

Polariscopes LSM product line-up



High sensitive polariscope by professional optical manufacturer
Strain view, stress direction analysis, quantitative measurement
in a product made from glass or plastics.

Japanese has this kanji word. —————> What is this word called in English?



(HIZUMI)



strain

As a word, there are several images for "strain".

What do you think about right image of "HIZUMI = strain" ?

The most suitable image is abstracted from a dictionary.

strain: physical pressure [uncountable, countable] the pressure that is put on something when a physical force stretches, pushes, or pulls it (Oxford Advanced Learner's Dictionary 9th edition).

Although strain occurs in metal and wood, LUCEO focuses on strain occurred in transparent body. Following 4 products are major examples of transparent body.

glassware

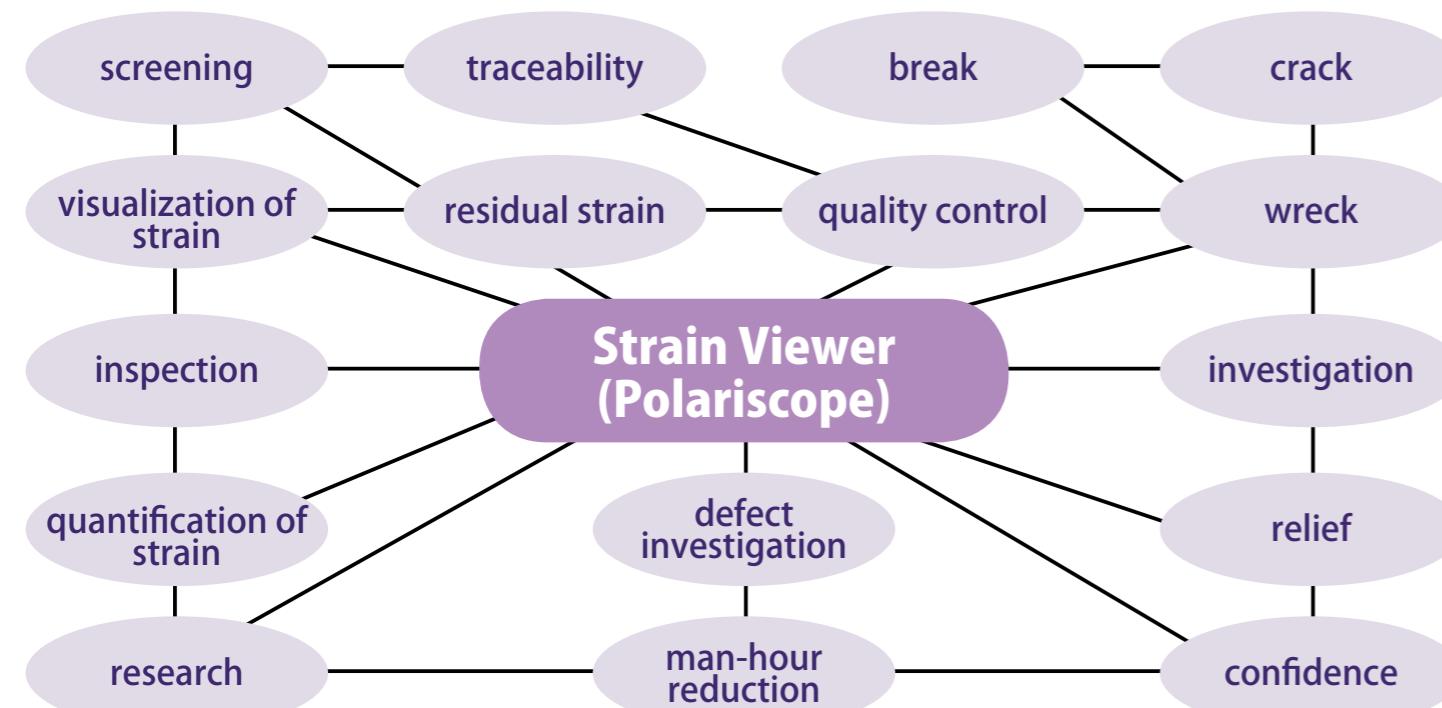
resin film

plastic product

crystalline material

LSM product family, Strain Viewer (Polariscope), provides solutions

for **strain** in transparent body.



