



Strainoptic Technologies, Inc.

STRAINOPTIC™ POLARISCOPE- POLARIMETER SYSTEM PS-100

BULLETIN PS-103

INTRODUCTION

Strainoptic™ Polarimeter System PS-100 is a modular instrument. It provides the user with a broad choice of components for handling a full range of applications and measurement tasks, such as:

- Photoelastic **STRESS ANALYSIS**
- **MEASUREMENT OF STRESS** in annealed and tempered glass products
- **QUALITY CONTROL AND PROCESS CONTROL** of cast, molded, or extruded **polymers**
- **RESIDUAL STRAIN, ORIENTATION AND BIREFRINGENCE** measurements

Using the PS-100 Polarimeter is simple. The strain-induced birefringence produces an optical interference pattern that can be observed as a colorful display of fringes.

The **PS-100 POLARIMETER SYSTEM** extracts data from the display, using easy-to-operate compensators, yielding a direct, quantitative readout. The background and procedures used are described in the instruction manual and are also documented in several books, publications and Standard Test Methods issued by ASTM.

SELECTION OF COMPONENTS

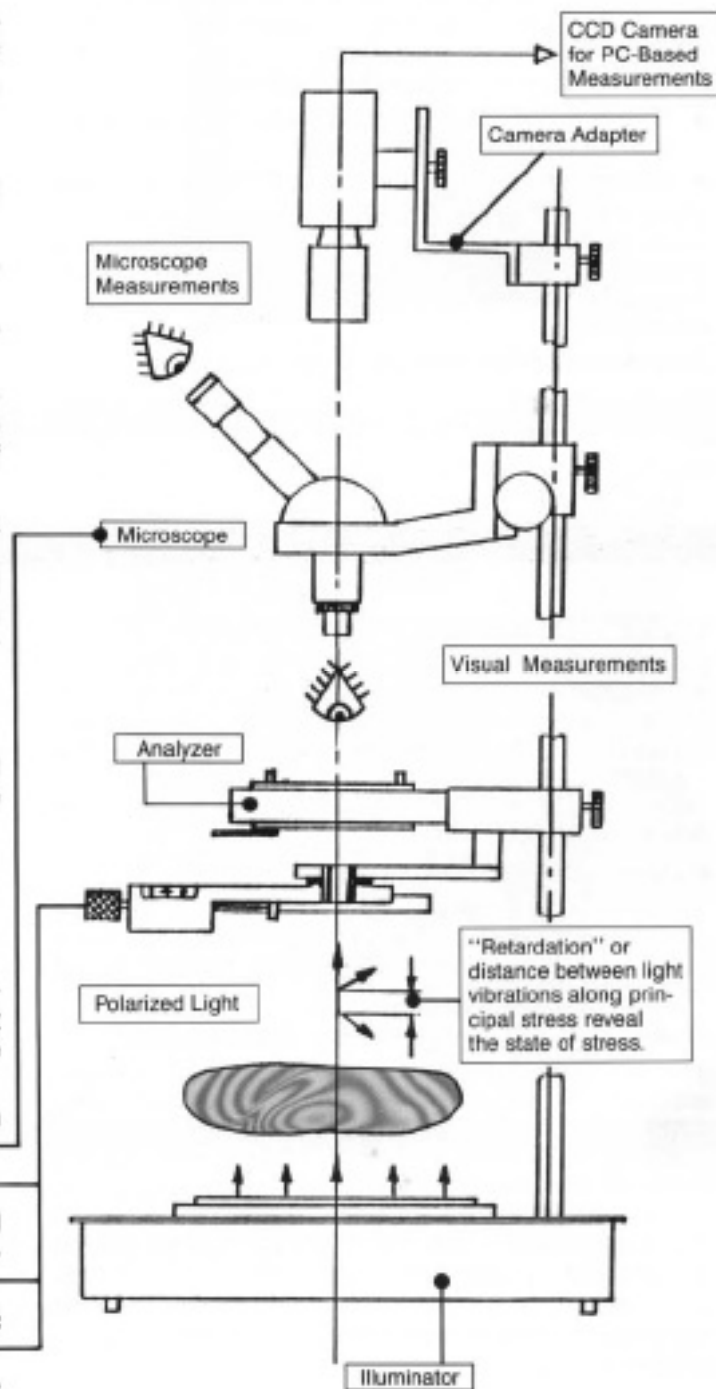
PS-100 Polarimeter system components are sold separately or in complete packages. Four package systems are available:

- | | |
|----------------------|------------------|
| • Basic System | PS-100-BS |
| • Standard System | PS-100-SF |
| • Large Field System | PS-100-LF |
| • Research System | PS-100-RD |

Each PS-100 System consists of a polarizing illuminator and STRAINOPTIC Analyzer to perform most strain/stress/birefringence measuring tasks. For more specialized work, accessories can be easily attached:

- **MICROSCOPE** – for applications requiring high magnification.
- **FILTERS** – When monochromatic light is required.
- **COMPENSATORS** – Babinet (wedge) or Soleil (double wedge) for quantitative readout of measured strains.
- **TINT PLATE** – For color-enhanced polariscopic examination of low strain items.
- **IMMERSION CELL** – For handling applications where index-matching liquid is required.
- **CAMERA ADAPTER**

If your task requires other accessories or a different system configuration, call Strainoptic for more available options.



