

API Delevan® Resolvers

Specifying The Best Resolver For Your Application

To ensure best performance, know your application demands, your system parameters, and your budget before you order.

A resolver is a rugged, analog device that can provide position and velocity feedback for a wide range of demanding applications, from wood processing to semiconductor fabrication, from radiation treatment machines to steel mills (see figure 1). Based on a simple transformer design that does not require onboard electronics, resolvers perform even when exposed to harsh conditions like extreme temperatures, high shock and vibration, and contamination. Of course, designing a successful product requires matching the resolver to the application. In this white paper, we'll review the key electrical and mechanical characteristics you need to understand to properly specify your resolver and get the best performance and lifetime from your system.

A resolver consists of rotating windings and two fixed core windings that generate an analog (sine and cosine) feedback output (see "API Delevan Resolvers: Understanding the Basics"). The ratio of these two signals is processed to determine absolute position. Because a single-speed resolver is an analog device and the electrical outputs are continuous through one complete mechanical revolution, resolvers deliver position feedback with infinite theoretical resolution.

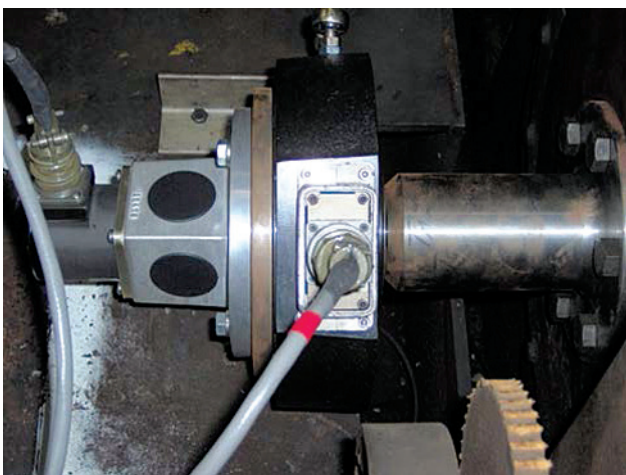
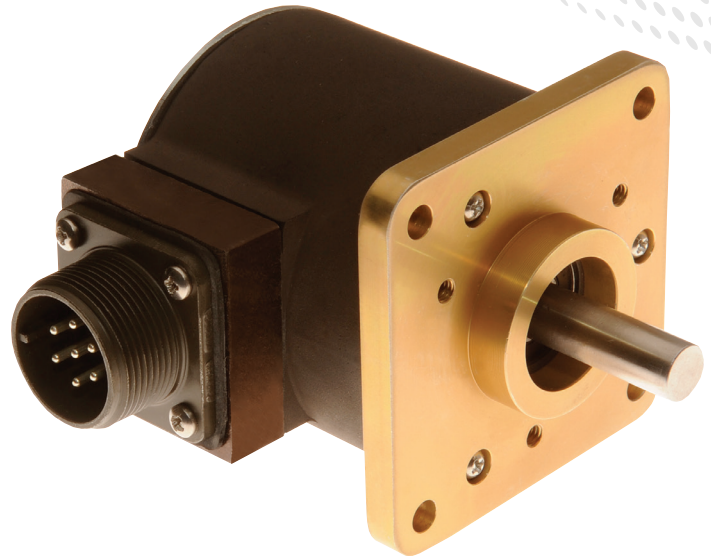


Figure 1

Designed to operate without vulnerable electronics, resolvers like this R25 housed resolver (left) provide high-resolution, robust feedback solutions in demanding environments like steel mills.



When it comes to choosing a resolver to fit your system, you need to consider electrical characteristics and mechanical characteristics. Some of the specifications of the resolver are driven by the needs of the application, while others are defined by the other components of the system. Let's take a closer look.

Electrical Specifications

Seven main functional electrical operating parameters define resolver operation.

Accuracy or Electrical Error

Defined as the difference between the mechanical angular position indicated by the electrical output signals and the true or actual mechanical angular position of the rotor with respect to the stator, usually given in arc minutes. This information can be used to plot an error curve that displays the error (arcmin) versus angular position (degrees) over a full rotation of 360°. There are two ways to specify error: error spread (peak-to-peak error) or maximum deviation from actual value (+/-). Peak-to-peak error is defined as the difference between the highest positive error and the lowest negative error recorded in 360° while the maximum deviation represents the absolute value of the maximum error (see figure 2).

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Figure 3

Resolver mounting options include frameless (upper left), housed flange-mounted (upper right), and housed hub-mounted (lower left). Tethers are added to maintain stability, as in this tethered housed hub-mounted resolver (lower right).

With the frameless resolver, the cost is minimized but the customer must assume the responsibility to correctly mount both the stator assembly and the rotor assembly. The cost is greater for a housed resolver package because the resolver now has its own shaft, bearings, and housing but the installation process for the customer is both faster and easier.

Resolvers deliver high-performance feedback in a rugged package for high-reliability applications in a wide range of harsh-environments. Because the results simply depend on the ratio of output voltages, the devices require no additional on-board electronics that might make them vulnerable to temperature extremes. They don't include detectors, so contamination and age will not degrade their performance. Simple, robust, and effective, resolvers play an essential role in systems ranging from missile-fin adjusters to centrifuges. Whether you're working with temperatures as high as 200°C, high radiation environments, or high shock and vibration loads, a resolver can deliver the resolution and long-lasting performance you need.

What to know before you call

1. What kind of accuracy do you need?
2. What are your operating conditions (temperature, contamination, vibration, etc.)?
3. What input voltage and frequency does your system present to the resolver?
4. What is your desired transformation ratio?
5. What is your system requirement for phase shift?
6. What is your maximum allowable input current?
7. How long are your cable runs?
8. What is the shaft diameter?
9. Should the resolver be housed or frameless?

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270 Quaker Road, East Aurora, NY 14052 • Phone: 716-652-3600 • Fax: 716-652-4814
Email: Resolver@delevan.com • www.delevan.com