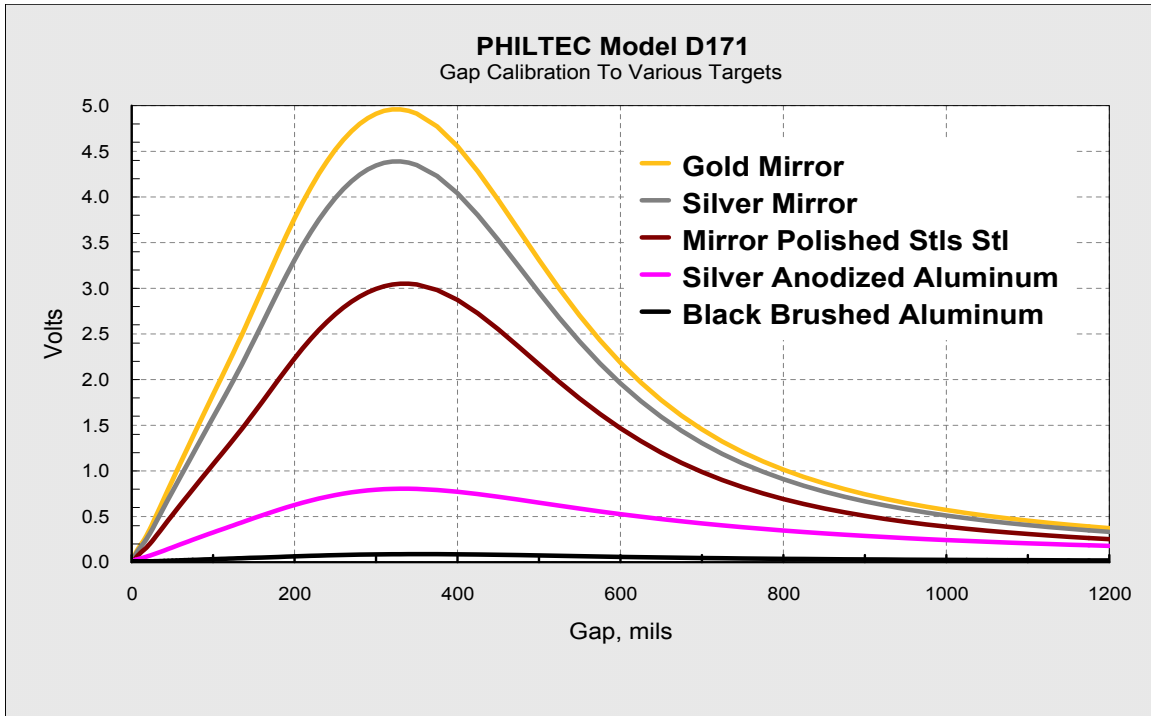# Reflectance Dependent (D) Sensors

With **Type D Reflectance Dependent** fiberoptic sensors**,** the output is proportional to the gap between the sensor tip and target surface **AS WELL AS** the reflectance of the target.


PHILTEC Model D171
Gap Calibration To Various Targets

| TARGET	% REFLECTANCE
Gold Mirror	100
Mirror Polished Aluminum	85 - 90
Mirror Polished Stls Steel	60 - 70
Brushed Aluminum	40 - 50
Copper Clad PC Board	45
Matte Finish Aluminum	30 - 35
Anodized Aluminum	20 - 25
Silver Paint, Glossy	15 - 20
Inkjet Paper, Bright White	8
Fiberglass, Glossy	7
Black Plastic, Glossy	6
Black Matte Finish	3
Flat Black Rubber	1

REFLECTANCE DEPENDENCE

The effect of changing target reflectance is to shift the output voltage higher or lower. With Philtec's D model sensors, a gain adjustment is provided to scale (calibrate) the sensor to the present target surface. This is accomplished by setting the peak voltage level to full scale: 5.0 volts. The factory supplied calibration can then be applied to perform precision linear displacement measurements on most materials. The reflectance of some common materials are shown in this table.

