LTN

LTN Servotechnik GmbH

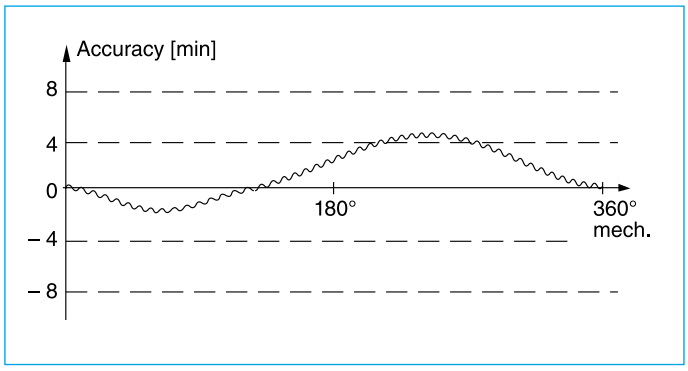
Resolver

RE-15

- Hollow shaft Ø: 12 mm max.
- Outer Ø: 36.8 mm
- Length: 16 mm

RE-21

- Hollow shaft Ø: 17 mm max.
- Outer Ø: 52.4 mm
- Length: 26 mm



Main features

- Operating temperature: –55°C ... +155°C
- Permissible speed: 20,000 rpm max.

- Accuracy absolute: ±4'/±6'/±10'
- Accuracy ripple: 1' max.

- Rotor and stator completely impregnated

- 1/2/3/4 pole pairs

Operating Principle

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

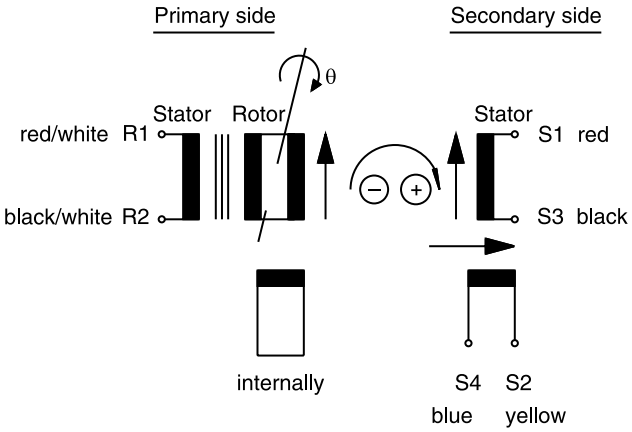
The stator bobbin winding is energized with an AC voltage $\mathbf{E_{R1-R2}}$. This AC voltage is transferred to the rotor winding with transformation ratio **Tr**. The AC voltage then induces the voltages $\mathbf{E_{S1-S3}}$ and $\mathbf{E_{S2-S4}}$ into the two output windings of the stator.

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-R2}

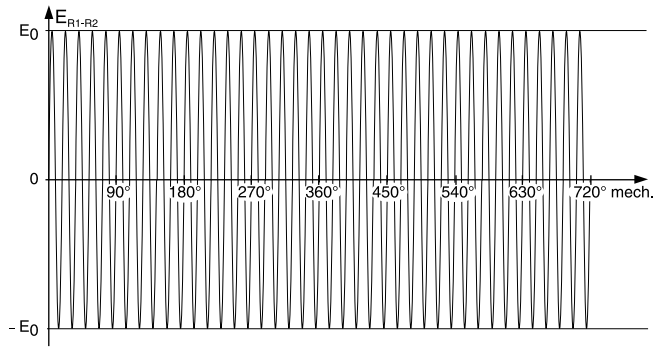
Output: E_{S1-S3}

E_{S2-S4}



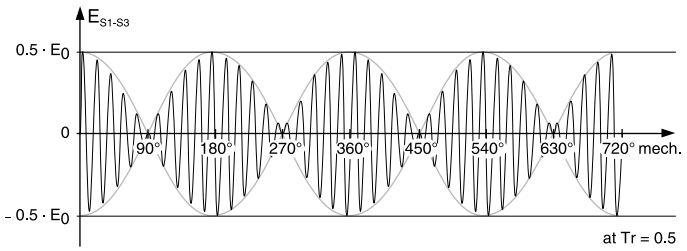
Input Signal:

