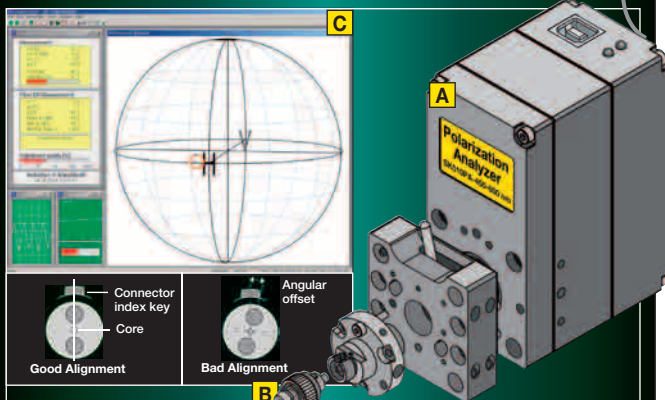


Polarization Analyzer Series SK010PA-...

Multiple Wavelength Ranges 350 – 1600 nm
Interface: USB 2.0

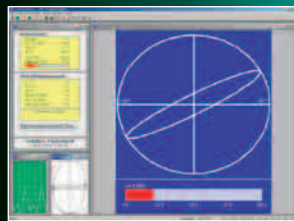


The SK010PA-... Polarization Analyzers are universal analytical devices for measuring the State Of Polarization (SOP) of free beams and lasers coupled to polarization-maintaining fibers.

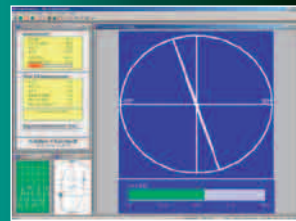
Measurement setup:
A Polarization Analyzer SK010PA
B Polarization-maintaining fiber with FC-APC connector
C Software

Measured values of the polarization are displayed interactively as dots on the Poincaré Sphere, as a Polarization Ellipse, a red/green color bar and as numeric output.

Graphical display:
 • Poincaré Sphere for PM fiber alignment with high coherent laser sources
 • Ellipse view for low coherent light sources
 • Red/green color bar indicates excellence of adjustment



Polarization extinction ratio (PER) of a misaligned PM fiber



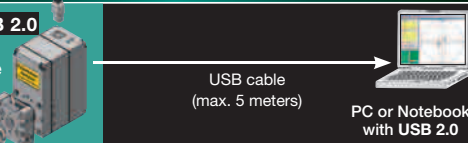
PER in elliptical view of an optimally aligned PM fiber

Analysis Software SKPolarimeter

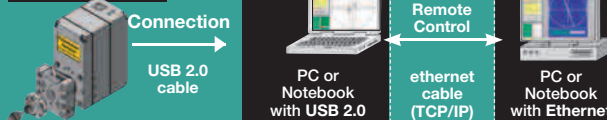
- Extinction ratio (ER) measurement
- Display of polarization state on a Poincaré sphere
- Display of polarization ellipse (linear or logarithmic scale)
- Adjustment support for PM fiber coupling of high and low coherent sources
- Measurement results can be logged and saved
- Log file of measurements over a designated time
- Calibration of polarization zero phase and resetting to the original factory settings
- Integration of the polarimeter in customizable software with LabVIEW VI-library and DLL
- Remote control and client/server application via TCP/IP

Interface: USB 2.0

Control, data transfer, voltage supply from PC



Remote Control



The polarization analyzer series SK010PA-VIS/NIR is a comprehensive universal measurement and test system, for free beam applications and laser beam sources with polarization-maintaining fiber optics, that was developed for ease of use by experts in the field.

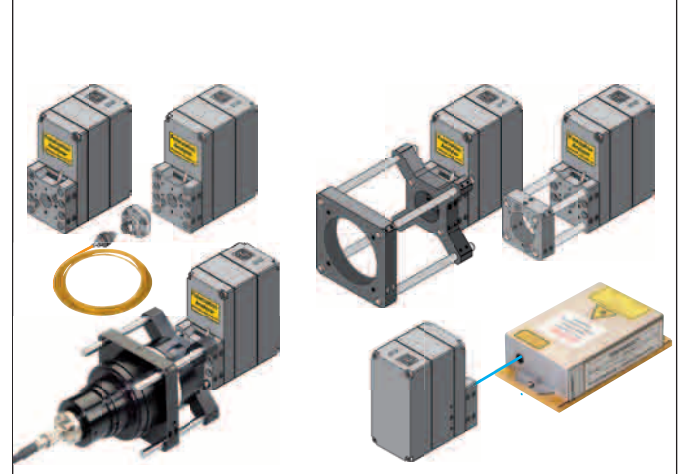
The polarization analyzer is a plug & play device and connects to the USB port of a standard computer. Alignments and measurements are performed rapidly, especially in comparison with tedious and highly time-consuming standard methods. A real-time interactive display shows the state of polarization and the oscillating axis of the linearly polarized fraction, as well as the orientation of the connector key index for when a fiber cable is attached.

