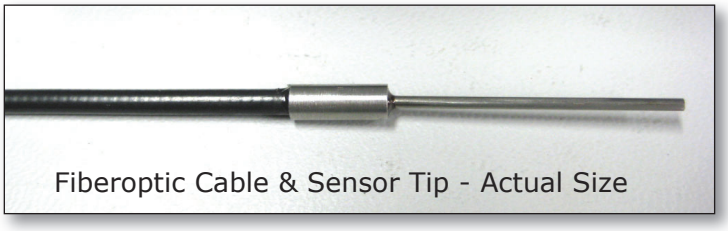
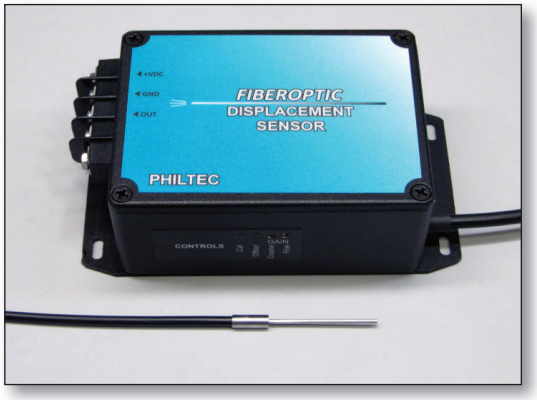
Fiberoptic Sensor - *Reflectance Dependent**

Model D47



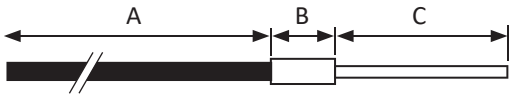


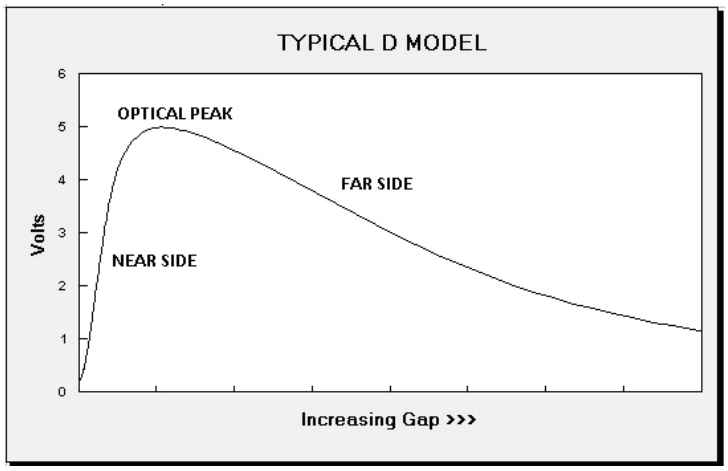
For The Measurement of Distance, Displacement and Vibration of Small Targets > Ø 1.2 mm

Features

- Reflectance Dependent Output with Dual Functions: Far Side/Near Side
- Ø 1.16 mm Target Spot Size (0.047 inch)
- 5 mm Total Operating Range
- 1.6 mv/µm Far Side Sensitivity
- 45 mv/µm Near Side Sensitivity

Tip & Cable Dimensions





FEATURE	mm	inch
Tip Outer Diameter, Ø C	1.61	0.065
Fiberoptic Diameter	1.16	0.047
Tip Length, C	38.1	1.5
Collar Length, B	12.7	0.5
Collar Diameter, Ø B	4.75	0.187
Cable Length, A	914	36
Cable Diameter, Ø A	3.34	0.135
Cable Min. Bend Radius	19	0.75

The output function includes a region of maximum output voltage referred to as the OPTICAL PEAK. The useable operating range of these devices includes linear ranges on both sides of the peak, as well as operation at the peak itself. Operation in the NEAR SIDE region gives high sensitivity with limited operating range. Operation on the FAR SIDE gives moderate sensitivity with greater operating range. Operation at the Optical Peak has zero displacement sensitivity, but is reflectance dependent.

