# Position Sensing Detector

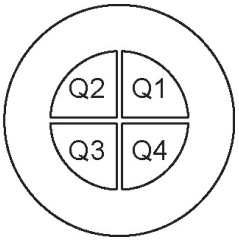
**PDQ30C**




## Description

The PDQ30C is a large area, four quadrant type position sensing detector fitted with an Indium-Gallium-Arsenide (InGaAs) photodiode for precise path alignment of light in the 1000 to 1700 nm infrared (IR) range. The sensor is segmented into four separate active areas, allowing it to measure beams with a spot size up to 3 mm. For optimal use, a spot size diameter of less than 0.5 mm is recommended.

X-axis sensor: (Q2 + Q3) - (Q1 + Q4)
Y-axis sensor: (Q1 + Q2) - (Q3 + Q4)
SUM: (Q1 +Q2 + Q3 + Q4)




The sensor outputs three analog voltages.

The X-axis and Y-axis signals are proportional to the light difference sensed by the left-minus-right and top-minus-bottom pairs of photodiode elements in the detector array, while the SUM signal is proportional to the total amount of light falling on the sensor.

It is developed to work with the K-cube series KPA101 PSD Auto-Aligner.

## Specifications

| Electrical Specifications | Value |
|---|---|
| **Wavelength Range** | 1000 – 1700 nm |
| **Peak Responsivity** | 1 A/W @ 1630 nm |
| **Transimpedance gain** | 10 000 V/A |
| **Max Photocurrent** | 1 mA |
| **Output Voltage Range** | ±4 V to ±14 V[a] |
| **Signal Output Offset** | 0.4 mV (Typ.),<br>7 mV (Max) |
| **Bandwidth** | 150 kHz |
| **Recommended Spot Size** | < Ø0.5 mm |
| **Supply Voltage Requirement** | ±5V to ±15V DC,<br>35 mA |
| **Operating Temperature** | 10 – 40 °C |
| **Storage Temperature** | -20 – 80 °C |

a. Depending On Supply Voltage

| Physical Specifications | Value |
|---|---|
| **Sensor Size** | Ø3.0 mm |
| **Clear Aperture** | Ø0.50" (Ø12.7 mm) |
| **Aperture Thread** | SM05 (#0.535-40) |
| **Dimensions** | 2.00" x 1.20" x 0.65"<br>(50.8 x 30.5 x 16.5 mm) |
| **Mounting Thread** | #8-32 x 0.25" Min Depth |
| **Metric Adapter** | M4 to #8-32 Adapter<br>(Part No AS4M8E) |
| **Cable Length, Typical** | 5' (1.5 m) |
| **Connector (Plug)** | Hirose HR10A-7P-6P |
| **Mating Receptacle** | Hirose HR10A-7R-6S |
| **Weight** | 0.25 lbs (114 g) |

## Instructions

1. Unpack the PDQ30C sensor and install the adapter if metric mounting is preferred.
2. Plug the connector into the KPA101 controller.
3. Follow the directions for operation of the controller as described in its operating manual.
4. Place a spot onto the detection window for measurement. The input beam spot size should be less than 0.5 mm, however the detector will work with wider spot sizes. For best results the spot should be located within 80% of the center of the detector. Adjust the power level so that the SUM output voltage is less than or equal to 8V. This will ensure the best signal to noise ratio and that the system is not saturated.

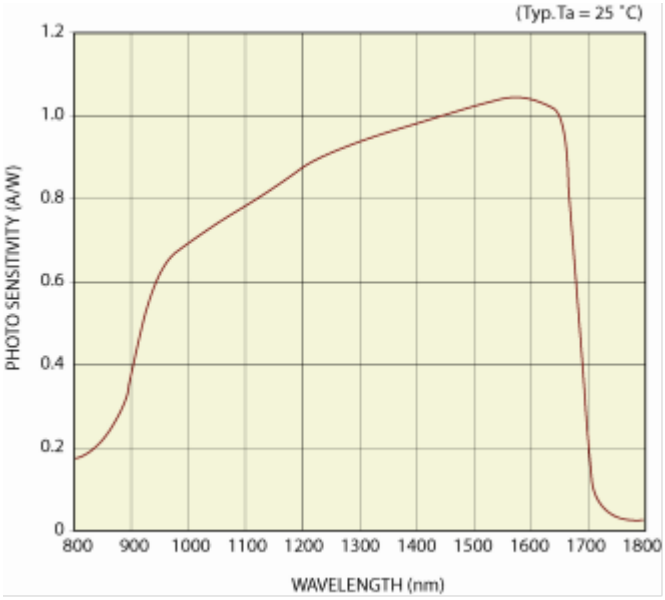
## Application Note

For best results low power levels should be used for the position sensor. For the PDQ30C the max photocurrent is 1 mA. Using the photosensitivity curve opposite, the system saturation power can be calculated as:

$$P_{\max} = \frac{1mA}{Photosensitivity\ (in\ A/W)}$$

The input voltage range of the KPA101 PSD Aligner is ±10 V. When the PDQ30C is used in conjunction with the KPA101 for alignment purposes, the optical power should be adjusted so that the SUM signal is in the 2 V to 10 V range.

