16 Pin Male (S5 / S6 Only)									PRP

Standard Models = Bold; Further Models on Request

ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE

Accessoires

	Compatible with Type	Part Number
Mating Connector 12 Pin M23	OCD-SXXXX-XXXX-XXXX-PXL	34501210
Mating Connector 12 Pin M23 Female, 90°	OCD-SXXXX-XXXX-XXXX-PXL	34501203
Mating Connector 16 Pin M23	OCD-SXXXX-XXXX-XXXX-PXL	34501602
Mating Connector 16 Pin M23 Female, 90°	OCD-SXXXX-XXXX-XXXX-PXL	34501603
Shaft Coupling	OCD-SXXXX-XXXX-C10X-XXX OCD-SXXXX-XXXX-S10X-XXX	29100450
Shaft Coupling	OCD-SXXXX-XXXX-C06X-XXX OCD-SXXXX-XXXX-S06X-XXX	29100350
1 x Clamp Disc	OCD-SXXXX-XXXX-CXXX-XXX OCD-SXXXX-XXXX-SXXX-XXX	32400150
4 x Clamp Disc	OCD-SXXXX-XXXX-CXXX-XXX OCD-SXXXX-XXXX-SXXX-XXX	32400155
2 x Clamp Disc	OCD-SXXXX-XXXX-CXXX-XXX OCD-SXXXX-XXXX-SXXX-XXX	32400152
Reducing Adapter 14 mm Hub Shaft	OCD-SXXXX-XXXX-B15X-XXX	32220294
Reducing Adapter 12 mm Hub Shaft	OCD-SXXXX-XXXX-B15X-XXX	32220291
Reducing Adapter 11 mm Hub Shaft	OCD-SXXXX-XXXX-B15X-XXX	32220293
Reducing Adapter 10 mm Hub Shaft	OCD-SXXXX-XXXX-B15X-XXX	32220292
Reducing Adapter 8 mm Hub Shaft	OCD-SXXXX-XXXX-B15X-XXX	32220295
Reducing Adapter 10 mm Hub Shaft, Stainless	OCD-SXXXX-XXXX-B15V-XXX	32220298
Reducing Adapter 12 mm Hub Shaft, Stainless	OCD-SXXXX-XXXX-B15V-XXX	32220299
Reducing Adapter 8 mm Hollow Shaft, ST	OCD-SXXXX-00XX-T12X-XXX	10002796
Reducing Adapter 8 mm Hollow Shaft, MT	OCD-SXXXX-1XXX-T12X-XXX	10002797
Reducing Adapter 10 mm Hollow Shaft, ST	OCD-SXXXX-00XX-T12X-XXX	10002800
Reducing Adapter 10 mm Hollow Shaft, MT	OCD-SXXXX-1XXX-T12X-XXX	10002801

ABSOLUTE OPTICAL ROTARY ENCODER WITH SSI INTERFACE

Check Out Some of the Other POSITAL Products



Draw Wire Sensor to Measure Linear Displacements

For the measurement of linear movements absolute rotary encoders can be combined with cable pull adapters.

[More Information](#)



Absolute Magnetic Encoders for Industrial Environment

To measure rotary movements or rotary displacements, an absolute magnetic rotary encoder can be used. The contact-free measuring sensor stage of the IXARC Magnetic Sensor doesn't have any abrasion. The Sensor can be directly connected to digital control units via SSI- or CANopen or Analog Interface.

[More Information](#)



Heavy Duty Magnetic Encoder Line for Toughest Environments

Its stainless steel housing and high protection class of IP69K makes the IXARC Magnetic Heavy Duty rotary encoder resistant against active chemical cleaning, high-pressure water and corrosion. Combined with the sturdy ball bearings (for high shaft loads up to 300 N) this sensor is an ideal choice for reliable measurement under extreme environmental conditions and outdoor applications.

[More Information](#)

Disclaimer

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