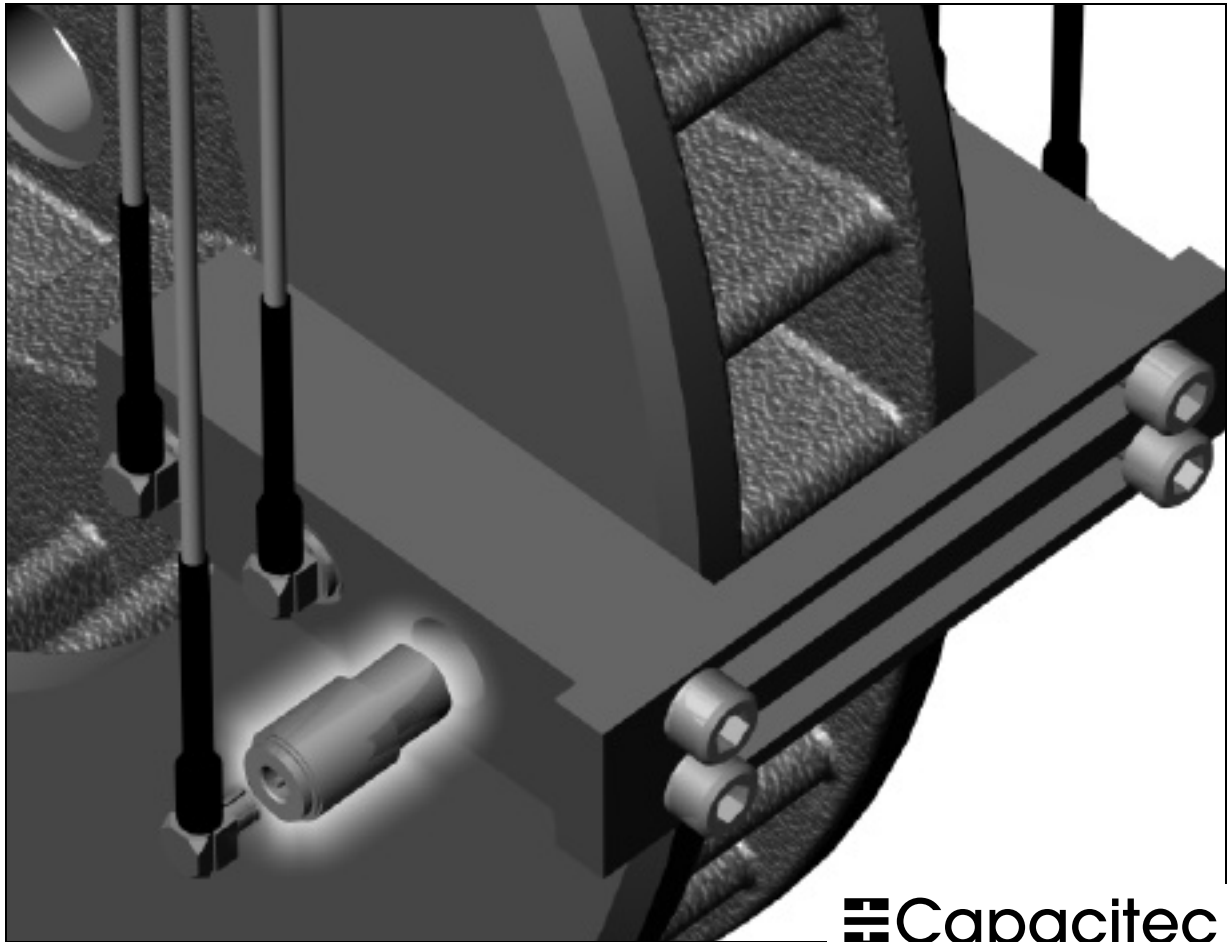


D I S C B R A K E W E A R A N A L Y S I S
S E N S O R S



 Capacitec

OVERVIEW

Disc Brake Wear Analysis Sensors

The increased demand for closer tolerances and rapid prototype designs has forced automotive brake system and testing engineers to look for new ways to verify engineering predictions and/or explain the dynamic physical characteristics of braking system components.

Driven by Automotive Manufacturers, Disc Braking Systems Suppliers and Testing Laboratories in the US, Europe and Asia, Capacitec has developed a new line of specialized non contact capacitive sensors. The new model HPC-150 C-H sensor assembly combines the benefits of small size and high temperature (400°C) operation.

Another major advantage of the new configuration is lower sensor replacement cost. The redesigned sensor surface provides enhanced "impact survivability". In addition, an innovative new integral connector, located behind the sensing surface, allows easy replacement of coaxial extension cables without the added cost of replacing the sensors themselves.

This new sensor system is capable of taking dynamic brake system measurements both on-vehicle at test track facilities as well as in testing laboratories using dynamometers.

