■ Specifications

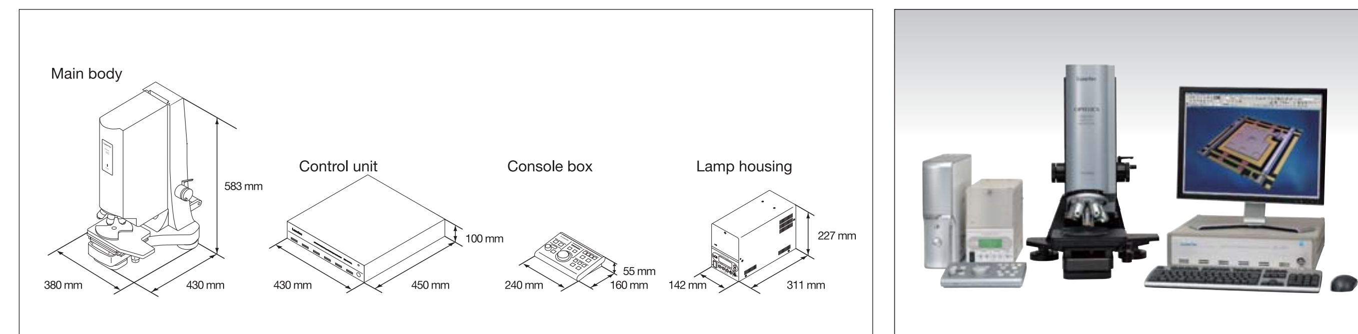
OPTELICS® H1200 (WIDE)

		Magnification of objective lens	Magnification on 20 inch monitor	Viewing Field [μm]	Pixel resolution [μm]
Magnification/ Viewing Field / Pixel resolution		5×	140×	3600×3600	1.76
		10×	280×	1800×1800	0.88
		20×	560×	900×900	0.44
		50×	1400×	360×360	0.18
		100×	2800×	180×180	0.088
Frame rate (Variable Frame Rate)		15Hz ～120Hz			
Line width measurement	Display resolution	0.001 μm			
	Repeatability (3σ)	0.01 μm ※1			
	Accuracy	±[0.02x(100/magnification of the objective lens)+L/1000] μm (Accuracy at pitch measurement in the x direction)			
Height measurement	Range	8 mm			
	Display resolution	0.001 μm			
	Repeatability (σ)	0.01 μm ※2			
	Accuracy	±(0.11+L/100) μm (NA of the objective lens used is larger than 0.9)			
Frame memory	Intensity	1024 H×1024 V×12 bit／high-definition mode 2048 H×2048 V×12 bit			
	Height	1024 H×1024 V×16 bit／high-definition mode 2048 H×2048 V×16 bit			
Real time zoom		Continuous real time zoom Max 8×			
Z stroke		Manual Stage: 90 mm／Auto stage: 70 mm			
Bit length of Z counter		24 bit			
X-Y stage Stroke	Manual	150×150 mm (with a rotation holder for 6 inch wafer attached)			
	Auto (option)	150×150 mm (with a rotation holder for 6 inch wafer attached)			
Light source		Xenon or HgXe lamp, selectable			
Objective lens switching		5 hole revolving nosepiece (with automatic lens recognition function)			
Auto focus		High speed confocal auto focus method			
Software	1 click mode	3D、Profile、Roughness 2D、Roughness 3D、Image capture			
	Image capture	Macro function、Focus composition、Patch work、Wide contrast、3D Noise canceller、First peak			
	Image processing	Color separation、Horizontal compensation、Gradation editing, Image size conversion、Color abstraction、Color composition、Color balance、Spline filter			
	Basic measurement	3D Display、multilayer 3D display、Height、Line width、Surface roughness (JIS、ISO)			
	Shape Measurement	Area、Cubic volume、Superficial area、Equivalent Circle diameter、Compass length、roundness、Absolute Max length、ferre Diameter etc. total 20 items			
	Surface shape measurement	Average step、approximate R、Film thickness、Angle			
	Reporting	Layout、Image data base、Template、File extension bundle conversion			
	Option	Auto stage (Alignment, Mapping)、Record & play back of moving image for long hours, Auto Measurement			
Utility		Power source AC 100 V～240 V、50/60 Hz、600 VA (Single phase)			
Dimensions	Main body	380(W)×430(D)×583(H)mm			
	Control unit	430(W)×450(D)×100(H)mm			
	Console box	240(W)×160(D)× 55(H)mm			
	Lamp housing	142(W)×311(D)×227(H)mm			
Weight	Main body	41 kg			
	Control unit	7.1 kg			
	Console box	0.7 kg			
	Lamp housing	6.7 kg			
Options WIDE	Wave	Illumination wave length selection	405 nm (Purple)、436 nm (Blue)、488 nm (Cyan)、546 nm (Green)、577 nm (Yellow)、630 nm (Red)		
	Interferometer	Mirau/Linnik interferometer	Z resolution: 1 nm、Measuring Time :2～3 Sec		
	DIC	Differential Interference Observation･Polarized light observation			
	Exceed	Atomic Force Microscope	Scan range: XY 20×20 μm、Z 2 μm or less		

