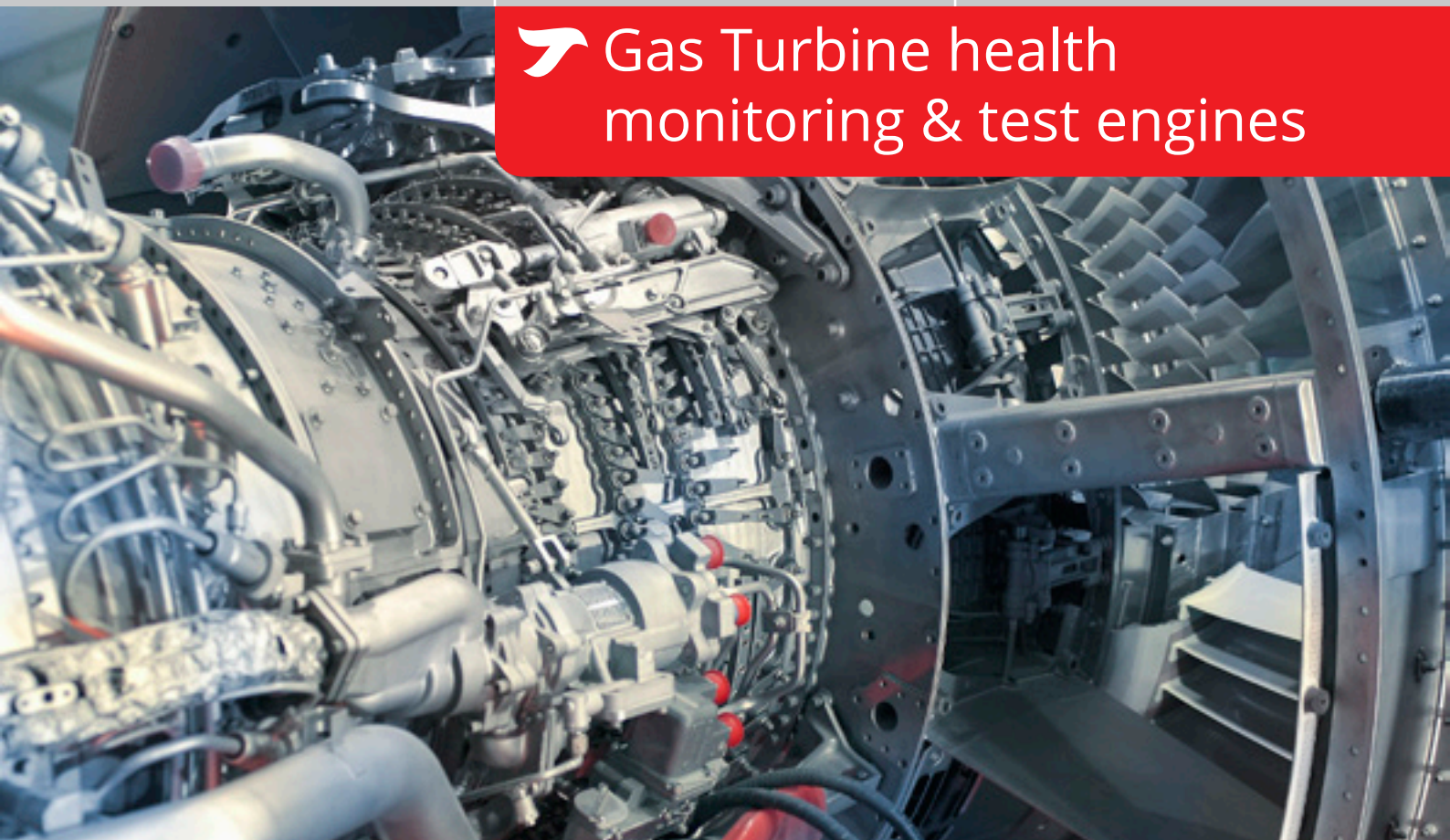


➤ Gas Turbine health monitoring & test engines



THERMOCOAX
TURBOCOAX®

Capacitance sensors for non contact measurement

Capacitive sensors were first developed to measure the clearance between the tip of the blades and the casing of turbo engines.

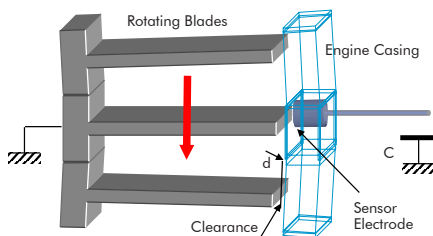
The turbo engine output is directly related to this clearance which must be as small as possible, to give maximum output efficiency, however in no circumstances must the blades touch the engine casing.

