SpotOn

Optical Beam Position and Power Measurement System

For Windows

Sophisticated Cost-Effective System

- **Versatile**: Measures both Beam Position (over area up to 8 mm diameter) and power (from 10 µW to 10 mW).
- **Precise**: Available with Quadrant detector (1µm position accuracy, down to 0.1 µm position resolution) or dual-axis Lateral Effect detector (50 µm position accuracy, 3 µm position resolution).
- **Convenient**: Plug-in card, detector and software work with any PC under windows operating system.
- **Easy to use**: User-friendly software using mouse/keyboard control, complete on-line help routine.

NEW A new hardware & software configuration enables ***simultaneous operation of either One or Two PSD's*** using one plug-in card and one software package!

NEW DLL Drivers for user-defined applications based on SpotOn hardware!

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Precision Optical Beam Position sensing

Choice of Lateral Effect or 4-Quadrant detectors
Precision linearization of position in software

Large area silicon Position Sensitive Detectors (PSD's) detect and record the position of an incident light beam. There are two types of detectors used for sensing the position of the centroid of the beam in X-Y plane orthogonal to the beam: the **4-Quadrant detector** and the **dual-axis Lateral Effect detector.**

The 4-Quadrant detector is a combination of 4 independent detectors separated by 30µm wide gaps across their surface (10µm gaps optional). A symmetric laser centered on the detector will generate equal photo-currents from each of the four sectors. If the beam moves from the center of the detector the currents from the four sectors will change and the processing algorithm will give the X and Y displacements relative to the center, which is known very accurately.

Thus the major utility of the quadrant sensor is in systems where a beam must be aligned or centered to an optical-axis ("nulled") or where it is necessary to monitor and measure small displacements over long periods with high stability.

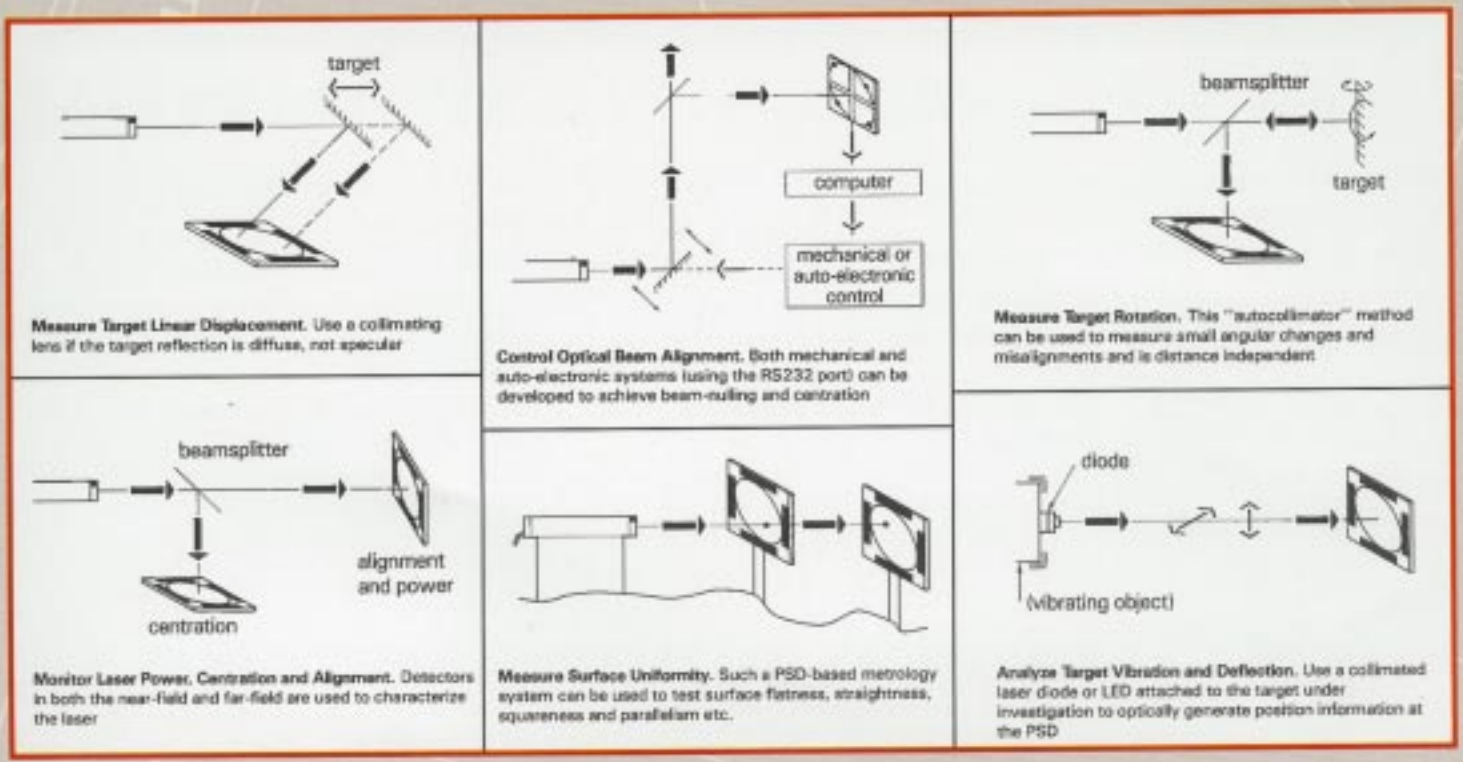
The dual-axis Lateral Effect detector uses a doped disc of silicon with four electrodes connected equidistant around the perimeter. Photocurrents processed by the algorithm give displacement values in X and Y directions respectively (in µm).