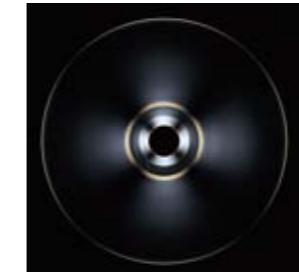
Inspection method

<<< There are 5-ways in 2-types of inspection method for polariscopes >>>

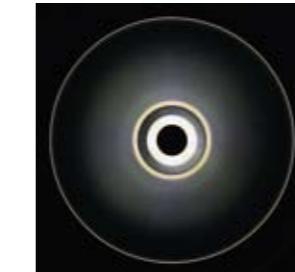
Observational method

Observe presence/absence, distribution state, feature and direction of strain in transparent body. For example, mold injection product of an optical disk is seen like below pictures according to inspection method.(Observation object: transparent CD disc)

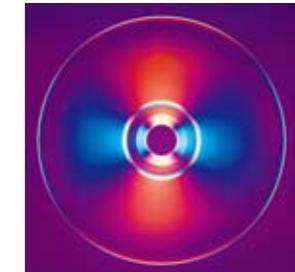
Crossed Nicols method



Circularly Polarized method



Sensitive Color method

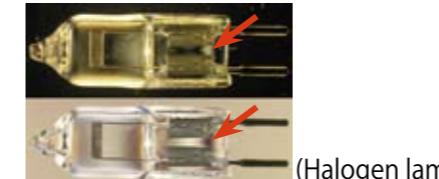


Measurement method

Numerical value and direction of strain are quantified.

Senarmont method

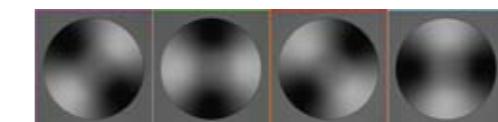
Calculates strain by finding the angle of the darkest portion of the brightest part in a sample as rotating the analyzer.



(Halogen lamp) (Lens)

Rotating Analyzer method

Calculates value and direction of strain by rotating the analyzer at previously defined angles based on change of brightness.



(Lens)

RGB Linear Polarization Method

Rotates the polarizing plate at a specified angle while maintaining the orthogonal and parallel positions, and calculates the magnitude and direction of distortion from the change in brightness.



(Crystal glass)

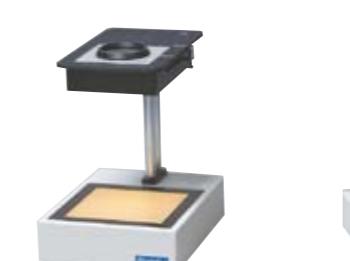
Type of polariscope

<<< 3-families of polariscopes according to inspection method >>>

Observational method			Measuring method		
Crossed Nicols	Circularly Polarized	Sensitive Color	Senarmont	Rotating Analyzer	RGB Linear Polarization
StrainEye < Visual >	Semiauto Senarmont < Semi-Automated >	Fullauto StrainEye < Fully-Automated >			



Visual inspection

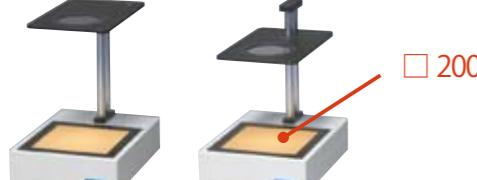
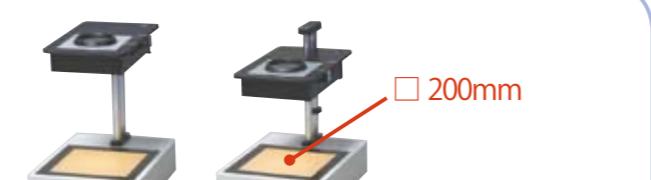
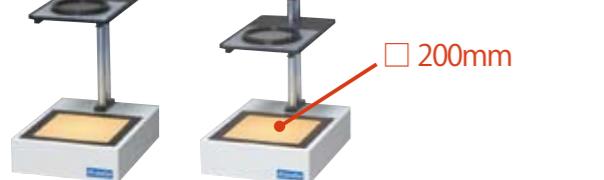


