TECHNICAL INFORMATION

PREDICTIVE MAINTENANCE SYSTEMS

SENSONICS LTD

Air Gap Transducer System

CS75 Capacitive Sensor – 75 mm measurement range

- 75mm measurement range
- Non contact measurement of static or dynamic surfaces
- Robust sensor arrangement with integral dual coaxial cable
- Driver unit with multiple output options
- Dynamic, Pole Profile and Minimum Gap outputs
- Probe operating temperature range -20 °C to +125 °C

Air Gap monitoring of hydro electric generators is a critical measurement requirement driven by the need to understand the dynamic relationship between the rotor and stator in power generation applications. On large hydro electric plant the rotor to stator air gap can be used to monitor both the eccentricity of the rotor relative to the stator and individual pole to stator air gaps.

Centrifugal and magnetic forces, in addition to changes in temperature, have a direct impact on the eccentricity and hence the efficiency of the generator. Individual pole gap analysis also provides important rotor condition monitoring data which can be utilised to schedule maintenance and extend the life of older plant minimising downtime for inspection and refurbishment. The early detection of rotor / stator rubs allows the generator to be shutdown prior to the onset of permanent damage.

The CS75 air gap sensor from Sensonics is a non-contact dynamic position transducer utilising a capacitive technique to provide an accurate displacement measurement from the sensor face to a metal target. The advantage of the capacitive technique in generator applications is the high immunity to magnetic fields; the CS75 also provides high resolution and relative insensitivity to different (metal) target materials.

The sensor is designed in a robust stripline mechanical arrangement for mounting on the stator wall, the integral coaxial cable is routed over the stator wall or through ventilation holes to the driver which provides the transmission signal for the stripline and receiver detection. A linearised opto-isolated output is provided in both voltage and current format which can be configured to represent various rotor pole measurements with respect to the stator.

DS1256

Air Gap Transducer System

System Performance

Measurement Range:	7.0 mm to 75.0 mm
Linearity: (% of FS)	± 2% up to 60 mm ± 3% between 60 mm and 70 mm Useable up to a range of 80 mm ± 3% variation over operating temperature range
Sensitivity:	125 mV / mm ± 2 % (V) (1.0 V = 7.0 mm, 9.0 V = 71.0mm) 200uA / mm ± 2 % (I) (5.6 mA = 7 mm,18.6 mA = 70 mm
Resolution:	<0.05 mm
Absolute Accuracy:	< ± 3% of Full Scale Range
Interchangability:	The sensor and driver are provided as matched pairs. Maximum interchangability error replacing either probe or driver in calibrated system is ± 3% at 40mm gap.
Available system lengths:	5 m and 10 m
Cable length tolerance Cable Extension (5 m): Cable Extension (10 m):	 5.0 m to 5.2 m 10.0 m to 10.2 m
Frequency Response:	DC to 1 kHz
System Outputs:	Dynamic (Isolated I or V) Pole Profile (Isolated I or V) Minimum Gap (Isolated I or V)
System Warm up time:	20 minutes typically

Probe

Probe dimensions: (L x W x D)	290 mm x 60 mm x 3.2 mm
Probe material:	High Temperature FR4
Cable type:	RG179 75 Ohm Coaxial PTFE Insulation Separate cables for Tx and Rx Polyester monofilament braided outer jacket (+150 °C)
Connector type:	SMC Female Plug
Temperature Drift:	250 ppm / °C
Operating Temp Range:	-20 °C to +125 °C
Storage Temp Range:	-30 °C to +125 °C
Immunity to Magnetic Field:	1.5 Tesla Max.
Weight with 10m cable:	450 grams
Weight with 5m cable:	250 grams

Driver

Dynamic Output:	This represents the measured continuous air gap of the rotor.
Pole profile:	This represents a sampled level of each pole air gap in the rotor removing the dynamic measurement associated with the pole to pole transition.
Min Gap:	This represents the minimum rotor gap with a droop of 5.0 s / V.

