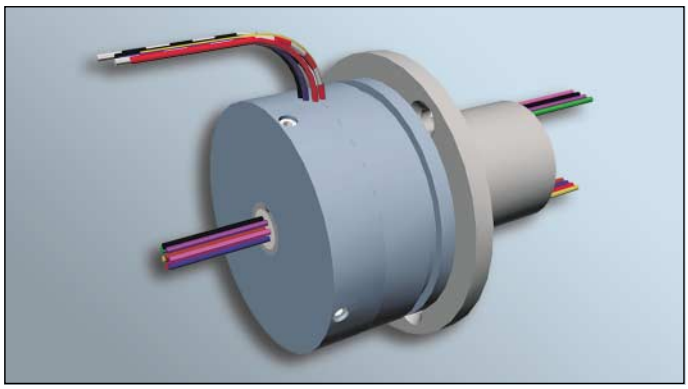
# LTN

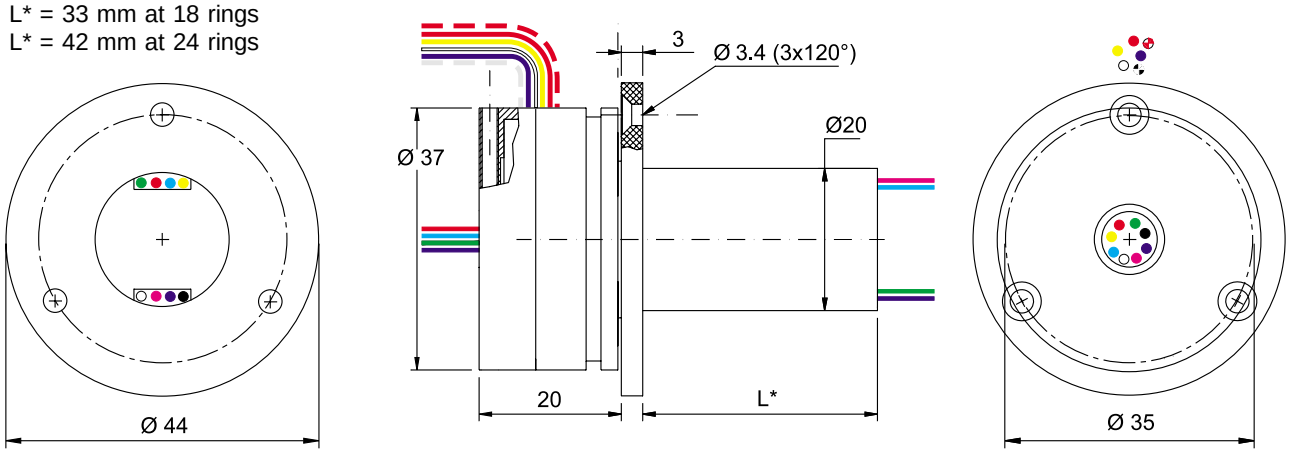
LTN Servotechnik GmbH

# Slip Ring Capsule SC 020-R



- Slip ring SC020 + Resolver RE-15-1-B24
- 6, 12, 18 or 24 rings for max. 2 A each
- 2 rings combined for 4 A; 3 rings for 6 A
- Outer diameter 20 mm
- 240 V DC / 240 V AC max.

L* = 15 mm at 6 rings
L* = 24 mm at 12 rings
L* = 33 mm at 18 rings
L* = 42 mm at 24 rings




## Electrical Data

| | |
|---|---|
| Number of rings: | 6, 12, 18 or 24 |
| Current: | 2 A max. per single ring; 4 A with 2 combined rings; 6 A with 3 rings |
| Voltage: | 240 V DC / 240 V AC max. |
| High pot: | 500 V AC |
| Insulation resistance: | 1000 MOhm at 500 V DC |
| Noise: | 60 MOhm at 5 rpm, 6 V DC and 50 mA |
| Contacts / Leads: | Gold-gold / silver plated copper with teflon insulation |

## Mechanical Data

| | |
|---|---|
| Speed: | 250 rpm max. |
| Protection class: | IP 40 |
| Temperature: | -20 °C ... +80 °C (-5 °F ... +175 °F) |
| Rotor connection: | 300 leads; AWG 26/19 (0,15 $mm^2$) |
| Stator connection: | 300 / 500 / 1000 mm leads; AWG 26/19 (0,15 $mm^2$); others on request |
| Bearings: | Miniature ball bearings of steel |
| Housing: | with flange of POM; others on request |
| Weight: | 200 g max. |

