The DF-60 is a member of the DF series of Electric Encoders™, based on Netzer precision proprietary technology. The Electric Encoder™ offers many advantages - some unparalleled

- Low profile (10 mm)
- Hollow, floating shaft
- No bearings or other contacting elements
- High resolution and precision
- High tolerance to temperature extremes, shock, moisture, EMI, RFI and Magnetic fields
- Low weight
- Holistic signal generation
- Digital interfaces

The Electric Encoder™ is unique in being holistic, i.e., its output reading is the averaged outcome of the whole area of the rotor. This feature makes the Electric Encoder™ forgiving to mounting tolerances, mechanical wander etc.

The absence of components such as ball bearings, flexible couplers, glass disc, light sources and detectors, along with very low power consumption makes the Electric Encoder™ virtually failure free.

The internally shielded, DC operated Electric Encoder™ includes an electric field generator, a field receiver, a sinusoidal shaped dielectric rotor, and processing electronics.

The output of Electric Encoder™ is a digital serial with absolute position single turn. The combination of precision, low profile, low weight and high reliability have made Netzer Precision encoders particularly suitable to a wide variety of industrial automation applications.

### General

- **Angular resolution**: 18-20 bit
- **Maximum tested static error**: ±0.020°
- **Extended accuracy static error**: ±0.010°
- **Maximum operational speed**: 1500 rpm
- **Measurement range**: Unlimited rotation
- **Rotation direction**: Adjustable CW/CCW*
- **Build In Test BIT**: Optional

* Default same direction from bottom side of the encoder

### Mechanical

- **Allowable mounting eccentricity**: ±0.1 mm
- **Allowable axial mounting tolerance**: ±0.1 mm
- **Rotor inertia**: 10,154 gr · mm²
- **Total weight**: 40 gr
- **Outer Ø / Inner Ø / Height**: 60 / 30 / 11.5 mm
- **Material (stator, rotor)**: Aluminum
- **Nominal air gap (stator, rotor)**: 0.6 mm

### Electrical

- **Supply voltage**: 5V ± 5%
- **Interconnection**: Shielded cable
- **Cable length**: 1,500 mm MAX

### Environmental

- **EMC**: IEC 61000-6-2, IEC 61000-6-4
- **Operating temperature range**: -40°C to +85°C
- **Storage temperature**: -50°C to +100°C
- **Relative humidity**: 98% Non condensing
- **Shock endurance**: 100 g for 11 ms
- **Vibration endurance**: 20 g 10 – 2000 Hz
- **Protection**: IP 40
Digital SSi Interface

Synchronous Serial Interface (SSi) is a point to point serial interface standard between a master (e.g. controller) and a slave (e.g. sensor) for digital data transmission.

- **Signal latency**: ±250 μSec
- **Output code**: Binary
- **Serial output**: Differential RS-422
- **Clock**: Differential RS-422
- **Clock frequency**: 0.5 ÷ 2.0 MHz
- **Position update rate (Max)**: 30 kHz
- **Current consumption**: 180 mA

SSi interface wires color code
- Clock + Grey
- Clock - Blue
- Data - Yellow
- Data + Green
- GND Black
- +5V Red

SSi / BiSS Output signal parameters
- **Signal latency**: ±250 μSec
- **Output code**: Binary
- **Serial output**: Differential RS-422
- **Clock**: Differential RS-422
- **Clock frequency**: 0.5 ÷ 2.0 MHz
- **Position update rate (Max)**: 30 kHz
- **Current consumption**: 180 mA

SSi / BiSS interface wires color code
- **Clock +**: Grey
- **Clock -**: Blue
- **Data -**: Yellow
- **Data +**: Green
- **GND**: Black
- **+5V**: Red

Synchronous Serial Interface (SSi) is a point to point serial interface standard between a master (e.g. controller) and a slave (e.g. sensor) for digital data transmission.

**Digital BiSS-C Interface**

BiSS – C Interface is unidirectional serial synchronous protocol for digital data transmission where the Encoder acts as “slave” transmits data according to “Master” clock. The BiSS protocol is designed in B mode and C mode (continuous mode). The BiSS-C interface as the SSi is based on RS-422 standards.