By measuring the displacement data on a brake rotor in motion, measurements can be collected and analyzed to show the following characteristics:

- Rotor run-out (TIR)
- Rotor thickness variation (RTV)
- Rotor coning
- Plate-to-plate orientation (V-ing, barreling)
- Wobble
- Thermal expansion

Dynamic On-Vehicle or In Lab Analysis Profiles

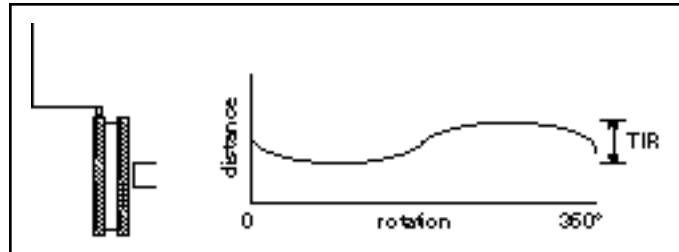


FIG. 1 - A single probe is mounted parallel to the rotor rubbing surface.

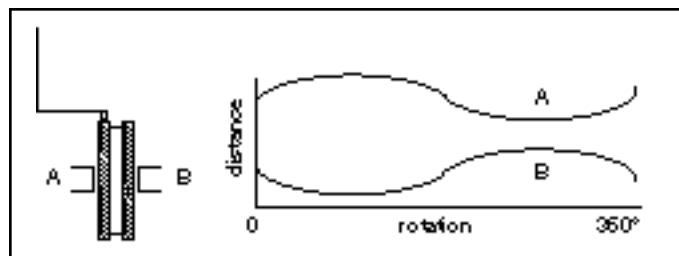


FIG. 2 - Mounting the probes opposite to one another will output the TIR on both sides of the rotor.

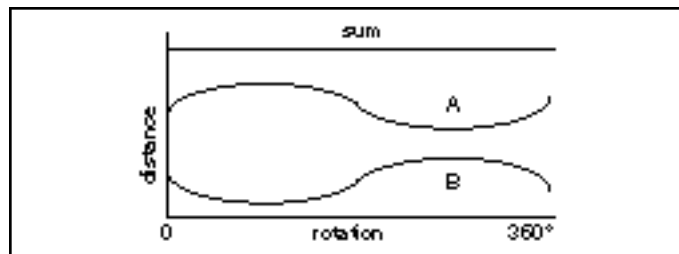


FIG. 3 - The sum of the two outputs (A-B) will be a constant value if there are no variations in the rotor thickness.

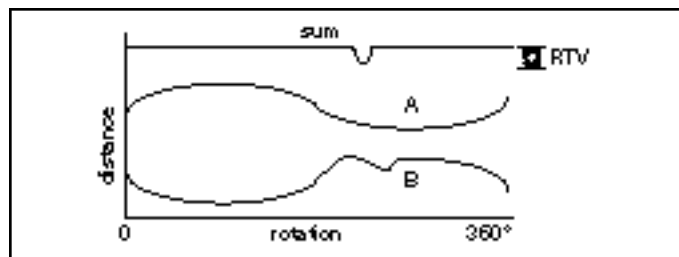


FIG.4 - If there is a variation in the rotor thickness, there will be a corresponding change in the summed constant value output.



FEATURES/BENEFITS

- High Temperature operation to 400°C at the sensor face
- Rugged small sized sensors with integral connectors
- Small sensor diameter (OD 9.5mm) for large stand off (up to 2mm) or high sensitivity
- Replaceable coaxial extension cable
- Easy to process DC voltage output
- Modular, multichannel electronics
- AC power for labs/DC power for on-vehicle test

PROBE ORDERING FORMAT

HPX

Shape

C: Cylindrical
B: Button
T: Threaded

-XXX

Sensor Diameter

Thousandths"
(.0254)

X

Probe Length

A: 0.500" (12.7)
B: 0.625" (15.9)
C: 0.750" (19.1)
D: 0.875" (22.2)
E: 1.000" (25.4)
F: 1.250" (31.7)
G: 1.500" (38.1)
H: 1.750" (44.5)
I: 2.000" (50.8)

-X

Operating Temperature

A: 32 to 300°F
(0 to 150°C)
E: -100 to 400°F
(-73 to 205°C)
H: -100 to 750°F
(-73 to 400°C)
V: -100 to 1600°F
(-73 to 871°C)

-XX

Cable Type

L2: .093 (2.4)
L3: .063 (1.6)
I2: .125 (3.2)
N: .125 (3.2)
ND: .165 (4.2)
T: .063 (1.6)

-XX

Cable Length

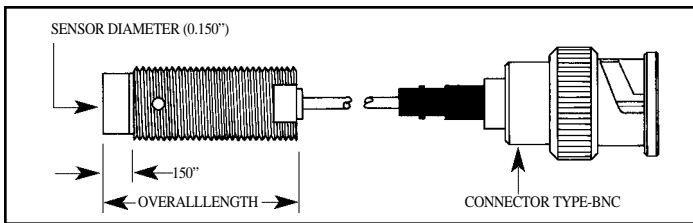
In feet
(about 0.3m)