※1：This is the value obtained when the standard pattern of a photomask is measured with an apochromatic objective lens of 100× (NA0.95), under no vibration environment.

※2：This is the value obtained when the standard bump made by VLSI Standard Corporation is measured with an apochromatic objective lens of 100× (NA0.95), under no vibration environment.

■ Dimensions



Notice regarding safety： Please read carefully the "Operation Manual" before you start the operation of the microscope and please operate the microscope in the correct way.

- ●Contents listed on this brochure are as of August 2011.
- ●The specifications and the products are subject to alteration without notice and the sellers and the manufacturer are excluded from any and all liability regarding the alteration.
- ●All the monitor images in this brochure are composite pictures.

Lasertec corporate head office was ISO 9001:2008 certified in June,2009

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Lasertec

OPTELICS®

H1200 (WIDE)

3CCD REAL COLOR CONFOCAL MICROSCOPE

3 CCD Real Color Confocal Microscope comes on the scene with 12 Million Pixels

Real Color Confocal Image by 3CCD Image Sensors

A new color confocal microscope with high image quality and excellent color separation is implemented by using prismatic RGB light and receiving those RGB lights by corresponding three CCD image sensors. One CCD sensor consists of 4 million pixels (2048×2048) maximum and an image comprising of **12 million pixels** is obtained as a result of 3 RGB image synthesis. Thus, a color confocal image with unprecedented good color separation and high resolution now can be displayed.

An Advanced Optics

Optics that makes the objective lens' pupil diameter up to 20 mm effective provides height measurement resolution high over a wide range of magnification from low magnification to high magnification and also this optics exerts powerful measurement ability on inclined plane. Therefore, samples of semi-sphere shape or samples of V shape trench can be expressed in beautiful 3D display without any noise. Employment of specially selected objective lens provides high-resolution measurement over a wide viewing field and the clear image mode realizes very clear observation/measurement of samples that include areas of totally different reflection light intensities within one viewing field.

High-Speed Processing

The Variable Frame Rate (VFR) Mode, **from 7.5** frames/sec **to 120** frames/second, makes this microscope compatible with wide variety of purposes such as high-resolution observation to high-speed measurement. The VFR mode also displays its greatest force in high-speed automatic measurement, record and play back of moving images, patchwork and so on.

