POSITAL
FRABA

# DATA SHEET
# ABSOLUTE MAGNETIC ROTARY ENCODER SSI
# HEAVY DUTY

Robust rotary sensor based on reliable magnetic technology. Its steel housing with an automotive certified coating and high protection class of IP69K make the IXARC Heavy Duty resistant against high-pressure water and corrosion. Combined with the sturdy ball bearings (for high shaft loads up to 200N) this sensor is an ideal choice for reliable measurement under extreme environmental conditions and outdoor applications. The POSITAL IXARC Series uses the Wiegand effect technology to keep perfect track of the number of rotations even if the rotations are slow and/or there is no system power. The system comes without backup batteries making it maintenance free as well as ROHS compliant.

**Main Features**

- Cost Efficient Heavy Duty absolute Encoder
- Steel housing with scratch resistant protection coating
- Salt spray resistant according to EN ISO 9227
- Protection Class up to IP69K & IP68
- Compact Design (36mm)
- Up to 180N Shaft Load
- Gear and Battery Less Multi-Turn
- Interface: SSI (Synchronous-Serial Interface)
- Max. revolution not limited (typical 13 bit)
- Preset input

**Mechanical Structure**

- Aluminum flange
- Coated steel housing (automotive certified)
- Stainless steel shaft
- Sturdy ball bearings
-

**Applications**

- Construction Machinery
- Cranes and Trucks
- Onshore and Mobile Applications

**Electrical Features**

- Polarity inversion protection
  Over-voltage-peak 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 |
| Supply voltage | 4,5 – 30 V DC (absolute maximum ratings)[1] |
| Turn on time | < 1 s |
| Power consumption | About 0.25 W |
| Electrical lifetime | > $10^5$ h |
| EMC | Emitted interference: EN 61000-6-4<br>Noise immunity: EN 61000-6-2 |

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

### Sensor Data

| | |
|---|---|
| Single-Turn Technology | Magnetic 2 axis Hall sensor |
| Single-Turn Resolution | Up to 4096 steps/revolution (12 bit) |
| Single-Turn Accuracy | ± 0.35° |
| Internal cycle time Single-Turn | < 600 µs |
| Multi-Turn Technology | Self supplied magnetic pulse counter (Wiegand Sensor) |
| Multi-Turn Resolution | Can measure up to 200 Billion revolutions, limited by memory |

### Environmental Conditions

| | |
|---|---|
| Operating Temperature Sensor | -40 – +85° (-40 – +185°F) |
| Storage Temperature | -40 – +85° (-40 – +185°F) |
| Humidity | 98 % (without liquid state) |
| Protection Class (EN 60529) | IP 65 / IP 67 / IP 68 / IP 69K |

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**Mechanical Data**

| | |
|---|---|
| Housing | Steel Housing with Scratch Resistant Coating |
| Flange | Aluminum |
| Shaft | Stainless Steel (1.4112; ASTM/AISI 440B; UNS S44003) |
| Lifetime | Dependent on shaft version and shaft loading – refer to table |
| Max. Shaft Loading | Axial 180 N, Radial 180 N |
| Friction Torque at +25°C | ≤ 3 Ncm, (2.8 oz-in) |
| RPM (continuous operation) | Max. 6.000 RPM |
| Shock | EN 60068-2-27 ≤ 300 g half sine,6 ms XYZ) |
| | MIL-STD-810C ≤ 200 g (half sine, 3 ms XYZ) |
| Permanent Shock | EN 60068-2-29 ≤ 30 g (half sine, 16 ms XYZ) |
| | MIL-STD-810C ≤ 30 g (half sine, 11 ms XYZ) |
| Vibration | EN 60068-2-6 ≤ 30 g (10 Hz – 1000 Hz XYZ) |
| | MIL-STD-810 ≤ 4.2 g (5 Hz – 500 Hz XYZ) |
| Weight (Standard Version) | ≈ 180 g (0.77 lbs) |

**Minimum (mechanical) Lifetime**

| | Lifetime in $10^8$ revolutions with ($F_a$/$F_r$ ) | | |
|---|---|---|---|
| Flange | 180 N/180 N | 150 N/150 N | 100 N/100 N |
| S10 Synchro Flange (MCD-…-S10G-…) | 10 | 15 | 30 |