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



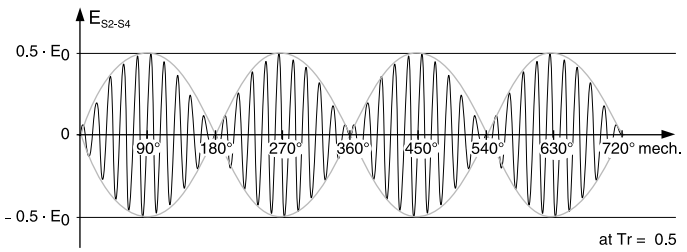
Output Signal:

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



Output Signal:

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



Accuracy

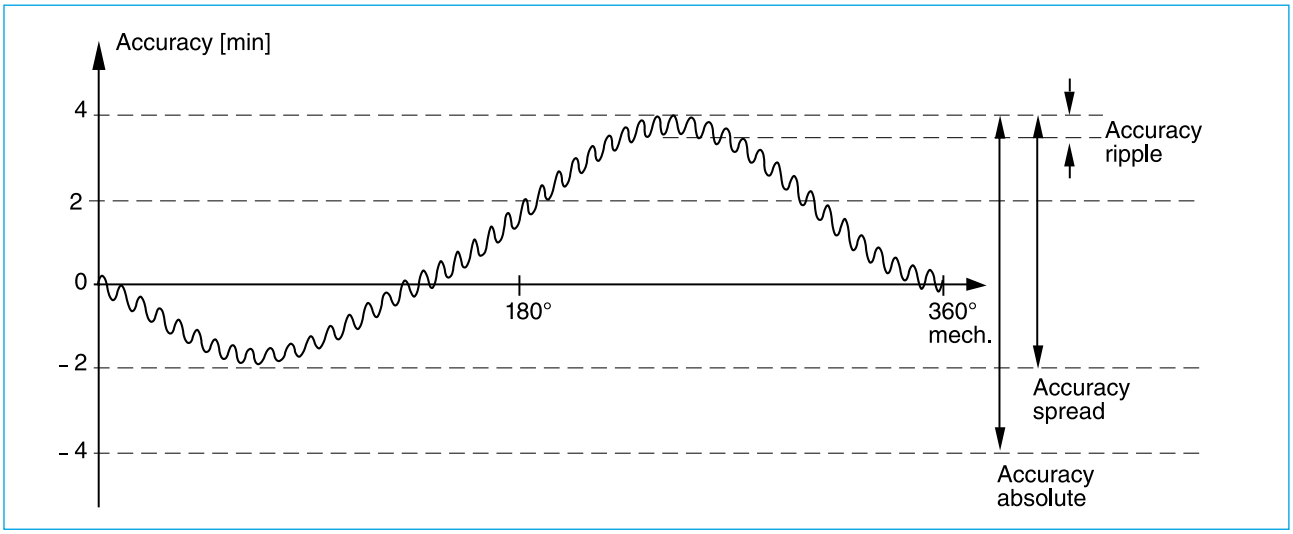
The accuracy ε is defined as the difference between the electrical angle θ_{el}, indicated by the output voltages of the secondary windings, and the mechanical angle or rotor position angle θ_{mech}.

accuracy (ε) = electrical angle (θ_{el}) – mechanical angle (θ_{mech})

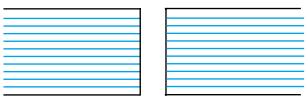
For each LTN resolver the accuracy is indicated in the data sheet by the terms 'accuracy absolute', 'accuracy spread' and 'accuracy ripple'.

