

# Laser Beam Stabilization System “Compact”



## Options, upgrades and accessories

The basic configuration of the *Compact* system is fully equipped for stabilization tasks in laser machines. However, for specific installations or lasers we offer adaptations and additional modules which further help to optimize the system for relevant parameters.

### 1. Controller modifications

#### 1.1. Sample&hold circuit (“ADDA“) to fix the laser beam during laser off times

In some applications the laser beam is switched on and off during the stabilized operation. In laser off times there is no intensity on the detectors and hence no control signal for the closed-loop controller. With the additional sample & hold circuit the positions of the steering mirrors can be fixed for an arbitrarily long time interval without control signal or laser intensity on the detectors. In that way it is possible to start the control-loop after switching on the laser not from the zero position but from the latest stabilized position.

#### 1.2. Adaptation for low repetition rates

For lasers with low repetition rates (e.g. 10 ... 300 Hz) the detector electronics can be modified in order to maintain a position signal in the time gaps between two laser pulses.

### 2. Interfaces, additional inputs and outputs

The basic configuration provides outputs for the position signals on each detector (analog -5 to +5V) and a status signal. Other signal outputs or inputs can be provided as options:

#### 2.1. External activation

This option enables the change of the operation state of the stabilization system with an external signal.

#### 2.2. Direct drive of Piezo actuators („Drive Actuator“)

With this option it is possible to drive the actuators with an external control signal. It makes use of the integrated 4-channel high-voltage amplifier of the system.

#### 2.3. Voltage offset inputs to move the target position on PSDs (“Adjust-in“)

The measurement principle of PSDs allows to move the target position on the detector. For this purpose we can implement additional inputs for the x and y axes of both stages.

#### 2.4. Intensity outputs at controller

In addition or as an alternative to the intensity level display at the detector's housing we can provide an additional output of the intensity level at the controller box.

#### 2.5. Range outputs for monitoring applied Piezo voltages

This option allows to read out the applied voltage ranges of the Piezos, e.g. to see whether or not the Piezos are operated at the maximum tilting range. If the Piezo actuators are combined with additional motorized mounts in order to enlarge the overall tilting range, the Piezo voltage can be used to trigger and control the motor drivers.

#### 2.6. Set-box for adjustment of target position on PSD

The set-box was developed as a tool for demonstration purposes and laboratory applications. It enables the user to adjust the target positions and the corresponding outputs to the Piezo driver electronics (e.g. “Adjust In”, see section 2.3) by simply turning potentiometers.

## 3. Detectors

### 3.1. Wide intensity detector: 4-quadrant diode with wide intensity range

In some applications the laser intensity is varied or modulated over wide ranges. For such systems we offer a wide intensity detector, where the signal amplification automatically adapts to changing intensities in real time. The intensity can vary by a factor of >1,000 without the need of any user interactions. Since the signal-to-noise ratio is not significantly changed over the entire intensity range, the stabilization system reaches the maximum resolution over the entire intensity range.

### 3.2. 4-Quadrant diodes for UV and IR

Specification:	UV 4-QD 3x3	IR 4-QD (InGaAs)	IR 4-QD (Ge)	Thermopile 4-QD
Wavelength range:	190-1.,000 nm	900-1,700 nm	800-1,800 nm	190 nm-15 µm
Sensitive area:	3x3 mm <sup>2</sup>	Ø = 3 mm	Ø = 5 mm	18x18 mm <sup>2</sup>

### 3.3. PSDs

Specification:	PSD for VIS	PSD for UV
Wavelength range:	400-1,100 nm	200-1,100 nm
Sensitive area:	9x9 mm <sup>2</sup>	10x10 mm <sup>2</sup>

In contrast to 4-quadrant-diodes, PSDs allow to change the target position on the sensor.

## 4. Mirror mounts

Our standard mirror mounts PKS and PSH have holders for 1" mirrors. But we also offer actuators and mirror mounts for 0.5", 1.5", 2", 3" and 4" mirrors. Our mirror mounts are characterised by a design which is optimized with regards to control speed and tilting range, even for set-ups with larger mirrors. The following table shows the most often applied mirror mounts:

Specification:	PKS	PSH	P4S30
Bandwidth:	~ 700 Hz (1" mirror)	~ 840 Hz (1" mirror)	highest performance with large mirrors
Mechanical tilt:	1 mrad (± 0.5 mrad)	2 mrad (± 1 mrad)	4 mrad (± 2 mrad)

## 5. Vacuum adaptations

Both, the detectors and the actuators can be adapted for use in vacuum.

## 6. Additional accessories

- shutters
- optical components
- cable adaptations

## 7. Contact

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