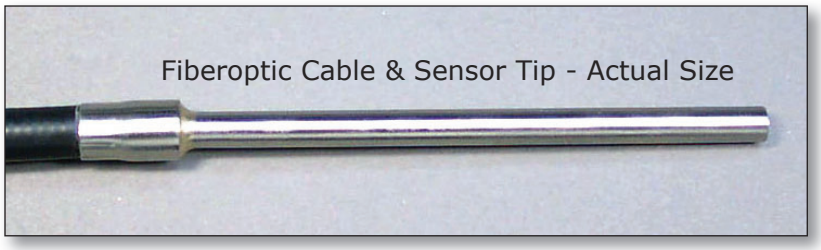
## Fiberoptic Sensor - *Reflectance Dependent**

# Model D169



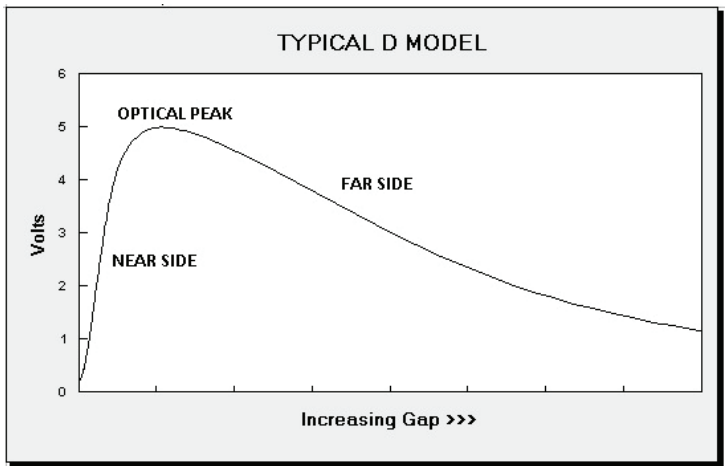




For The Measurement of Distance, Displacement and Vibration of Targets > Ø 4.3 mm

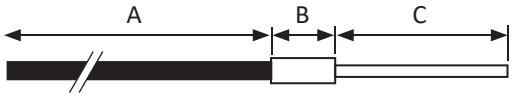
### Features

- Reflectance Dependent Output
- Ambient Light Rejection
- Ø 4.29 mm Target Spot Size (0.169 inch)
- 19 mm Total Operating Range
- 0.4 mv/µm Far Side Sensitivity




The Far Side output function starts at the maximum output voltage referred to as the OPTICAL PEAK. The amplitude of the output is proportional to the reflectivity of the target surface. A factory calibration is provided with the Optical Peak set to 5.000 volts. A gain control is provided for calibration of the sensor output to 5 volts for various target surfaces.

### Tip & Cable Dimensions




| FEATURE | mm | inch |
|---|---|---|
| Tip Outer Diameter, Ø C | 4.75 | 0.187 |
| Fiberoptic Diameter | 4.29 | 0.169 |
| Tip Length, C | 76.2 | 3 |
| Collar Length, B | 15.9 | 0.625 |
| Collar Diameter, Ø B | 7.92 | 0.312 |
| Cable Length, A | 914 | 36 |
| Cable Diameter, Ø A | 6.86 | 0.27 |
| Cable Min. Bend Radius | 25.4 | 1 |

**These are reflective type transducers based upon detecting the intensity of reflected light. The output is proportional to:*

- *distance between the sensor tip and target; and,*
- *the reflectivity of the target surface.*

*D models are commonly used in applications where the target reflectivity stays constant; i.e., the target has a reciprocating or vibratory motion parallel to the axis of the sensor.*

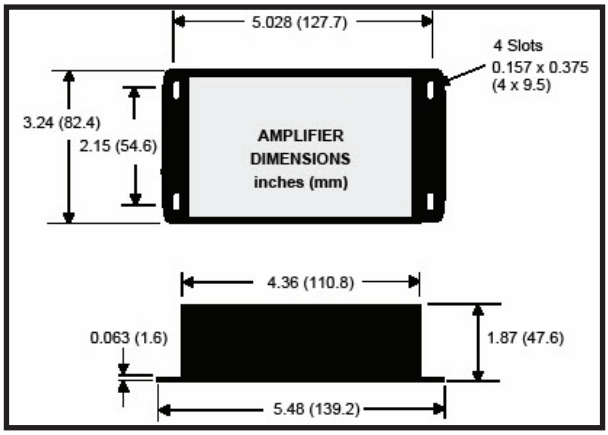
**AMBIENT LIGHT REJECTION**

Incoming light signals are bandpass filtered at a wavelength of 850 ±22 nm.