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

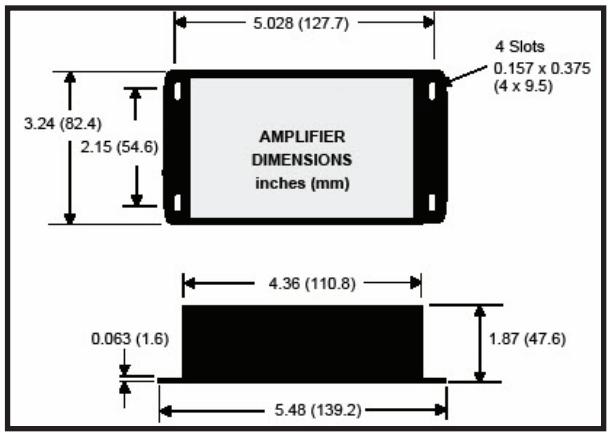
- *distance between the sensor tip and target; and,*
- *the reflectivity of the target surface.*

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.

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

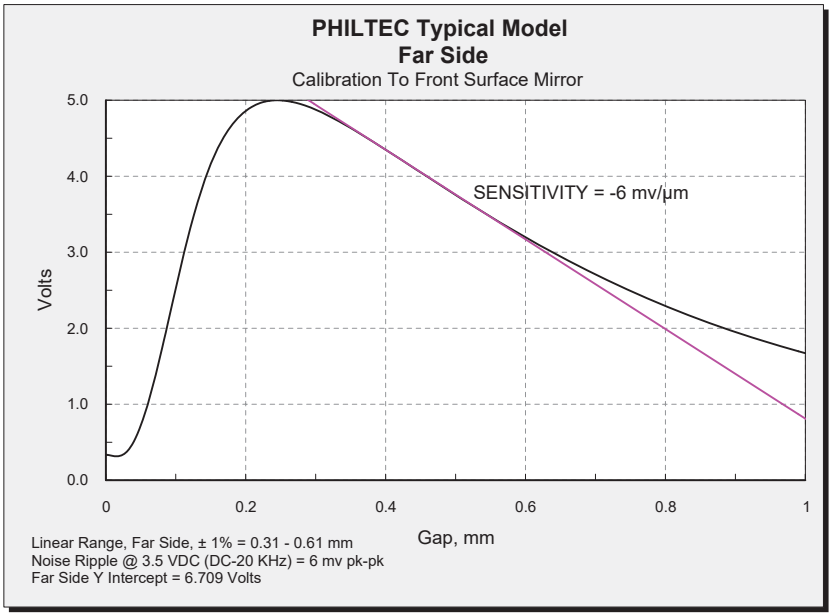
CONVERTING THE ANALOG OUTPUT TO DISTANCE

