

## DATA SHEET

### ABSOLUTE ROTARY ENCODER SSI



#### 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 Ø 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

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**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), $\pm 2$ LSB (at 16 Bit)                             |
| Cycle Time           | < 25 $\mu$ s  |
| Turn On Time         | < 1 s   |
| Supply Voltage*      | 4.5 to 30 V DC (Absolute Maximum Rating)<br>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<br>Immunity According to EN 61000-6-2:2005     |
| Connection           | Connector or 1 m Cable Exit (Other Lengths on <u>Request</u> )                            |
| MTTF <sub>d</sub>    | 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 <sup>2</sup>                                |
| 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 <sup>8</sup> 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)<br>w/o Shaft Seal  | 420   | 145         | 100         | 55           |
| Synchro Flange (∅ 10 mm Shaft)<br>with Shaft Seal | 300   | 100         | 65          | 25           |
| Synchro Flange (∅ 6 mm Shaft)<br>w/o Shaft Seal   | 550   | 195         | 135         | 85           |
| Synchro Flange (∅ 6 mm Shaft)<br>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](http://www.posital.eu).

**Incremental-Outputs**

|                    |   |
|--------------------|---|
| Driver             | RS-422, TTL,<br>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 $\Omega$  |

#### 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 $\Omega$   |

#### Interface Versions

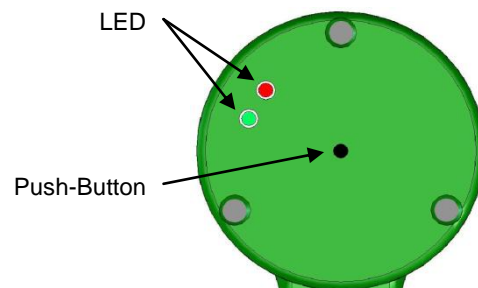
|        |  |
|--------|--|
| OCD-S1 | SSI with Preset-Function (Basic Version)   |
| OCD-S3 | SSI with Preset-Function<br>Incremental Outputs A, /A, B, /B (RS-422, TTL Compatible)<br>1024 to 16384 PPR Incremental                             |
| OCD-S4 | SSI with Preset-Function<br>Preset Push-Button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

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**Diagnostics LEDs (OCD-S4)**

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

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

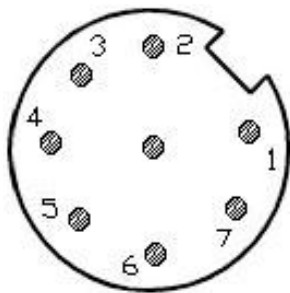


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**ABSOLUTE ROTARY ENCODER SSI**

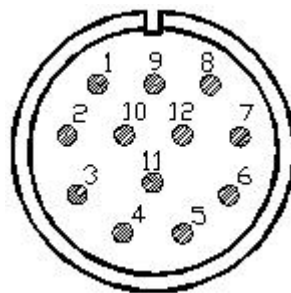
**Electrical Connection**

|                  | Male M12<br>Connector | Male M23<br>Connector |           | Cable with Male D-Sub Test<br>Connector |                                   |
|------------------|-----------------------|-----------------------|-----------|---|-----------------------------------|
|                  | 8 Pin                 | 12 Pin                | 16 Pin    | 9 Pin                                   | 15 Pin                            |
| Interface        | S1 / S4               | S1 / S3 / S4          | S5 / S6   | S1 / S4                                 | S3 / S5 / S6                      |
| Clock –          | 4                     | 1                     | 1         | Yellow (3)                              | Yellow (3)                        |
| Clock +          | 3                     | 2                     | 2         | Green (4)                               | Green (4)                         |
| Data +           | 5                     | 3                     | 3         | Grey (1)                                | Grey (1)                          |
| Data –           | 6                     | 4                     | 4         | Pink (2)                                | Pink (2)                          |
| DIR              | 8                     | 8                     | 8         | Red (7)                                 | Red (10)                          |
| + V <sub>s</sub> | 2                     | 11                    | 11        | Brown (8)                               | Brown (11)                        |
| GND              | 1                     | 12                    | 12        | White (9)                               | White (12)                        |
| Preset           | 7                     | 9                     | 9         | Black (6)                               | Black (9)                         |
| A                | –                     | 5 (S3 Only)           | 5         | –                                       | Blue (5)                          |
| /A               | –                     | 6 (S3 Only)           | 6         | –                                       | Violett (6)                       |
| B                | –                     | 7 (S3 Only)           | 7         | –                                       | Grey-Pink (7)                     |
| /B               | –                     | 10 (S3 Only)          | 10        | –                                       | Red-Blue (8)                      |
| Z                | –                     | –                     | 13        | –                                       | White-Green (13)<br>(S5, S6 Only) |
| /Z               | –                     | –                     | 14        | –                                       | Brown-Green (14)<br>(S5, S6 Only) |
| Shielding        | Shell                 | Connector             | Connector | Shield                                  | Shield                            |

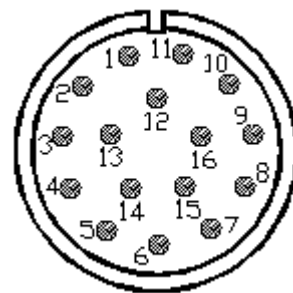
8 Pin M12 Connector (Front)