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Fiberoptic Sensors for the Measurement of Distance, Displacement and Vibration
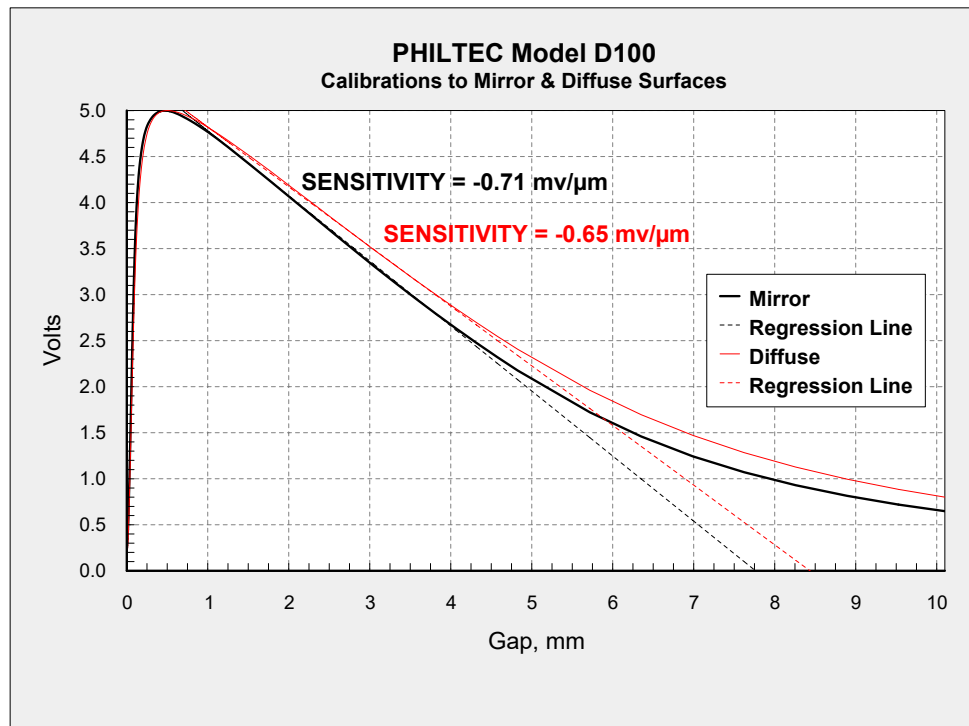
REFLECTIVE NATURE OF THE TARGET SURFACE

Specular Targets...A mirror surface calibration should be used when making measurements to very smooth, highly polished, mirrored, glossy or very shiny; i.e., specular target surfaces.

SPECULAR REFLECTION
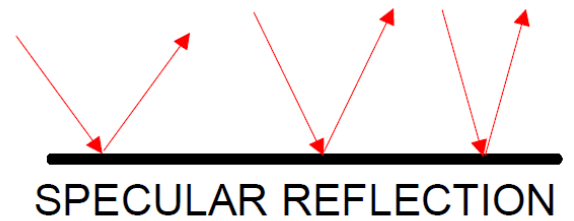
Diffuse Targets... A diffuse surface calibration should be used when making measurements to diffuse surfaces. A diffuse surface looks dull rather than shiny.


DIFFUSE REFLECTION
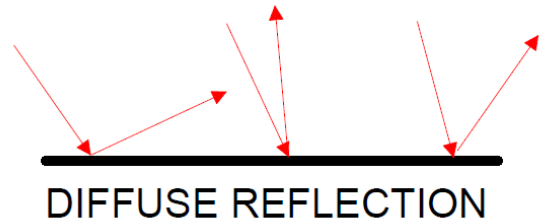
Factory Calibrations... With diffuse surfaces, reflected light rays travel randomly varying path lengths back into the sensor tip, and the sensitivities are 5-10% different than the mirror surface responses. The 5 volt peak setting does not correct for this random scattering of light rays. Therefore, calibrations to both types of targets surfaces are provided....The XY calibration data points are made available upon request.

PHILTEC Model D100
Calibrations to Mirror & Diffuse Surfaces

SENSITIVITY = -0.71 mv/µm

SENSITIVITY = -0.65 mv/µm

Volts

— Mirror
--- Regression Line
— Diffuse
--- Regression Line

Gap, mm

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APPLICATIONS FOR D TYPE SENSORS

Recommended for applications where the target moves parallel to the axis of the sensor...
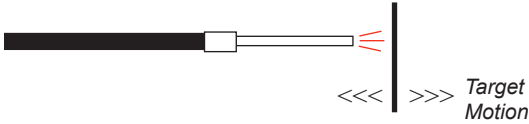
<<< | >>> *Target Motion*

Single Axis Motion

Applications for Philtec's D models are usually limited to targets having a reciprocating or vibratory motion parallel to the axis of the sensor. With that single-axis motion, the target reflectivity remains constant, and accurate distance measurements can be made.

Actuator Stroke **Bearing Vibration** **Diaphragm Deflection** **Displacement In Fluids** **Impact & Shock Studies**	**Parts Positioning** **Piezoelectric Crystal Vibration** **Piston Registration (TDC)** **Piston Stroke** **Read/Write Head Tracking**	**Scratch Detection** **Servo-Control** **Solenoid Travel** **Structural Deformation** **Surface Finish Evaluation**	**Tachometry** **Turbine Blade Vibration** **Ultrasonic Vibration** **Vacuum Process Control** **Valve Dynamics & Stroke**

Speed Sensing Applications (Tachometry)

Standard Machinery

Reflectance Dependent sensors can also be used to measure rotor speeds, turbine blade rate and turbine blade flutter. They generate a fast rising pulse in response to one of two conditions:
a) a sharp change in reflectance (i.e., black to shiny) or

b) the passage of the edge of a part such as a narrow turbine blade.

Micro-Turbomachinery

MEMS Researchers (micro-electromechanical systems) in leading universities use Philtec sensors in their experiments. The smallest model, the D6, has been popular in this field. These sensors have been provided with bandwidths of 1 MHz and higher.

Sensor Tip

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