Non-Contact DVRT®

Differential Variable Reluctance Transducer

Introduction

Ideal for difficult sensing applications, this transducer can measure the displacement & proximity of a metal target without physical contact. The measurement is unaffected by interposed nonmetallic, non-conductive materials, such as polymers and biomaterials.

The stainless shell of the device houses two coils; one for sensing and the other for temperature compensation. The coils and teflon cable are mounted on a stable PEEK substrate. This assembly is potted into the stainless housing using high-grade, vacuum-pumped epoxy and includes integral strain relief.

This packaging allows the sensor to be used in applications requiring long-term immersion in water and saline solutions.

Miniature "plug and play" signal conditioners provide linear DC output when supplied with unregulated DC power. Multichannel, OEM and digital display systems are also available.

Custom ranges are available on request.

Features & Benefits

- available with sub-micron resolution
- operating temperature to 175 °C
- frequency response up to 20 kHz
- 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
- non-contact design suitable for high duty-cycle applications
- easily customized to suit specific application

Applications

- miniature control elements in automotive and robotic systems
- process control for production-line monitoring
- measurement of tissue deformation and implant micromotion in biomedical studies
- materials science, civil engineering: structural deflections, strain extensometry
- optical components: linear/angular positioning
- miniature sensors: force, torque, acceleration

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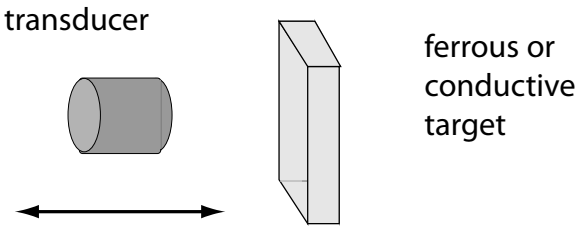
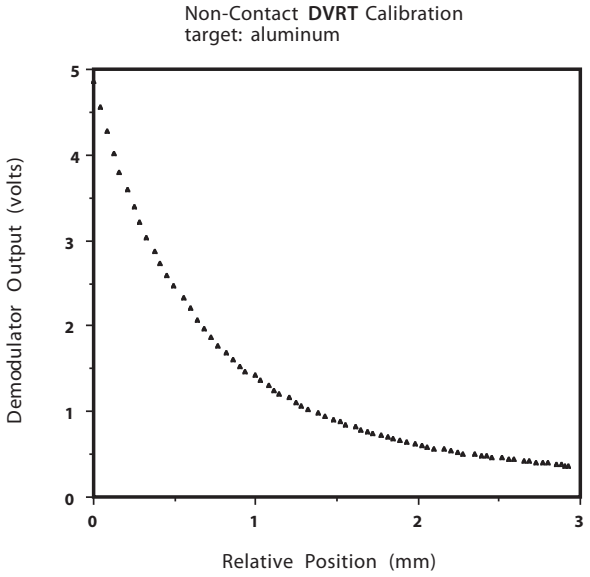
How it works

Two coils within the non-contact **DVRT®**'s housing form its sensing and compensation elements. When the face of the transducer is brought in close proximity to a ferrous or highly conductive material, the reluctance of the sense coil is changed, while the compensation coil acts as a reference.

The coils are driven by a high-frequency sinewave excitation, and their differential reluctance is measured using a sensitive demodulator. Differencing the two coils' outputs provides a sensitive measure of the position signal, while cancelling out variations caused by temperature.

Ferrous targets change the sense coils' reluctance by altering the magnetic circuit's permeability; conductive targets (such as aluminum, see graph) operate by the interaction of eddy currents induced in the target's skin with the field around the sense coil.





Electrical Specifications

(with **MicroStrain®**'s DEMOD-**DVRT®**)

Measurement range NC-DVRT-0.5 NC-DVRT-1.0 NC-DVRT-1.5 NC-DVRT-2.5 NC-DVRT-5.0	 0.5 mm 1.0 mm 1.5 mm 2.5 mm 5.0 mm
Accuracy	±0.2 to ±1 % with polynomial calibration
Nonlinearity	exponential output
Sensitivity	5 volts/mm typical
Signal to noise	Standard - 1000 to 1 with filter 3 dB down at 1 KHz
Resolution	0.1% minimum
Frequency response	800 Hz standard, 20 KHz optional
Temperature coefficient	offset 0.0039%/°C (typical) span 0.016%/°C (typical)
Hysteresis	±2 microns
Repeatability	±2 µm typical (at constant temperature)

Mechanical Specifications

Size NC-**DVRT®**-0.5 NC-**DVRT®**-1.0 NC-**DVRT®**-1.5 NC-**DVRT®**-2.5 NC-**DVRT®**-5.0	diameter x length (thread) 2.84 mm x 8.4 mm (4-40 UNC-2A) 4.83 mm x 19.0 mm (10-32 UNF-2A) 6.35 mm x 19.0 mm (¼-28 UNF-2A) 12.70 mm x 19.0 mm (½-20 UNF 2A) 19.1 mm x 32.0 mm (smooth body)
Housing material	300 series stainless steel
Attachment method	threaded stainless nuts (excluding NC-DVRT-5.0)
Leadouts	45 cm, shielded, teflon insulated, stainless wire reinforced, multistrand conductors
Connector	Lemo 4-pin male with shrink polyolefin covering
Operating temperature	-55 to 175 °C
Cable diameter	0.036" to 0.070"

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

NC-**DVRT®-0.5** is not compatible with **DEMOD-DC®**2.

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

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