Strainoptics PS-100 Polarimeter

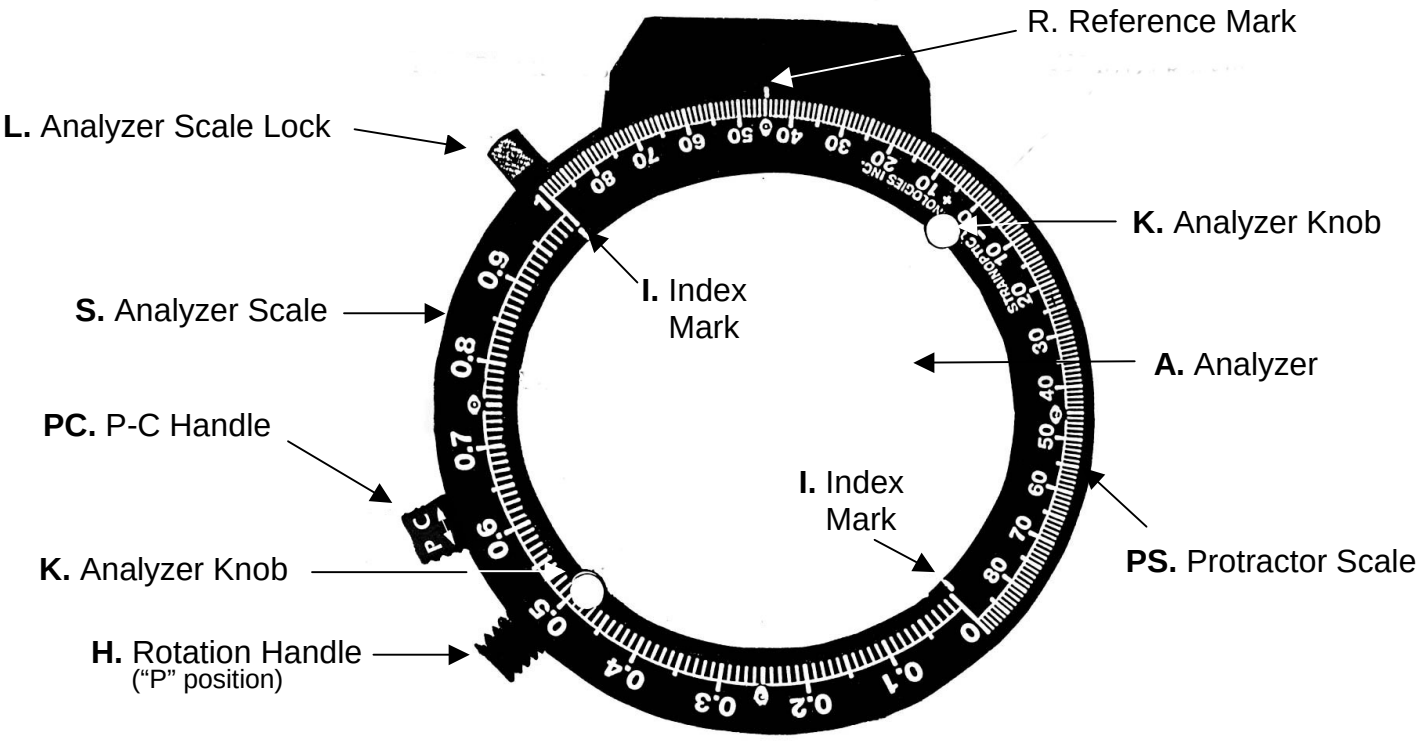
Quick-Start Guide

Senarmont Method (Analyzer Rotation)

Note: These instructions are not meant to replace the full Strainoptics PS-100 instruction manual supplied with your polarimeter. If you are not yet familiar with the initial setup, general operation, and maintenance requirements of your instrument, or if questions arise, please refer to the complete manual for further details. Before proceeding, we recommend that you become familiar with the names of the various instrument components as shown in the illustration below.