Components of the PS-100 System

STRAINOPTIC ANALYZERS

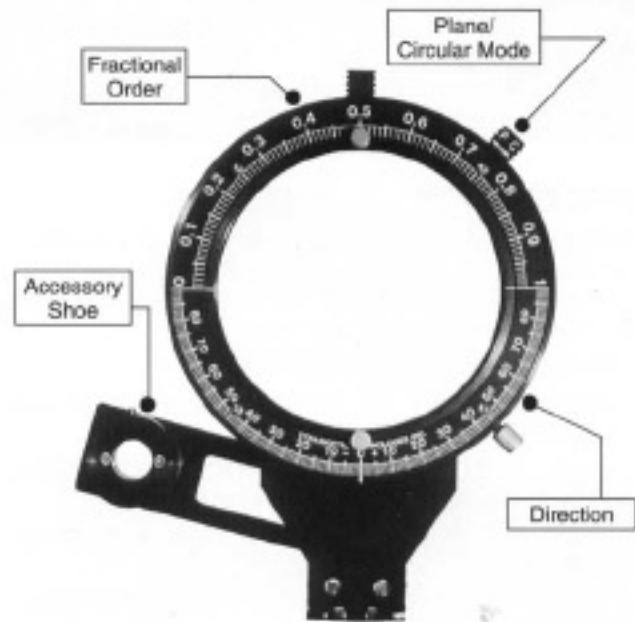
Model **SA-100 Analyzer** is equipped with a 115 mm diameter rotatable analyzer and precision quarter-wave-plate compensator for plane or circular polarization. A dual-scale precision dial offers direction-of-strains readout (+90° to -90°) and retardation readout in fringes (Dial A) or nano-meters (Dial B). An accessory shoe to mount optional tint plates, compensators, and other accessories is included. The SA-100 will perform the following tasks:

- Observation of full-field strain patterns
- Measurement of retardation using Tardy or Senarmont analyzer rotation method
- Measurement using the LWC or DWC compensator

Model **A-100 Analyzer** is equipped with a fixed quarter-wave plate for measurement using the Senarmont analyzer rotation method with plane polarization. Accessory shoe is optional to attach a tint plate or compensator.

Specifications: SA-100 and A-100 Analyzers

Measurement sensitivity	Dial A	0.01 Fringes
	Dial B	5nm
Quarter-wave plate precision		5nm



Model SA-100 Analyzer

COMPENSATORS DWC-100 & LWC-100

A compensator is a measuring device, providing direct quantitative readout of strain-and stress-birefringence. Placed in series with the observed item, it adds a retardation of opposite sign to the specimen, cancelling the photoelastic effect. A zero order (black fringe) moves to the point of measurement and the compensator scale reads the retardation directly.

Model LWC-100 Linear Wedge (Babinet)

The LWC compensator is simple and easy to use. It is placed near the specimen and the shift of the black fringe on the scale provides a direct readout of the measured retardation.

Model DWC-100 Double-Wedge (Babinet-Soleil)

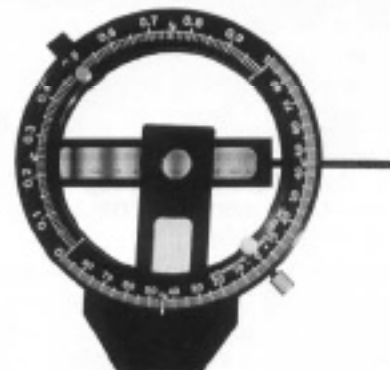
The DWC consists of two superimposed wedges exhibiting an opposing slope, providing a uniform retardation window. Retardation of the compensator is adjusted by relative motion of wedges and digitally indicated on a readout counter.

Since the uniform field eliminates the need to focus on the compensator scale, the DWC-100 can be placed anywhere in the light path, in series with the specimen. As a result of its uniform field feature, the DWC-100 is advantageous when measuring strain in areas of high gradients.

