HEIN LANZ®

Housed bearing-type resolvers

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

Selection Guide for Electrical Data

Basic Model	R1-15BN-XX21		R1-15BN-XX23		R1-15BN-XX24	
Primary Side	R1 – R2		R1 – R2		R1 – R2	
Pole Pairs	1		3		4	
Transformation Ratio	0.5 ± 0.05					
Input Voltage	7 V_{rms}					
Input Current	58 mA	36 mA	50 mA	24 mA	16 mA	10 mA
Input Frequency	5 kHz	10 kHz	4 kHz	10 kHz	5 kHz	10 kHz
Phase Shift (± 3°)	8°	–6°	15°	0°	15°	1°
Null Voltage	30 mV max.					
Impedance						
Z_{ro} in Ω	75 j 98	110 j 159	74 j 120	145 j 250	208 j 393	319 j 657
Z_{rs} in Ω	70 j 85	96 j 150	78 j 110	135 j 240	207 j 375	306 j 636
Z_{so} in Ω	180 j 230	245 j 400	430 j 450	570 j 1030	831 j 2496	939 j 4272
Z_{ss} in Ω	170 j 200	216 j 370	435 j 410	535 j 970	840 j 2396	899 j 4145
D.C. Resistance (± 10%)						
Rotor	40 Ω		34 Ω		58 Ω	
Stator	102 Ω		380 Ω		659 Ω	
Accuracy	±10’, ±6’ on request		± 5’		± 6’	
Accuracy Ripple	1’ max.		3’ max.			
Operating Temperature	–55°C ... +155°C					
Max. Permissible Speed	20,000 rpm					
Shock (11 ms)	1000 m/s^2					
Vibration (10 to 500 Hz)	500 m/s^2					
Weight Rotor/Stator	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					

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 $\mathbf{E_{R1\text{-}R2}}$. This AC voltage is transferred to the rotor winding with transformation ratio **Tr**.

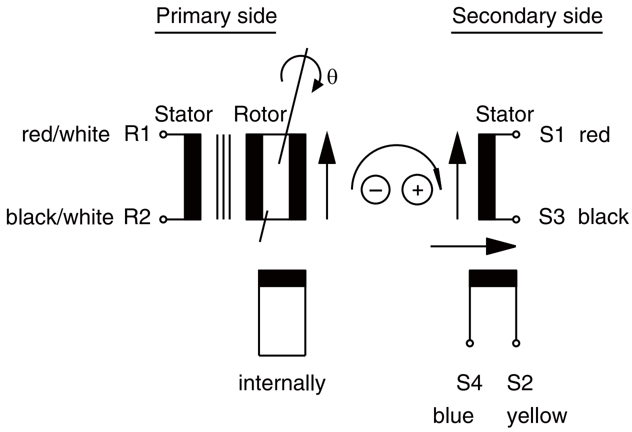
The AC voltage then induces the voltages $\mathbf{E_{S1\text{-}S3}}$ and $\mathbf{E_{S2\text{-}S4}}$ into the two output windings of the stator.

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

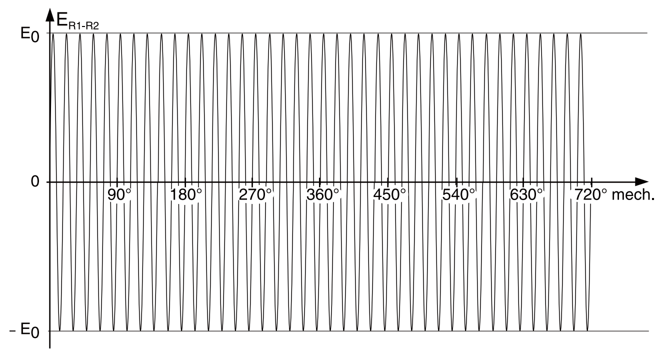
Output: $E_{S1\text{-}S3}$

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



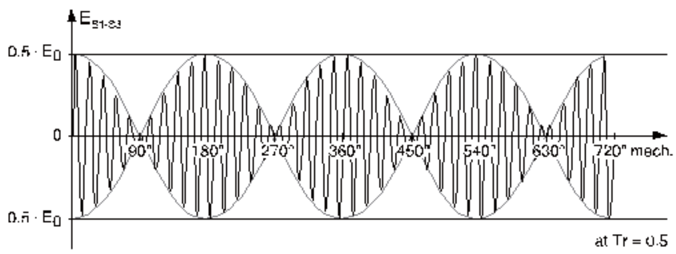
Input Signal:

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



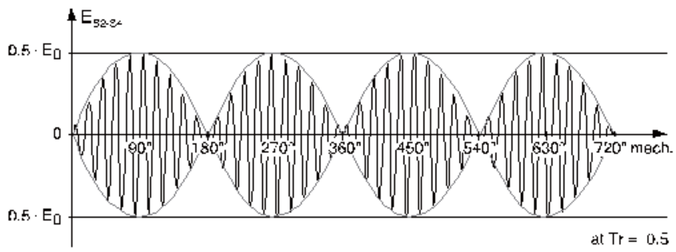
Output Signal:

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



Output Signal:

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



Accuracy

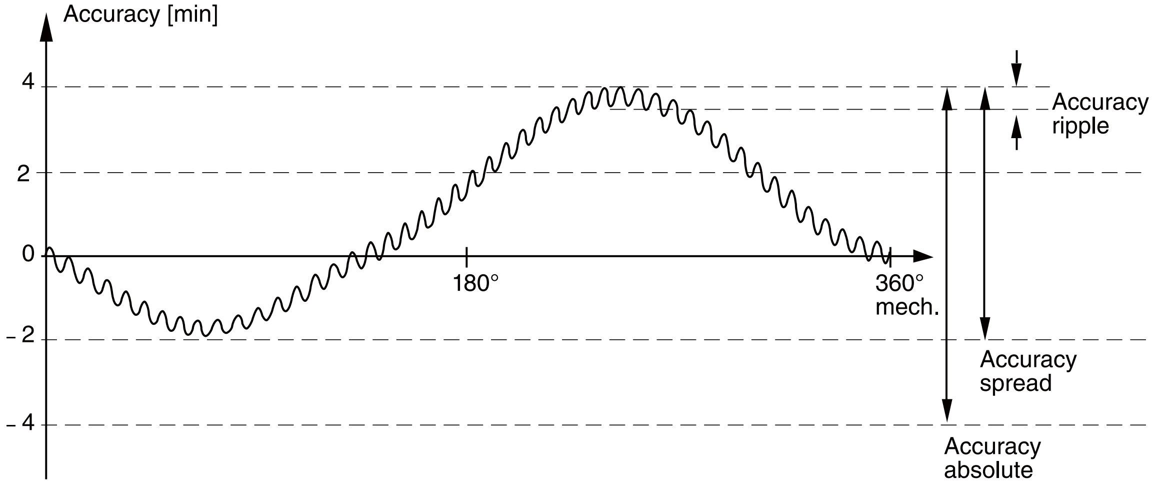
The accuracy ε is defined as the difference between the electrical angle θ_{el}, indicated by the output voltages of the secondary windings, and the mechanical angle or rotor position angle θ_{mech}.

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

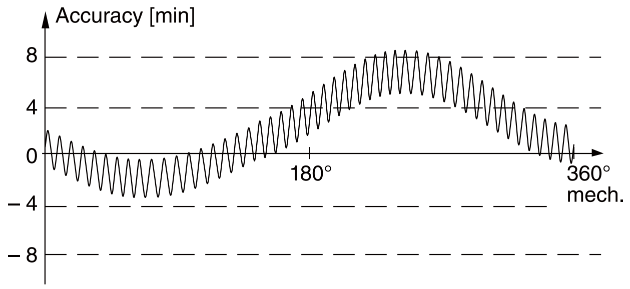
For each our resolver the accuracy is indicated in the data sheet by the terms 'accuracy absolute', 'accuracy spread' and 'accuracy ripple'.

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.

