

## 1. Introduction

The Laser Beam Stabilization *Compact* is a modular system. The most frequently sold 4-axes system consists of a controller, two piezo actuated mirrors (e.g. P2S30) and two position detectors (e.g. Si-4QD). Due to the modularity, it is possible to realize different setup variants. This has the great advantage that the system can be easily integrated into existing laser setups. There is always a suitable solution to position the components. In the following text, we describe the standard setup, which provides an optimal stabilization result in most cases.

## 2. Description

Figure 1 shows the typical setup of a 4-axes system in which two stages, each with a detector and a piezo actuated mirror, are arranged one after the other. Detector 1 is placed behind actuated mirror 2. There it detects the leakage and fixes the position of the laser on the mirror. The second stage stabilizes the angle. For this purpose, detector 2 can be placed behind a mirror further in the beam path. The beam splitter cube in the photo is only used for better visualization.

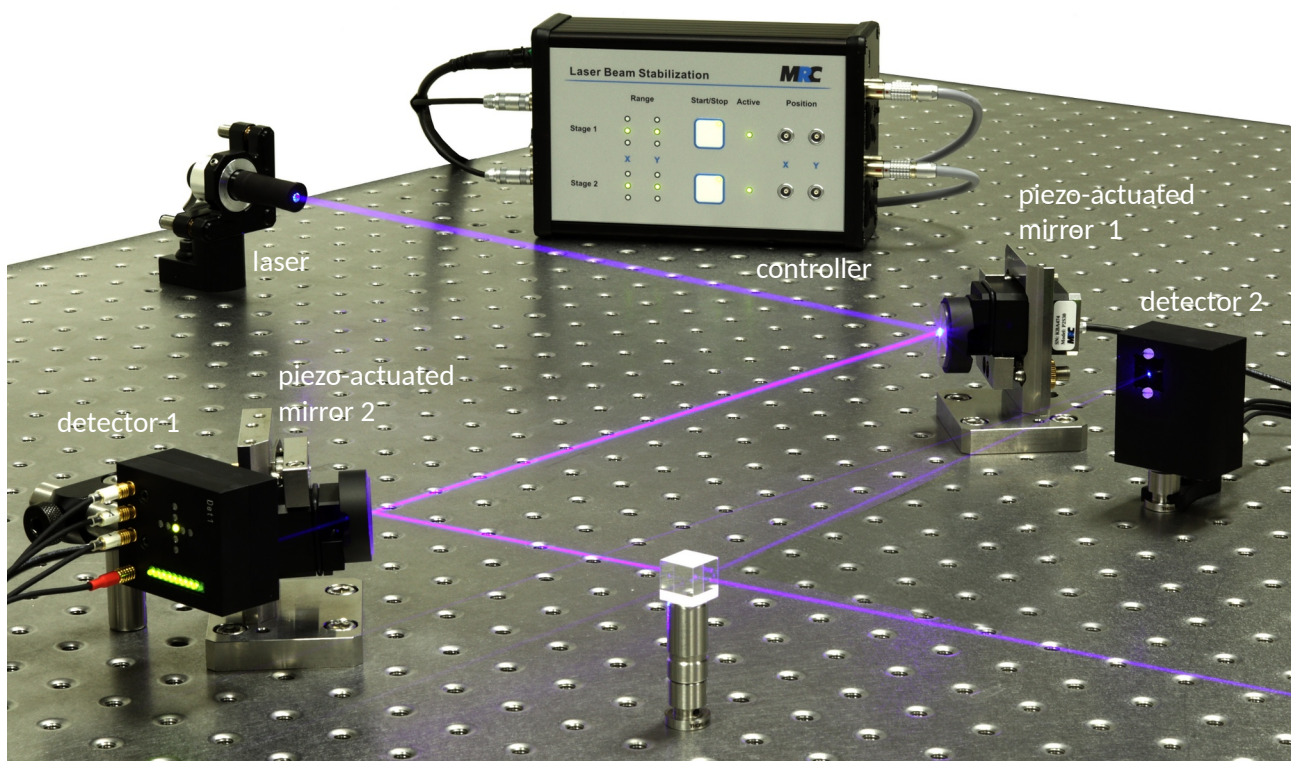


Figure 1: Standard setup of a 4-axes system  
(Laser, mirrors and beam splitter are not included in the delivery)

In the following, the components are explained in a little more detail in the way they follow each other in the beam path:

### 2.1. Piezo actuated mirror 1

The first piezo actuated mirror should be placed as early as possible at the beginning of the setup. Ideally, it is the first mirror after the laser. In this way, a long control path is achieved and the full potential of the system can be utilized.

### 2.2. Piezo actuated mirror 2

The second piezo actuated mirror can be placed at a different mirror position of the beam path. This component should be placed approximately halfway between the laser and the target, although the exact position is not crucial. We recommend a distance of 0.5 m or more between the two piezo mirrors.

### 2.3. Detector 1

As it can be seen in figure 1, detector 1 can be easily placed behind piezo actuated mirror 2. Since our detectors require only a very small portion of the beam, the leakage behind an HR mirror is usually sufficient. It is important that the mirror used has a polished backside so that the beam can hit the detector unhindered.

This ensures that detector 1 is as close as possible to actuated mirror 2. This way it can fix the position of the laser on this mirror. This setup can always be used if the beam diameter is not larger than approx. 8 mm, as the sensor area of the standard detector is 10x10 mm<sup>2</sup> and the aperture for beam transmission in the piezo actuated mirror mount is limited. The aperture of the P2S30 mirror mount is 12 mm. For larger beam diameters, the setup can be easily modified by using a beam splitter or by placing the detector behind another mirror. Corresponding suggestions can be found in our description "Setup configurations" and in the user manual.

### 2.4. Detector 2

Detector 2 should be placed as close as possible to the target. In many cases it can be placed behind the last mirror in the setup. Ideally, the distance to detector 1 should also be 0.5 m or more. If this is not possible, you can optimize the setup by using a lens. Please refer to our description "Optimization of the setup with lenses" in this case.



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