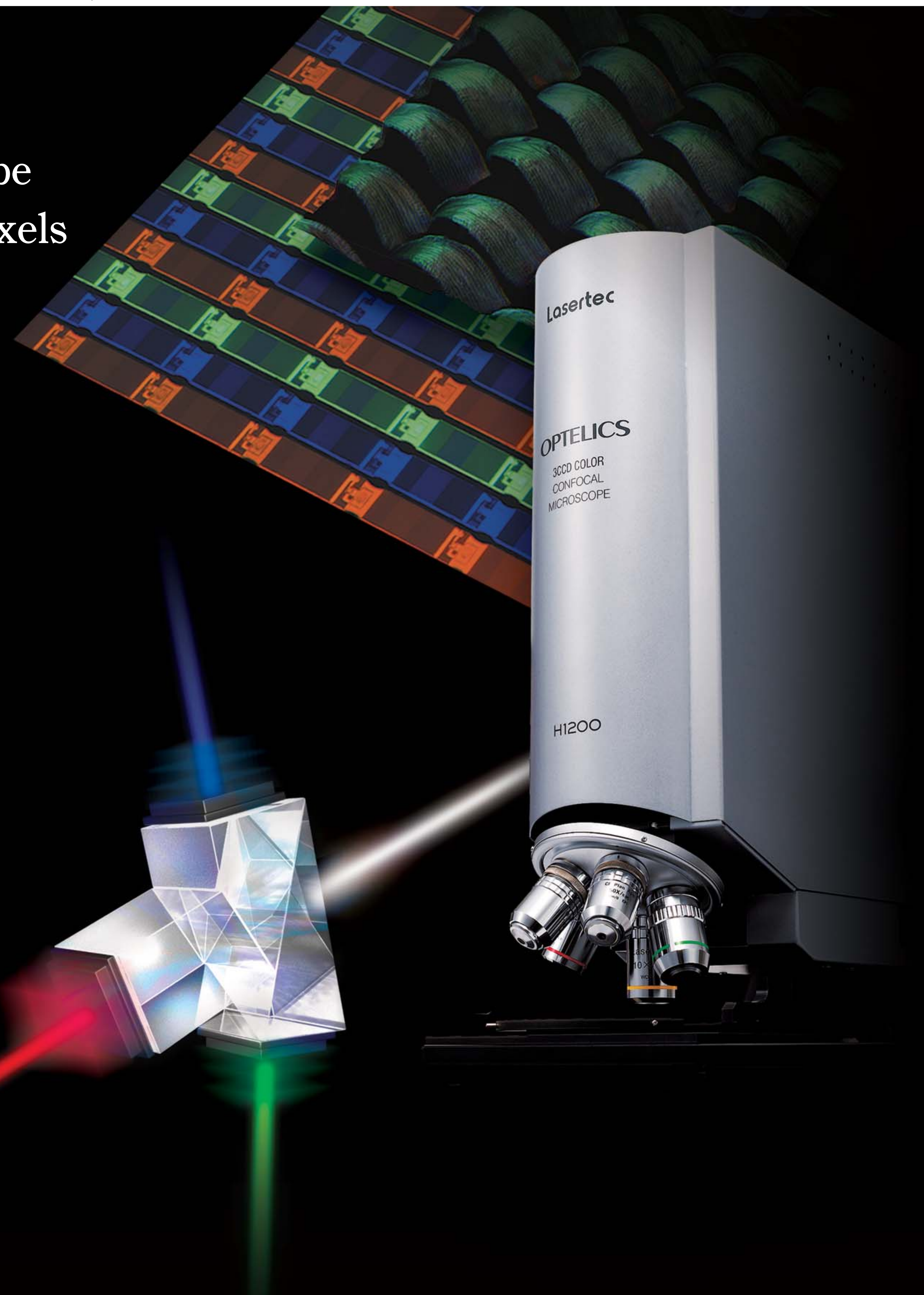
Simple Operation

One click operation provides easy acquirement of not only full color confocal images but also confocal image of each RGB wavelength. Frequently used functions such as 3D expression, profile measurement, surface roughness measurement and such are also operated by a simple one click. Furthermore, when a recipe of a proficient operator is memorized, a novice can perform the same operation only by pushing the replay button.

