Semiauto Senarmont

Polariscope

LSM-7000LE

LED light source new type

High sensitive polariscope by professional optical manufacturer

luceo

With unique technology having been established by a manufacturer specialized in optical instruments, the accuracy in quantitative measurements of strains has been substantially improved by way of digitally displaying image brightness to thereby reduce errors in measured values due to visual observations.

The Semiauto Senarmont LSM-7000LE, is an instrument to make strains caused inside a transparent object visible to thereby quantitatively measure those strains.

Senarmont method is an inspection method for measuring strains, wherein an operator turns an analyzer so that the brightness of a part to be measured changes from the brightest state to the darkest state to thereby measure strains. With the inspection instruments of the visual observation type in the past, however, it has been problematic that variations in the measured brightness may occur due to difference in the condition during the measurement and in the operators.

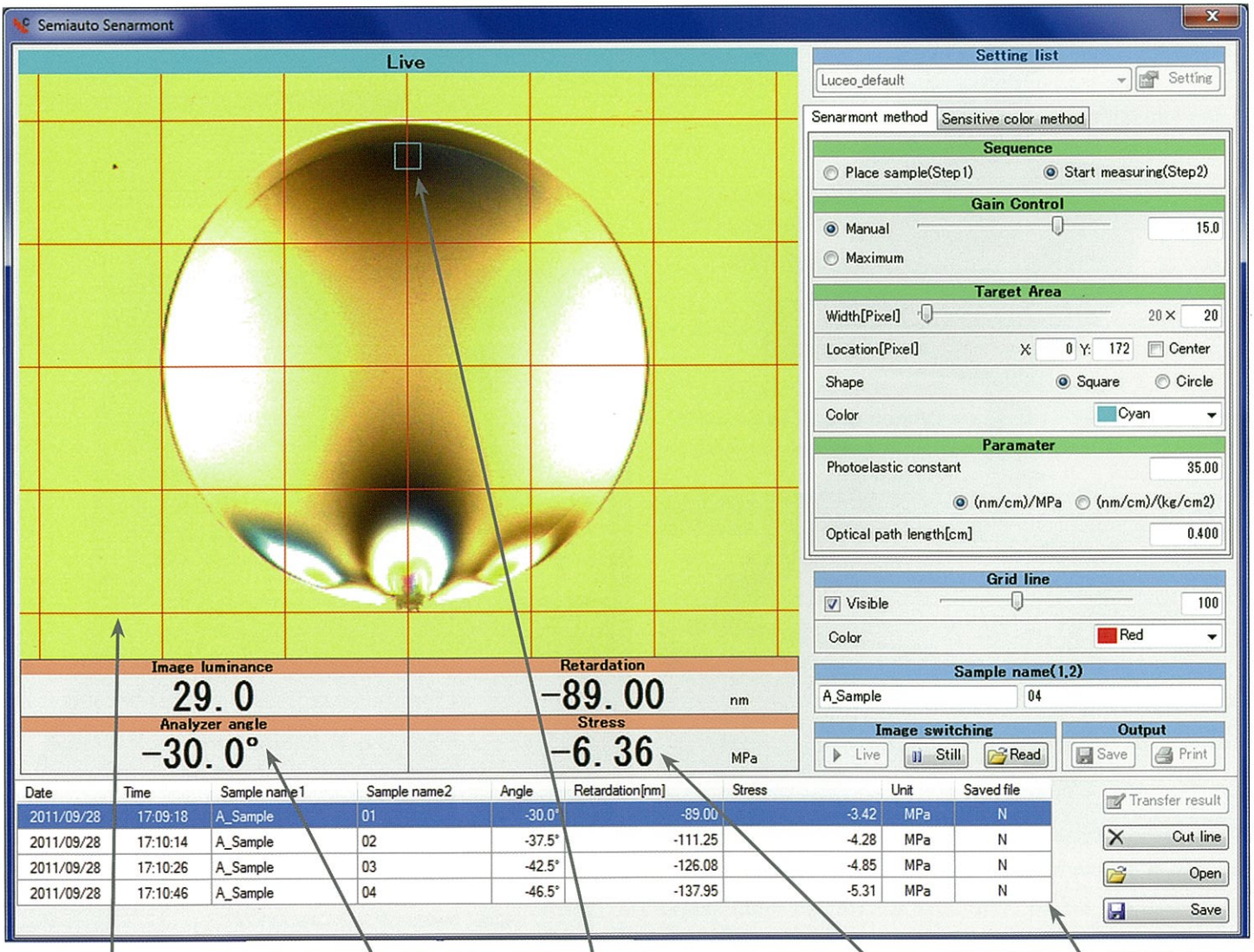
With this detector, brightness of an image is displayed with a digital value on the monitor so that the mode of determining the darkness and brightness of an image is changed from sensory evaluation to digital evaluation. Accordingly, decision of a turning angle at which an image became the darkest may be made easily and accurately, and errors in the measurements of the retardation are reduced in comparison with instruments of the visual observation type.