12 Pin M23 Connector (Front)



16 Pin M23 Connector (Front)


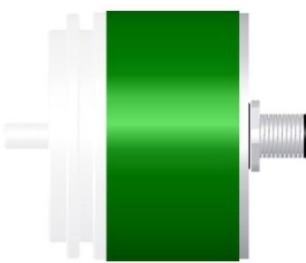



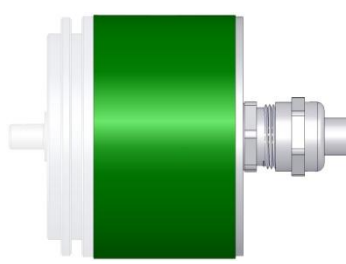


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**Mechanical Drawings**

**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.posital.eu](http://www.posital.eu).

|   |   |   |
|---|---|---|
| <p>Radial and Axial<br/>M12 Connector</p> | <p>OCD-SXXX-XXXX-XXXX-PRQ</p>   | <p>OCD-SXXX-XXXX-XXXX-PAQ</p>    |
| <p>Radial and Axial<br/>M23 Connector</p> | <p>OCD-SXXX-XXXX-XXXX-PRL</p>  | <p>OCD-SXXX-XXXX-XXXX-PAL</p>  |
| <p>Radial and Axial<br/>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](http://www.posita1.eu).

|   |  |                 |     |     |     |     |
|---|--|-----------------|-----|-----|-----|-----|
| Synchro Flange<br>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<br>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<br>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<br>OCD-SXXX-XXXX-B15X-XXX<br>OCD-SXXX-XXXX-B12X-XXX<br>OCD-SXXX-XXXX-B10X-XXX<br>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**

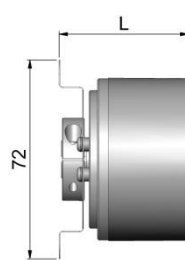
The flange can be combined with both connection types. For technical drawings and 3D-models please visit [www.posita1.eu](http://www.posita1.eu).

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



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**Ordering Code for Solid Shaft and Hub Shaft Models**

| Description                 | Ordering Code   |           |           |          |            |
|-----------------------------|---|-----------|-----------|----------|------------|
| Interface SSI               | Preset  | <b>S1</b> |           |          |            |
|                             | 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  | <b>01</b> |           |          |            |
|                             | 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  | <b>G</b>  |           |          |            |
|                             | Binary  | B         |           |          |            |
| Revolution (Bits)           | Single-Turn   | <b>00</b> |           |          |            |
|                             | Multi-Turn (4,096 Revolutions)                        | <b>12</b> |           |          |            |
|                             | Multi-Turn (16,384 Revolutions)                       | 14        |           |          |            |
| Steps per revolution (Bits) | 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> |            |
|                             | Hub Shaft   |           |           | <b>B</b> |            |
| Shaft diameter              | Ø 06 mm   |           |           |          | <b>06</b>  |
|                             | Ø 10 mm   |           |           |          | <b>10</b>  |
|                             | Ø 12 mm (Hub Shaft Only)                              |           |           |          | <b>12</b>  |
|                             | Ø 15 mm (Hub Shaft Only)                              |           |           |          | <b>15</b>  |
| Mechanical Options          | Without   |           |           |          | <b>0</b>   |
|                             | Shaft Seal (IP66)                                     |           |           |          | <b>S</b>   |
|                             | Stainless Steel                                       |           |           |          | <b>V</b>   |
|                             | Customized  |           |           |          | <b>C</b>   |
| Connection                  | Axial M12 Connector 8 Pin Male (S1 / S4 Only)         |           |           |          | <b>PAQ</b> |
|                             | Radial M12 Connector 8 Pin Male (S1 / S4 Only)        |           |           |          | <b>PRQ</b> |
|                             | Axial M23 Connector 12 Pin Male (S1 / S3 Only)        |           |           |          | <b>PAL</b> |
|                             | Radial M23 Connector 12 Pin Male (S1 / S3 / S4 Only)* |           |           |          | <b>PRL</b> |
|                             | Axial Cable, 1m                                       |           |           |          | <b>CAW</b> |
|                             | Radial Cable, 1m                                      |           |           |          | <b>CRW</b> |
|                             | Axial Male M23 Connector 16 Pin Male (S5 / S6 Only)   |           |           |          | <b>PAP</b> |
|                             | Radial Male M23 Connector 16 Pin (S5 / S6 Only)       |           |           |          | <b>PRP</b> |

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                                 |           |           |          |            |
|----------------------|---|-----------|-----------|----------|------------|
| Interface SSI        | Preset  | <b>S1</b> |           |          |            |
|                      | 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  | <b>01</b> |           |          |            |
|                      | 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  | <b>G</b>  |           |          |            |
|                      | Binary  | B         |           |          |            |
| Revolution (Bits)    | Single-Turn                                   | <b>00</b> |           |          |            |
|                      | Multi-Turn (4,096 Revolutions)                | <b>12</b> |           |          |            |
|                      | Multi-Turn (16,384 Revolutions)               | 14        |           |          |            |
| Steps per revolution | 4,096 Bit (0.09°)                             |           | <b>12</b> |          |            |
|                      | 8,192 Bit(0.04°)                              |           | <b>13</b> |          |            |
|                      | 65,536 Bit (0.005°)                           |           | 16        |          |            |
| Flange               | Though Hollow Shaft                           |           |           | <b>T</b> |            |
| Shaft Diameter       | Ø 12 mm                                       |           |           |          | <b>12</b>  |
|                      | Ø 10 mm                                       |           |           |          | <b>10</b>  |
|                      | Ø 8 mm  |           |           |          | <b>08</b>  |
| Mechanical Options   | Without                                       |           |           |          | <b>0</b>   |
|                      | Customized                                    |           |           |          | C          |
| Connection           | Cable, 1m                                     |           |           |          | <b>CRW</b> |
|                      | 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