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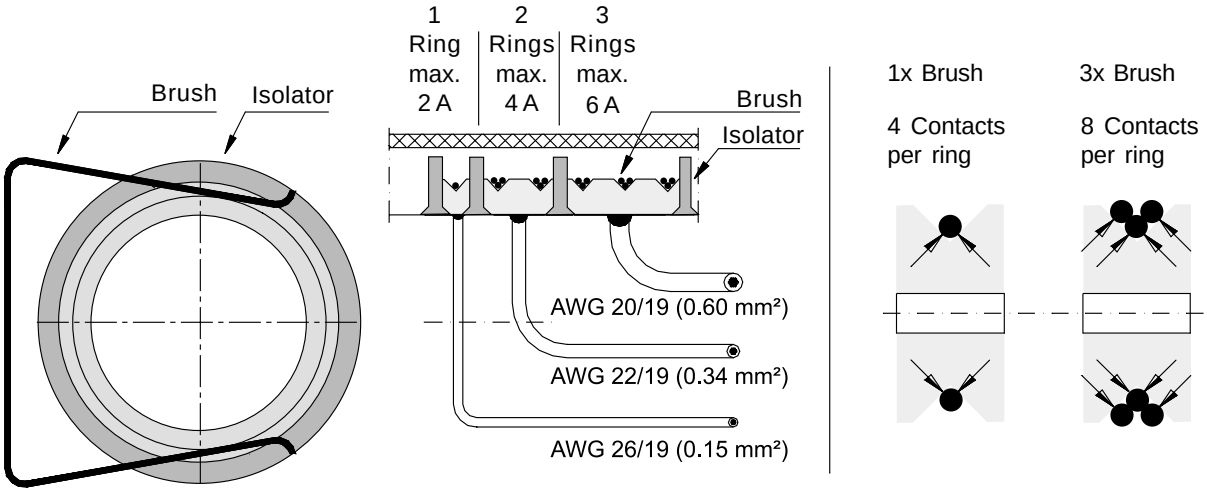
## Operating Principle: Slip Ring




## Operating Principle Resolver

A resolver is a **contact less** rotary transformer that provides information on the rotor position angle θ.

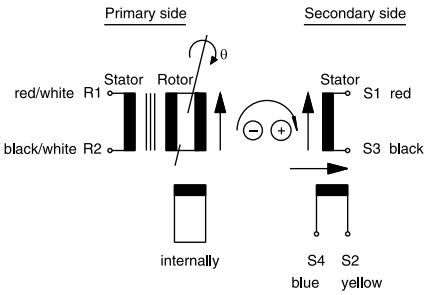
The stator bobbin winding is energized with an AC voltage $\mathbf{E_{R1\text{-}R2}}$. This AC voltage is transferred to the rotor winding with transformation ratio **Tr**. The AC voltage then induces the voltages $\mathbf{E_{S1\text{-}S3}}$ and $\mathbf{E_{S2\text{-}S4}}$ into the two output windings of the stator.

The magnitude of the output voltages vary with the sine and the cosine of the rotor position angle θ, because the two secondary windings are shifted by 90°.

Input: $E_{R1\text{-}R2}$

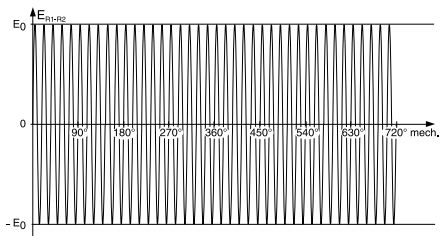
Output: $E_{S1\text{-}S3}$

$E_{S2\text{-}S4}$



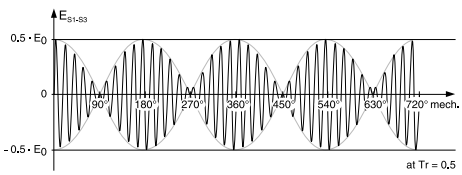

Input Signal:

$$E_{R1\text{-}R2} = E_0 \sin(\omega t)$$



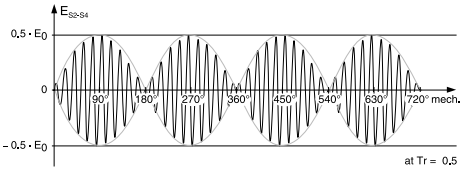

Output Signal:

$$E_{S1\text{-}S3} = Tr \cdot E_{R1\text{-}R2} \cdot \cos\theta$$




Output Signal:

$$E_{S2\text{-}S4} = Tr \cdot E_{R1\text{-}R2} \cdot \sin\theta$$



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## Accuracy Resolver

The accuracy ε is defined as the difference between the electrical angle $\theta_{el}$, indicated by the output voltages of the secondary windings, and the mechanical angle or rotor position angle $\theta_{mech}$.

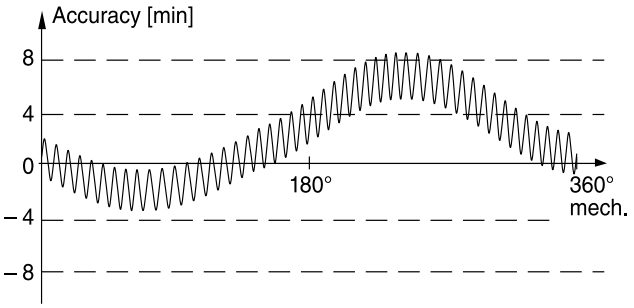
accuracy (ε) = electrical angle ($\theta_{el}$) – mechanical angle ($\theta_{mech}$)

For each LTN resolver the accuracy is indicated in the data sheet by the terms 'accuracy absolute', 'accuracy spread' and 'accuracy ripple'.