**Cable**[1]

| | |
|---|---|
| Operating temperature cable | Flexing -30°C to +70°C (-22 – +158 °F)<br>Static -40°C to +70°C (-40 – +158 °F) |
| Minimum bend radius | Flexing 10x cable diameter<br>Static 5x cable diameter |
| Cable | Approx ∅ 7 mm (~0.275 in)<br>Type: LSP12YC11Y 4x2x0.35mm² - (~AWG22 ) |

1 Valid for types: MCD-…-GAW

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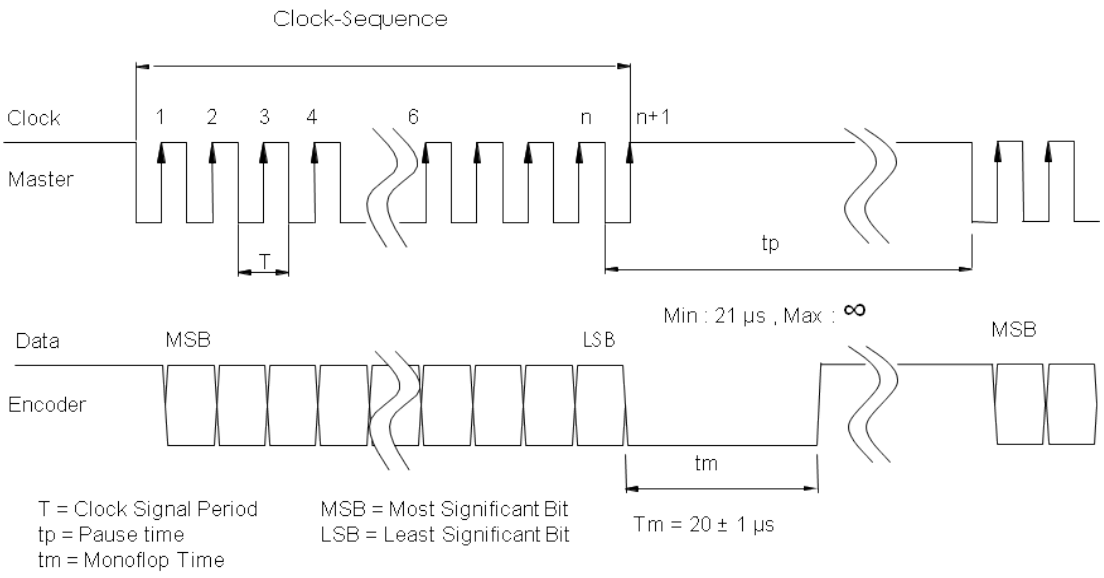
## Interface

### Synchronous-Serial Interface (SSI)

| | |
|---|---|
| Driver | Driver meets EIA standard RS 422, transmission rates up to 10 Bit/s |
| Transfer | Transfer distance up to 1.200 m |
| Transmission | Balanced transmission provides high noise immunity,<br>shielded and twisted pair lines are essential to attain extremely |

### Protocol SSI




Detailed SSI-Interface description under technical description SSI interface.

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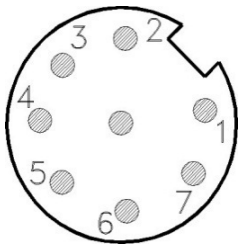
**Electrical Connection**

| Function | Connector Pin-No. | Wire end |
|---|---|---|
| GND | 1 | white |
| Supply Voltage $+U_b$ | 2 | brown |
| SSI Clk+ | 3 | green |
| SSI Clk- | 4 | yellow |
| SSI Data+ | 5 | grey |
| SSI Data- | 6 | pink |
| Preset | 7 | Black or blue |
| Complement / DIR | 8 | red |

MCD-XXXX-XXXX-XXXX-PAM




8 Pin M12 Connector Male
(front view)

**Preset Function**

| Voltage Level | Function |
|---|---|
| 0 (Input = N.C. or GND) | Inactive |
| 1 (Input ≥ 10V / Input ≤ UB) | Preset is activated.[1] The Encoder value will be set to 0 in the moment the Preset Level will change to inactive again (falling flange) |
| 0 (Input = N.C. or GND) | 10 Ohm |

1 The Preset needs to be activated for at least 1 second before the falling Edge will be detected

**Complement Function/DIR-Function**

| Voltage Level | Encoder counting direction for clockwise rotation (view on shaft) |
|---|---|
| 0 (Input = N.C. or GND) | Up |
| 1 (Input ≥ 10V / Input ≤ UB) | Down |
| Input Resistance | 10 kOhm |

It takes 1 sec before the change take effect. The Encoder value is inverted after the Complement/DIR is activated.