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

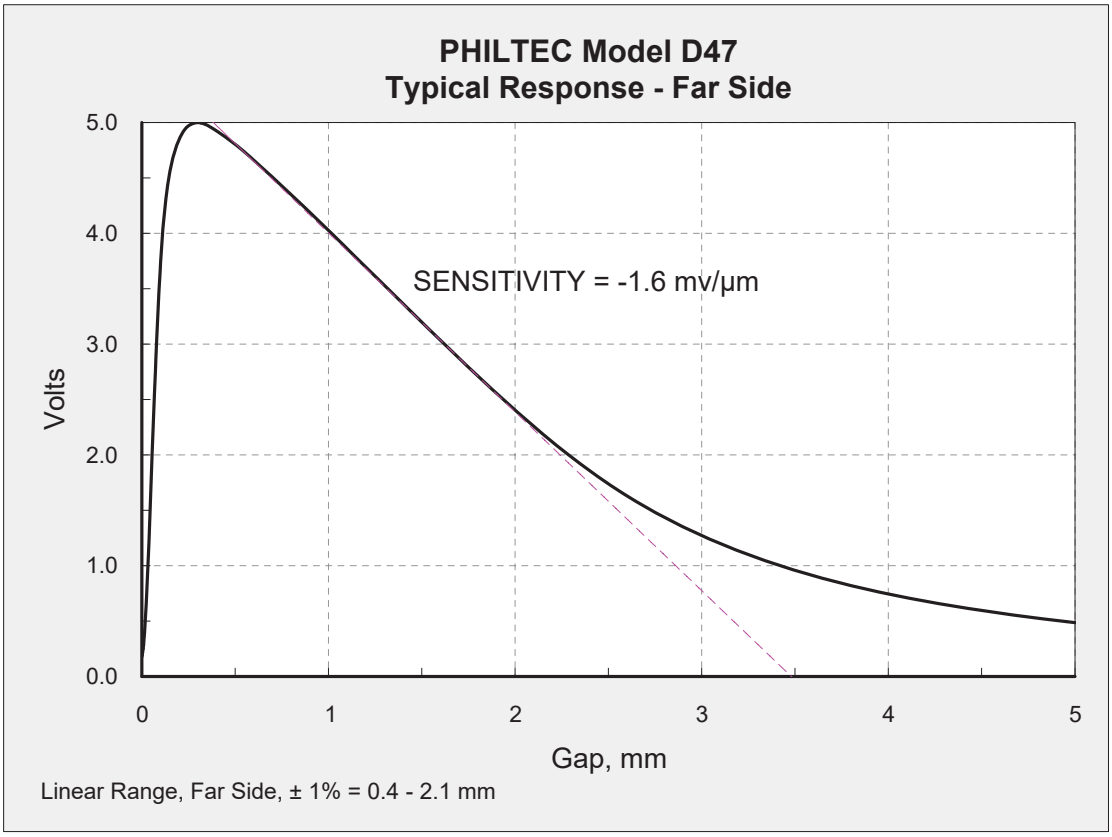
Calibration charts are provided for Near and Far Side regions. A typical factory supplied calibration chart provides:

- 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

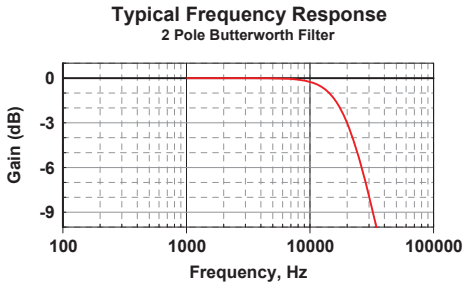
1 mil = 0.001 inch
1 mil = 25.4 µm
1 mil = 0.0254 mm

Standard Specifications - D47 Far Side

Electronics		Fiberoptics		Analog Output (0-5 Volts)		
Light Source	LED, 850 nm	**Light Beam Spread**	**30°**	**Total Range**	0.175 in.	4.7 mm
Input Voltage	+12 to +24 VDC	**Tip Material**	300 Series SS	**Linear Range***	0.050 in.	1.3 mm
Input Current	125 ma max	**Tip Epoxy Outgas**	0.3% @ 200°C 2.4% @ 300°C	**Nominal Standoff***	0.044 in.	1.1 mm
Bandwidth	DC-20 KHz 3 db down	**Tip Operating Pressure**	15 bar	**Nominal Sensitivity***	41 mv/mil	1.6 mv/µm
Isothermal Drift	0.5%	**Tip Operating Temperature**	-55 to 200°C continuous; to 300°C intermittent 1-2 hours	**Resolution**** **DC - 200 KHz** **DC - 20 KHz** **DC - 100 Hz**	 60 µin 30 µin 15 µin	 1.6µm 0.8 µm 0.4 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			

