Incremental instructions

Incremental Hollow Shaft Encoder
RI 58-D, RI 58TD

Item No. 2 531 069, Edition: 3 160604 Ste1  Page 1/2

Introduction
These installation instructions are provided for the connection and starting procedure of your shaft encoder. The shaft encoder is available in two versions:

- Standard version (RI 58-D) or High Temperature version (RI 58TD) and each in the mounting versions:
  - P = Blind shaft with front clamping ring
  - E = Blind shaft with screw connection
  - D = through shaft with front clamping ring
  - H = through shaft with rear clamping ring

Safety and Operating Instructions

- The incremental shaft encoders of the type RI 58-D / RI 58TD model series are quality products manufactured in accordance with established electrical engineering standards.
- The units have been delivered from the factory in perfect conformance to safety regulations. To maintain this condition and to ensure trouble-free operation, please observe the technical specifications of this document.
- Installation environment and wiring are influential on the encoder's EMC: Thus the installer must secure EMC of the whole facility (device).
- The encoder may only be operated within the limits specified by the technical data.
- Maximum operating voltages must not be exceeded!
- The units are designed complying with VDE 0160, protection class III.
- To prevent dangerous structure-borne currents, the equipment has to be run on safety extra-low voltage (SELV) and must be in an area of equipotential bonding.
- Application: Industrial processes and control systems.
- Overvoltage at the connecting terminals must be limited to the values within overvoltage category II.
- The high-quality EMC specifications are only valid together with standard-type cables and plugs. When using screened cables, the screen must be connected to ground on both ends. Likewise, the voltage-supply cables should entirely be screened.
- If this is not possible you will have to take appropriate filtering measures.
- Installation environment and wiring are influential on the encoder's EMC: Thus the installer must secure EMC of the whole facility (device).
- Transient peaks on the power supply leads are to be limited by the pre-connected power supply cables during installation work.
- The units may only be operated within the limits specified by the technical data.
- For use in class II circuits only

Connection diagram

<table>
<thead>
<tr>
<th>Colour (P)</th>
<th>Colour (PVC)</th>
<th>Output</th>
<th>RS 422 (T)</th>
<th>RS 422 (R)</th>
<th>Push-pull (K, D)</th>
<th>Push-pull-complementary (I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>brown white</td>
<td>Channel A</td>
<td>Channel A</td>
<td>Channel A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>green white/brown</td>
<td>Channel A</td>
<td>Channel A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>grey green</td>
<td>Channel B</td>
<td>Channel B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pink green/brown</td>
<td>Channel B</td>
<td>Channel B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>red yellow</td>
<td>Channel N</td>
<td>Channel N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>black yellow/brown</td>
<td>Channel N</td>
<td>Channel N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>violet white</td>
<td>Sense GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue yellow/red</td>
<td>Sense VCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>brown/green</td>
<td>5 VDC</td>
<td>5/10...30 VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>green/black</td>
<td>GND</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Screen 1 | Screen 2 | Screen 3 |

Identification code (see identification plate)

<table>
<thead>
<tr>
<th>D</th>
<th>direct hollow shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>5,000</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
</tr>
<tr>
<td>I</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Push-pull</th>
<th>RS 422 + Alarm</th>
<th>RS 422 + Sense</th>
<th>push-pull complementary</th>
<th>push-pulse 5 V, 30 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>cable PVC radial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>cable TPE radial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>CONIN flange box radial, left-turning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>CONIN flange box radial, right-turning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mechanical Data

- Mounting: synchro flange with clamped shaft or blind shaft
- Hollow shaft diameter: 10/12/14/15 mm; required dim. of mounting shaft:
  - Ø 10 mm, tolerance g8: ±0.005 – –0.027 mm
  - Ø 12/14/15 mm, tolerance g8: ±0.006 – –0.033 mm
- Speed: E, F: max. 6000 RPM; D, H: max. 4000 RPM
- Torque: E, F: ≤ 1 Ncm (564); D, H: ≤ 2 Ncm (644)
- Moment of inertia: F: approx. 35 gcm²; E: approx. 20 gcm²; D, H: 60 gcm²
- Operating temperature: RI 58-D: −20...+70 °C; RI 58TD: −25...+100 °C
- Storage temperature: −25...+85 °C
- Shock resistance (IEC 68-2-27): 100 g = 100 m/s² (6 ms)
- Vibration performance (IEC 68-2-6): 10 g = 100 m/s² (10 ... 2000 Hz)
- Noise immunity as per EN 50082-2 (edition 1995)
- Noise emission as per EN 50081-2 (edition 1993)
- General design: as per DIN VDE 0160, protection class III, contamination level 2, overvoltage class II
- Protection class housing/bearing: F, E, D: IP 65/64; D, H: IP 64/64

Electrical data

- Supply voltage U9: 5 V DC (SELV) ±10% 10 ... 30 V DC (SELV)
- Output circuit: PP, PP, RS422, PP compl., RS422
- Code letter: K, D, R, T, I
- Output load [mA]: ±10 ±30 ±30 ±30 ±30
- Output level [V]: High 22.5 22.5 22.5 22.5 22.5 22.5 22.5 Low 0.5 0.5 0.5 0.5 0.5 0.5 0.5
- Pulse rise time [ns]: 250 ±10 100 100 100 2000 2000 2000
- Max. pulse frequency [kHz]: 300 ±10 300 300 300 300 300 300
- Pole protection of U9: yes yes yes yes yes yes yes
- Short circuit proof: yes yes yes yes yes yes yes
- Pulse duty factor: 1 : 1
- Pulse width error: ± 25 electrical
- Phase shift: 90° (Channel A to B at is at least 0.45 µs at 300 kHz)
- Pulse shape: rectangular
- Alarm output: Open Collector, NPN (5 mA, 24Vmax with U9=5VDC; 5 mA, 32 V max. with U9=10...30VDC

