

## 1. Introduction

The *Compact* laser beam stabilization system is also suitable for use in applications under vacuum and clean room conditions. We offer modified versions of our components for this purpose. The following description gives you an overview of the available versions. Depending on your requirements, we can make various modifications of the choice of materials, cables, seals and the temperature management. The modifications serve to prevent outgassing of substances and also to protect the components themselves in vacuum.

## 2. Piezo actuated mirror mounts

There are different vacuum versions of our actuated mirror mounts according to the requirements. These versions can also be used under clean room conditions. Figure 1 shows our vacuum-compatible *P4S30* mount for 1" mirrors. This mount also allows to use larger mirrors with appropriate adapters.

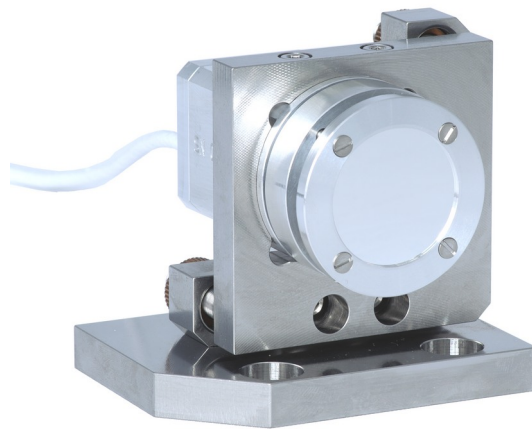


Figure 1: *P4S30* with 1" mirror

Solutions are available for all vacuum pressures down to  $10^{-11}$  mbar. Depending on the vacuum depth, different measures or actuators are required:

- In fine vacuum in the range of a few 10 mbar to  $10^{-2}$  mbar, there is a risk of gas discharges. This could damage conventional piezo stacks. To prevent this and to protect the components, actuators with properly insulated piezo stacks are used.
- In the high-vacuum range from  $10^{-2}$  to  $10^{-6}$  mbar, it is mainly a matter of preventing outgassing, which we solve by selecting appropriate materials. Our vacuum-compatible *P2S30* and *P4S30* mounts are used here.
- In ultra-high vacuum (UHV) down to  $10^{-11}$  mbar, specially designed piezo actuated mirror mounts are used. In their actuators, only inorganic materials are used for insulation and electrical contact. Brass parts are avoided. These measures mean that outgassing cannot occur even in UHV. In addition, these materials allow high annealing temperatures.

Below we have listed the components and materials we use for the modified versions.

| Description               | Clean-room / vacuum material                  |
|---------------------------|-----------------------------------------------|
| Housing                   | Bare aluminium                                |
| Piezo                     | Ceramics with polymer or inorganic insulation |
| Screws and standard parts | Stainless steel, brass                        |
| Thread lubrication        | Korasilon                                     |
| Cable sheath              | FEP                                           |
| Heat shrinkable tubing    | PTFE                                          |
| Connectors                | PEEK, Brass                                   |
| Glue                      | Torr Seal                                     |

### 3. Detectors

Our detectors are available as clean room and vacuum versions. In both versions, we attach great importance on the choice of materials to prevent the introduction of contaminants through outgassing. Both versions do not have LED indicators on the backside. The corresponding signals for beam position and intensity control can be read out by analog outputs on the controller, via the serial interface or in the software. The controller itself must not be placed in vacuum.



Figure 2: Front side of clean room and vacuum detector

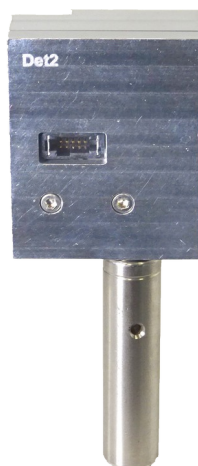


Figure 3: Rear side of vacuum detector



Figure 4: Cable box for signal processing outside vacuum

In contrast to clean room detectors, for which we mainly use special materials, vacuum detectors also require heat management for the electronics. Since heat dissipation is more difficult in vacuum, we outsource parts of the electronics for signal processing of the detectors. To do this, we use a small box integrated into the cable that can be placed outside the vacuum. The vacuum detectors don't have a potentiometer at the housing, but it's possible to remotely adjust the sensitivity.

## „Compact“ Laser Beam Stabilization Vacuum and clean room components



The controller remains unchanged and is compatible with all detector versions. In addition, special ceramic boards are used in the vacuum detectors.

In the following table, we have listed the modified materials compared to the standard. With the measures, the detectors can be used without problems at vacuum pressures down to  $\leq 10^{-6}$  mbar.

| Description                       | Clean-room material | Vacuum material                                       |
|-----------------------------------|---------------------|-------------------------------------------------------|
| Housing                           | Bare aluminium      | Bare aluminium                                        |
| Screws                            | Stainless steel     | Stainless steel                                       |
| Electronic boards                 | FR4                 | Ceramic                                               |
| Heat dissipation                  | -                   | Kapton (Polyimid),<br>Tflex HR600 (Laird, gap filler) |
| Cables and heat shrinkable tubing | PTFE                | PTFE                                                  |
| Screws for optical filters        | PEEK                | PEEK                                                  |
| Connectors                        | PTFE, PEEK, Brass   | PEEK, Brass, Liquid crystal polymer                   |
| Glue                              | Torr Seal           | -                                                     |

### 4. Cables and feedthroughs

For the clean room and vacuum actuated mirror mounts and detectors, we use cables and connectors that do not outgas. In addition, we can also offer vacuum cable feedthroughs. For more information, please refer to the "Vacuum connectors" data sheet.



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Subject to change