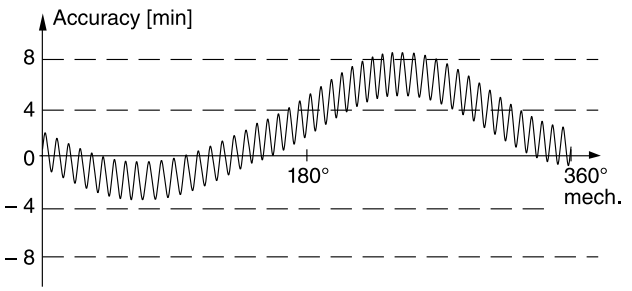
The **'accuracy absolute'** or the **'accuracy spread'** is caused by the internal error of the resolver and the mounting error resulting in 1st and 2nd order harmonics of the sinusoidal signal.

At low speeds the **'accuracy ripple'** effects the speed stability of a drive. This ripple is caused by 3rd and higher order harmonics. To ensure smooth drive performance even at low speeds LTN resolvers have an accuracy ripple of less than 1'. It is achieved by a patented procedure of stepping two lamination assemblies in the rotor.

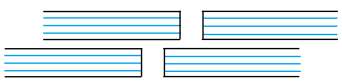


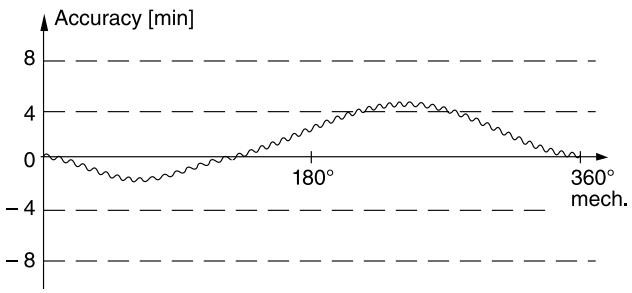
Straight lamination assembly:





Stepped lamination assembly:
(LTN patent)





Resolver RE-15: Selection Guide for Electrical Data

Various mechanical versions available

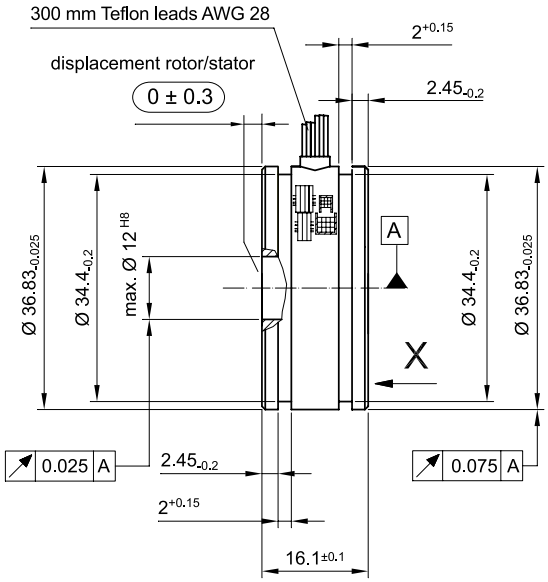
Basic Model	RE-15-1-A14		RE-15-1-K01		RE-15-1-V07		RE-15-3-D04		RE-15-4-D04	
Primary Side	R1 – R2									
Pole Pairs	1						3		4	
Transformation Ratio	0.5 ± 0.05									
Input Voltage	7 V_{rms}	7 V_{rms}	5 V_{rms}	5 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}
Input Current	58 mA	36 mA	48 mA	27 mA	58 mA	36 mA	40 mA	25 mA	16 mA	10 mA
Input Frequency	5 kHz	10 kHz	1 kHz	4.5 kHz	5 kHz	10 kHz	5 kHz	10 kHz	5 kHz	10 kHz
Phase Shift (± 3°)	8°	–6°	26°	0°	8°	–6°	13°	–1°	15°	1°
Null Voltage	30 mV max.									
Impedance										
Z_{ro} in Ω	75j98	110j159	55j87	164j255	75j98	110j159	89j151	135j254	208j393	319j657
Z_{rs} in Ω	70j85	96j150	62j81	145j210	70j85	96j150	90j142	128j241	207j375	306j636
Z_{so} in Ω	180j230	245j400	248j105	315j340	180j230	245j400	460j557	525j1015	831j2496	939j4272
Z_{ss} in Ω	170j200	216j370	256j88	278j280	170j200	216j370	458j521	500j966	840j2396	899j4145
D.C. Resistance (± 10%)										
Rotor	40 Ω		17.5 Ω		40 Ω		34 Ω		58 Ω	
Stator	102 Ω		200 Ω		102 Ω		380 Ω		659 Ω	
Accuracy	±10', ±6' on request				±4'		±5'		±6'	
Accuracy Ripple	1' max.						3' max.		3' 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									
Weight Rotor/Stator	25 g / 60 g		25 g / 70 g		25 g / 60 g		25 g / 60 g		25 g / 60 g	
Rotor Moment of Inertia	0.02 ×10^{-4} kgm^2									
Hi-pot Housing/Winding	500 V min.									
Hi-pot Winding/Winding	250 V min.									
Rotor	Completely impregnated									
Stator	Completely impregnated									
Length of stator	16.1 mm		21.3 mm		20.0 mm		16.1 mm		16.1 mm	