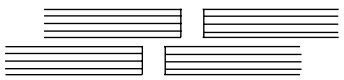
The **'accuracy absolute'** or the **'accuracy spread'** is caused by the internal error of the resolver and the mounting error resulting in 1st and 2nd order harmonics of the sinusoidal signal.

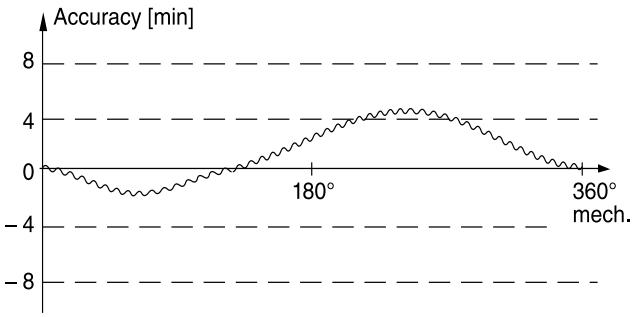
The **'accuracy ripple'** has decisive influence on the speed stability of a drive. This ripple is caused by 3rd and higher order harmonics. LTN resolvers have an accuracy ripple of less than 1' which is achieved by a patented procedure of stepping two lamination assemblies in the rotor.

Straight lamination assembly:




Stepped lamination assembly:
(LTN patent)






## Electrical Data Resolver RE-15-1-B24

| | | |
|---|---|---|
| **Primary Side** | R1 – R2 | |
| **Transformation Ratio (± 10%)** | 0.5 | |
| **Input Voltage** | 7 $V_{rms}$ | 7 $V_{rms}$ |
| **Input Current** | 58 mA | 36 mA |
| **Input Frequency** | 5 kHz | 10 kHz |
| **Phase Shift (± 3°)** | 8° | –6° |
| **Null Voltage** | 30 mV max. | |
| **Impedance** | | |
| $Z_{ro}$ | 75 j 98 Ω | 110 j 159 Ω |
| $Z_{rs}$ | 70 j 85 Ω | 96 j 150 Ω |
| $Z_{so}$ | 180 j 230 Ω | 245 j 400 Ω |
| $Z_{ss}$ | 170 j 200 Ω | 216 j 370 Ω |
| **D.C. Resistance (± 10°)** | | |
| Rotor | 40 Ω | 17.5 Ω |
| Stator | 102 Ω | 200 Ω |

| | |
|---|---|
| **Accuracy** | ±10' |
| **Accuracy Ripple** | 1' max. |
| **Operating Temperature** | –55°C ... +155°C |
| **Max. Permissible Speed** | 20,000 rpm |
| **Shock (11 ms)** | ≤ 10,000 $m/s^2$ |
| **Vibration (10 to 500 Hz)** | ≤ 500 $m/s^2$ |
| **Hi-pot Housing/Winding** | 500 V min. |
| **Hi-pot Winding/Winding** | 250 V min. |
| **Rotor** | Completely impregnated |
| **Stator** | Completely impregnated |

| | | |
|---|---|---|
| **Primary Side** | R1 – R2 | |
| **Pole Pairs** | 1 | |
| **Transformation Ratio (±10%)** | 0.5 | |
| **Input Voltage** | 7 $V_{rms}$ | 7 $V_{rms}$ |
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| **Max. Permissible Speed** | 20,000 rpm |
| **Shock (11 ms)** | ≤ 10,000 $m/s^2$ |
| **Vibration (10 to 500 Hz)** | ≤ 500 $m/s^2$ |
| | |
| **Rotor Moment of Inertia** | $0.02 \times 10^{-4}$ $kgm^2$ |
| **Hi-pot Housing/Winding** | 500 V min. |
| **Hi-pot Winding/Winding** | 250 V min. |
| **Rotor** | Completely impregnated |
| **Stator** | Completely impregnated |
| | |
| | |

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## Order Information

| | | | |
|---|---|---|---|
| Type of slip ring: | | S C 0 2 0 | |
| No. of rings with: | max. 2 A<br>max. 4 A<br>max. 6 A | | Standard: 6 / 12 / 18 / 24 |
| Length of leads in mm: | Rotor<br>Stator | | Standard: 300 mm<br>Standard: 300 mm |
| Resolver RE-15-1-B24 | | R 0 1 | Stator of resolver rotating with rotor of slip ring |

**LTN Servotechnik GmbH**
Georg-Hardt-Straße 4
D-83624 Otterfing
Germany
Tel: +49 - 08024 - 60 80 - 0
Fax: +49 - 08024 - 60 80 - 100
E-Mail: LTN@LTN.de
Internet: www.LTN.de