**Features**
- Hybrid technology
- Highly resistant to vibration/shock
- Highly resistant to fluid/dust ingress
- Robust design for industrial applications
- Highly repeatable
- RoHS compliant*

**Electrical Characteristics (@ 25 °C)**
- VDD Supply Voltage: 10 to 30 V DC
- Supply Current: 44 mA max.
- Output Signal (Single): RS-485
- Independent Linearity: ±0.1 % max.
- Hysteresis: 0.3 % VDD max.
- Effective Electrical Angle: 3600 ° ± 10 °
- Output Resolution: 163,840
- Baud Rate: 19,200

**Environmental Characteristics**
- Storage Temperature: -40 °C to +125 °C
- Operating Temperature: -40 °C to +85 °C
- Insulation Resistance: @ 500 V AC 500 MW min.
- Vibration: 15 G
- Shock: 50 G
- IP Rating: IP 65
- ESD Rating: 2 kV max.

**Mechanical Characteristics**
- Mechanical Angle: 3600 ° ± 10 °
- Shaft/RPM: 200 RPM max.
- Torque:
  - Starting & Running: 2.12 N-cm (3.0 oz-in.) max.
  - Mounting: 2.12 N-cm (3.0 oz-in.) max.
- Shaft Material: Stainless steel
- Bearing: 2 ball bearings
- Rotational Life (Shaft Revolutions): 5 million

**Product Dimensions**

**Additional Information**
Click these links for more information:

Click these links for more information:

**WARNING**
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

Asia-Pacific:
Tel: +886-2 2562-4117
Email: asiatcus@bourns.com

Europe:
Tel: +36 88 885 877
Email: eurocus@bourns.com

The Americas:
Tel: +1-951 781-5500
Email: americus@bourns.com

www.bourns.com

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Applications

- Patient platform positioning feedback
- 3D imaging position feedback
- Pneumatic control valve position feedback
- Draw wire position sensors
- Actuator motor position feedback
- Automated manufacturing robotics
- Electric linear actuator position sensors

HES38U-RS485 Hybrid Position Sensor

How To Order

HE  S  38  U  -  RS485  -  S  C 2F

Model

HE = Hybrid Encoder
Configuration
S = Serial
Body Size
38 = 38 mm Servo
Shaft
U = 6 mm diameter slotted shaft / 12 mm length
Output Type
RS485 = Non-Synchronous Serial Protocol, Differential, 163,840 Bit Output Resolution
Shaft Style
S = Slotted
Configuration
C = RJ-45 Connector
Cable Length
2F = 2 Feet

Connection Diagram

Connect the GND of the power supply with the GND of the RS-485 reader.

Serial Protocol

Model HES38 RS-485 Protocol

Maximum resolution for the Model HES38U is 163,840 bits = 027FFF HEX Baud Rate 19,200 BPS

Start frame and data length

```
0 1 0 1 1 1 0 1 1 1 0 1 0 1 1 1 0 1 0 0 1 1 0 0 0 0 0 0 1 0 0 1
```

Encoder position data

```
0 0 0 0 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 1
```

Parity and end frame

```
0 1 0 1 1 1 0 0 0 0 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1
```

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## Serial Protocol (Continued)

The position data is contained within bytes B, C, and D. Together, this data makes up a 24-bit packet referred to as DATA24 which could be a valid angle or an error condition. The meaning is distinguished by the MSB. DATA24: Position data P[17:0], Error data E[15:0].

### DATA24 Position Data Structure

<table>
<thead>
<tr>
<th>Most Significant Byte</th>
<th>Middle Byte</th>
<th>Least Significant Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P15</td>
<td>P14</td>
<td>P13</td>
</tr>
</tbody>
</table>

### DATA24 Error Data Structure

<table>
<thead>
<tr>
<th>Most Significant Byte</th>
<th>Middle Byte</th>
<th>Least Significant Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>E14</td>
<td>E13</td>
<td>E12</td>
</tr>
<tr>
<td>E6</td>
<td>E5</td>
<td>E4</td>
</tr>
</tbody>
</table>

### DATA24 Error Structure

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0</td>
<td>F_ERROR</td>
<td>Sensor error occurred</td>
</tr>
<tr>
<td>E1</td>
<td>F_INTSPIREAD</td>
<td>Internal SPI read failure</td>
</tr>
<tr>
<td>E2</td>
<td>F_ADCMONITOR</td>
<td>ADC failure</td>
</tr>
<tr>
<td>E3</td>
<td>F_ADCSATURA</td>
<td>ADC saturation (electrical failure or field too strong)</td>
</tr>
<tr>
<td>E4</td>
<td>F_RGTOOLOW</td>
<td>Analog gain below trimmed threshold (likely reason: field too strong)</td>
</tr>
<tr>
<td>E5</td>
<td>F_MAGTOOLOW</td>
<td>Magnetic field too weak</td>
</tr>
<tr>
<td>E6</td>
<td>F_MAGTOOHIGH</td>
<td>Magnetic field too strong</td>
</tr>
<tr>
<td>E7</td>
<td>F_RGTOOHIGH</td>
<td>Analog gain above trimmed threshold (likely reason: field too strong)</td>
</tr>
<tr>
<td>E8</td>
<td>F_FGCLAMP</td>
<td>Never occurring in serial protocol</td>
</tr>
<tr>
<td>E9</td>
<td>F_ROCLAMP</td>
<td>Analog chain rough offset compensation: clipping</td>
</tr>
<tr>
<td>E10</td>
<td>F_MT7V</td>
<td>Device supply Vdd greater than 7V</td>
</tr>
<tr>
<td>E11</td>
<td>F_ADCVDD</td>
<td>Potentiometer ADC VDD disconnected</td>
</tr>
<tr>
<td>E12</td>
<td>F_ADCGND</td>
<td>Potentiometer ADC GND disconnected</td>
</tr>
<tr>
<td>E13</td>
<td>F_ADCCON</td>
<td>Potentiometer ADC connection disconnected</td>
</tr>
<tr>
<td>E14</td>
<td>F_DACMONITOR</td>
<td>Never occurring in serial protocol</td>
</tr>
<tr>
<td>E15</td>
<td>F_INTCHKSUM</td>
<td>Internal checksum failure</td>
</tr>
<tr>
<td>E16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E17</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E18</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E19</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E20</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E21</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E22</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E23</td>
<td>F_SYSERROR</td>
<td>Internal system error flag</td>
</tr>
</tbody>
</table>

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