Pinout of flange box, CONIN 12 poles

<table>
<thead>
<tr>
<th>Pin</th>
<th>RS 422 (T)</th>
<th>RS 422 (R)</th>
<th>Push-pull (K, D)</th>
<th>Push-pull-complementary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Channel B</td>
<td>Channel B</td>
<td>N.C.</td>
<td>Channel B</td>
</tr>
<tr>
<td>2</td>
<td>Sense VCC</td>
<td>Sense VCC</td>
<td>N.C.</td>
<td>Sense VCC</td>
</tr>
<tr>
<td>3</td>
<td>Channel N</td>
<td>Channel N</td>
<td>Channel N</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Channel R</td>
<td>Channel R</td>
<td>Channel R</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Channel A</td>
<td>Channel A</td>
<td>Channel A</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Channel A</td>
<td>Channel A</td>
<td>Channel A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>N.C.</td>
<td>Alarm</td>
<td>Alarm</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Channel B</td>
<td>Channel B</td>
<td>Channel B</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>N.C.*</td>
<td>N.C.*</td>
<td>N.C.*</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sense GND</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5 VDC</td>
<td>5/10...30 VDC</td>
<td>5/10...30 VDC</td>
<td></td>
</tr>
</tbody>
</table>

* Screen for cable with CONIN-plug

1) PP = Push-pull; PP compl. = Push-pull complementary; RS422 = Line driver
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Mechanical installation

General information

Safety instructions

• All installation work must be carried out according to applicable safety instructions!
• During installation work all appliances worked on must be disconnected from electric current!
  Ensure that these appliances cannot be powered up during the installation work!
• In order to compensate for axial or radial angular offset of the actuating shaft, flange and case of the shaft encoder must remain movable!

The shaft encoder case must not rotate:
Fix the flange by means of
– a stator coupling (e.g. spring steel plate) (Accessories: Ord. code 1 531 162)
– or a cylindrical pin. A torque spring (at the encoder flange) in conjunctions with a cylindrical pin (at the actuating device) provides for the transmission of torque between encoder and actuating device.

Prerequisites for installation

at the actuating shaft (only in version E):
The actuating shaft must be provided with a threaded bore M4x10:
This bore accepts the fastening screw of the shaft encoder.

at the actuator case (for mounting with cylindrical pin):
A cylindrical pin must be installed in the actuator housing (pin diameter versions E and H: 4x16; versions D and F: 4x20; always DIN 6325).
This pin is required as a torque support (refer also to safety instructions) Please observe the following dimensioned drawings.

Assembly drawings

Mounting of versions D, F, and H

Legend for versions D, F, and H
1 Torque spring
2a Clamping ring with hexagon-socket screw, front (D+F)
2b Clamping ring with hexagon-socket screw, back (H)
3 Cylindrical pin
4 Actuating shaft

Mounting of version E

Legend for version E
1 Torque spring
2 O-ring
3 Cylindrical pin
4 Actuating shaft with threaded bore
5 M4-screw with spring washer
6 Cap

Checking the clamping device (D, F, and H versions)
The clamping device of versions D, F, and H contains a clamping ring with a hexagon-socket screw.

Versions D and F: Clamping ring and torque spring are located on the front side of the shaft encoder. This side will later on point to the actuator.
With version H, the clamping ring is located in the back, the torque spring is in front.
The front side will later on point to the actuator.

Check first whether the clamping ring is open:
• Hold the encoder in such a position that you can see the clamping ring from the side: The hexagon-socket screw is inserted into the side of the clamping ring.
• Check whether the clamping device of the hollow shaft is released by inserting the actuating shaft into the hollow shaft.
  The shaft must slide into the hollow shaft smoothly!
  Do not use force and do not try to drive the shaft into the hollow with hammer blows!
  This would damage the shaft encoder!
• If the shaft cannot be inserted: check the shaft diameter and/or release the clamping device.

Releasing the clamping device (D, F, and H versions)

• Open the clamping ring:
  Use a hex key (size 2); turn the screw to the left (counter-clockwise).

Mounting the encoder at the actuating shaft

For clamping shaft/clamping device versions (D, F, and H):
• For mounting with stator coupling:
  Fasten the spring steel plate to the encoder flange.
  • Slide the encoder onto the actuating shaft.
  • For mounting with cylindrical pin:
  Align the encoder in such a position that the torque spring and the cylindrical pin oppose each other. Engage the cylindrical pin in the torque spring.
  • For mounting with stator coupling:
  Align the encoder in such a position that the bores of the spring steel plate and of the actuator housing oppose each other.
  • Close the clamping ring:
    Use a hex key (size 2); turn the screw to the right (clockwise).
  • Tightening torque of the clamping-ring screw: 90 ... 100 Ncm!

For blind shaft version (E):
• For mounting with stator coupling:
  Fasten the spring steel plate to the encoder flange.
  • Put the O-ring* into the hollow shaft and slide the encoder onto the actuating shaft.
  • Put the spring washer* on the Phillips screw (M4x12)*. Hold the spring washer to the screw head.
  • Push the screw with the spring washer through the case opening and the shaft bore of the encoder into the threaded bore at the end of the actuating shaft.
  • Secure the encoder on the actuating shaft:
    Use a Philips screwdriver;
    Turn the screw to the right (clockwise) and tighten it moderately.
  • Push the cap* into the case opening.
  • For mounting with stator coupling:
    Screw together the spring steel plate and the actuator housing.

The encoder is now ready for connection.
Ensure that no external forces act on the shaft encoder during installation and operation!