- **Bit #**: Description
- **28**: Ack
- **Start**
- **0**: “start” bit follower
- **AP**: Absolute Position encoder data
- **Warn.**: Warning
- **Error**: Error
- **CRC (6 bits)**

Software tools: (SSi / BiSS - C)

Advanced calibration and monitoring options are available by using the factory supplied Electric Encoder Explorer software. This facilitates proper mechanical mounting, offsets calibration and advanced signal monitoring.
### Ordering Code

<table>
<thead>
<tr>
<th>DF</th>
<th>60</th>
<th>32</th>
<th>S</th>
<th>G</th>
<th>S</th>
<th>0</th>
<th>n</th>
<th>n</th>
<th>n</th>
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<tbody>
<tr>
<td>DF Product line</td>
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<td>Outer Diameter</td>
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<tr>
<td>Fine ECR</td>
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<tr>
<td></td>
<td>I</td>
<td>BiSS</td>
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<tr>
<td>Resolution</td>
<td>Code</td>
<td>Bit</td>
<td>CPR</td>
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</tr>
<tr>
<td></td>
<td>G</td>
<td>18</td>
<td>262,144</td>
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<tr>
<td>BIT (Build In Test): optional</td>
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<tr>
<td></td>
<td>B</td>
<td>BIT</td>
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</table>

### Extended Accuracy

<table>
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<th>EA</th>
<th>nnn</th>
<th>Custom</th>
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</thead>
</table>

### Interconnection

<table>
<thead>
<tr>
<th>0</th>
<th>250mm Flying leads (default)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500mm Flying leads</td>
</tr>
<tr>
<td>2</td>
<td>750mm Flying leads</td>
</tr>
<tr>
<td>3</td>
<td>1000mm Flying leads</td>
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<tr>
<td>C</td>
<td>Connector (optional)</td>
</tr>
<tr>
<td>S</td>
<td>Shielded cable 250 mm</td>
</tr>
</tbody>
</table>

### Cable Information

Cable: 30 AWG twisted pair (3) - 2 (30 AWG 25/44 finned copper, 0.15 PFE to Ø0.6 ± 0.05 OD).

Temperature rating: -60 to +150 Deg C.

Braided shield: Thinned copper braided 95% min. coverage.

Jacket: 0.45 silicon rubber jacket Ø3.45 ±0.2 OD

### Cable Description

- **30 AWG twisted pairs (3)**
- Braided shield
- Jacket 0.45mm

### Color Table

<table>
<thead>
<tr>
<th>Pair</th>
<th>Color</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Red/Black</td>
</tr>
<tr>
<td>2</td>
<td>Gray/Blue</td>
</tr>
<tr>
<td>3</td>
<td>Green/Yellow</td>
</tr>
</tbody>
</table>

### Optional Accessories

#### Demonstration Kit

- **DKIT-DF-60-32-SG-S0 - SSI interface**
- **DKIT-DF-60-32-IG-S0 - BiSS interface**

The Demo kit includes: mounted encoder on rotary jig, and RS-422 to USB converter.

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**Related documents**

- **DF-60 User Manual**: Mechanical, Electrical and calibration setup.

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**Sold & Serviced By:**

**ELECTROMATE**

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www.electromate.com

**SERVO2GO.com**

877-378-0240

sales@servo2go.com

www.servo2go.com
Unless Otherwise Specified

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Surface Finish</th>
<th>Linear Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5-4.9</td>
<td>±0.05 mm</td>
<td>5-30: ±0.1 mm</td>
</tr>
<tr>
<td>31-120</td>
<td>±0.15 mm</td>
<td>121-400: ±0.2 mm</td>
</tr>
</tbody>
</table>
Two Ø3 dowel pins and four countersink M3 holes, see sheet 1 for details.

UNLESS OTHERWISE SPECIFIED

Dimensions are in: mm  Surface finish: N6

Linear tolerances

<table>
<thead>
<tr>
<th>Range</th>
<th>Tolerance</th>
</tr>
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<tbody>
<tr>
<td>0.5-4.9</td>
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