

Real-time Laser Beam Position Detector

„XY4QD”

User Manual



1. Introduction

The *XY4QD* is a 4-quadrant-diode with readout electronics and outputs for x and y position. The position of the laser beam on the diode can be displayed without relevant time delay on a scope. Thus, even fastest fluctuations can be resolved. This is the main difference between this detector and beam profilers that can not measure a position in real-time and integrate over several pulses or fast photodiodes that can not measure any position.

Depending on the model the *XY4QD* can display information about the intensity level and the position directly on the housing. For this purpose a LED line and a LED cross are used, respectively.

The following figure shows the model with both options:



Figure 1: XY4QD with displays for intensity level and position

2. System components

A typical delivery includes the following components:

- Detector with integrated 4-quadrant-diode (4-QD), readout electronics, and optical filter
- 3 measurement cables MCX↔BNC (standard lengths 1.8 m)
- Wall power supply 12V
- User manual

3. Specification

3.1 Optional displays

The XY4QD is delivered with different display versions:

- 1) without display
- 2) with LED line for intensity level display
- 3) with LED line for intensity level display and LED cross for position display

3.2 Intensity scaling

The standard XY4QD is equipped with an intensity scaling. Here, a divider is integrated into the readout electronics that sets the intensity of each quadrant in relation to the total intensity on all four quadrants. In that way the measurement is independent on the actual laser power.

The intensity scaling can be omitted on request in order to reach even higher bandwidths and get access to the raw data.

Opto-electronic properties	
Bandwidth	up to 10 kHz (without intensity scaling > 100 kHz) (The bandwidth is optimized to a customized value in our lab. For the resolution of single pulses one should choose: band width \leq laser repetition rate)
Sensor area	10.0 x 10.0 mm ²
Typical spatial resolution	< 1 μ m (depending on the beam diameter and profile)
Spectral sensitivity	320 – 1100 nm
Mechanical dimensions	
Housing	49 x 40 x 20 mm ³
Thread	M4
Optical filter (can be adapted on laser power and wavelength)	
Dimensions	12 x 12 mm ²
Fastening screws	M2
Connectors	
x, y, I / Connectors	analog x, y: ± 5 V / I: 0 – 7V / MCX
Power supply / Connector	12V / DC pin-and-socket connector 1.1 mm

4. Installation and operation

The following description refers to the optional displays. If you have a model without display you can get comparable informations by using a scope. In order to get this you must connect the x and y signals to two channels of the scope and choose the scope's x-y-display mode.

The intensity on the 4-QD should be chosen with values that lead to illumination of at least 2 and not more than 9 LEDs. This corresponds to voltages of 0.5 to 6 V. You can achieve the correct values by means of appropriate filters in front of the 4-QD. The XY4QD should be aligned to the laser beam in that position where it hits the center of the 4-QD. In this case you can detect the widest range of position changes.

4.1 LED cross for position display

If the laser beam hits the center of the 4-QD only the green LED of the position display will shine (if available). In other cases also yellow and red LEDs will shine according to the examples in figure 2.

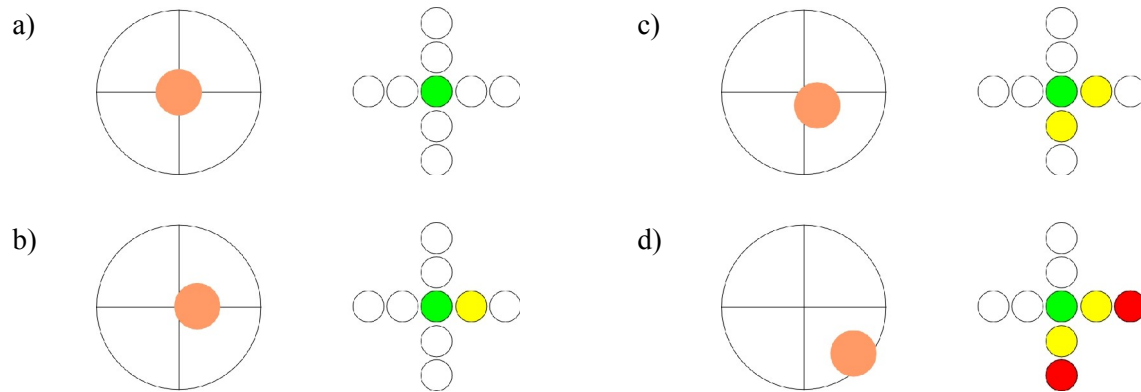


Figure 2: Examples for laser beams hitting the 4-QD (orange spots) and the corresponding position display. The left pictures are shown from the direction of the position display, i.e. from the rear side of the housing.

If only green and yellow LEDs shine the sensor electronics is in the linear range where a direct correlation between measured signal and position exists (see section “Calibration”). If a red LED shines too, the correlation is no more possible due to the principle of 4-QDs.

4.2 Calibration

The absolute position in x and y depends on the laser beam's diameter and (without the intensity-scaling feature) intensity. We recommend to perform a calibration of the detector for the actual laser beam parameters by moving the XY4QD relative to the laser beam by means of a micro-positioner and measuring the voltages for different positions.

4.3 Sham fluctuations at low intensities

Depending on the laser beam diameter and the chosen bandwidth sham fluctuations of the beam position can occur at low intensities although the beam position might be stable. These fluctuations are due to small intensity deviations of the laser and the noise of the diodes. Please take care for an appropriate intensity on the 4-QD.

If the intensity on the 4-QD is too small, the central green LED will not shine.

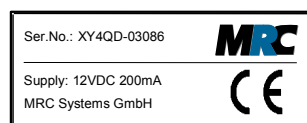
5. Safety

The detector has left our factory in a faultless state. Please only store and operate it in dry environments in order to maintain this state.



The device was designed and manufactured according to DIN EN 61000-3-2 and satisfies the requirements of the European EMC Directive 89/336/EWG.

Label



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