The algorithm is software controlled and calibration corrections stored in memory are used to linearize the response and obtain a precision calibration across the entire detector surface.

This linearization feature implies that unlike the 4-Quadrant detector, the dual-axis Lateral Effect detector can be used to measure the position of a beam over its entire surface.

Applications in Optics and Metrology

There is rapid expansion in the application of PSD systems in the fields of position, motion and distance measurement; optical system alignment; machine tool calibration; vibration and deformation analysis. Illustrated below are six typical basic techniques, which can be modified to suit particular OEM requirements.



Measure Target Linear Displacement. Use a collimating lens if the target reflection is diffuse, not specular

Control Optical Beam Alignment. Both mechanical and auto-electronic systems (using the RS232 port) can be developed to achieve beam-nulling and centration

Measure Target Rotation. This "autocollimator" method can be used to measure small angular changes and misalignments and is distance independent

Monitor Laser Power, Centration and Alignment. Detectors in both the near-field and far-field are used to characterize the laser

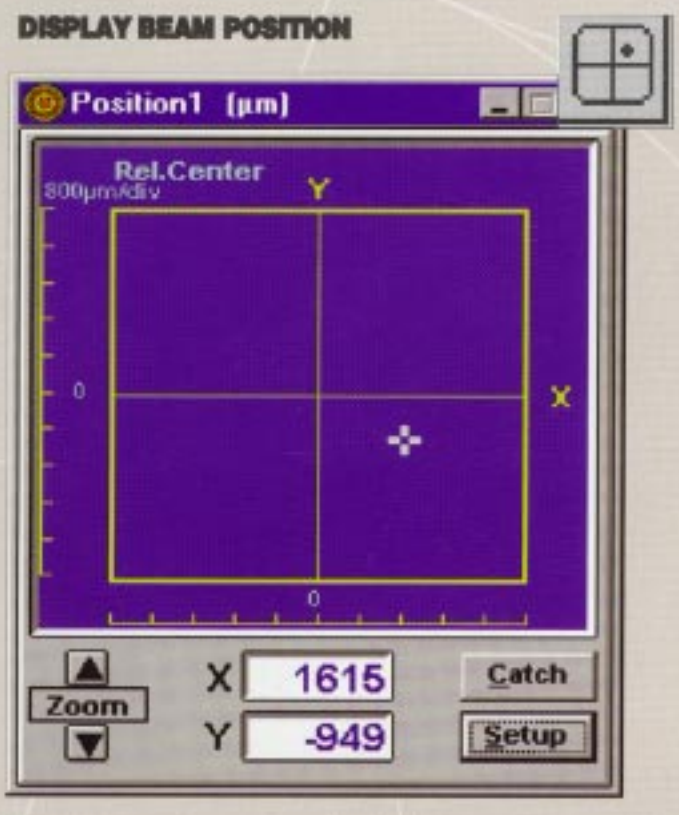
Measure Surface Uniformity. Such a PSD-based metrology system can be used to test surface flatness, straightness, squareness and parallelism etc.

Analyze Target Vibration and Deflection. Use a collimated laser diode or LED attached to the target under investigation to optically generate position information at the PSD

Powerful Position and Power Measuring System

The following presentations can be activated simultaneously, for either one or two PSD's being connected to the system:

DISPLAY BEAM POSITION



DISPLAY BEAM POSITION (x and y) of either a 4-Quadrant or a Lateral-Effect position detector. Relative center can be set for relative position measurements, zooming on displayed target, alarm setting and more!

DISPLAY POWER

DISPLAY POWER with analog and digital displays. Possible operations include: Change measuring units, load a pre-defined filter file, perform ambient-light suppression.

More features, including:

* Extended printing capabilities
* Transmission via RS 232 link protocol to another PC computer
* Configure setup screens and save for future sessions.
* Log data files at chosen intervals for a chosen period of time.