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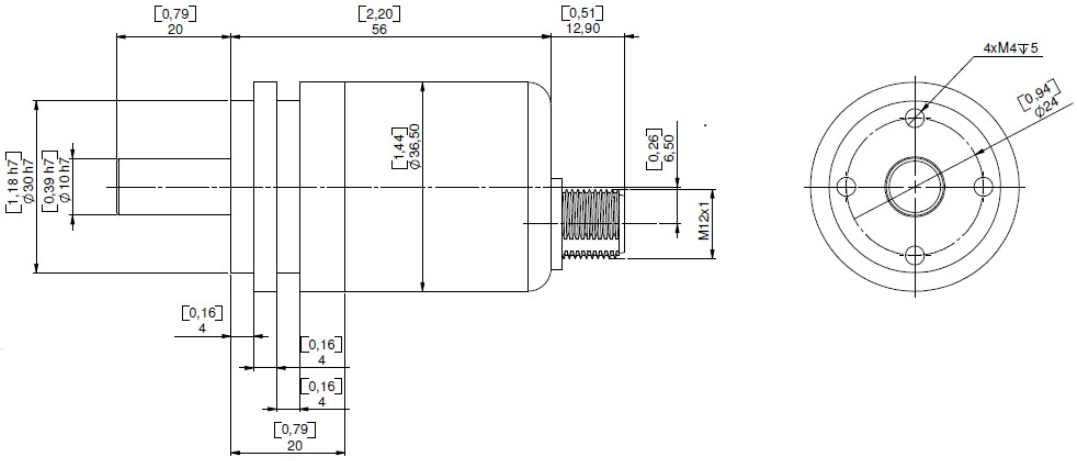
## Mechanical Models

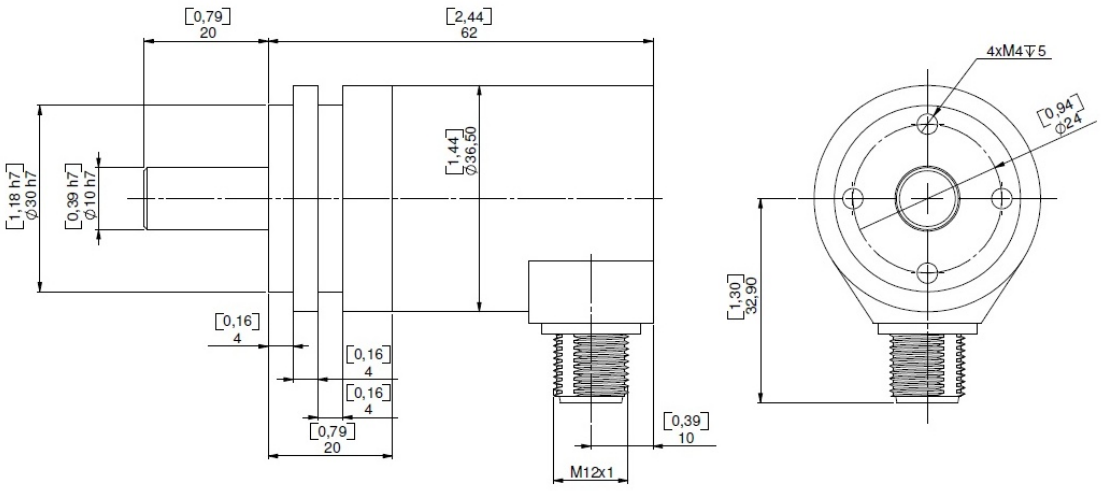
### Synchro Flange

MCD-S1XX-XXXX-S10D-PAM




All dimensions in mm/ [inch]

MCD-S1XX-XXXX-S10D-PRM




All dimensions in mm/ [inch]

