Harowe

Ultra Performance Feedback

Inductive resolvers are considered more rugged than rotary encoders for use in adverse operating conditions involving extreme temperature (up to 220‘C), high shock, vibration or dirty environments. Shielded, spaced support bearings found in our resolvers provide up to 10x the life of duplex bearings. Tooth-wound models cut electrical error 50% and brushless resolver models eliminate components that can limit life. Available in housed and frameless varieties.

Housed-Brushless Resolvers Our brushless construction uses a rotary transformer to pass the reference signal to the rotor. This design eliminates the normal brushslip ring sliding contact used in conventional resolvers. Since the brush and slip ring are life limiting components and can be a source of noise in harsh environments, the transformer coupled units enhance reliability and performance.

Industrial Frameless Resolvers Our brushless resolvers are the ideal position feedback transducer for brushless motors, robots and direct drive motors in precision rotary platforms and similar servo applications. They are rugged, reliable, provide absolute position information and are able to operate at 155‘C and are impervious to most particulate and liquid process contaminants.

The industry standard Size 11 resolver series has its own precision bearing system, making it ideal for coupling mounting. Its brushless construction uses a rotary transformer to pass the reference signal to the rotor -eliminating components that can limit life and cause noise. Series 11 has excellent angular accuracy and repeatability. Alternatively, the R11 shaft accepts pinions or pulleys for use in rack and pinion or cable measuring systems. Series 11 resolvers are rated up to 155’C for high temperature applications.

Harowe R25 Heavy Duty resolvers are designed for reliability in adverse operating conditions. Brushless resolvers are the better choice over encoders for applications that involve very high temperature, vibration and shock and

dirty environments. Unlike similar duplex-bearing packages, the R25 resolver uses a front-and-rear bearing arrangement that provides two to three times the radial load bearing capacity and up to ten tomes the L10 life of a package with duplex bearings. Rated for ruggedness with IP65 protection, 125’C continuous duty, shock resistance to 200g and vibration resistance to 40g.

These Harowe resolver models provide absolute position feedback for brushless motors, robots and direct-drive motors in precision rotary platforms and similar servo applications. This heavy duty frameless resolver series is ruggedized against vibration and shock, able to operate up to 200’C, resistant to noise, and impervious to most industrial contaminants. Options include multiple speeds, radiation hardened, high temperature, flux shielding technology and stainless steel housings.

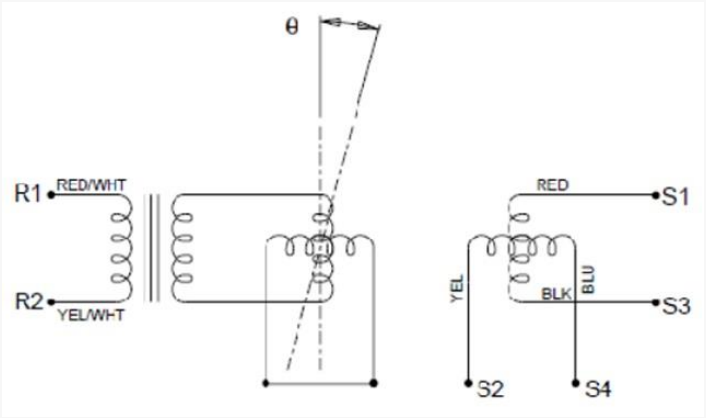
The 700 Series Harowe resolver product line provides maximum accuracy and minimum error for demanding position and velocity applications such as robotics. HaroMax resolver sizes 15 and 21 feature a tooth-wound design that reduces electrical error 50 percent less than that of a standard resolver and incorporates windings that are manufactured and installed completely automatically. The automatic installation provides the least amount of part-to-part variation for the greatest consistency. This set of high end resolver models are able to operate up to 200'C with high shock and vibration resistance.

Technical Information

A **Resolver** is an electromagnetic transducer that can be used be used in a wide variety of position and velocity feedback applications which includes light duty/servo, light industrial or heavy duty applications. Because the **resolver** is an analogue device and the electrical outputs are continuous through one complete mechanical revolution, the theoretical resolution of a single speed **resolver** is infinite. Because of its simple transformer design and lack of any on board electronics, the **resolver** is a much more rugged device than most any other feedback device and is the best choice for those applications where reliable performance is required in those high temperature, high shock and vibration, radiation and contamination environments which makes the resolver the sensible design alternative for shaft angle encoding.

