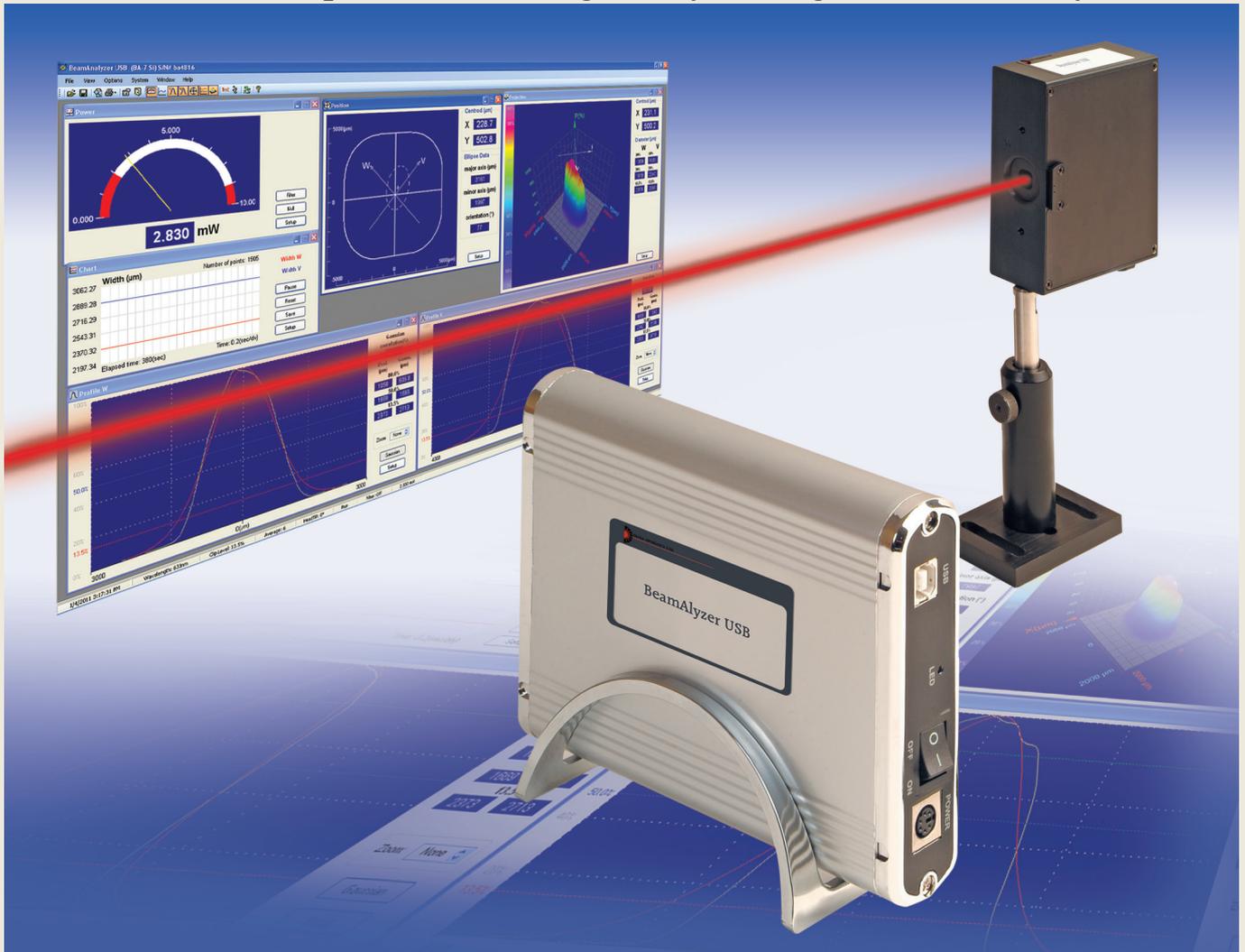# *B*eam *Analyzer USB*

Multiple Scanning Knife-Edge Beam Profiler

High precision beam diagnostics for CW lasers

- **Patented technology:** Unique tomographic image reconstruction of 2D/3D images

