

# SENSORS FOR VEHICLE HYDRAULIC STEERING

## LVDT SENSORS KEEP OFF-ROAD VEHICLES ON TRACK



Massive mining truck tires may stand as tall as a two-and-a-half story house, and must support more than 1 million pounds. Moving at top speeds in the 40 mph range, mining trucks win few races, but vastly outperform the handling capabilities of many vehicles on the road today. This precise handling is due to ergonomics that enable better control of the truck's force and movement range required by the driver, flexibility of where controls are located, and use of hydraulics for steering reliability and accuracy.

### Hydraulic Steering in Harsh Environments

Hydraulic technology provides precision control and smooth steering of mining trucks, allowing them to be operated in space-restricted environments where just inches mean the difference between a successful haul, or one resulting in catastrophic results for both the operator and truck. This is where TE Connectivity's (TE) Linear Variable Differential Transformer (LVDT) sensors play a significant role in sensing.

"There are many components to hydraulic steering systems including the steering pump, accumulators, oil cooler, relief valve and hand metering unit," states Dirk Enderlein, TE product manager for position sensors. "TE's LVDT sensor plays an important role in these systems as it monitors the position of a directional control valve, allowing fluid to flow into different paths to turn the wheels. Incorrect operation of this valve can significantly affect steering accuracy."

As the driver steers the truck, the LVDT sensor and the valve to which it is attached experience a sudden rush of hydraulic fluid toward the wheel that is being turned. The sensor consists of an electronic case with a hollow tube inside which the core moves. A solid metal rod is attached to the core with the other end attached to the valve mechanism. As the valve changes position, the metal rod moves in or out resulting in an electrical signal that is linear to the displacement, which in turn corresponds to the movements that the truck operator is making to steer the vehicle.

LVDT technology will accurately monitor the position of the valve to the thickness of one's fingernail regardless of road vibration, shocks from potholes, electromagnetic interference (EMI), temperature extremes, high fluid pressures, or voltage fluctuations in the electrical system. Most importantly, the LVDT offers long-term reliability in hostile applications as its low friction operation translates into higher repeatability and resolution.

LVDT's are just one of many sensor types that TE offers for commercial and off-road vehicles. More common applications include hydraulic pressures, fuel and oil levels, humidity control, seat occupancy, temperature, fluid property, DEF quality, cabin controls and braking. LVDTs are custom made and can have housings of different shapes to fit the application. Scroll down to browse through our LVDT sensors or to learn about TE's sensor solutions for industrial and commercial transportation applications.

## SENSORS FOR VEHICLE HYDRAULIC STEERING LVDT SENSORS



Mining trucks and other heavy duty vehicles use several different types of sensors to monitor and measure various aspects of vehicle functionality. TE offers a broad range of sensors for these different functions.

### [te.com/sensorsolutions](http://te.com/sensorsolutions)

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