More precise with PC analyzing



2D whole measurement

StrainEye < Visual >

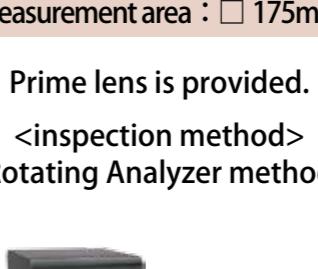
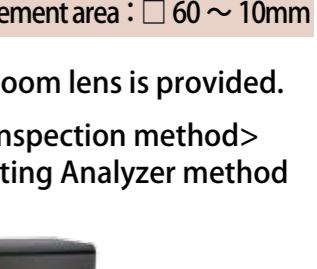
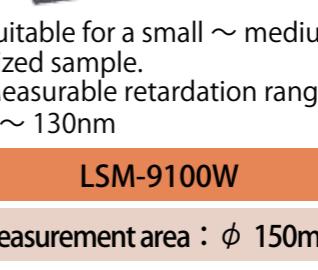
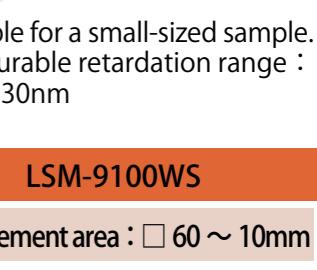
LSM-1000LE (Handheld)	LSM-2000LE (Portable)
	
Lighting area : Φ 78mm	Lighting area : \square 120mm
LSM-1000LE : Crossed Nicols Sensitive Color Senarmont	LSM-2100LE : Crossed Nicols LSM-2200LE : Circularly Polarized LSM-2300LE : Sensitive Color
(Inspection method is changeable by replacing a wave plate) • Suitable for a small-sized sample inspection. • Battery operation available. • Carriageable with the handle. • Easy to check edge conditions of large glass.	• Tilted lighting area enables to inspect seating in a chair. • Suitable for a small-sized sample inspection. • 1set/person by reasonable price.
LSM-4000LE family (Medium)	
• Select with/without height adjustment of analyzer. LSM-4*00LE : without height adjustment LSM-4*01LE : with height adjustment	Lighting area : \square 150mm Lighting area : \square 200mm
 LSM-4100LE LSM-4101LE : Crossed Nicols	 LSM-4410LE LSM-4411LE : Sensitive Color Senarmont
LSM-4200LE LSM-4201LE : Circularly Polarized	(Inspection method is switchable by sliding the lever)
LSM-4300LE LSM-4301LE : Sensitive Color (Select a model by inspection method)	
 LSM-4400LE LSM-4401LE : Crossed Nicols Sensitive Color Senarmont	 LSM-4400B LSM-4401B : Crossed Nicols Sensitive Color Senarmont
(Inspection method is changeable by replacing a wave plate)	(Inspection method is changeable by replacing a wave plate)
LSM-8000LE family (Large)	
	Lighting area: 350x300 350x350
LSM-8201LE : Circularly Polarized	
LSM-8400LE : Crossed Nicols Sensitive Color Senarmont	
(Inspection method is changeable by replacing a wave plate)	
• Suitable for a large-sized sample. • Analyzer height is adjustable.	

Device size comparison

10cm

1000 2000 4000 8000

Semiauto Semarmont < Semi-Automated >

LSM-7000LE	LSM-9001LE	LSM-9001S
		
Image range : 176 × 132 ~ 6.9 × 5.2mm	Measurement area : \square 175mm	Measurement area : \square 60 ~ 10mm
Standard zoom lens is provided. <inspection method> Sensitive Color Senarmont	Prime lens is provided. <inspection method> Rotating Analyzer method	6x Zoom lens is provided. <inspection method> Rotating Analyzer method
• Suitable for a small ~ medium-sized sample. • Analyzer height is adjustable.		
LSM-7000B		LSM-9100W
		
Image range : 150 × 112 ~ 6.9 × 5.2mm	Measurement area : ϕ 150mm	Measurement area : \square 60 ~ 10mm
□ 150mm High brightness Standard zoom lens is provided. <inspection method> Sensitive Color Senarmont	Prime lens is provided. <inspection method> RGB Linear Polarization method	6x Zoom lens is provided. <inspection method> RGB Linear Polarization method
• Suitable for a small ~ medium-sized sample with deep colored. • Analyzer height is adjustable.		
LSM-7000BZ		LSM-9100WS
		
Image range : 13.0 × 9.8 ~ 2.0 × 1.5mm	Measurement area : ϕ 150mm	Measurement area : \square 60 ~ 10mm
□ 150mm High brightness High magnification zoom lens is provided. <inspection method> Sensitive Color Senarmont	• Suitable for a very small-sized sample. • Analyzer height is adjustable.	• Suitable for a small ~ medium-sized sample. • Measurable retardation range : 0 ~ 3,000nm
• Best for a very small-sized sample. • Analyzer height is adjustable.		