Options (WIDE)

Wide varieties of optional functions (WIDE) extend the measurement possibility that satisfies needs of vast scientific and industrial areas.

Wave:Wavelength selection function of observation light extends the compatibility to variety of objects for observation.
Interferometer:Measurement using Mirau/Linnik interferometers realizes vertical resolution of 1 nm.
DIC:Observation of surface irregularity in nano-scale becomes possible by using Differential Interference Contrast.
Exceed:Integration of Atomic Force Microscope function provides **3D seamless observation/measurement from nano through milli range.**

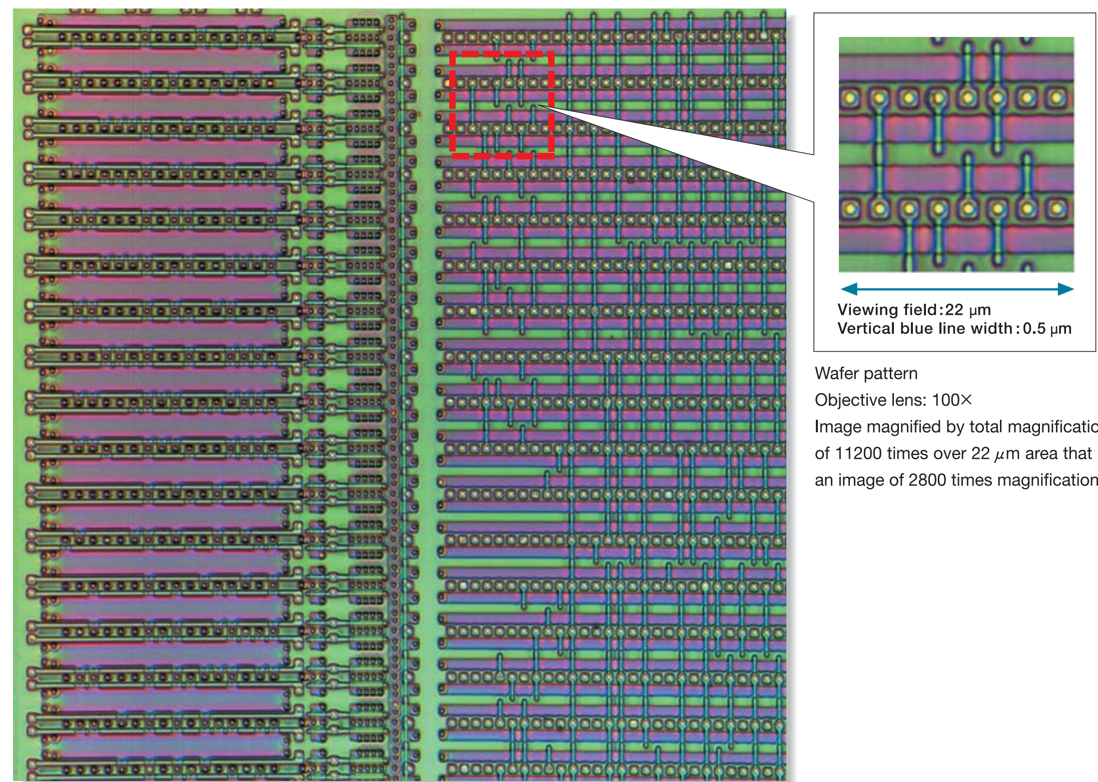


Amazing 12 million pixel images

accomplished by 3 CCD sensors

Ultra high-resolution image of 4 million pixels each × RGB

Pursuit of the best image obtainable by color confocal microscope has made high-resolution image of 12 million pixels based on the 3 CCD system come into existence. For the reason that the 3 CCD sensor system is introduced, images of excellent color separation and meticulously high resolution are displayed in real time. Moreover, even when magnification is raised up to 11200 times (on a 20 inch monitor) by the new real time zoom function, samples are observed by clear images with brightness unchanged.