- **Versatile:** Meaure beam profile, beam size, beam shape, position and power

- **Flexible:** Wide spectral range, from 190nm through 1800nm

- **Accurate:** Beam sizes from 3µm to 9mm with 0.1µm resolution

- **Compact:** Based on USB 2.0 manifold box, measuring head, software

Main Features

- **New! 12 bit A/D**
- High resolution sampling for all modes simultaneously
- Real time beam profiles, beam size and gaussian fit
- 2D/3D plots of beam in real time
- Beam centroid and ellipticity, Power measurement
- Direct data logging to Excel files
- Data streaming via RS232 or TCP/IP
- Save image and snapshot files
- Automatic Pass/Fail analysis report
- Windows control library for user's application program

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Patented Technology

The Beam Analyzer provides a bridging technology, producing the 3D intensity reconstruction of CCD cameras, while being capable of measuring very small spots at high resolution and huge dynamic range

The measuring technique is based on a multiple scanning knife-edge technology, combined with a tomographic image reconstruction for the creation of the 2D/3D display. When the drum spins, the knife-edges cut across the beam in an orthogonal plane to the direction of propagation. A stationary large detector inside the spinning drum measures light intensity. For attenuation, when needed, a built-in distortion free optical filter is inserted between the spinning drum and the detector. This technique provides the required attenuation without affecting beam quality. Each scanning knife-edge is oriented at a different angle on the drum and moves across the beam path in a different direction as the drum rotates. Consequently, during a single rotation of the drum, the instrument generates a set of profile curves, each representing the intensity profile of the beam from a different direction. This data is the input for the tomographic reconstruction algorithm to generate the 2D/3D intensity profile of the beam.

The **Beam Analyzer** is offered in two types of measuring heads: The BA7 uses seven individual knife-edges, providing more accurate measurement of the true beam shape and dimensions by gathering data from all 7 scans, while the BA3 uses only three knife-edges, and is recommended for smaller beams measurement as well as for a near-Gaussian beams. The more knife-edges, the greater the level of detail obtained. For a beam distribution that is significantly non-Gaussian the BA7 would reconstruct a plot that closely matches the real beam.
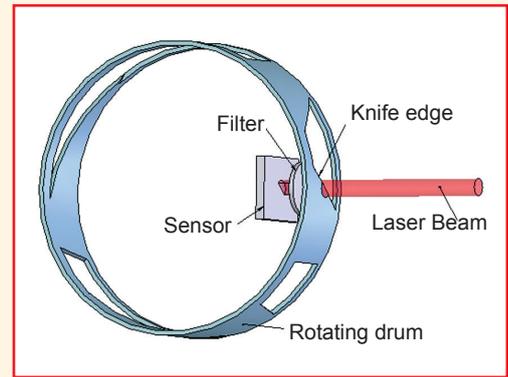
System Presentations

Beam Analyzer provides an extensive range of graphical presentations and analysis of laser beam parameters.

Beam Profiles and Width
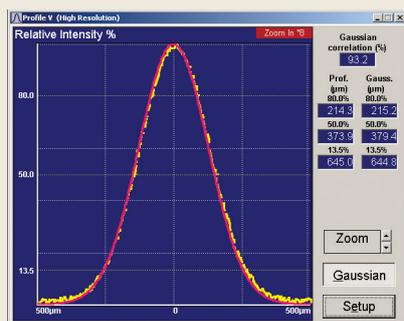
Beam Analyzer' control software simultaneously displays two profiles from two orthogonal knife-edges, or show each profile individually for greater visual detail. These main profiles, located at 45 degrees from the base of the head, are called "V" and "W".

Beam widths are digitally displayed for any three user selected clip levels, with up to 0.1µm resolution. The beam profile displays are auto-scaled (optional) to maximize on-screen detail and resolution. Added detail can be obtained in a special high-resolution mode. A Gaussian fit profile can be overlaid on profiles in real time, while the correlation and fit values are displayed digitally. Zoom function automatically increases the displayed spatial resolution.