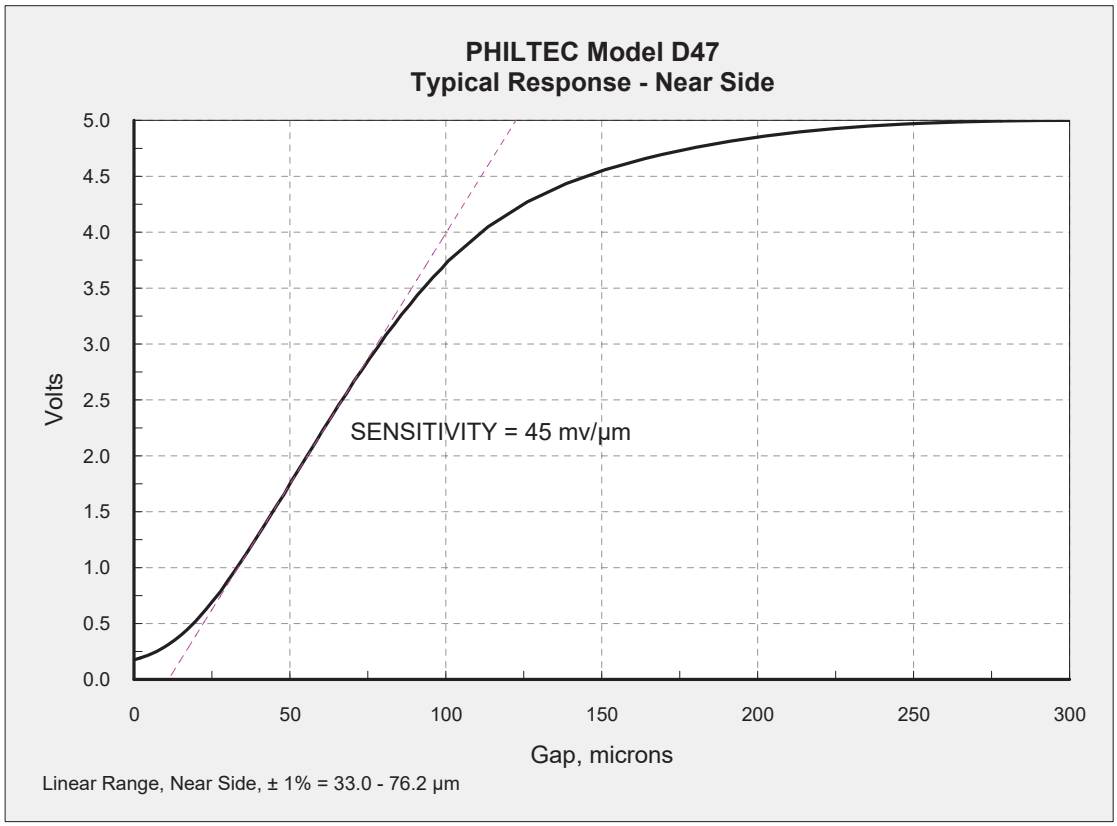
NOTE: *Nominal Standoff = the gap (distance) that places the sensor at the middle of the linear operating range.*
*Standard Specifications provide nominal values only. Actual production values may vary by as much as ±15%.

**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 to its range of highest sensitivity,
fiberoptic cable lengths are standard and the cable is not connectorized,
with dull targets, resolution values can be 2x - 3x higher.



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



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 - D47 Near Side

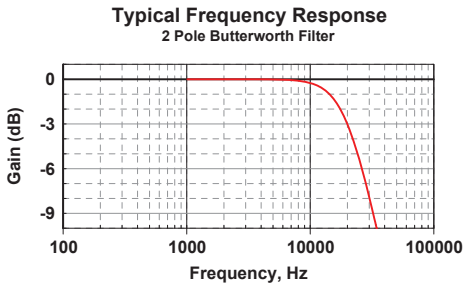
Electronics		Fiberoptics		Analog Output (0-5 Volts)		
Light Source	LED, 850 nm	**Light Beam Spread**	**30°**	**Total Range**	0.012 in.	300 µm
Input Voltage	+12 to +24 VDC	**Tip Material**	300 Series SS	**Linear Range***	0.0018 in.	46 µm
Input Current	125 ma max	**Tip Epoxy Outgas**	0.3% @ 200°C 2.4% @ 300°C	**Nominal Standoff***	0.0022 in.	55 µm
Bandwidth	DC-20 KHz 3 db down	**Tip Operating Pressure**	15 bar	**Nominal Sensitivity***	1.2 mv/µin	45 mv/µm
Isothermal Drift	0.5%	**Tip Operating Temperature**	-55 to 200°C continuous; to 300°C intermittent 1-2 hours	**Resolution**** **DC - 200 KHz** **DC - 20 KHz** **DC - 100 Hz**	 2 µin 1 µin 0.4 µin	 70 nm 35 nm 10 nm
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			

NOTE: *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 to its range of highest sensitivity,
fiberoptic cable lengths are standard and the cable is not connectorized.

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