Viewing field : 22 μm
Vertical blue line width : 0.5 μm

Wafer pattern
Objective lens: 100×
Image magnified by total magnification of 11200 times over 22 μm area that is an image of 2800 times magnification

Shape measurement by RGB 3 CCD sensors

Color filter, though it is laid on the backside of the glass plate, can be clearly observed through the glass plate and shape measurement of each RGB layer can be performed. Measurement data are made into summary with statistics such as maximum, minimum, sum, average, standard deviation, in a sheet form.

◎ Color filter

Objective lens 20× Viewing field 900×900 μm

R
G
B

●Digitization

●Measurement Graphs

Sheet [Real画像5_処理0(20)_R_形状特徴]

	面積	対角幅
No. 1	1570.978	60.790
No. 2	1492.879	59.568
No. 3	1465.094	59.269
No. 4	1425.294	59.483
No. 5	1510.902	61.460
No. 6	1438.060	59.468
No. 7	1384.743	59.483
No. 8	1392.253	59.468
No. 9	1480.864	59.568
No. 10	1417.034	59.468
No. 11	1374.230	59.483
No. 12	1392.253	59.568
No. 13	1426.796	58.987
No. 14	1341.188	59.092
No. 15	1278.860	59.074
No. 16	1371.977	59.652
最大値	1570.978	61.460
最小値	1278.860	58.987
合計	22763.405	953.881
平均値	1422.713	59.618
標準偏差	71.046	0.632

Sample information such as height, color and contrast is digitalized to measure characteristic values of various shapes. Measurement items are diversified such as area, surface area, volume, circle equivalent diameter, absolute maximum length, abound length, circularity, ferre equivalent circle diameter and such, counting up to 20 items.

Table for shape characteristic measurement results
16 pieces of measurement cells
Area, Diagonal line width

Profile measurement by RGB 3 CCD sensors

For observation and measurement of samples with transparency, the wavelength switching function is quite effective. One vertical scan acquires height measurement data simultaneously for RGB wavelengths and most suitable height data can be selected from each RGB height data. For even those samples difficult to measure surface shape for having transparent surface layer, shape of the outermost layer can be observed and measured by utilizing data by Blue wavelength. Not only that, shape of the lower layer can be selectively observed and measured by utilizing data by Red wavelength.

◎ Flexible Substrate

Objective lens 20× Viewing field 900×900 μm

B
R

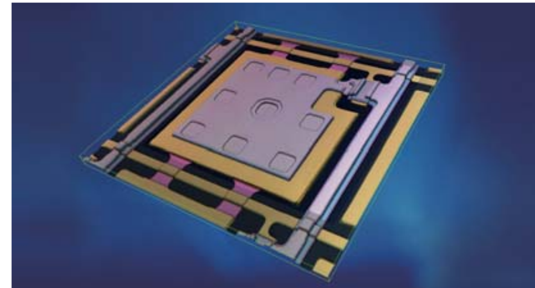
Flexible substrate is displayed in omnifocal state from the top to bottom layers by utilizing a focal point shifting memory. Each top layer and bottom layer can be displayed in 3D image as is shown in the photo on the right. A 3D display of flexible substrate can be obtained with sharp separation of the top layer and the bottom layer based on the Blue data for the top layer and the Red data for the bottom layer. When confocal color image is overlaid as texture on Z-image of each top and bottom layer, data of each layer is displayed in color 3D image. Profile information, surface roughness and such are also acquired for each layer.

Newly Developed Optics

Newly Developed Optics

The employment of optics that effectively utilizes a high NA objective lens results in improved height measurement accuracy and powerful measurement ability on inclined plane.