-X

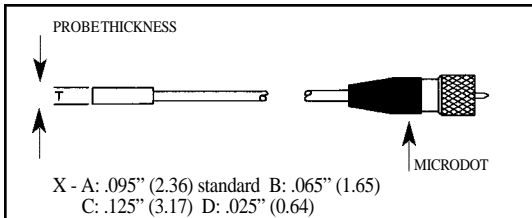
Connector Type

M: 10-32
Microdot
B: BNC
FX:MCX
Female
MX:MCX
Male

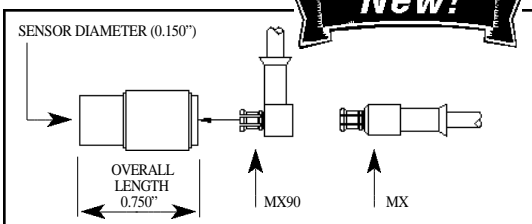
EXAMPLE (1) : HPT-150E



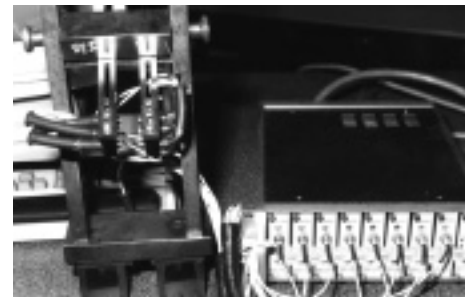
EXAMPLE (2) : HPB-150X-V



EXAMPLE (3) : HPC-150C-H-FX



Capacitec 4000 Series Electronic Racks



Typical 8 channel connection to rotor sensors.

SPECIFICATIONS & PROBE ORDERING NOTES

DIMENSIONS: All dimensions are shown as typical only. Please contact the factory for exact dimensions.

MAXIMUM RANGE: Same as the diameter of the sensor element. (Minimum range is touch or 0.1% of full scale.)

LINEAR RANGE: Two thirds (0.67) times the sensor diameter typical.

PROBE INTERCHANGEABILITY: ±10% of full scale maximum change, ±2% typical.

PROBE MATERIAL COMPOSITION: A, E and H, stainless 303; V, Inconel 600, other materials available.

CALIBRATIONS: There are 21 numbered, standard calibrations available, please consult factory and specify when ordering.

RANGE: •Standard listed ranges are ratios from 0-10.000VDC analog output, but each probe may be calibrated with several range versus sensitivity calibrations. Calibration sensitivity from 0.001VDC/0.001"(0.0254mm) to 10.000VDC/0.001"(0.0254mm) are available.

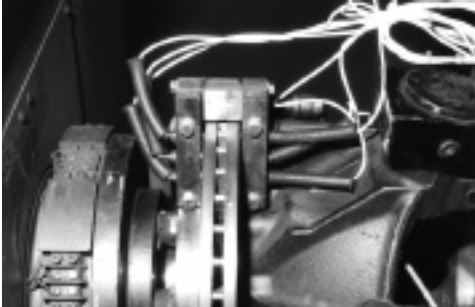
•Range is defined as from touch to full scale reading, ±50% of range = ±10.000VDC calibration optional.

GROUNDING: "-D" dip coatings are available (for A & E series only) to prevent the electronically driven sensor/guard elements from being accidentally earth grounded and shorted.

EXTENSION CABLES: Many extension cables are available (eg:EC-CMX90-L2-10 typical for HPC-150C-H-FX series probe) depending upon connector types. Consult factory for proper part numbers. Standard example: EC-D-L2-5 is a standard 5 foot extension cable with female BNC

APPLICATIONS

Laboratory testing on dynamometers



Capacitive probes mounted in a holder used to measure characteristics of a brake rotor while running on a dynamometer.



Close-up of probe holder, showing adjustable fixture used to adapt to different rotor sizes.

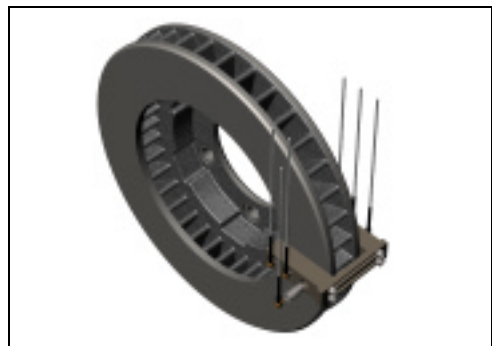


The capacitive probes mounted in a magnetic based fixture, shown with the associated signal conditioning amplifiers.

On-vehicle testing



Capacitive probes mounted in a holder measuring disc brake wear and run out during on-vehicle testing.




Capacitive probes shown with new integral connectors and mounted on disc brake.

Capacitec

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