Resolver Design

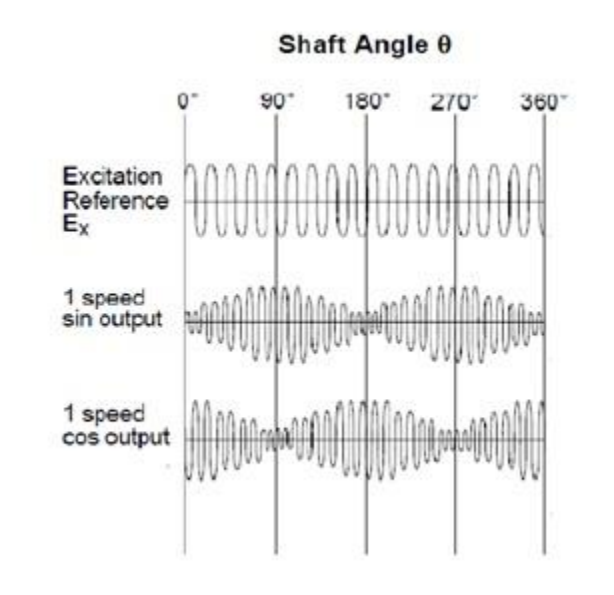
The **resolver** is a special type of rotary transformer that consists of a cylindrical rotor and stator. Both the rotor and the stator are manufactured with multi-slot laminations and two sets of windings. The windings are normally designed and distributed in the slotted lamination with either a constant pitch-variable turn or variable pitch-variable turn pattern. In either case, the winding distribution is in a sinusoidal pattern. The windings for a single speed **resolver** create one complete Sine curve and Cosine curve in one mechanical revolution while the windings for a multi-speed **resolver** create multiple Sine and Cosine curves in one mechanical revolution. While a single speed provides absolute feedback and the multi-speed does not, the multi-speed does provide better accuracy. The number of speeds available is limited by the size of the **resolver**. The two sets of windings are positioned in the laminations at 90 degrees to each other. These are called the Sine and Cosine windings. One set of windings in the rotor are normally shorted internally to improve the accuracy.



How a Resolver Works

Energizing the input phase of the **resolver** with an AC voltage (VAC) induces a voltage into each of the output windings. The **resolver** amplitude modulates the VAC input in proportion to the Sine and the Cosine of the angle of mechanical rotation. The **resolver** is sometimes known as an Analogue Trigonometric Function Generator or a Control Transmitter. The function of the **resolver** is to resolve a vector into its components (Sine and Cosine). Electrical Zero (EZ) is defined as the position of the rotor with respect to the stator at which there is minimum voltage amplitude across the Sine winding

and the maximum voltage amplitude across the Cosine winding when the input winding is excited with the rated voltage. The rotor position or angle is simply the Arc tan of the voltage output of the Sine winding divided by the output of the Cosine winding. This ratio metric format provides an inherent noise reduction feature for any injected noise whose magnitude is approximately equivalent on both windings and also results in a large degree of temperature compensation.



There are 7 functional operating parameters which define the **resolver** operation. These are 1) Accuracy 2) Input Excitation Voltage 3) Input Excitation Frequency 4) Input Current Maximum 5) Transformation Ratio of Output Voltage to the Input Voltage 6) Phase shift of the Output Voltage from the Input Voltage and 7) Null Voltage

Resolver Applications

The simplicity of the **resolver** design makes it reliable in many standard and extreme applications such as servo motors, factory automation, steel and paper mills, oil and gas production, jet engine fuel systems, aircraft flight surface actuators, communication position systems, missile fin actuators and land based military vehicles

Dynapar's most-popular Resolver products:

HaroMax Size 15
HaroMax Size 21
Frameless 10/15/21/31/55 Resolvers
Series 11 Heavy Duty

Please ask for further details, specification and pricing…
INDUSTRIES

Aerospace & Defence

When the military relies on a line of resolvers for proven performance, you know it's a top-of-the-line product. Precise feedback and speed control of their aircraft at all times is imperative to pilots. That's why they trust Harowe brand resolvers to deliver reliable and accurate feedback.

Thrust reversers, throttle valve indicators and starter/generator feedback are just some of the critical mechanical and jet operation applications that Harowe brand resolvers control. They are also used for flap position indicators, fuel control valve indicators, inertial guidance systems and auto-pilot controls. Battling gravity and top speeds, pilots must be confident their resolvers will perform to specification.

Harowe products are designed to meet aerospace and defence requirements, including: high-speed applications (over 30,000RPM), high-temperature environments (up to 200C), high-shock and vibration environments, dual speeds, and tandems for redundancy applications. We can supply COTS, Modified COTS and ITAR solutions.

Recommended Solutions

HaroMax Resolver

Ideal for brushless motors, robots and direct-drive motors in precision rotary platforms and similar servo applications.

R25 Heavy Duty Brushless Resolvers

The better choice over encoders for applications that involve very high temperature, vibration and shock and/or dirty environments.

Size 31 & 55 Frameless Resolvers

Lightweight, compact and provide accurate, absolute position feedback and resistance to high shock, vibration, EMI noise, radiation