Most capacitive sensors applications have been mainly used for measurement in aircraft engines however the same types of measurement apply to industrial gas turbines:

- ▶ Compressor control
- ▶ Turbine control
- ▶ Development measurement
- ▶ Engine monitoring

Clearance measurement

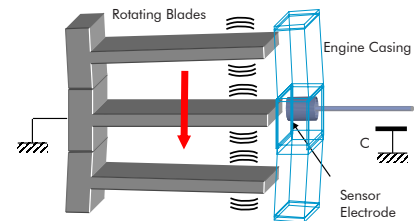
- ▶ Maximize the turbo engine yield which is directly related to this clearance.



$$C = \epsilon * S/d$$

Tip timing

- ▶ Measurement of the blade vibration



Debris Monitoring

- ▶ The capacitance technology allows to monitor the metallic particles ejected from the turbine in the exhaust line
- ▶ Enables to manage the maintenance schedule

Shaft displacement and vibration measurement

- ▶ Typical measurements:
 - Concentricity of the shaft
 - Vibration of the exhaust wall

TURBOCOAX® 1100 triaxial

- ▶ Temperature range: -55°C up to 1000°C nominal
- ▶ Maximum gas temperature : 1 100°C peak
- ▶ Versions : full triaxial or pseudo triaxial
- ▶ Body: Inconel® alloy 600, thread or smooth
- ▶ Triaxial cable:
 - Sheath material: Inconel® alloy 600
 - Insulation: highly compacted magnesia powder
 - Outer diameter: 2 mm and more
- ▶ Pressure: 0.5 to 40 bars
- ▶ Vibrations: <150 G, 10 to 20 KHz
- ▶ Insulation resistance:
 - 1013 MΩ / 250 V at 20°C
 - 10 MΩ / 250 V at 600°C



EFFICIENT MAINTENANCE PROGRAM

	Electrode	Overall dimension	Clearance range*	Mounting
Pseudo triaxial	Ø 4 mm	Ø 6.28 mm	From 0 mm up to 10 mm	Electrode: Kovard alloy Body: Inconel® alloy 600 Mounting: thread or smooth with flange for welding
	Ø 4.5 mm	Ø 6.33 mm		
	Ø 5 mm	Ø 9 mm		
	Ø 8 mm	Ø 14 mm		
Triaxial	Ø 3 mm	Ø 8.2 mm	From 0 mm up to 20 mm	
	Ø 8 mm	Ø 20 mm		
	Ø 17 mm	Ø 22 mm		

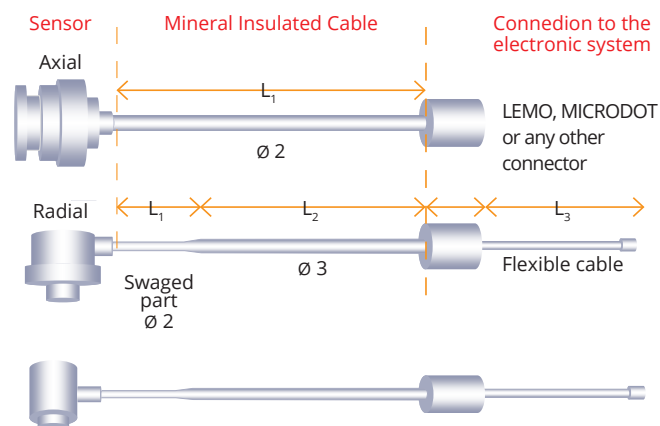
SMALLER THE PROBE, EASIER ITS INTEGRATION

TURBOCOAX[®] 1400 pseudo triaxial

- Temperature range: -55°C up to 1300°C nominal
- Maximum gas temperature : 1 400°C peak
- Version: pseudo triaxial
- Ceramic / Platinum brazing know-how
- Body: Inconel[®] alloy 600, thread or smooth
- Electrode: platinum
- Triaxial cable:
 - Sheath material: Inconel[®] alloy 600
 - Insulation: highly compacted magnesia powder
 - Outer diameter: 2 mm and more
- Pressure: 0.5 to 40 bars
- Vibrations: <150 G, 10 to 20 KHz
- Insulation resistance:
 - 1013 MΩ / 250 V at 20°C
 - 10 MΩ / 250 V at 600°C



Mounting types

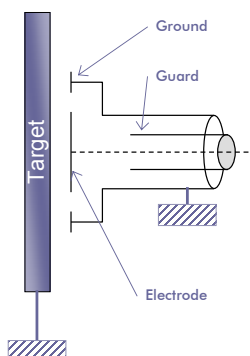


	Electrode	Overall dimension	Clearance range*	Mounting
Pseudo triaxial	Ø 4.25 mm	Ø 10 mm	Up to 4 mm	Smooth with flange to be welded

*depending on the electronic system

Pseudo triaxial

Coaxial sensor with triaxial cable

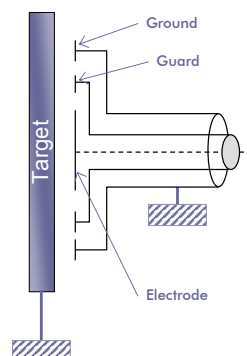


Triaxial

Triaxial sensor with triaxial cable



THERMOCOAX
Triaxial MI cable



	Triaxial	Pseudo triaxial	Coaxial
Static measurement	Excellent	Good at short time	Bad
Dynamic measurement	Excellent	Excellent	Mean
Vibration rejection (cable)	Excellent	Excellent	Mean
Rejection of temperature	High	High	Mean
Cable length effect	Mean	Mean	High



OUR COMPANY

With nearly 60 years of experience in heating solutions and temperature measurement, THERMOCOAX has acquired a great deal of skill and expertise.

THERMOCOAX products are widely used and endorsed in many industries where the highest quality and utmost reliability are essential. All our mineral insulated cables are manufactured in-house with our proprietary and unique procedures.



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