The selection guide and the mounting dimensions contain a sample of resolvers designed and manufactured by LTN. The performance parameters and mechanical dimensions can also be used as a guideline for new mechanical or electrical designs to satisfy your future requirements with an innovative, cost effective solution.

Housed bearing-type resolvers are also designed and manufactured by LTN, but not subject to this data sheet. Please contact us for further information.

Resolver RE-15: Mounting Dimensions

RE-15-1: Version A/B

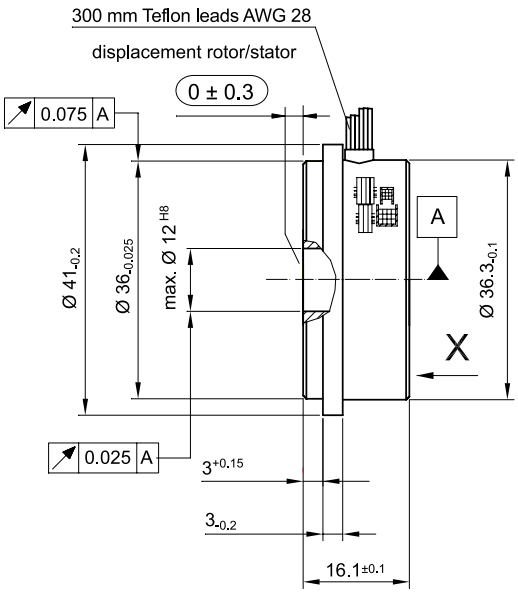


Inner diameter stator = 22.800 min.
Outer diameter rotor = 22.325 max.

Positive counting direction:
Rotor cw as viewed from bobbin end (X ←)

Dimensions in mm

RE-15-1: Version C/D



Inner diameter stator = 22.800 min.
Outer diameter rotor = 22.325 max.

Positive counting direction:
Rotor cw as viewed from bobbin end (X ←)