In order to calculate stress in your material, you must know its thickness in millimeters and its material stress constant in Brewsters.

1. Configure the instrument for PLANE polarization as follows:
   a. Verify that the Polarizer plate (not shown) is installed with the nameplate "PLANE" facing up.
   b. Loosen the Analyzer Scale Lock (L). Using the Rotation Handle (H), rotate the Analyzer Scale (S) until the number "1" on the Analyzer Scale lines up with the Analyzer Scale Lock (L). The Reference Mark (R) should be adjacent to the number "+45" on the Protractor Scale (PS). Tighten the Analyzer Scale Lock.
   c. Using the Analyzer Knobs (K), rotate the Analyzer (A) so that the Index Marks (I) are aligned with the number "1" and "0" on the Analyzer Scale.
   d. Move the P-C handle (PC) to the "P" position (under the Rotation Handle).



2. Turn on the illuminator. When looking through the Analyzer, the field will be dark. Place the sample to be measured on the Polarizer plate.

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3. Using a felt-tip pen, mark the area around the point of interest (POI) on the sample. Position the sample in the correct orientation for measurement as follows:
   a. Looking through the Analyzer, rotate the sample until the POI becomes dark.
   b. Rotate the sample 45º, either clockwise or counterclockwise, until the POI exhibits maximum light intensity.

4. If there is stress present in the sample, it will be seen through the analyzer as varying shapes and colors (fringes). The shape and color of the fringes indicate the distribution and magnitude of the stresses. (Very low stresses will appear white or gray.) Identify the LOWER fringe order (n) closest to the POI using the following table. For example, if gray is the color at the POI, then n = 0. Likewise, if bright yellow, n = 0. If the color at the POI is blue, then n = 1. *Write this value down*. **n =** ___

Decreasing Intensity

Color at POI	Fringe Order
Black	**0**
-Gray	
-White->Yellow	
-Bright Yellow	
-Orange (dark yellow)	
-Red	
Indigo->Violet	**1**
-Blue	
-Blue->Green	
-Green->Yellow	
-Yellow	
-Orange (dark yellow)	
-Red	
Indigo->Violet	**2**
-Green	
-Green->Yellow	
-Pink	
Violet	**3**
-Green	

5. From Step 4, note the HIGHER fringe order closest to the POI. This would be n+1. For example, if the lower fringe order (n) is 0, then the higher fringe order would equal 1.

6. While observing the movement of the fringes in the sample, rotate the Analyzer CLOCKWISE until a fringe is centered on the POI. Read the fractional fringe order (f) from the Analyzer Scale. This value will be between 0.0 and 1.0. *Write this value down.* **f =** ___

7. If you observed in Step 6 that a LOWER order fringe (see table) has moved TOWARD the POI, calculate the fringe order (N) at the POI using the values from Step 4 and Step 6 in this relation: **N = n+f** *Write this value down. The stress measured at the POI (parallel to the reference direction) is in tension (+).*

8. If you observed in Step 6 that a HIGHER order fringe (see table) has moved TOWARD the POI, calculate the fringe order (N) at the POI using the values from Step 4 and Step 6 in this relation: **N = (n+1)-f** *Write this value down. The stress measured at the POI (parallel to the reference direction) is in compression (-).*

9. To calculate the measured stress in MPa , use the following relation: $$S = \frac{N * \lambda}{T * C_B} = \frac{R}{T * C_B}$$

Where:
S = Stress (MPa) *Note: Multiply by 145 to arrive at PSI.*
N = Fringe order at POI
λ = Wavelength (565 nm for glass; 570 nm for plastic)
T = Thickness of material at POI, in mm
C_B = Material constant, Brewsters (2.65 for soda-lime glass)
R = Retardation (nm)

Strainoptics, Inc.
108 West Montgomery Ave. · North Wales, PA 19454 · Tel: (215) 661-0100 · Fax: (215) 699-7028
E-mail: stress@strainoptics.com · www.strainoptics.com