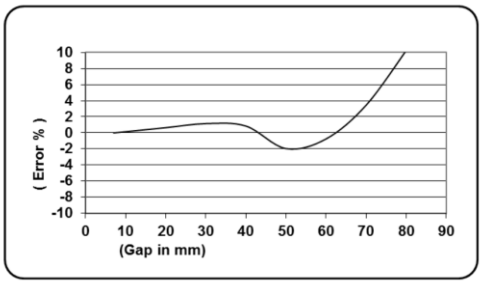
Voltage Outputs

Range:	0.0 to 10.0 Vdc
Output Impedance:	100 Ohms
Minimum Load:	5.0 KOhm
Isolation:	1500 Vrms

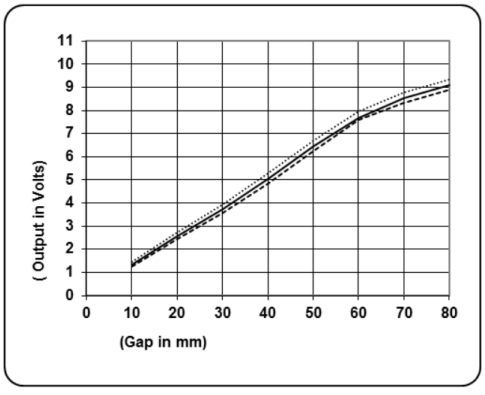
Current Outputs

Range:	4.0 to 20.0 mA
Maximum Load:	500 Ohms
Isolation:	1500 Vrms

Power supply range:	20 Vdc to 28.0 Vdc
Power supply sensitivity:	< 0.3 mV$_{out}$ / V$_{supply}$
Power consumption:	250 mA max +24 Vdc
Mass:	600 grams
Operating Temp Range:	0 °C to +50 °C
Storage Temp Range:	-30 °C to +80 °C