With this detector, it is possible to observe strains according to Sensitive tint color method having been often used for strain observations, and it is further useful to confirm the direction of stress.

This detector is equipped with a zoom lens, so that it is possible to increase the magnification of an image to inspect small samples. Moreover, this detector may be connected with a PC, and it is therefore feasible to record the measured data and observed images with ease.

This detector uses a high intensity LED as a light source and is designed for the type capable of using over a long life and consuming less power. Accordingly, labors required for maintenance in respect of replacement of the light source and running cost required for the detector can be reduced.

A screen for measurements according to Senarmont Method



Date	Time	Sample name1	Sample name2	Angle	Retardation[nm]	Stress	Unit	Saved file
2011/09/28	17:09:18	A_Sample	01	-30.0°	-89.00	-3.42	MPa	N
2011/09/28	17:10:14	A_Sample	02	-37.5°	-111.25	-4.28	MPa	N
2011/09/28	17:10:26	A_Sample	03	-42.5°	-126.08	-4.85	MPa	N
2011/09/28	17:10:46	A_Sample	04	-46.5°	-137.95	-5.31	MPa	N

Grid lines may be displayed so that the position adjustment for a sample can be made with ease.

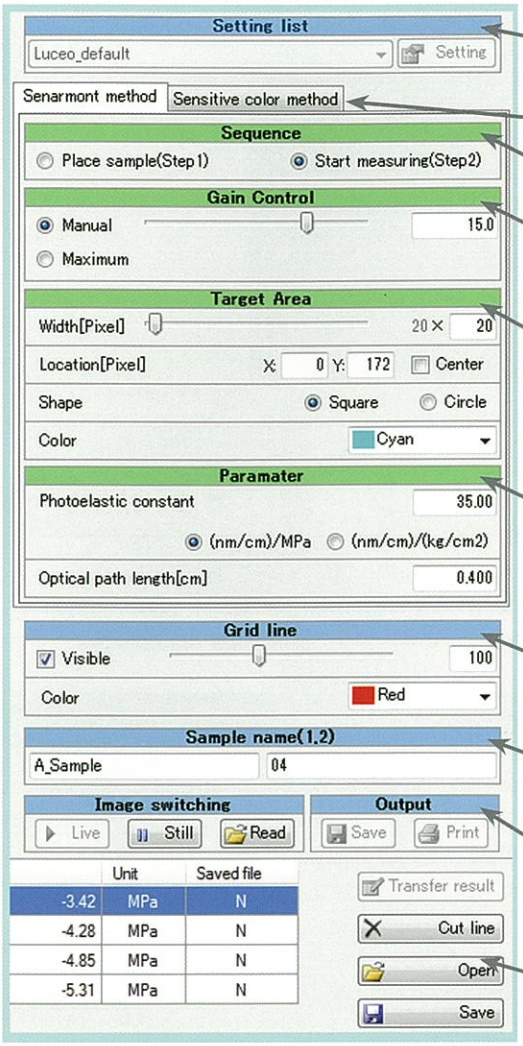
For a measurement, the analyzer is turned to find a position at which an image brightness shows the lowest value.

The area for a measurement may be adjustable in the size and may be moved to arbitrary positions within the screen.

Inputting a photoelastic constant and an optical path length of a sample leads to display the stress value on the screen.

A list of the measured data may be edited and stored them in the csv format.

Operation panel



Various settings for carrying out measurements may be named and stored, and any of those settings can be selected depending on a sample and the condition for measurement.

For switching the mechanism of strain detection from Senarmont method to Sensitive tint color method and vice versa.