◎LCD Pattern

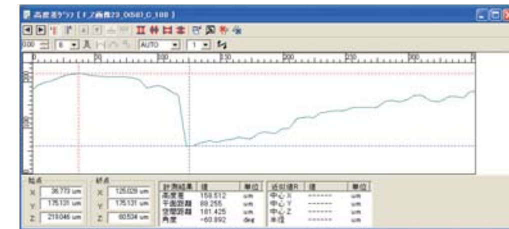


●Profile Graph

Objective lens: 100×
Viewing Field: 180×180 μm
Maximum pattern height: 1.05 μm

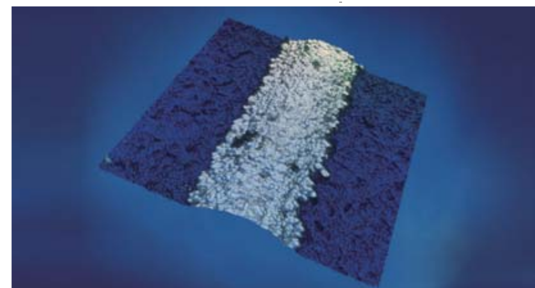
◎Paint covering fabric

●Profile Graph



Objective lens: 50×
Viewing Field: 360×360 μm
Maximum pattern height: 158.512 μm

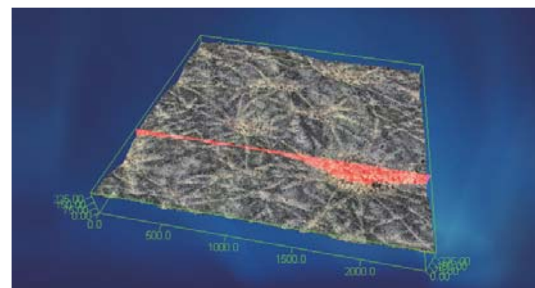
◎Crystal type PV cell finger line and surface texture



●Profile Graph

Objective lens: 50×
Viewing Field: 360×360 μm
Average height: 23.8 μm
Width: 120 μm

◎Skin with foundation



●Profile Graph

Objective lens: 20×
Patchwork: 3×3
Viewing Field: 2.5×2.5mm
Depth: 239 μm

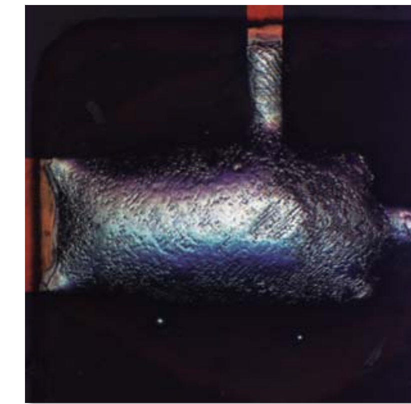
Clear Mode

A real-time compensation mode for saturated signal from very bright surface and very week signal from dark surface is developed. For example, in a case that such materials like solder of high reflectivity is on a substrate of low reflectivity, picture information level at the solder/substrate boundary is intrinsically low and difficult to see the image. This new mode produces clear image even from data submerging as dark area.