Dimensions in mm

Resolver RE-21: Selection Guide for Electrical Data

Various mechanical versions available

Basic Model	RE-21-1-A01		RE-21-1-A04		RE-21-1-A05		RE-21-1-K05		RE-21-3-A01	
Primary Side	R1 – R2									
Pole Pairs	1								3	
Transformation Ratio	1.0 ± 0.1	0.5 ± 0.05								
Input Voltage	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	7 V_{rms}	5 V_{rms}	5 V_{rms}	7 V_{rms}	7 V_{rms}
Input Current	40 mA	30 mA	40 mA	27 mA	80 mA	56 mA	32 mA	17 mA	22 mA	13 mA
Input Frequency	5 kHz	10 kHz	5 kHz	10 kHz	5 kHz	7 kHz	1 kHz	4,5 kHz	5 kHz	10 kHz
Phase Shift (± 3°)	11°	–7.5°	11°	–8°	8°	0°	26°	–10°	4°	–8°
Null Voltage	30 mV max.									
Impedance										
Z_{ro} in Ω	133 j 115	170 j 200	132 j 120	165 j 205	70 j 74	78 j 96	112 j 108	217 j 322	148 j 292	230 j 500
Z_{rs} in Ω	122 j 105	149 j 190	120 j 107	145 j 195	62 j 65	68 j 88	114 j 96	190 j 304	138 j 265	202 j 469
Z_{so} in Ω	800 j 1454	1310 j 2400	215 j 385	345 j 625	108 j 206	140 j 260	357 j 289	573 j 933	427 j 940	609 j 1619
Z_{ss} in Ω	740 j 1230	1150 j 2270	193 j 340	293 j 590	96 j 183	120 j 238	360 j 252	502 j 880	399 j 854	532 j 1520
D.C. Resistance (± 10%)										
Rotor	90 Ω		90 Ω		44 Ω		65 Ω		60 Ω	
Stator	252 Ω		62 Ω		28 Ω		252 Ω		245 Ω	
Accuracy	±6', ±4' on request									
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									
Weight Rotor/Stator	90 g / 200 g									
Rotor Moment of Inertia	0.14 × 10^{-4} kgm^2									
Hi-pot Housing/Winding	500 V min.									
Hi-pot Winding/Winding	250 V min.									
Rotor	Completely impregnated									
Stator	Completely impregnated									
Length of stator	25.6 mm									

The selection guide and the mounting dimensions contain a sample of resolvers designed and manufactured by LTN. The performance parameters and mechanical dimensions can also be used as a guideline for new mechanical or electrical designs to satisfy your future requirements with an innovative, cost effective solution.

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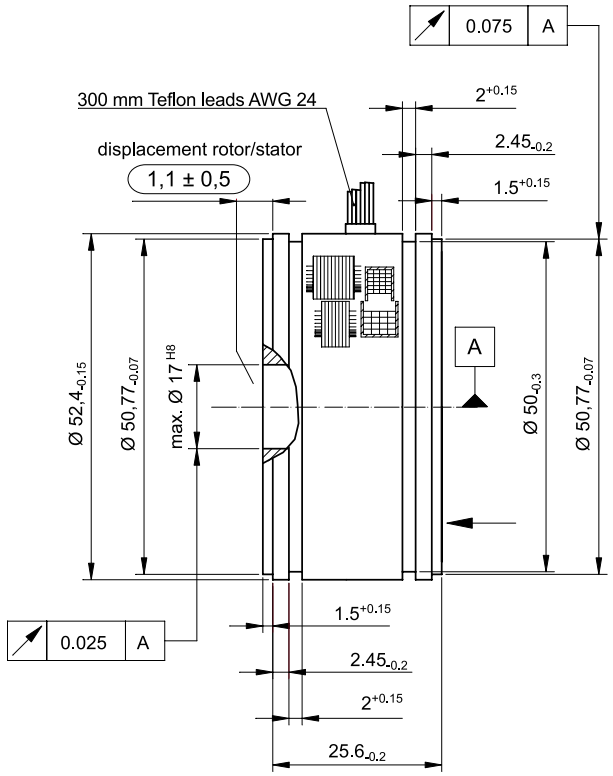
Resolver RE-21: Mounting Dimensions