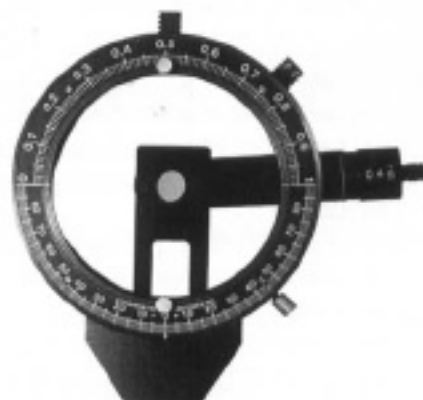
Specifications:

Standard Range:		2500 nm
With RE-2500 Range Extender:		5000 nm
Sensitivity:	LWC -100	10 nm
	DWC -100	5 nm

Factory calibration report included.



A-100 Analyzer shown with LWC-100 Compensator



SA-100 Analyzer shown with DWC-100 Compensator

POLARIZING ILLUMINATORS PQI

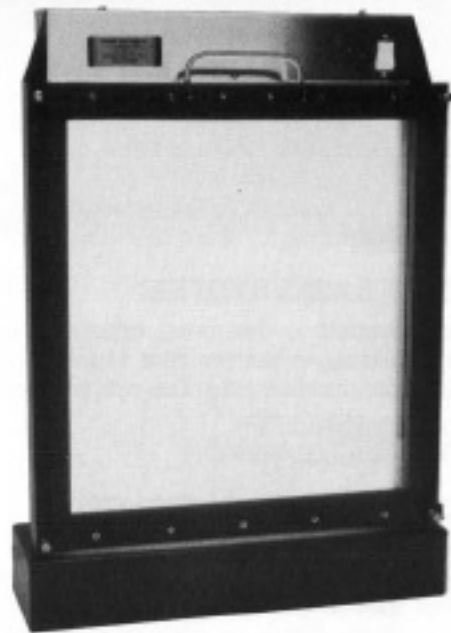
STRAINOPTIC polarizing illuminators are high-intensity DIFFUSED LIGHT SOURCES offering an exceptional uniformity of field illumination with a choice of PLANE and CIRCULAR polarization. Model PI-100 offers PLANE polarization only.

MODEL	SYSTEM	POLARIZING FIELD
PQI-500	PS-100-LF	740 mm x 420 mm (29 x 17 in.)
PQI-300	PS-100-LF	380 mm x 420 mm (15 x 17 in.)
PQI-200	PS-100-SF	200 mm x 200 mm (8 x 8 in.)
PI-100	PS-100-BS	200 mm x 200 mm (8 x 8 in.)
PRI-100	PS-100-RD	115 mm dia. (4.5 in. dia.)

The PQI-200 Illuminator includes a 1 inch (25 mm) stainless steel column for mounting the SA-100 Analyzer and MISC-100 Microscope, as pictured below.

The PRI-100 Illuminator includes a coupling shaft for synchronous rotation of Polarizer, used in the PS-100-RD system for precision measurements of direction of stresses, shear stresses, and a variety of research applications.

Custom Polarizing Illuminators are also available. Ask for details



PQI-300 Illuminator

MICROSCOPIC ACCESSORY MISC-100

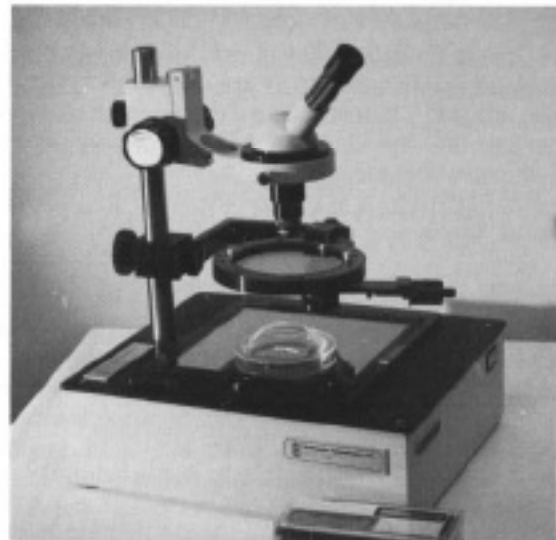
In a large variety of applications, magnifications is required for better resolution of details, and to accurately evaluate stresses in a region of high gradient.

Model MISC-100 Microscope

The MISC-100 Microscope attachment is a perfect tool for these purposes. It mounts directly above the Analyzer SA-100/A-100 on the column of PQI-200 Illuminator.

A precision rack-and-pinion mechanism permits easy focusing, with 20x (std.) magnification optics. Higher magnification is optional. Standard Model MISC-100 includes a 45° inclined monocular eyepiece. The optional MISC-100-C provides a separate camera port for simultaneous viewing and photography.

The MISC-100 microscope can also be equipped with the Measuring Wedge Assembly MWA-100. In this configuration, the SA-100 Analyzer is not required, and observation at very high magnification is possible.