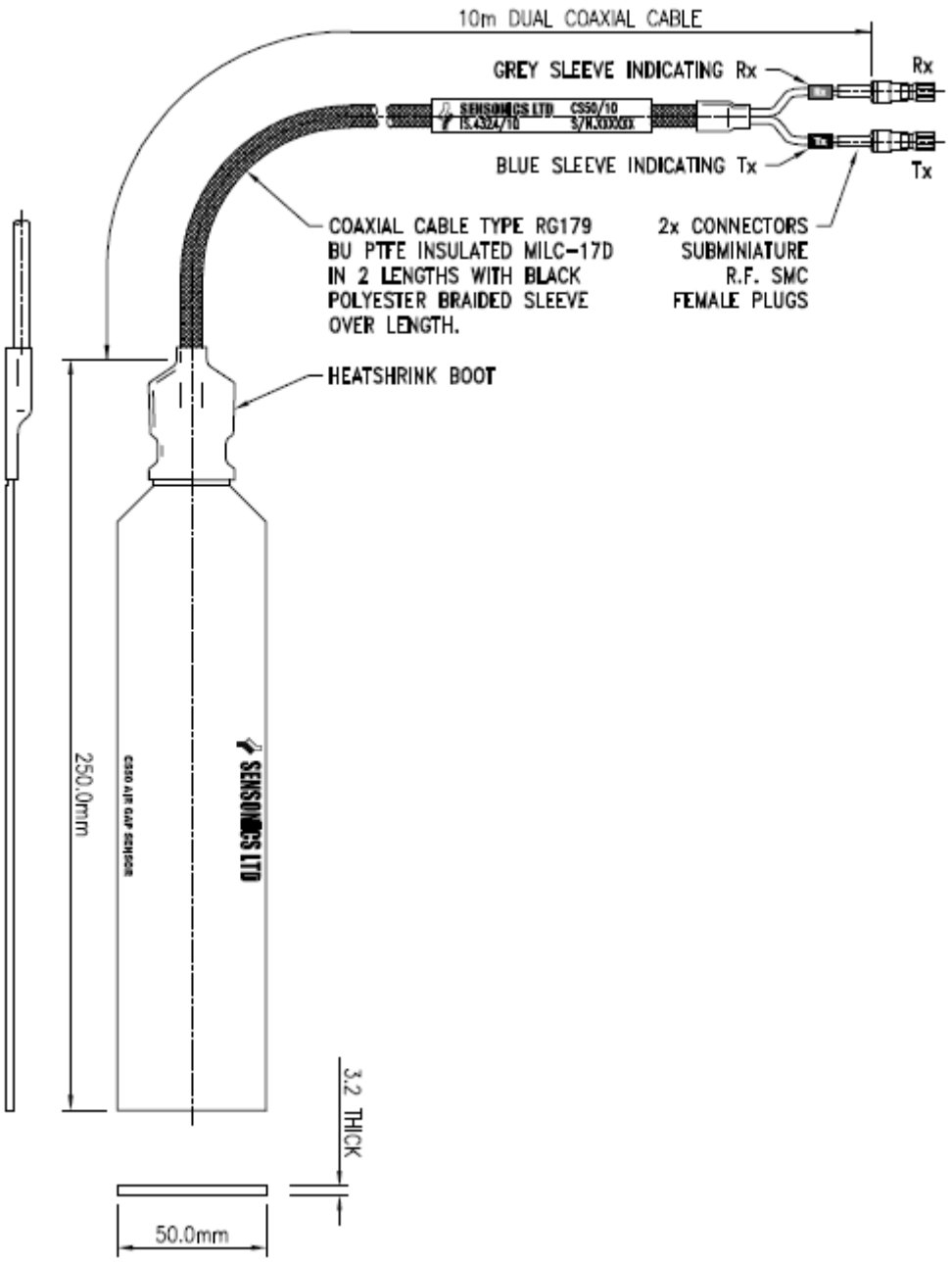


Typical 10m system performance at 25 °C



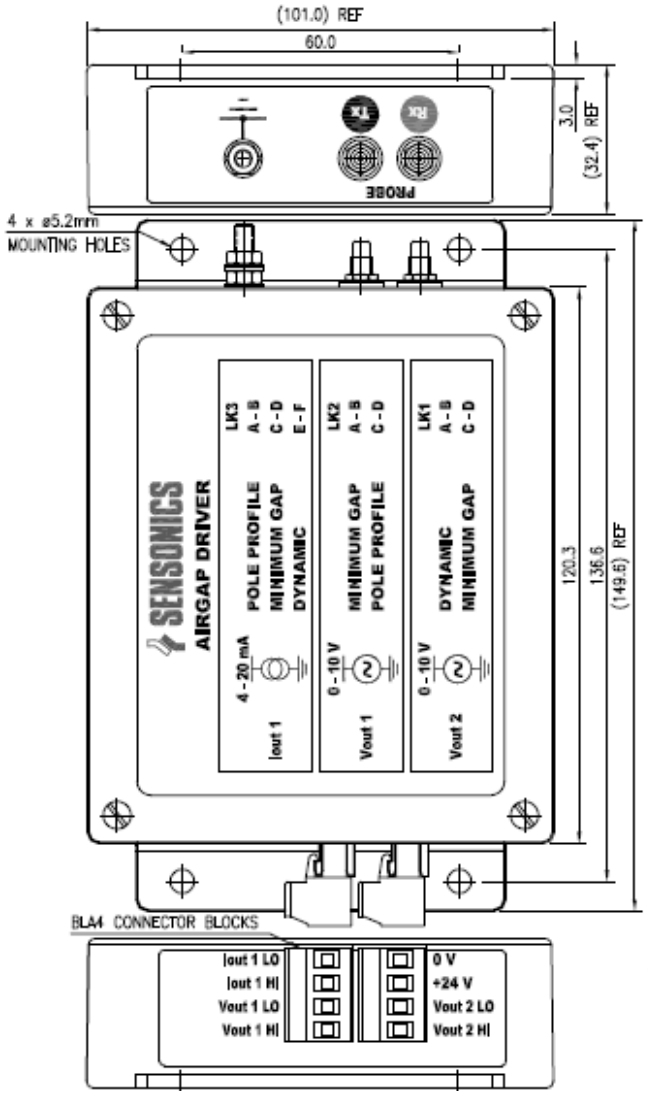
Typical Driver Performance – – – – *0 °C* ····· *25 °C* ——— *50 °C*

Probe Mechanical Configuration



Note:- Performance of the sensor will be significantly affected through contact with liquid.

Driver Mechanical Configuration



Housing is Painted Aluminium. Internally potted and sealed with Silicon compound.

Ordering Information

Sensor CS75/5, Driver CSD75/5 – Air Gap System with 5m interconnecting cable
Sensor CS75/10, Driver CSD75/10 – Air Gap System with 10m interconnecting cable

Sensonics Ltd
Northbridge Road
Berkhamsted
Herts, HP4 1EF
United Kingdom
Tel: +44 (0)1442 876833
Fax: +44 (0)1442 876477
www.sensonics.co.uk