RE-21-1: Version A/B

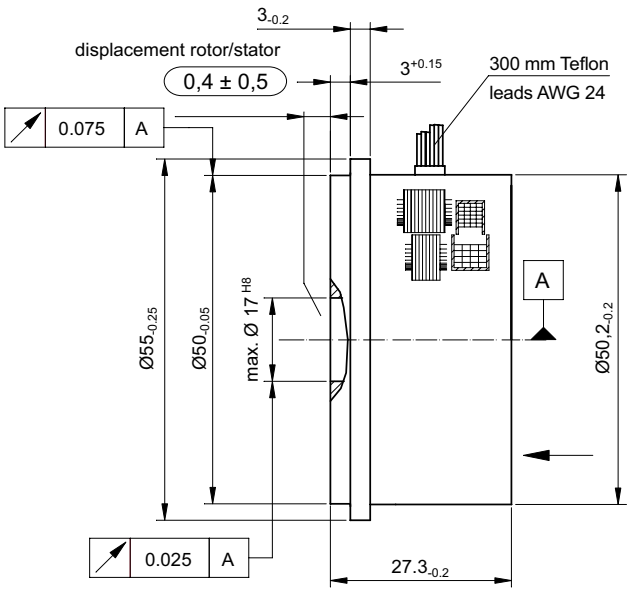


Inner diameter stator = 33.470 min.
Outer diameter rotor = 32.735 max.

Positive counting direction:
Rotor cw as viewed from bobbin end (X ←)

Dimensions in mm

RE-21-1: Version C/D



Inner diameter stator = 33.470 min.
Outer diameter rotor = 32.735 max.

Positive counting direction:
Rotor cw as viewed from bobbin end (X ←)

Dimensions in mm

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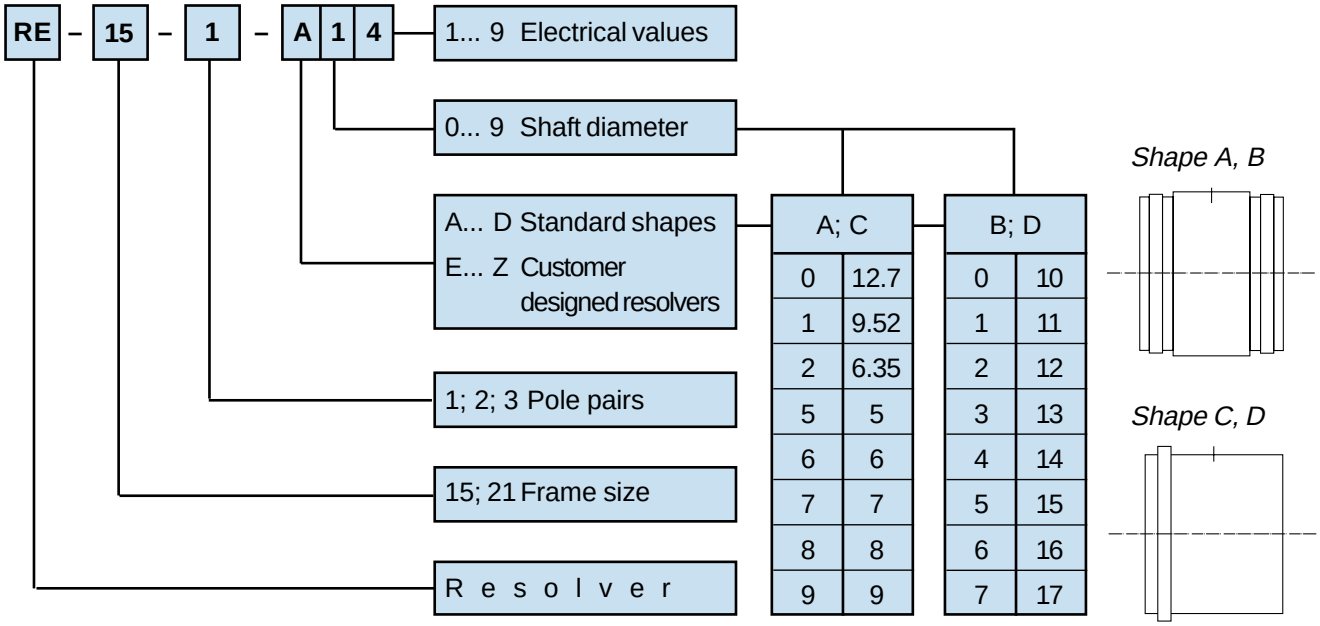
Ordering Information



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