Chart mode

It is frequently necessary to monitor the Beam Width (or alternatively Beam Position) as a function of time. In Chart Mode, these parameters can be viewed in strip chart format, showing long term time-dependent stability or drift. The measured data can be viewed on screen, saved or printed for further analysis.
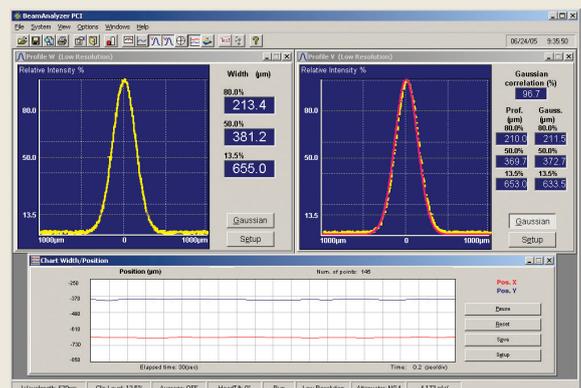
2D and 3D Intensity Plots

The Projection function provides either a 2D or a 3D plot of the beam intensity profile, and is created using reconstructive tomography.

The 2D contour maps and the 3D isometric plots can be displayed with or without scan axis and grids. These plots can be rotated along the beam optical axis, as well as be flipped. This feature enables the user to view the image from various angles around the beam. It is also possible to control the 3D plot wire density, as well as view the 3D figure projections on XZ and YZ planes

Data about the beam size and centroid position is displayed digitally along with centroid and beam size data.
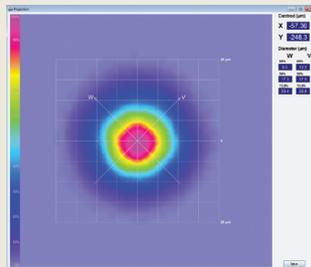
2D Plot
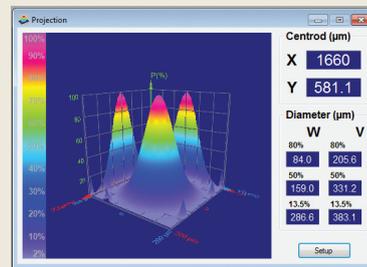
3D Plot

Power Measurement

The beam power can be displayed either as a digital readout, or as a bar-type display or in combination with an analog "needle". Power presentation units can be chosen as mW, µW or dBm. The user can offset the zero to deactivate the ambient light suppression. Pre-defined filter transmission files can be selected. A test range can be defined and displayed to monitor beam power within specific limits, audio alarms are optional.
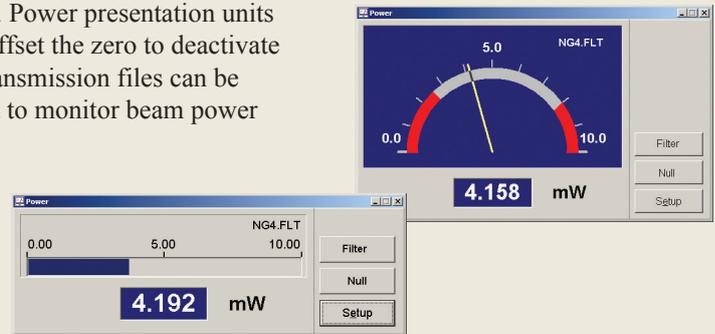
Beam Position and Ellipticity
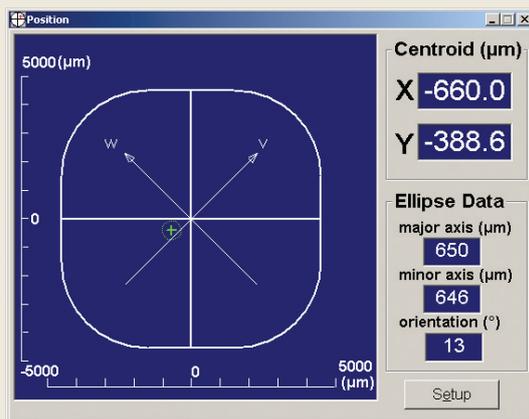
The beam centroid position is continuously monitored relative to the center of the sensor area in real-time, along with beam shape, ellipticity (major and minor axes) and angular orientation. A zoom function is available for viewing the footprint of small beams more clearly.