**Spectral Response**



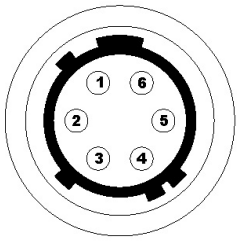
## Application Note (Continued)…

The segmented-quadrant position sensors consists of four distinct yet identical quadrant-shaped photodiodes that are separated by a ~45 µm gap and together form a circular detection area capable of providing a 2D measurement of the position of an incident beam. When light is incident on the sensor, a photocurrent is detected by each sector (labelled Q1, Q2, Q3, and Q4 as shown in the figure on page 1). From these signals difference signals can be determined using an appropriate A/D converter. The sum of all four signals is also determined for normalisation purposes.

If a symmetrical beam is centered on the sensor, four equal photocurrents will be detected, resulting in null difference signals, and hence, the normalised coordinates will be (X, Y) = (0, 0). The photocurrents will change if the beam moves off center, thereby giving rise to difference signals that are directly proportional to the beam displacement from the center of the sensor.

These sensors are very accurate and are ideal for auto-alignment applications. However, care should be taken in the shape and density distribution of the incident beam. A beam that does not have a Gaussian power distribution will be centered based on the power, rather than the geometric center of the beam. For these types of beams, a lateral sensor such as our PDP90A might be better suited.

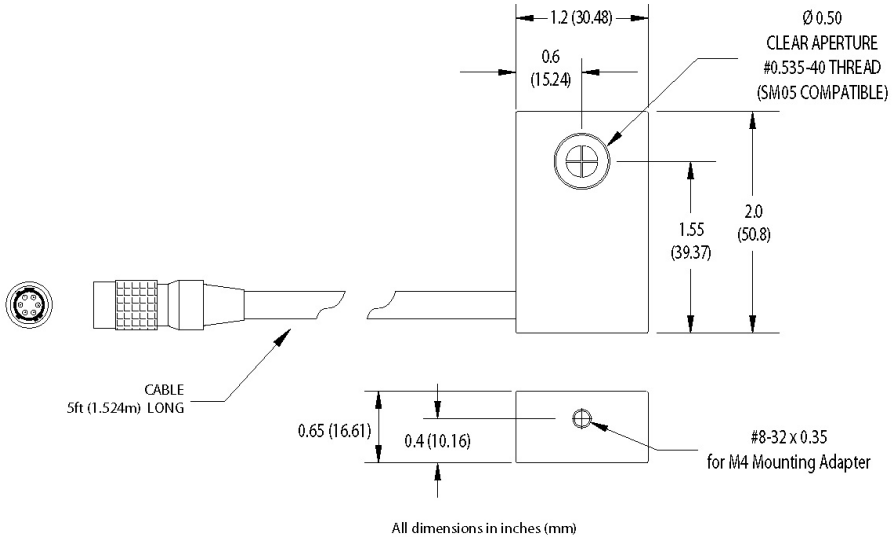
## Drawings




HIROSE CONNECTOR*

Pin Assignments

Pin 1: X-Axis or (A + C) - (B + D)
Pin 2: Y-Axis or (A + B) - (C + D)
Pin 3: Sum or (A + B + C + D)
Pin 4: +5 V to +15 V
Pin 5: Common
Pin 6: -5 V to -15 V



# CE Certificate

THORLABS
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## *EU Declaration of Conformity*

*in accordance with EN ISO 17050-1:2010*

*We* Thorlabs Ltd.

*Of* 1 St. Thomas Place, Ely, CB7 4EX, United Kingdom

*in accordance with the following Directive(s):*

| | |
|---|---|
| 2004/108/EC | Electromagnetic Compatibility (EMC) Directive |
| 2011/65/EU | Restriction of Use of Certain Hazardous Substances (RoHS) |

*hereby declare that:*

*Model:* ***PDQ30C***

*Equipment:* ***Quadrant Detector Sensor Head, Infrared (1000 -1700 nm)***

*is in conformity with the applicable requirements of the following documents:*

| | | |
|---|---|---|
| EN61326-1 | Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements | 2013 |

*and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:*

does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive

*I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.*

*Signed:* *On:* 08 September 2014

*Name:* Keith Dhese

*Position:* General Manager

*EDC - PDQ30C -2014-09-08*

CE