LUCEO has been a specialist of optical instruments for over 50years from its establishment.

LUCEO is the pioneer who produces polarizers and wave plates by mounting in-house optical films to optical glass plates. We provide product portfolio taking advantage of polarization technologies adapting to the changing social needs consistently.

Polarizer	Wave plate	Broadband Wave plate	Circularly polarized plate	Optical prism	Striae inspect device	Optical unit	Optical lens
							



In LUCEO showroom, you can experience demonstrations of inspection and measurement looking closely at our various products.

Polariscopes LSM products Specification list

items	StrainEye												Semiauto Senarmont			Fullauto StrainEye						
	Handheld	Portable			Medium							Large (8000)		Semiauto Senarmont			Fullauto StrainEye					
	LSM-1000LE	LSM-2100LE	LSM-2200LE	LSM-2300LE	LSM-4100LE	LSM-4200LE	LSM-4300LE	LSM-4400LE	LSM-4400B	LSM-4410LE	LSM-4411LE	LSM-8201LE	LSM-8400LE	LSM-7000LE	LSM-7000B	LSM-7000BZ	LSM-9001LE	LSM-9001S	NEW LSM-9100W	NEW LSM-9100WS		
Inspection Method	Crossed Nicols	●	●		●			●				●										
	Circularly Polarized			●			●				●											
	Sensitive Color	●			●			●		●	●		●									
	Senarmont	●						●		●	●		●									
	Rotating Analyzer																	●				
	RGB Linear Polarization																					
Retardation Range	Re:0~270nm	—	—	—	—	—	—	—	Re:0~270nm		—	Re:0~270nm		Re:0~270nm				Re:0~130nm		Re:0~3,000nm		
Repeat Accuracy	—	—	—	—	—	—	—	—	—	—	—	—	—	Approx.±1.5nm				$\sigma = 1\text{nm}$		1-wavelength mode $\sigma < 1\text{nm}$	3-wavelength mode $\sigma < 3\text{nm}$	
Measurement Area (mm)	φ 78	120×120			200×200				150×150	200×200	350×300	350×350	MAX:176×132 MIN:6.9×5.2	MAX:150×112 MIN:6.9×5.2	MAX:13.0×9.8 MIN:2.0×1.5	175×175	MAX:60×60 MIN:10×10	φ 150	MAX:60×60 MIN:10×10			
Effective Pixels (Pixel)	—	—	—	—	—	—	—	—	—	—	—	—	—	640×480				1100×1100				
Set Wavelength	Senarmont :540nm	—	—	—	—	—	—	—	Senarmont :540nm		—	Senarmont :540nm		Senarmont:540nm				590nm		420~680nm		
Light Source	High Brightness LED White 3000K	High Brightness LED White 3000K			High Brightness LED White 3000K				High Brightness LED White 3000K		High Brightness LED White 3000K				High Brightness LED							
Usable Dimension of Polarizer (mm)	φ 78	120×120			200×200				150×150 (High Brightness)	200×200	350×300	350×350	200×200	150×150 (High Brightness)				200×200	70×70	φ 150	70×70	
Usable Dimension of Analyzer(AN) (mm)	φ 54	φ 84			φ 110			φ 114		φ 80	φ 200		φ 80				Built-in					
AN Height Adjustment					● (Available for LSM-xx01)						●	●										
Sample Available Height (mm)	70	115			300			285		250	80~500	65~500	25~240 (WD:25~200)		25~240 (WD:25~90)		0~160	0~115	0~160	0~115		
					65~290			55~275		25~240												
Outer Dimension (W×D×H mm)	96×135×150 (Handle:L=85)	180×245×264			280×375×415			280×375×430		500×550×660		280×375×705				300×353×540	300×353×580	300×353×540	300×353×580			
Weight (Body)	0.7kg	3.4kg			10kg			11kg		12kg	26kg		16kg				19kg	21kg	22kg	24kg		
Power	DC Input 15-24V 0.8A	DC Input 15-24V 0.8A			100-240VAC 50/60Hz 0.14A				100-240VAC 50/60Hz 0.3A	100-240VAC 50/60Hz 0.14A	100-240VAC 50/60Hz 0.77A	100-240VAC 50/60Hz 0.2A	100-240VAC 50/60Hz 0.3A	AC100-240V 50/60Hz DC Input 24V 1.6A								
Power Consumption (Body)	15W	15W			14W				30W	14W	77W		20W	30W		38W		35W	38W			
Component	Body, (1/4waveplate, Sensitive Color plate)	Body			Body, Cables			Body, Cables, 1/4 wave plate, Sensitive Color plate		Body, Cables	Body,Cables, (8400LE: 1/4 wave plate, Sensitive Color plate)		Body, Computer, USB-Camera, Zoom Lens, Cable				Body, Computer, Cables					
Attachment	AC Adapter, Sample Glass, (Battery Charger)	AC Adapter, Body Cover		AC Adapter, Body Cover, Sample Glass	Body Cover			Body Cover, Sample Glass				AC Adapter, Body Cover, Sample Glass										
Computer OS	—	—	—	—	—	—	—	—	—	—	—	—	Windows10(64bit) Japanese/English				Windows10(64bit) Japanese/English					

