Microminiature DVRT®

Differential Variable Reluctance Transducer

Introduction

Ideal for critical linear displacement measurements, the micro-miniature **DVRT®** delivers high performance in a tiny package. Advanced materials and electronics have resulted in a rugged, fast, and sensitive instrument, capable of submersion in aqueous environments.

Features of our micro-miniature **DVRT®**s include micron to sub-micron resolution, linear analog output, flat dynamic response to kHz levels, and very low temperature coefficients. Free-sliding transducer cores are extremely lightweight and utilize flexible, elastic, bio-compatible alloys to provide resistance to kinking and permanent deformation.

A range of stroke lengths and specialized, modular attachments have been developed. Longer stroke lengths provide greater linearity **DVRT®**s with nonlinearity as low as ± 0.15%. This performance, combined with versatility of design allows the micro-miniature **DVRT®** to meet the needs of a wide variety of applications.

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 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 application

Applications

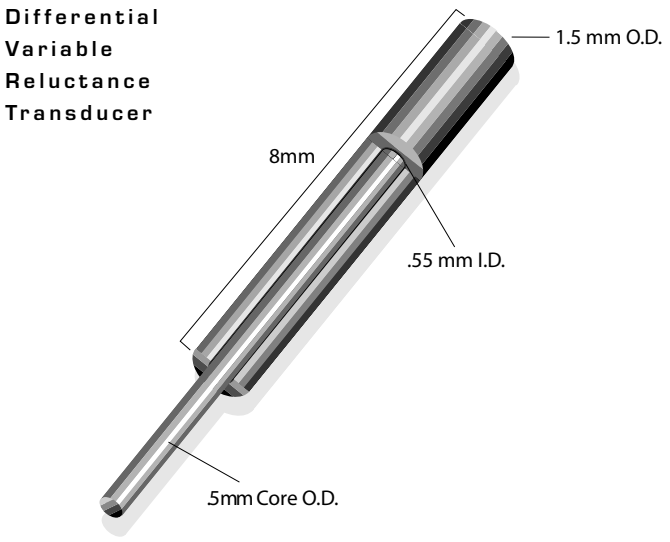
- miniature control elements for automotive and robotic systems
- process control for production-line monitoring
- dimensional gauging for quality control applications
- measuring strain and deflection in materials science and civil structures
- linear/angular positioning of optical components
- miniature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

Microminiature DVRT® Differential Variable Reluctance Transducer

How it works

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 flex circuit leads are sealed in vacuum-pumped epoxy, within the stainless-steel case. This provides outstanding environmental resistance. The micro-miniature **DVRT®** has been successfully employed in harsh applications, including short term immersion in saline and pressurized oil.



Electrical Specifications

(obtained using **MicroStrain®**'s 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)
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

* at constant temperature

Mechanical Specifications

Overall length	11.3 mm for 3 mm stroke 18.7 mm for 6 mm stroke 26.8 mm for 9 mm stroke 11.3 mm for high resolution version
Outside diameter	1.5 mm (standard version) 1.8 mm (high resolution)
Housing material	smooth 316 stainless steel; 4-40, 6-32 & 8-32 400 series stainless steel threaded body options
Attachment method	stainless steel clamp, screws, barbs, threaded body
Leadouts	45 cm, multi stranded, shielded, stainless steel reinforced, Teflon insulated
Connector	keyed Lemo 4-pin with polyolefin strain relief
Operating temperature	-55 to 175 °C
Core weight	3 mm: 0.06 g, 6 mm: 0.07 g, 9 mm: 0.07 g, 1.5 mm: 0.06 g
Core material	0.020" diameter super elastic NiTi alloy, 00-90 threaded optional
Cable diameter	0.036 "

U.S. Patent No. 4,813,435; 5,497,147; 5,777,467

*Units available for long term submersion can be custom built to meet specific application requirements

MicroStrain®

MicroStrain Inc.
459 Hurricane Lane, Suite 102
Williston, VT 05495 USA
www.microstrain.com

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