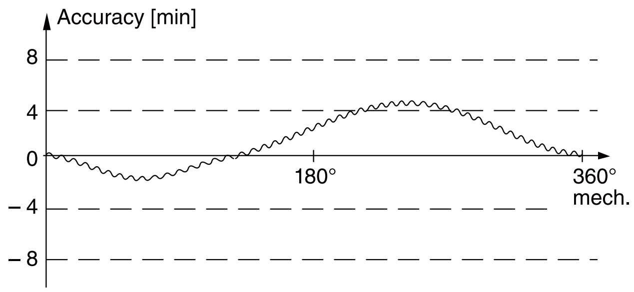
At low speeds the **'accuracy ripple'** effects the speed stability of a drive. This ripple is caused by 3rd and higher order harmonics. To ensure smooth drive performance even at low speeds our resolvers have an accuracy ripple of <u>less than 1</u>'. It is achieved by a special procedure of stepping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



Straight lamination assembly:

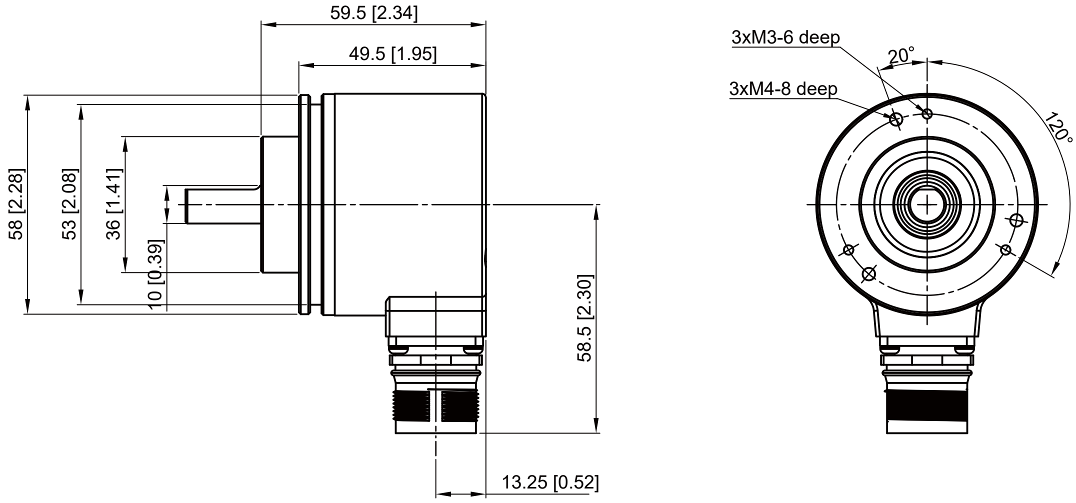


Stepped lamination assembly:

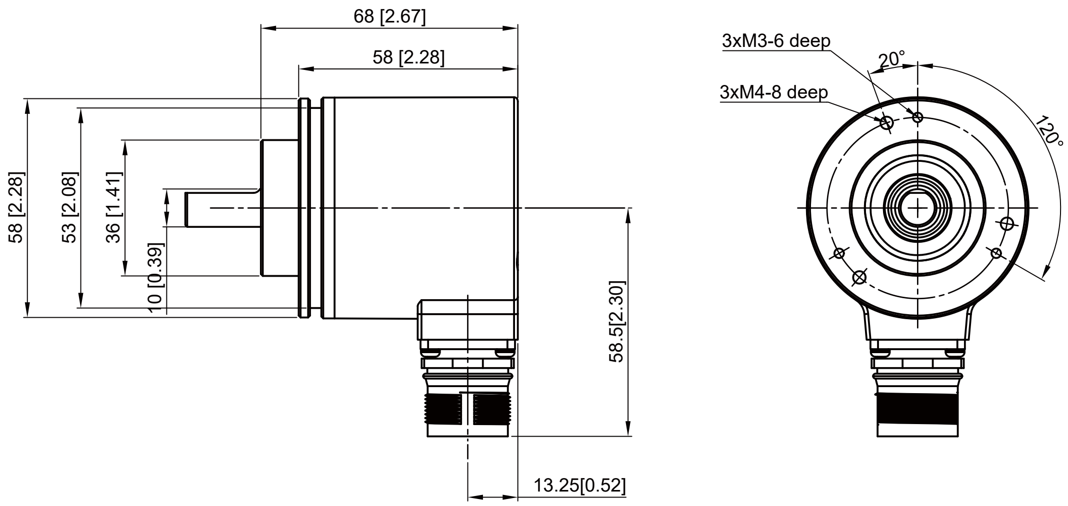


Dimensions

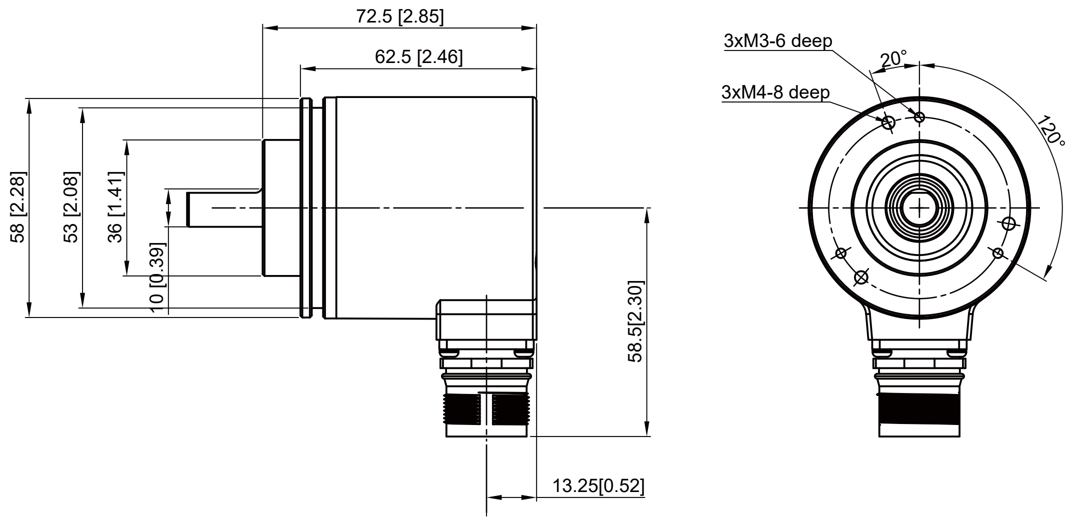
Only Resolver



Resolver and Incremental encoder



Resolver and Absolute encoder



HEIN LANZ®

Order Code

R1-15NN-X X X X- X X X X

Type ⓘ ⓙ ⓐ ⓑ ⓒ ⓓ ⓔ ⓕ ⓖ ⓗ

ⓐ Flange
1 = Clamping flange, IP65
2 = Clamping flange, IP67
3 = Synchronous flange, IP65
4 = Synchronous flange, IP67

ⓑ Shaft
5 = ø10 x 20 mm
6 = ø12 x 20 mm

ⓒ Input Voltage
1 = 5 V rms
2 = 7 V rms

ⓓ Pole Pairs
1 = 1 Pole Pairs
3 = 3 Pole Pairs
4 = 4 Pole Pairs

ⓔ Transformation Ratio
1 = 0.5
2 = 1

ⓕ Input Frequency
1 = 1 KHz
2 = 4.5 KHz
3 = 5 KHz
4 = 10 KHz

ⓖ with Interface / Power supply*
1 = Only resolver
2 = Rresolver with SSI (Gray 24bit)/ 5 ... 30 VDC
3 = Rresolver with SSI (Binary 24bit)/ 5 ... 30 VDC
4 = Rresolver with SSI (Gray 25bit)/ 5 ... 30 VDC
5 = Rresolver with SSI (Binary 25bit)/ 5 ... 30 VDC
6 = Rresolver with RS422 1024ppr
(with incremental Z channel)
7 = Rresolver with HTL 1024ppr
(with incremental Z channel)

ⓗ Connection
7 = Radial M23 12-pin connector
9 = Radial M23 16-pin connector

ⓘ Type
N = Without housed and bearing
B = Housed bearing-type

ⓙ Type
N = Industrial type
S = Stainless steel

* If the incremental output part requires other resolution products, please call us.

The selection guide and the mounting dimensions contain a sample of housed bearing-type resolvers designed and manufactured by us. 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 future requirements with an innovative, cost effective solution.

Resolvers are also designed and manufactured by us, but not subject to this data sheet. Please contact us for further information.