**Analog sensors** are fast responding units ideal for process control and vibration measurements in dynamic applications:

- DC-20 KHz bandwidth is standard
- DC-200 KHz or higher (up to 2 MHz) is optional
- DC-100 Hz providing best resolution, is optional

Standard single channel units include amplifier and sensor tip with 914 mm long (3 foot) fiberoptic cable, require +12 VDC input power, and provide 0 to +5 volt analog output with DC - 20 KHz bandwidth.




**Standard Enclosure for D Models**

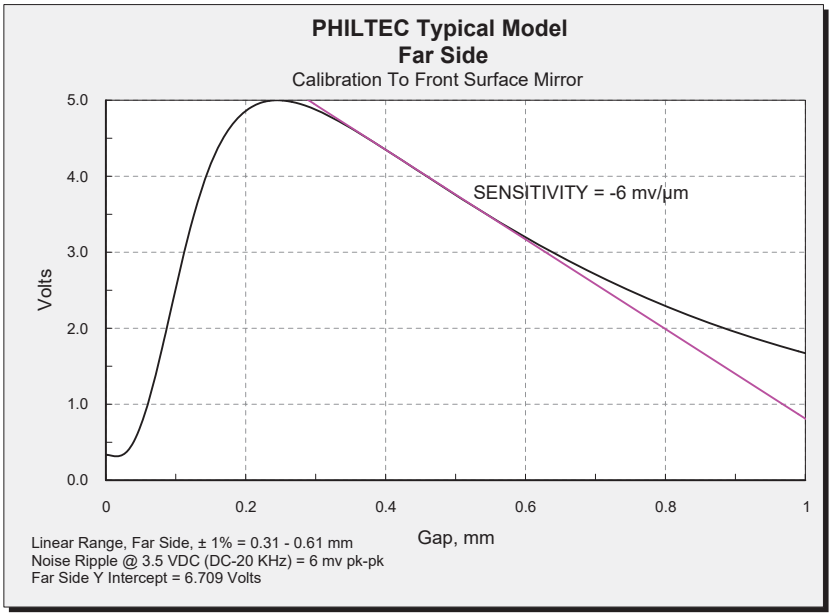
## CONVERTING THE ANALOG OUTPUT TO DISTANCE

A calibration chart is provided with each sensor giving the voltage output response to distance. There are three ways to derive accurate distance measurements:

a) within the bounds of the linear range, convert the change in voltage output as follows:
Distance = Δ milliVolts ÷ Sensitivity = µm

b) over the non-linear range, create a lookup table using the XY calibration data points, or

c) use a polynomial curve fit to accurately map the sensor's output function




## FACTORY CALIBRATIONS

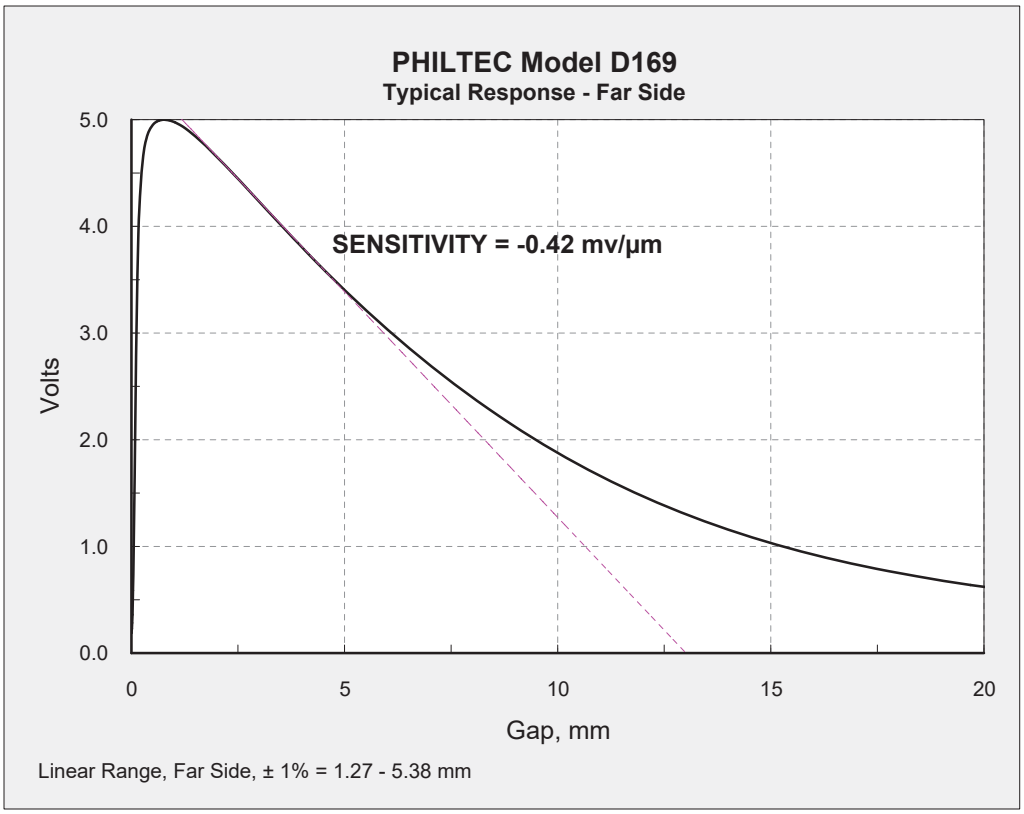
Calibration charts are provided for the Far Side region. A typical factory supplied calibration chart provides:

- Sensor model & serial number
- Date of calibration
- The linear sensing range
- The slope sensitivity
- The y intercept of the linear range
- The AC noise ripple

The XY calibration data points are made available upon request.

## END USER CALIBRATION

The effect of changing target reflectance is to shift the voltage output higher or lower. Factory calibrations have the Peak Voltage set to 5.000 volts. A gain control is provided for calibration of the sensor output to various target surfaces. In-situ calibration is performed simply, by adjusting the sensor's tip-to-target gap until the peak output voltage is attained, and then by using the gain control to set the peak voltage to full scale (5.000 volts). After setting the peak to 5 volts, the factory gap calibration chart applies for the target being measured. This procedure allows the sensor to be used to perform precision linear motion measurements on most materials.




Conversions

1 µm = 39.37 µinch
1 mm = 39.37 mils

1 mil = 0.001 inch
1 mil = 25.4 µm
1 mil = 0.0254 mm

## Standard Specifications - D169 Far Side

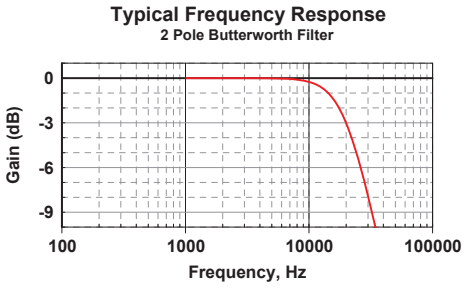
| Electronics | | Fiberoptics | | Analog Output (0-5 Volts) | | |
|---|---|---|---|---|---|---|
| **Light Source** | LED, 850 nm | **Light Beam Spread** | **30°** | **Total Range** | 0.750 in. | 19 mm |
| **Input Voltage** | +12 to +24 VDC | **Tip Material** | 300 Series SS | **Linear Range*** | 0.185 in. | 4.7 mm |
| **Input Current** | 125 ma max | **Tip Epoxy Outgas** | 0.3% @ 200°C<br>2.4% @ 300°C | **Nominal Standoff*** | 0.13 in. | 3.3 mm |
| **Bandwidth** | DC-20 KHz<br>3 db down | **Tip Operating Pressure** | 15 bar | **Nominal Sensitivity*** | 12 mv/mil | 470 mv/mm |
| **Isothermal Drift** | 0.5% | **Tip Operating Temperature** | -55 to 200°C continuous;<br>to 300°C intermittent<br>1-2 hours | **Resolution****<br>**DC - 200 KHz**<br>**DC - 20 KHz**<br>**DC - 100 Hz** | <br>180 µin<br>87 µin<br>43 µin | <br>4 µm<br>2 µm<br>1 µm |
| **Operating Temperature** | **0 to 70°C** | **Cable Operating Temperature** | **10 to 107°C** | | | |
| **Weight** | **0.7 kg - 1.5 lbs.** | **Cable Jacket** | PVC over Steel Monocoil | | | |

NOTES: *Nominal Standoff = the gap (distance) that places the sensor at the middle of the linear operating range.*

* Standard Specifications provide nominal values only. Actual production values may vary by as much as ±15%.

** These specifications represent best case performance where:
the target is flat, smooth and highly reflective,
the sensor is perpendicular to the target,
the sensor is gapped into its linear range,
fiberoptic cable lengths are standard and the cable is not connectorized,
with dull targets, resolution values can be 2x - 3x higher.

*** for best results, sensors have BNC outputs, not bare wire hookup.




**FREQUENCY RESPONSE**

The standard D sensor has a 20 KHz 2-pole butterworth frequency rolloff. With the 3 db down point set at 20 KHz, the output is flat out to approximately 6 KHz.

**PHILTEC, INC., ANNAPOLIS, MD USA 410-757-4404**
**Fax 410-757-8138 e-mail sensors@philtec.com**