※Specifications are subject to change without notice.

Polariscope LSM product line-up can inspect wide variety of strain in a product made from glass or plastics properly.



■ objects of polariscopes

glassware

large float glass plate, automotive glass, industrial new material glass, optical new material glass, glass wafer, thermister, glass paste
glass tube <variou types of lamps, electronic tube (vacuum tube, gas-enclosing tube), sealing glass tube for electronic component, combustion partition for heating appliance>
laboratory glassware <flask and beaker, test tube and connecting, tubule, analysis component, evaporating dish and watch glass, etc. >
material of optical glass <crystal, quartz, lens glass material, etc.>
optical glass element <optical filter, LD cover glass, ball lens, lens array, lens, prism, V-groove substrate, etc.>
glass container <bottle for beverage, wide-mouth bottle, preservation container, glass, dish, etc.>

plastic(synthetic resin) products

large resin plate, resin film
mold injection resin products <LCD monitor cover, sun visor, resin container, etc.>
resin optical elements <lens array, lens, prism, etc.>

*note:Please ask other kind of products without mention of the list. There are some of products that can be inspected by polariscopes.

■ use applications

products	use applications
large float glass plate	inspect belt-like strain at the edge of the glass caused during manufacturing process of float glass
automotive glass	inspect strain caused around metal electrode at bonding to glass
industrial new material glass	inspect strain in new glass at its development phase
optical new material glass	inspect strain in new glass at its development phase
glass wafer	inspect fine processing strain caused during its manufacturing process
thermister	inspect strain caused in contact with metal and glass condition setting for annealing treatment
glass paste	inspect strain caused by shrinkage after dissolution or anchoring
glass tube <variou types of lamps, electronic tube(vacumtube, gas-enclosing tube) sealing glass tube for electronic component, combustion partition for heating appliance>	inspect strain caused in contact with metal and glass inspect strain caused by influence after high thermal exposure inspect strain caused by thermal history around portion of highly thermal processed condition setting for annealing treatment inspection after annealing process
laboratory glassware <flask and beaker, test tube and connecting tubule, analysis component, evaporating dish and watch glass,etc.>	inspect strain caused by influence after high thermal exposure inspect strain caused by fire process condition setting for annealing treatment inspection after annealing process
material of optical glass <crystal,quartz,lens glass material,etc.>	inspect strain caused in manufacturing process of material condition setting for annealing treatment inspection after annealing process

products	use applications
optical glass element < optical filter,LD cover glass,ball lens,lens array, lens, prism, V-groove substrate >	inspect fine processing strain caused during its manufacturing process inspect strain caused by thermal history at mold press. condition setting for annealing treatment inspection after annealing process inspect strain caused by fitting a thing into a metal frame
glass container < bottle for beverage, wide-mouth bottle, preservation container, glass,dish >	inspect strain caused by forming condition setting for annealing treatment inspection after annealing process
large resin plate	inspect strain caused during manufacturing process of resin plate
resin film	inspect uniformity of strain in film
mold injection resin products < LCD monitor cover, sun visor, resin container, etc. >	inspect residual strain and orientational strain caused by mold injection condition setting for injection speed inspection after annealing process inspect strain caused by fitting a thing into a metal frame
resin optical elements <lens array,lens,prism, etc.>	inspect fine processing strain caused during its manufacturing process inspect strain caused by thermal history at mold press condition setting for annealing treatment inspection after annealing process inspect strain caused by fitting a thing into a metal frame