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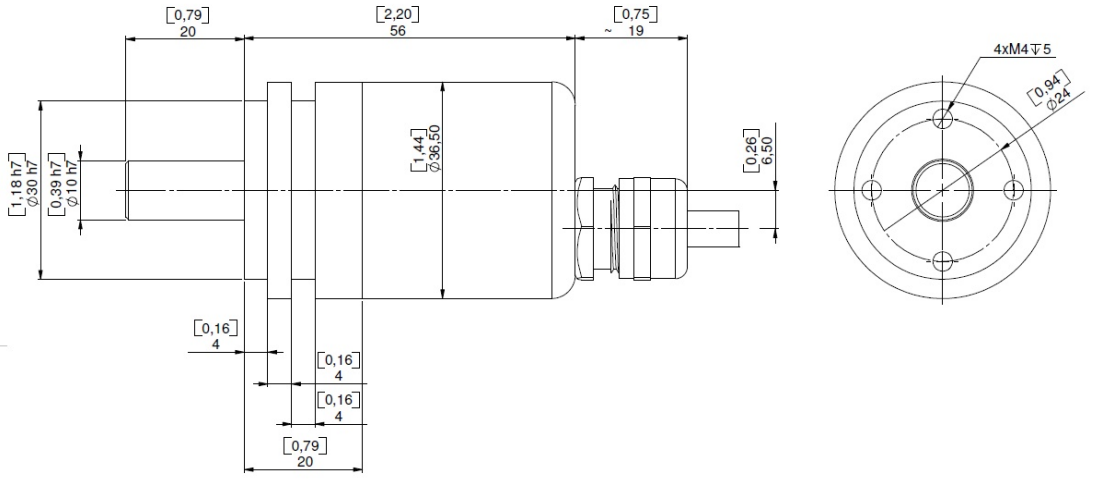
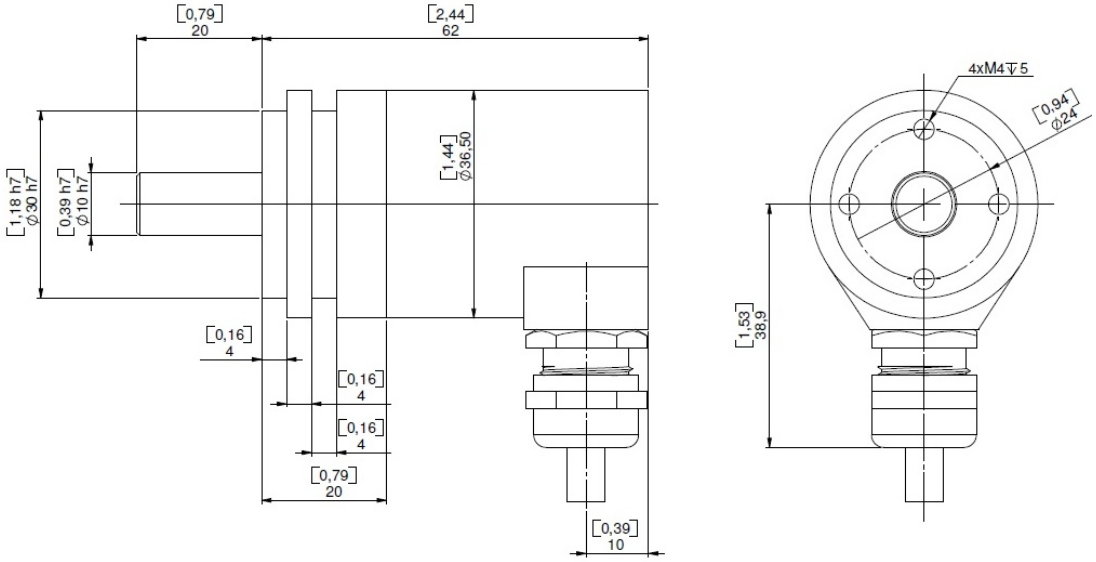
MCD-S1XX-XXXX-S10D-GAW




All dimensions in mm/ [inch]

MCD-S1XX-XXXX-S10D-GRW




All dimensions in mm/ [inch]

For detailed drawings please refer our website as drawing, IGES Drawing and STEP 3D Model under mechanical drawings or contact us.