CHART

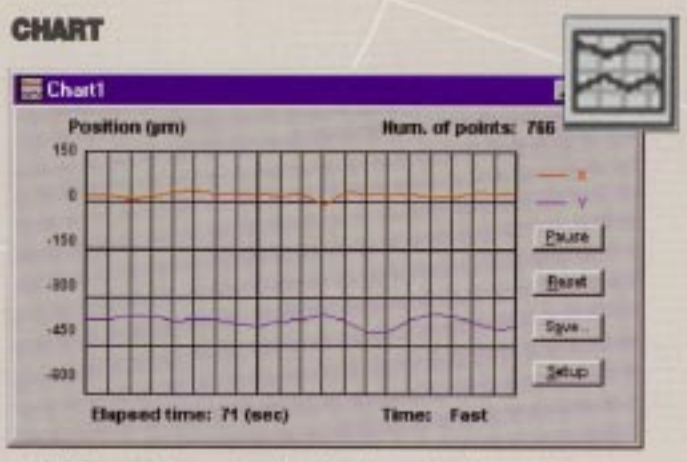
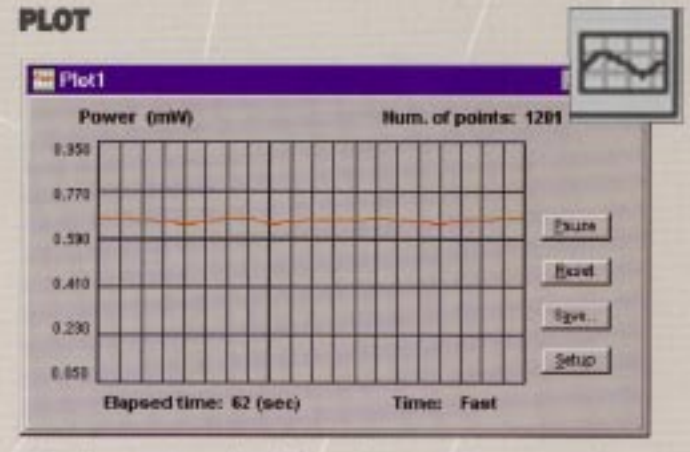


CHART function is used to display changes in the position (x and y) with time, with autoscaling and saving capabilities.

PLOT



PLOT function is used to display changes in the power with time, with autoscaling and saving capabilities.

Host Computer Requirements

IBM-PC 486 (or Pentium), 8MB RAM, 4MB free on HDD
Windows 3.11, Windows 95, Windows NT 4.0 (Work station)
Standard ISA BUS and space for a half-size expansion slot
One FDD (3.5") 1.44MB
VGA Screen, 1MB 256 color
Keyboard/mouse operated

Measurement specifications

	4-Quadrant Detector	Lateral Effect Detector
Photodetector	10mm X 10mm silicon 4 sectors separated by 30µm gap Optional: Separated by10µm gap	10mm X 10mm dual axis silicon 8mm calibrated diameter
Usable Beam size range	50µm < diameter < 8mm	
Position Measurement range	4mm diameter circle maximum centered on the detector center The beam must overlap all 4 sectors	8 mm diameter circle maximum centered on the detector center
Position Resolution	Better than 0.5µm	Better than ±1µm
Position accuracy	±1µm or ±0.25% of beam diameter whichever is greater	±50µm over 8mm diameter calibrated area (software linearization)
Operational Spectral range:	350-1100nm	
Power Range: (*)	10µW to 10mW	
Power Accuracy: (*)	±5%	

* To maintain the full calibration accuracy, attenuating optical ("neutral-density") filters may be necessary for operation with beams greater than 1mW. Saturating "non-linear" effects depend on the beam size, type and wavelength, but caution should be exercised when using the quadrant detector above 3-6mW or the lateral effect detector above 1-3mW.

Dimensions

Sensor Head: 38mm diameter, 25.5mm long, M4 tapped post-mounting hole, aligned to detector axes to <±0.5°, Optical aperture threaded 1"-32 TPI ("C") for mounting filters
Cable: 3m long, attached to sensor head
Plug-in card: Standard AT ISA, 165mm long, 2x9 pin D-Type connectors
Weights: Sensor Head: 175g with cable, Computer plug-in card: 160g
Environmental: Operating Temperature Range: 0° to +35°C

Ordering Information

Complete system, including sensor head/s with attached cable/s, computer plug-in card, control software on 2x3.5" diskettes, user-manual. C-mount transmission filter (about 25%) is optional **(DFILT001)**

SpotOn Single types:

One Quadrant detector system (30 µm gap)	**DQUAD01**
One Quadrant detector system (10 µm gap)	**DQUAD02**
One Lateral Effect detector system (10x10mm)	**DLAT001**

SpotOn Duplex types:

Two Quadrant detectors system (30 µm gap)	**SPOTQQ**
Two Lateral Effect detectors system (10x10mm)	**SPOTLL**
One Lateral Effect detector & One Quadrant detector system (30 µm gap)	**SPOTLQ**
Two Quadrant detectors system (10 µm gap)	**SPOTUU**
One Lateral Effect detector & One Quadrant detector system (10 µm gap)	**SPOTLU**

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