MISC-100 Microscope mounted on
PQI-200 Illuminator Column

STANDARD WAVELENGTH FILTER SWF-100

The PS-100 Polarimeter is used mostly with white light. Monochromatic light is preferred in photographic work and for calibration. To obtain monochromatic light, a filter that transmits only the STANDARD wavelength is needed.

Model SWF-100 is a high efficiency Interferential Filter, mounted in a housing in front of the SA-100 Analyzer. The SWF-100 transmits a narrow band centered around the standard 565 nm wavelength.

RP-100 TINT PLATE

The RP-100 Tint Plate is a retardation plate exhibiting a uniform retardation of one wavelength (565 nm) over its entire area. The TINT PLATE, when placed in the field of view, permits observation of color-enhanced polariscopic strain patterns. Color vs. retardation tables permit quantitative evaluation of low strains.

Specifications

Dimension:	20 x 60 mm
Retardation	565 nm
Uniformity:	5 nm

PS-100 Systems

Four PS-100 standard systems are available from Strainoptic. Optional accessories can be easily attached. If your application requires a different system configuration or custom manufactured components, please call Strainoptic for more available options.

PS-100-BS BASIC SYSTEM

The basic system is the most economical desktop package to measure stress- and strain-birefringence using plane polarization only. The system includes:

- A-100 ANALYZER
- PI-100 ILLUMINATOR

PS-100-SF STANDARD SYSTEM

The Standard System is the most versatile desktop package. It offers accurate measurements of any object that can fit conveniently on the stage of the Illuminator using plane or circular polarization. The system includes:

- SA-100 ANALYZER
- PQI-200 ILLUMINATOR

PS-100-LF LARGE FIELD SYSTEM

The Large Field System is an inspection polarimeter designed for installation on a workbench to accommodate larger objects. The distance between the Analyzer and the Illuminator is completely adjustable. The system includes:

- SA-100 ANALYZER
- PQI-300 ILLUMINATOR

PS-100-RD RESEARCH SYSTEM

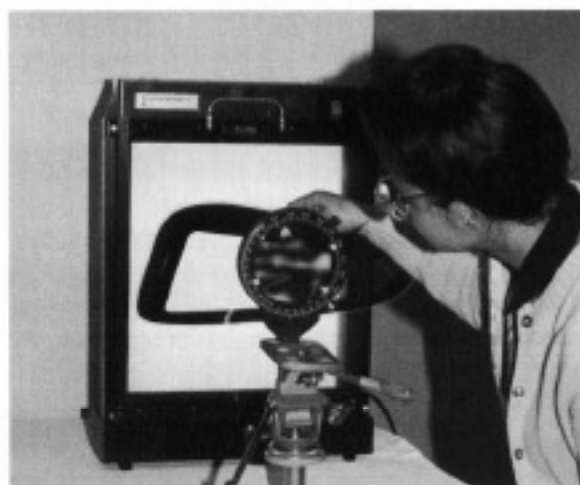
The R&D system includes the SA-100 Analyzer coupled to the PRI-100 Illuminator, permitting synchronization of the Polarizer/Analyzer axes. This model includes a specimen stage and accepts the broadest range of specialized accessories. It is particularly useful in research, photoelastic stress analysis and for PC-based Digital Image Analysis using the STRAIN-OPTIC DIAS-1600 system.

STRAINOPTIC's engineering staff will be glad to assist you in selecting a system which offers the greatest flexibility for your applications.

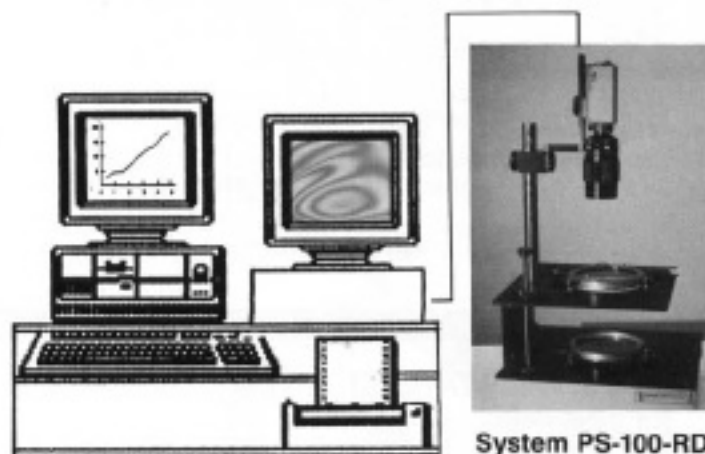
Instruction manuals are included with all STRAINOPTIC PS-100 Polarimeter Systems. We also offer training programs on the measurement of residual strains and birefringence. CEU certificates are granted for those who attend our short course. Ask for details.



System PS-100-SF



Large Field System PS-100-LF



System PS-100-RD

System 1600 Digital Image Analysis System



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