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## Models / Ordering Description

Description

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Magnetocode | MCD- | _ _ | 00 | B - | _ _ | _ _- | D | 10 | D- | PAM |
| Interface/Voltage | SSI- 5 – 30 VDC | **S1** | | | | | | | | |
| Version | | | **00** | | | | | | | |
| Code | Grey | | | **G** | | | | | | |
| | Binary | | | B | | | | | | |
| Bits for Revolutions | Single-Turn | | | | 00 | | | | | |
| | Multi-Turn (4096 Turns) | | | | 12 | | | | | |
| | Multi-Turn (32768 Turns) | | | | **13** | | | | | |
| Steps per revolution (Bits) | 4096 | | | | | **12** | | | | |
| Flange | Synchro Flange (10 mm Shaft Diameter) | | | | | | **D** | | | |
| Shaft Diameter | | | | | | | | **10** | | |
| Mechanical Options | Heavy Duty | | | | | | | | **D** | |
| Connection | Connector: Axial M12 (5 pin) | | | | | | | | | **PAM** |
| | Connector: Radial M12 (5 pin) | | | | | | | | | PRM |
| | Cable: Axial 1 m | | | | | | | | | CAW |
| | Cable: Axial 2 m | | | | | | | | | 2AW |
| | Cable: Axial 5 m | | | | | | | | | 5AW |
| | Cable: Axial 10 m | | | | | | | | | AAW |
| | Cable: Radial 1 m | | | | | | | | | CRW |
| | Cable: Radial 2 m | | | | | | | | | 2RW |
| | Cable: Radial 5 m | | | | | | | | | 5RW |
| | Cable: Radial 10 m | | | | | | | | | ARW |

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

Ordering example:
MCD-S100G-1312-D10D-PAM

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**Accessories**

| Article No. | Article | Description steps. |
|---|---|---|
| 34500800 | P8F | Counter Connector for MCD-…-PAM (IP67 only) |
| 34500801 | P8F-STK8.2 | Counter Connector for MCD-…-PAM with 2m PUR cable |
| 34500802 | P8F-STK8.5 | Counter Connector for MCD-…-PAM with 5m PUR cable |

List of types:

| | | |
|---|---|---|
| MCD-S100B-0012-S10D-PAM | MCD-S100B-1312-S10D-PAM | MCD-S100G-1212-S10D-PAM |
| MCD-S100B-0012-S10D-PRM | MCD-S100B-1312-S10D-PRM | MCD-S100G-1212-S10D-PRM |
| MCD-S100B-0012-S10D-GAW | MCD-S100B-1312-S10D-GAW | MCD-S100G-1212-S10D-GAW |
| MCD-S100B-0012-S10D-GRW | MCD-S100B-1312-S10D-GRW | MCD-S100G-1212-S10D-GRW |
| MCD-S100B-1212-S10D-PAM | MCD-S100G-0012-S10D-PAM | MCD-S100G-1312-S10D-PAM |
| MCD-S100B-1212-S10D-PRM | MCD-S100G-0012-S10D-PRM | MCD-S100G-1312-S10D-PRM |
| MCD-S100B-1212-S10D-GAW | MCD-S100G-0012-S10D-GAW | MCD-S100G-1312-S10D-GAW |
| MCD-S100B-1212-S10D-GRW | MCD-S100G-0012-S10D-GRW | MCD-S100G-1312-S10D-GRW |

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## Check Out Some of the Other POSITAL Products

**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 Sensor does not have any abrasion. The Sensor can be connected directly to digital control units via SSI, CANopen or Analog Interface.
More Information

**Heavy Duty Stainless steel Magnetic Encoders for the Toughest Environments**
Its stainless steel housing and high protection class of IP69K makes the IXARC Heavy Duty rotary encoder resistant against active chemical cleaning and corrosion. Combined with the sturdy ball bearings this sensor is an ideal choice for reliable measurement under extreme environmental conditions and outdoor applications.
More Information

**Tilt Sensors to Measure Inclinations up to 360°`**
IXARC is developed on advanced MEMS technology based capacitance measurement. The sensor is a pre-calibrated device which can be put into immediate operation, upon simple and easy installation with a three point mount and setting of preset. Its compact design, installation “anywhere” and other versatile features makes it an ideal choice for very accurate measurement.
More Information

## Disclaimer