The radiation coupled to the polarization analyzer is collimated, passed through a rotary quarter-wave plate and a polarizer and recorded by a photo detector. The photo detector signal and the rotary angle are evaluated by an onboard chip and transferred via the USB port to the computer. The software SKPolarimeter evaluates the components of the Stokes Vector and displays them as points on the Poincaré Sphere and as a Polarization Ellipse.

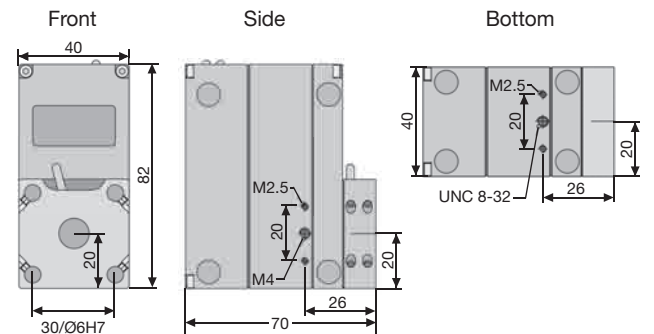
The measurements are saved with a simple command in the software menu, can be followed using a timer-based logging function or can be fed into external software using the DLL or LabView files that are delivered with the device for user customization.

- 'Plug & play' device, no interface card necessary
- Large spectral ranges: 350 - 450 nm SK010PA-UV
450 - 800 nm SK010PA-VIS
700 - 1100 nm SK010PA-NIR
1100 - 1600 nm SK010PA-IR
- Connection for fiber connectors of types FC-APC included in delivery
- Compatible with microbench for beam optics applications
- Diaphragm as power attenuator and automatic electrical gain control
- 'Real-time' display with 30 measurements per sec
- USB interface, PC operating system: Windows

Free beam and fiber-optic configurations



Dimensions



Order Code	SK010PA - VIS	Wavelength range:
		UV 350 - 450 nm
		VIS 450 - 800 nm
		NIR 700 - 1100 nm
		IR 1100 - 1600 nm

Software applications: PM fiber alignment

PM fiber adjustment with coherent sources

The extinction ratio, ER, of fiber-coupled radiation is the ratio of the optical power coupled to the two main axes of a polarization-maintaining fiber. The polarization analyser can be used to optimize the coupling alignment of polarization-maintaining fibers.

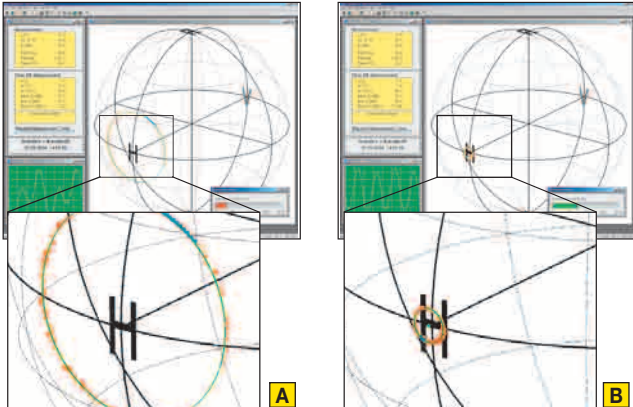


Figure 3: Enhanced measurement adjustments for PM fiber axes

A
When linearly polarized radiation is not coupled exactly to one of the fiber polarization axes, the actual state of polarization fluctuates with temperature or with fiber position. The measured states of polarization are mapped as a circle on the Poincaré sphere. The center of this circle represents the mean extinction ratio for the given alignment. For an ideal linear birefringent fiber, the center is on the equator of the sphere. The circle data point furthest away from the equator represents the lowest extinction ratio that can occur with the current alignment. The radius of the circle is a measure of the misalignment angle of the fiber, with a smaller radius indicating an improvement in the coupling alignment of the PM fiber. For perfect coupling of linear polarized radiation to one of the main axes of a polarization-maintaining linear birefringent fiber, the circle degrades to a single point located on the equator of the Poincaré sphere.

In the software modus ER, a series of measurements are performed and the data logged. For the modulation of the polarization state, the fiber is stressed or heated and a circular cloud of data points is generated on the Poincaré sphere. After data acquisition, a circle is automatically fitted to the data.