For switching the modes of “arrangement of sample” and “measurement of sample”.

For adjusting brightness of an image to a proper degree in combination with diaphragming of a zoom lens.

For altering the contents of a measured part called “target area”.
Either square or round shape can be selected.
The size and the position may be changed freely.
Select an easily-identifiable color for the border line from the six colors provided.

Input “a photoelastic constant” and “an optical path length” as parameters for calculating stress.
Photoelastic constant is a value being inherent to the material of a sample.
Either MPa or kg/cm2 is selected for that unit.
Input an optical path length.

For changing the contents of grid lines.
A distance between lines starting from the central line of an image may be altered freely.
Select an easily-identifiable color for the line from the six colors provided.

Input the name for a sample. The input name will be the file name for storage.

Output : Image data, the results of measurements and text data of the set contents may be stored and printed.
Image switching : For switching moving images, static images and playback images of the stored files to one another.

A list of measured data may be edited and stored. Opening of a stored file and an addition of a measured data can be done.

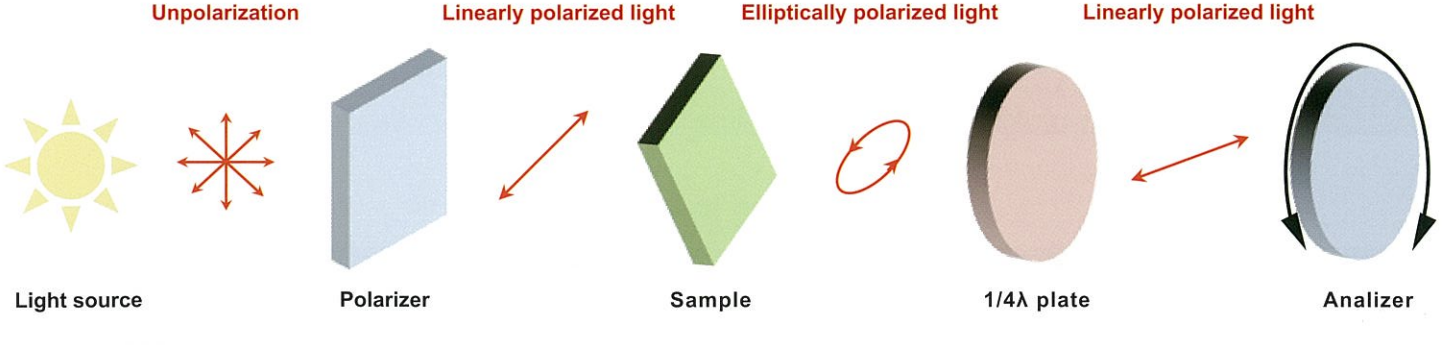
Advantageous characteristics of LSM-7000LE

- Errors in the measured values due to difference of the operators may be reduced.
- Input a photoelastic constant and an optical path length beforehand, so that stress can be automatically computed.
- This detector is configured to store measured data and images of observed strains in a PC. Therefore, monitoring of records and preparation of a report can be pursued easily with the PC.
- Magnification of the monitor can be switched in a range of from approximately 1 to 24 times with use of a zoom lens. (When using a liquid crystal monitor of 15.4 inches and 1280×800 dots)

