

## ASK THE ENGINEER

Rotary Variable Differential Transformer (RVDT)



Rotary Variable Differential Transformers (RVDTs) are electromechanical transducers that provide measurement of angular displacement and offer reliable and repeatable position sensing for a range of applications.

LISK's field proven RVDT products are designed to meet the demands of new and legacy fly by wire systems ensuring ease of integration and outstanding performance.

Below, Fred O'Neal, RVDT Engineering Manager shares his insights on Rotary Variable Differential Transformers and the benefit they can have on fly by wire systems.

**Q:** How do RVDTs differ from other rotary position sensing technology like resolvers or potentiometers?

**A:** RVDTs actually have several things in common with other rotary sensor technologies but vary from each of them in different ways. For example a potentiometer is not internally frictionless so it wears out much faster than an RVDT. Hall effect sensors rely on solid state components and electronics so they are not as robust for extreme temperature, vibration, or corrosive environments. Resolvers have more internal magnet wire windings and magnet wire leads that need to be managed during construction so they have a lower reliability than RVDTs. Each of these sensors have pros and cons, but if an RVDT can be utilized you will be integrating a sensor that can be the most durable and reliable in extreme environments for many years.

**Q:** How do RVDTs perform in challenging applications when compared to other types of rotary

position sensing devices?

**A:** RVDTs have a very predictable output signal and reliability when exposed to different stresses. Since they are analog devices, they are simple and repeatable with very little change in electrical performance over their life.

**Q:** How do RVDTs Operate?

**A:** RVDTs require an alternating current input (AC voltage) and they output an AC voltage. The input signal typically ranges from 6 to 10 volts, 1000 to 5000 Hz. The RVDT has a rotating shaft that engages with your system and is highly tailorable. The module (or body) of the RVDT itself engages with the non-rotating component of the system and can again be tailored to mount in several ways depending on your need. The RVDT rotor shaft and body module are already integrated together – so we've taken care of all of the alignment, bearings,

and assembly that enable the RVDT's accurate and repeatable performance. The output voltages from each secondary coil are typically demodulated ratiometrically to units of gain, so the signal is more usable over a range of temperatures.

**Q: What are the benefits of utilizing RVDTs?**

**A:** RVDTs have a long history in the aerospace domain. Because of this, there are many lessons learned in the construction and application of the devices. These lessons learned facilitate a scenario where RVDTs constructed and utilized today have a known reliability, a known capability in different environments, an ease of integration with the system components in a fly by wire application, and a known mechanical envelope for simple integration with mechanical and electrical system components.

**Q: What sizes of RVDTs are commonly utilized?**

**A:** The most common size of an lk RVDT is called size 8. An RVDT has a cylindrical, steel envelope that has an approximate diameter of 0.8". The length of the RVDT body that extends away from the input shaft is

predictably either 0.755", 0.955", or 1.355" depending on the input signal frequency. This industry acceptance of standard hardware envelope allows manufacturers and system/component integrators to remove a majority of the technical and program risk.

**Q: What are the typical applications for RVDTs?**

**A:** RVDTs are most commonly found in aerospace and defense applications due to their robustness during exposure to extreme environments. In aerospace, RVDTs can be found everywhere from the airframe or engine to the benign environment of the flight deck. RVDTs can operate without life limitation from -55°C to +200°C, in random or sinusoidal vibration locations, in corrosive SO<sub>2</sub> environments, rain, deicing fluid, hydraulic fluid, or jet fuel environments. In defense applications the high temperature, high acceleration, or vibrational shock of weapons systems can be well suited.



To learn more about LISK's RVDT product offering visit: [gwlink.com/solutions/sensors/rvdt/](http://gwlink.com/solutions/sensors/rvdt/)

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