The aim of the subsequent adjustments is to cause the convergence of these data points to the center of this circle, by rotating the linear input state of polarization with respect to the fiber main axes.

As an additional aid, the reciprocal distance from the center is displayed continuously by means of a bar plot with a linear or logarithmic scale.

B
A second measurement of the extinction ratio has been performed. This reduced radius indicates that the fluctuation of the current state of polarization is reduced. For the final ER measurement, the mean and minimum ER values are displayed on the linear or logarithmic bar plot.

PM fiber adjustment with low coherent sources

The ER measurement procedure described applies only to a coherent laser source with the degree of polarization close to 100%.

For low coherent sources, the light not coupled to the main axis of the fiber contributes to the unpolarized light, described by an extinction ellipse, see figure 4.

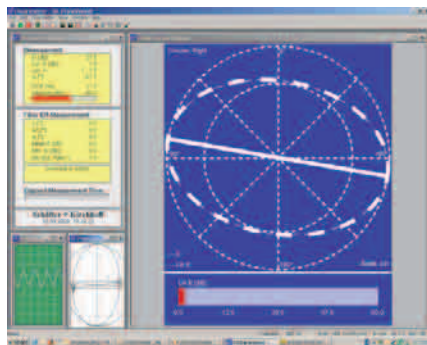


Figure 4: Polarization ellipse of PM fiber alignment with a low coherent laser source

For each measured degree of polarization lower than 80%, an additional dotted polarization ellipse depicts the ratio between linearly polarized light and the sum of circular and unpolarized light. The dotted ellipse becomes smaller for improved alignments between the fiber axes and the linear polarized fraction of the light.

Technical Data

Power range: 0.01 - 50 mW
Accuracy: η : 0.2°, ϕ : 0.2°,
Extinction ratio ER: 0.5 dB,
Degree of polarization: 2%
Sensor Aperture: 2.85 by 2.85 mm²
PC interface: USB (providing power supply)
Housing: 40x70x82 (w x l x h)

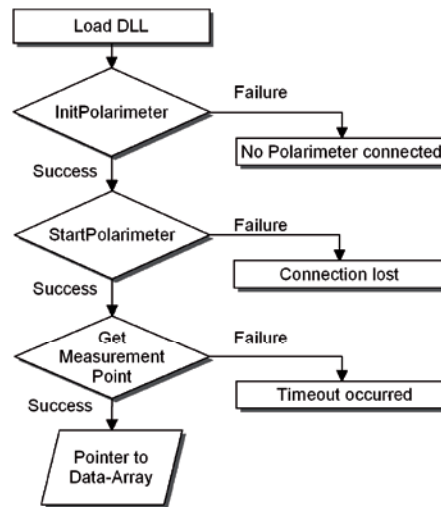
Accessories (included):

- USB cable
 - Adapter for fiber connectors of type FC-APC'
 - Analysis software: SKPolarimeter for WINDOWS 7/Vista/XP (32/64 Bit)
- LabVIEW DLL included



External programming

To integrate the Polarization Analyzer into a customized software application, only three functions from the SKPolarimeter DLL are needed.



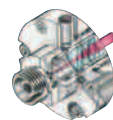
The first initialization is performed by calling the DLL, where earlier settings from previous measurements can be adopted. Continuous measurement by the polarization analyzer is started using the next function.

To obtain a measurement point from the constant stream of data produced by the polarization analyzer only one function call is required. Any feature of the SKPolarimeter software can be included in customer-produced software projects. This applies to all dialog boxes for input of different parameters, all graphical displays and the measurement of the extinction ratio of polarization-maintaining singlemode fibers.

Attachments

Adapter for fiber connectors of other wavelengths

Connector Type	Spectral Range	Order Code
FC-APC	400 - 600 nm	9780-60SMS-4-A6.2-01
	600 - 1050 nm	9780-60SMS-4-A6.2-02
	1050 - 1550 nm	9780-60SMS-4-A6.2-03
FC-PC	1300 - 1750 nm	9780-60SMS-4-A6.2-45
	400 - 600 nm	9780-60SMS-0-A6.2-01
	1300 - 1750 nm	9780-60SMS-0-A6.2-45



Adapters for fiber connectors type F-SMA, ST and DIN-AVIO are available on request.



Adapter plate

For attaching beam optical components with Ø 19.5 mm system mount or with Ø 25 mm compatible with microbench systems

- Order Code**
- 48MC-MP-19.5 Ø 19.5 mm
- 48MC-MP-25 Ø 25 mm

Rod for mounting to microbench system

- Order Code** 48MC-6-75

