

Micro Gauging DVRT[®]

Differential Variable Reluctance Transducer



Introduction

Designed to get into tight spaces, the micro-miniature gauging DVRT[®] delivers high performance in a tiny package. A sapphire bearing and ruby ball guide the spring-loaded tip, providing an exceptionally smooth static & dynamic response.

Features of micro-gauging DVRTs include: micron to sub-micron resolution, linear analog output, flat dynamic response to kHz levels, and very low temperature coefficients. Extremely lightweight, captive cores are tiny yet rugged. Superelastic, corrosion-resistant alloys provide resistance to kinking & permanent deformation, and allow complete submersion of the instrument.

Micro-gauging DVRTs are ideal for applications requiring closely spaced sensing arrays. Sensor arrays of only 5 mm center-to-center spacing can be readily implemented with our clamping collar mounting system. This system also protects the sensor and test items from excess applied force or over-range displacement.

Miniature “plug and play” signal conditioners provide linear DC output when supplied with unregulated DC power. Multi-channel, OEM and digital display systems are also available.

Features & Benefits

- available with sub-micron resolution and long stroke range
- operating temperature to 175 °C
- frequency response up to 20 kHz
- lightweight core will not influence frequency response
- stainless steel and high-performance polymer design suitable for extremely harsh environments
- waterproof, suitable for submersion in corrosive media such as brake fluid and hot saline
- low-friction design suitable for high duty-cycle applications
- easily customized to suit specific application

Applications

- miniature control elements for automotive and robotic systems
- process control for production-line monitoring
- dimensional gauging for quality control applications
- measuring strain and deflection in materials science and civil structures
- linear/angular positioning of optical components
- miniature force, torque, acceleration sensors



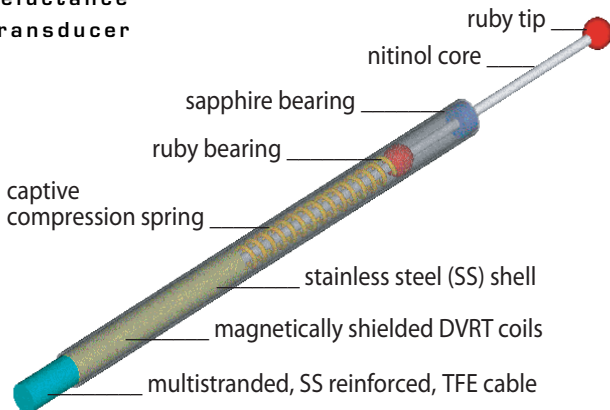


How it works

Core position is detected by measuring the coils' differential reluctance, using a sinewave excitation and synchronous demodulator. This differential detection method provides a very sensitive measure of core position while cancelling out temperature effects.

The transducer's coils & multistranded leads are sealed in vacuum-pumped epoxy within the stainless-steel case. This provides outstanding environmental resistance. The DVRT® has been successfully employed in harsh applications, including immersion in saline and pressurized oil.

Differential Variable Reluctance Transducer



U.S. Patent No. 4,813,435 and Patents Pending

Electrical Specifications

(with MicroStrain DEMOD-DVRT®)

Linear Stroke Lengths	3, 6 & 9 mm (standard version) 1.5 mm (high resolution version)
Accuracy*	± 1.0% using straight line ± 0.1% using polynomial
Sensitivity	2 volts/mm typical
Signal to noise	2000 to 1 (with filter 3 dB down at 800 Hz, standard); 600 to 1 (unfiltered) noise measured peak to peak
Resolution (0.05% of full scale for standard version)	1.5 µm for 3 mm stroke 3.0 µm for 6 mm stroke 4.5 µm for 9 mm stroke 300 nm for high resolution version
Frequency response	7 KHz (unfiltered)
Temperature coefficient	offset 0.0029%/ °C (typical) span 0.030%/ °C (typical)
Hysteresis*	±1 micron
Repeatability*	± 1 micron
Cycle life	fully operational after >20 million cycles to full scale displacement

* at constant temperature

Mechanical Specifications

Overall length	24 mm for 3 mm stroke 40 mm for 6 mm stroke 50 mm for 9 mm stroke 24 mm for high res version
Outside diameter	1.8 mm (smooth body)
Spring stiffness	0.2 Newtons/mm (1 lb/inch)
Bearing materials	sapphire and ruby on stainless steel
Standard core tips	1.5 mm ruby ball, 1.5 mm sapphire cup, sapphire stylus with 60 micron tip radius
Housing material	stainless steel, smooth body, or 8-32/10-32 400 series stainless steel threaded body
Mounting system	clamping collar or threaded body
Sensor spacing	5.0 mm minimum center-to-center with smooth body & clamping collar mounting system
Leadouts	45 cm multistranded, shielded, stainless steel reinforced, teflon insulated
Connector	keyed Lemo 4-pin, polyolefin relief
Operating temperature	-55 to 175 °C
Core weight	30 milligrams, with ruby tip and bearing
Core material	superelastic NiTi alloy



MicroStrain Inc.

310 Hurricane Lane, Unit 4
Williston, VT 05495 USA
www.microstrain.com

ph: 800-449-3878
fax : 802-863-4093
sales@microstrain.com