

μ Aligna

Laser Beam Alignment and Stabilization System

μ Aligna

μ Aligna[®]

Automated Laser Beam Alignment and Stabilization System

- fully automated high-precision beam alignment
- self-learning parameter settings
- modular system, control of up to 2 beams, all wavelengths
- 2D and 4D scanning (position X,Y and angle X,Y)
- very compact form factor

Applications

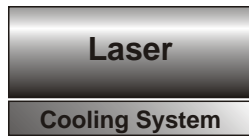


- high precision material processing
- compensation of thermal drifts
- compensation of disturbance by moved optical components (delay lines, tuning elements, zoom optics,...)
- switching one laser between several applications
- multi-dim scans for characterization of optical setups
- automatic coupling / optimization to single-mode fibers or to High Harmonic Generation Capillaries
- complete auto-alignment after laser replacement
- parallelization of laser beams to moving axes

Principle of Operation

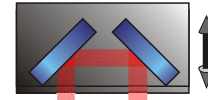
Laser beams, used in an experiment or in industrial applications, can move in space for many reasons:

1: thermal drifts inside the laser, movements by frequency detuning, by power variation, etc.



2: thermal drifts of cooling system and mechanical laser mounts

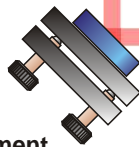
6: moved optical elements (delay lines, switching mirrors, motorized telescopes,...)



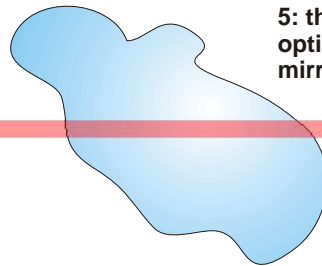
5: thermal effects in optical elements and mirrors



3: drifts of alignment and folding mirror holders



4: air fluctuations and temperature gradients

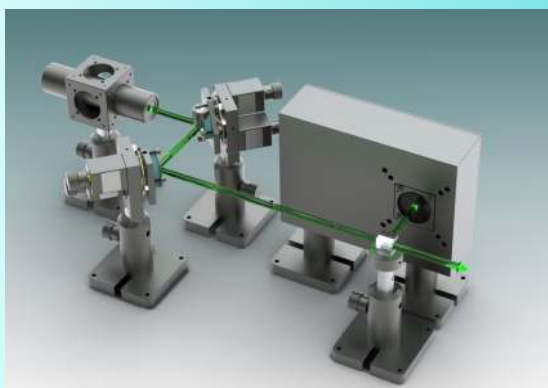


7: Movement of the experimental (optical) tables or vacuum chambers



- cw and pulsed lasers: rep. rates 5 kHz ... 200 MHz / cw
- flexible system, up to two beams controlled by one device
- servo loop accuracy: $< 1 \mu\text{m}$, $< 1 \mu\text{rad}$
- all wavelengths (with standard detectors: 380 ... 1100 nm, with special detectors 180 nm ... 10 μm , even THz), any beam diameter
- several combinations of motorized actuators and PSDs or other detectors
- full computer control via USB (serial or ethernet optional) and autarkic operation
- connection of external measurement devices (power meters, PDs, ...)

* with motorized mirror mounts "Aligna 40"



PSD 4D e:
Position Sensitive Detector 4D:
Position X,Y, Angle X,Y



Visualization and Control System

- logging of pointing and power
- several beams simultaneously
- automatic learning of opto-mech setup

μAligna: Compact Control Electronics

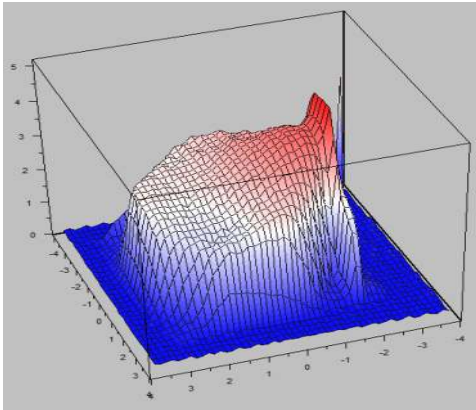
- μController, 8 bit
- interfaces: USB (serial, ethernet or wireless optional)
- up to eight motor driver outputs (more on request), 1.5 A max
- up to 16 input channels ($\pm 10V$) for two PSD 4D detectors or other measurement heads (power meters, photo diodes, temperature, ...)
- up to 16 output channels ($\pm 10V$)



