

## Microminiature Gauging Differential Variable Reluctance Transducer



### Introduction

Designed specifically for tight spaces, the Microminiature Gauging DVRT<sup>®</sup> delivers high performance in a tiny package. A sapphire bearing and ruby ball guide the spring-loaded tip, providing an exceptionally smooth static and dynamic response. The Microminiature Gauging DVRT<sup>®</sup> features 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 and permanent deformation, and allow complete submersion of the instrument.

MicroStrain's desktop consoles and in-line signal conditioners provide the Microminiature Gauging DVRT<sup>®</sup> with plug and play housing, power, analog output, LCD display, RS-232 output and software.

A range of modular positioning attachments and custom strokes 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 with DEMOD-DC
- frequency response up to 8 kHz with DEMOD-DVRT
- lightweight core will not influence frequency response
- stainless steel and high-performance polymer design suitable for extremely harsh environments
- waterproof, suitable for short term submersion in corrosive media such as brake fluid and hot saline
- frictionless design suitable for high duty-cycle applications
- easily customized to suit specific applications

### Applications

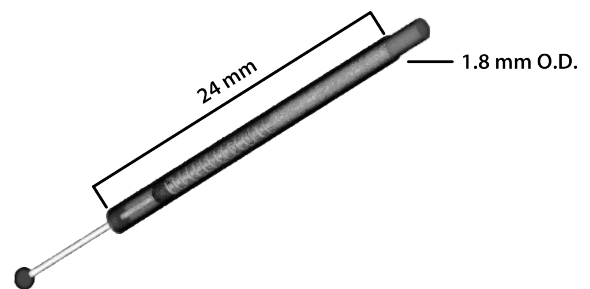
- miniature control elements for automotive and robotic systems
- process control for production-line monitoring
- dimensional gauging for quality control applications
- measuring strain and deflection in materials science and civil structures
- linear/angular positioning of optical components
- miniature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

### Sensor Design

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

The transducers' coils and Teflon<sup>®</sup> cables are sealed in vacuum-pumped epoxy, within the stainless-steel case. This provides outstanding environmental resistance. The DVRT<sup>®</sup> has been successfully employed in harsh applications, including short term immersion in saline and pressurized oil.

Units available for long term immersion, corrosive and high pressure environments can be custom built to meet such requirements



3 mm MG- DVRT<sup>®</sup>



## Electrical Specifications

Obtained using DEMOD-DVRT® and DVRT® with 800 Hz low pass filter at constant temperature

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	DEMOD output/sensor range
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	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	800 Hz standard, 20 kHz optional
Temperature coefficient	offset 0.0029%/ °C (typical) span 0.030%/ °C (typical)
Hysteresis	±1 micron
Repeatability	± 1 micron

## Mechanical Specifications

Overall body 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 on stainless steel
Standard core tips	1.5 mm sapphire ball, 1.5 mm sapphire cup, sapphire stylus with 60 micron tip radius
Housing material	316 stainless steel, smooth body; or 8-32, 400 series stainless steel threaded body
Attachment method	clamping collar or threaded body
Leadouts	45 cm multistranded, shielded, stainless steel reinforced, Teflon insulated
Connector	keyed Lemo 4-pin, polyolefin relief
Operating temperature	-55 to 175 °C
Core material	superelastic NiTi alloy
Cable diameter	0.036"

Contact us for information on custom designs suitable for immersion, corrosive and high pressure environments.