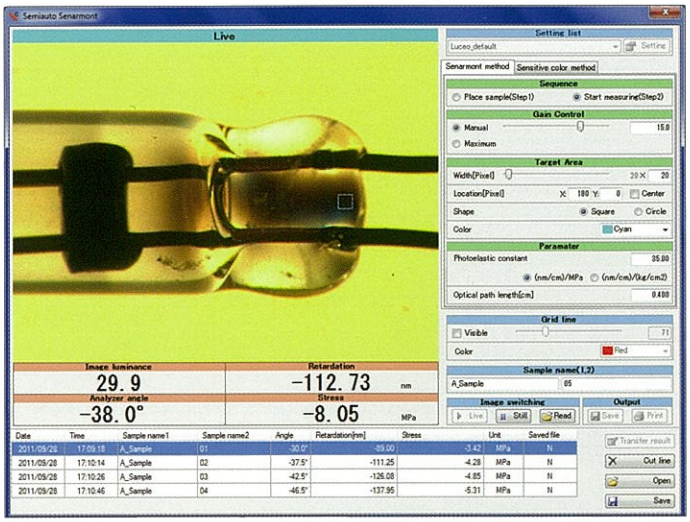
Constitution of Senarmont Method

Light from a light source is converted to a linear polarized light with use of a polarizer. When a sample having strains is placed at a defined angle in the linear polarized light, a phase difference occurs between the x component wave perpendicular to the linear polarized light and the y component wave to generate an elliptic polarized light. Then, when the elliptic polarized light passes through a 1/4 wave plate, the elliptic polarized light is converted to a linear polarized light, the direction of the polarizing axis of which is different from that of the original linear polarized light.

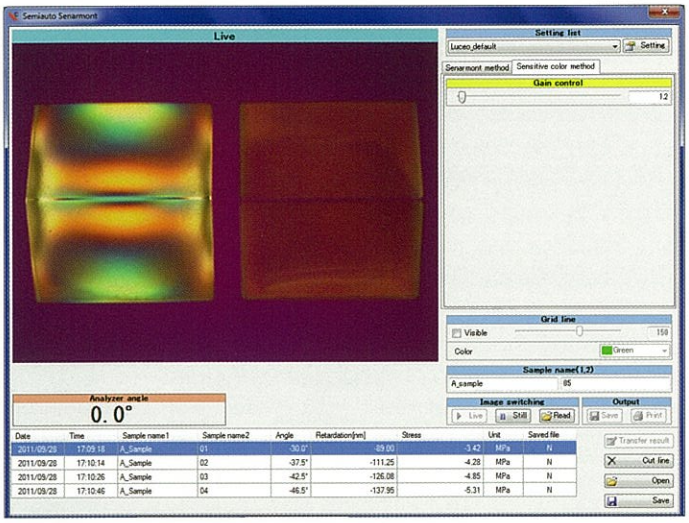
Turn the analyzer from the starting position to cause the converted linear polarized light to be the most dark condition where the penetrating axis of polarized light is made orthogonal. Since this turned angle is in a proportional relation with the phase difference due to strains in a sample, it is possible to obtain the phase difference according to a calculation equation.



Example



Stress measurement between electrodes of a special lamp according to Senarmont method.



Verification of stress condition before and after subjecting a prism to annealing according to Sensitive tint color method.
Left: Before annealing Right: After annealing

Product specification

Contents	Specification
Size (body)	W280 x D380 x H730 mm
Weight (body)	16kg
Effective Dimension of Polarizer (PL)	W200 x D200 mm
Effective Dimension of Analyzer (AN)	ϕ80 mm
Length between PL and AN	26 ~ 240 mm
Inspection Method	Sensitive Tint Color Method Senarmont Method
repeat accuracy (standard deviation)	about ±1.5 nm (Analyzer rotation angle ±0.5°)
resolution	about 1.5 nm (Analyzer rotation angle 0.5°)
Camera view field	Max. 176×132 mm Min. 6.9×5.2 mm
Light Source	White LED 3,000K
Power Consumption (body)	19.5W
Power Source	AC 100 ~ 240V 50/60Hz
Component	Main body, CCD camera, Zoom lens, PC, Cable
Accessories	Main body cover, Bar to check the direction of stress (glass and acrylic)
OS	windows7(64bit)/windows8(64bit)

Purpose

- Quantitative measurement of residual stress of glassware
- Strain inspection of plastic products
- Phase difference measurement of the optical film
- Check whether there is any strain of crystalline material, etc.

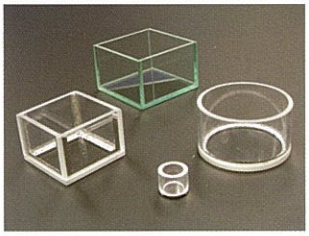
Minor change

An effective dimension of the polarizer, an effective dimension of the analyzer, a height of a sample arrangement space and the like may be modified to desired dimensions in consideration of an operational distance and an image angle of the zoom lens.

Please feel free to contact us, if you have any requests for other customizing.

Option

The sample which has asperity or curve like a lens should be inspected with soaking in immersion liquid. We can make various kinds glass cell according to customer's individual needs.



Test object

The sample is limited to transparent material. It may be unavailable for law transmittance or law transparency sample.

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