Software

Kangoo: Comprehensive Control Program

- visualization of all μController parameters
- logging of any value vs. time
- 2D or 4D scanning and measurement
- fully scriptable
- compatible with Windows 7, Vista, XP, 2k, 9x
- plain-text communication with the μController for simple integration with other control software



Opto-Mechanics

Aligna 60: Motorized Mirror Mount 60x60 mm

- two ultra microstepping linear actuators
- manual adjustment by knurled knobs
- reference optical encoder for both axes
- several fixing methods for mirrors or other components (1", 1/2", 2", and others, any thickness)

Aligna 40: Motorized Mirror Mount 40x40 mm

- same as *Aligna 60*, smaller form factor
- preferred for tight space requirements

Aligna R: Rotational Stage

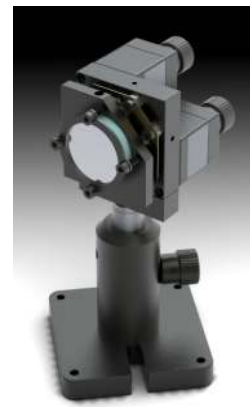
- precise control of polarizing elements
- laser intensity stabilization
- rotations of cylindrical lenses

PSD 4D i: Position Sensitive Detector "industrial"

- 4D measurement of position X,Y and angle X,Y
- cw and pulsed lasers (test beam pow. cw: 100 μW...10 mW, pulsed: >10 nJ)
- high accuracy: < 1 μm, < 1 μrad



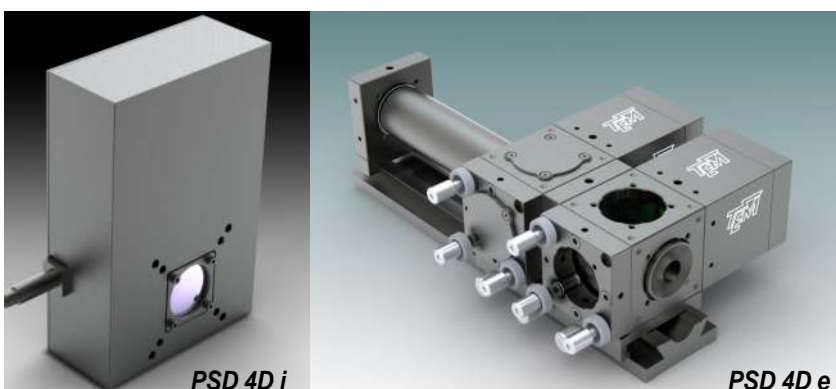
Aligna60



Aligna40



Aligna R



PSD 4D i

PSD 4D e

PSD 4D e: Position Sensitive Detector "experimental"

- like "PSD 4D i", with discrete components
- easily adapted to any experimental setup or to even higher accuracies (< 10 nm, < 10 nrad)

Dimensions:

| | |
|---------------------------------|------------------------|
| control electronics: | 210 x 125 x 45 / 90 mm |
| Aligna40 motorized mirror mount | 40 x 40 x 63 mm |
| Aligna60 motorized mirror mount | 60 x 60 x 63 mm |
| PSD-4D i: | 100 x 147 x 47 mm |
| PSD-4D e: | 200 x 110 x 60 mm |

Interfaces:

protocol: USB, RS232 serial, (ethernet optional)
clear text ASCII commands, internal script language
including visualization and measurement software
incl. user-spec. adaptations, LabView VIs available

Aligna® Control Unit

μC: AVR ATmega
Electrical supply: 9 - 24V DC power Adapter, 5A
Power consumption: < 50W (30W typ.)

Number of input channels: 8 or 16 (up to 4 PSD-2D or 2 PSD-4D)
Number of motor driver outputs: 4 or 8 (up to 4 Aligna40 or Aligna60 actuators)

Subject to change without notice

Development, Manufacturing and Distribution



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