Observing beam position stability versus time is available upon setting up of the Chart function to monitor beam position at the selected clip level.

More Software Features

- Pass/Fail testing can be performed on measured results for acceptance within specific tolerances.
- Data logging to a Text file or to Excel file
- Live Snapshot files replay for complete analysis of results
- Average setting, Zooming
- TCP/IP communication protocol and remote control
- Data transmission via RS-232 link to another computer
- Slave Mode controlling the measurements upon request
- Screen images can be saved as BMP/JPG files or printed out
- ActiveX software for integration in user's application program

Specifications

Manifold box drawing

162 Ref.
152.8 Ref.
31
127
121
60

BA3 / BA7 Head Drawing

BA7   BA3

35.2   87   15   15
15   37.6
Φ11
Φ68   105   50   □9   Φ5.4
3x M4 Thread
3.5   M22x0.5 Thread
15   M4 Thread   13   15
Cable outlet   2x M4 Thread Deep 3.5

Dimensions are in mm

Sensor type	Silicon (Si), UV-Silicon (UV-Si) InGaAs (IR) or IR Enhanced (IRE)
Wavelength range	**Si** 350-1100nm
	UV-Si 190-1100nm
	IR 800-1800nm
	IR Enhanced (E) 1200-2700nm
Number of blades	3 for BA3 heads, 7 for BA7 heads

Beam size range

3µm-5mm	for BA3-Si and BA3-UV
15µm-10mm	for BA7-Si and BA7-UV (Oval)
15µm-9mm	for BA7-Si and BA7-UV (Round)
3µm-3mm	for BA3-IR3 and BA3-IR3-E
15µm-3mm	for BA7-IR3 and BA7-IR3-E
3µm-5mm	for BA3-IR5
15µm-5mm	for BA7-IR5

Beamwidth resolution	1µm for beams>100 µm in size, 0.1µm for beams<100µm in size
Beamwidth accuracy	±2%
Power accuracy	±5% for Si and UV-Si heads, ±10% for InGaAs heads
Power range	10µW to 1W with filters for Si and UV-Si heads, 10µW to 5mW (no filters provided) for the InGaAs heads
Saturation	0.1 W/cm² without filter, 20W/cm² with NG9 (Si and UV-Si)
Power resolution	0.1µW
Position accuracy	±15µm
Position resolution	1µm
PC interface	USB 2.0
Operating Temperature	10º to 35ºc
Weight	Sensor head 755 gr with cable, manifold box 350 gr
Measurement rate	5Hz
CE Compliance	

Host Computer Requirements

Pentium IV Core 2 Duo, 1GB RAM, 300MB Free HDD, 128 MB 16 bit VGA card, CD Drive any type, 1 free High Speed USB 2.0 port. OS: Windows XP/VISTA/7, 32 & 64 bit.

Ordering Information

The system consists of a measuring head with 2.5m long attached cable, a post, USB 2.0 manifold Box, NG4 and NG9 filters in housing (for Si and UV-Si heads), software on CD disk, carrying case.

BA3-Si	3-blades, Si detector 5mm circular
BA7-Si	7-blades, Si detector 9mm square
BA3-UV	3-blades, UV-Si detector 5mm circular
BA7-UV	7-blades, UV-Si detector 9mm square
BA3-IR3	3-blades, InGaAs detector 3mm circular
BA3-IR3E	3-blades, InGaAs Enhanced 3mm circular
BA7-IR3	7-blades, InGaAs detector 3mm circular
BA7-IR3E	7-blades, InGaAs Enhanced 3mm circular
BA3-IR5	3-blades, InGaAs detector 5mm circular
BA7-IR5	7-blades, InGaAs detector 5mm circular

Optional Accessories

SAM3-B	Beam Sampler, with mounting adapter - sampling reduction factor 0.0016 average
BA-Fiber	A fiber adapter with an FC connector
BA-Mount	A mount enabling head rotation about the optical axis

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