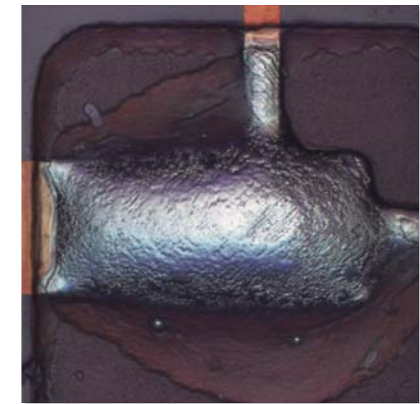
◎Soldered portion of pad

Objective lens: 20× View field: 900×900 μm

●The clear mode not activated



●The clear mode activated

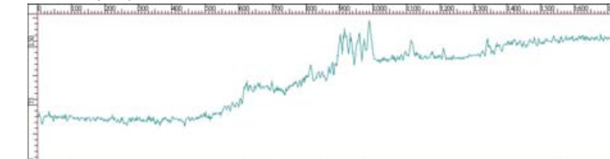


Specifically designed objective lens

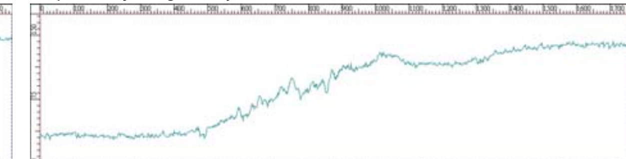
Low magnification objective senses, 5×, 10× and 20×, are specifically designed to enhance measurement ability in wide viewing field. The pupil diameter of the objective lens is 20 mm and the resulting incident angle at the outermost circumference is 14.5 degrees with diametric view of 3.6 mm, which raises condensing rate of reflective light. For this reason, images can be acquired with high brightness even under low magnification and also with solid securement of data from dark area.

Specifically designed objective lens	NA (Numerical Aperture)	Incident angle at outermost circumference	Pupil diameter of objective lens	Viewing field
LT5×	0.25	14.5°	20	3600×3600
LT10×	0.50	30.0°	20	1800×1800
LT20×	0.75	48.6°	15	900×900

●Ordinary objective lens:10×



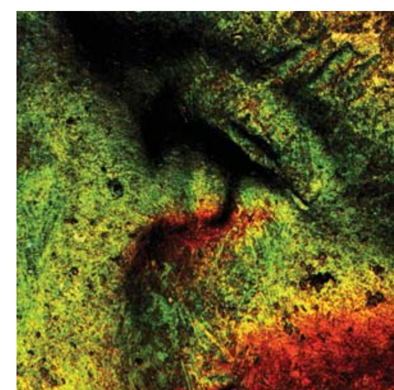
●Specifically designed objective lens:10×



Even those areas that scarcely reflect light on inclined plane can be brightly observed and optical noise in Z information drastically decreases.

◎Relief image on a coin, an eye

●Ordinary objective lens:10× Confocal image

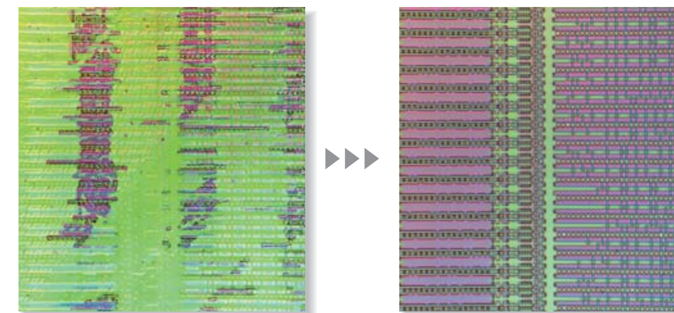


●Specifically designed objective lens:10× Confocal image

Accurate, Simple and High-Speed Measurement

High Speed Processing

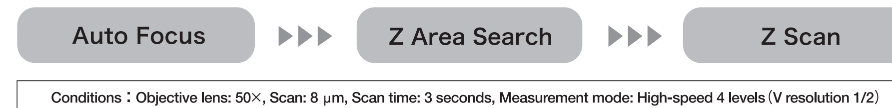
Variable Frame Rate, from 7.5 frames/sec up to 120 frames/sec, provides compatibility with wide variety of purposes, such as high accuracy observation and high-speed measurement. Moreover, a function for long hour image record and play back at specified frame rate is equipped. Electric stage, Auto Focus, Automatic Measurement and Inspection Software are integrated as options to be used as a system component.



The stage of H1200 can be moved quickly without image blurring even when wafer patterns are observed because scan speed of H1200 is very fast. Because lens movement time can be set short when z-direction measurement is performed, specifying of measurement point is simple, measurement time is shortened, and effect of vibration becomes minimum.

Simple operation mode

Simple operation mode that is newly developed makes it possible, by a simple one-click operation, to automatically perform focusing, setting of prescribed z-scan range, and subsequent measurement of 3D expression, surface profile and surface roughness. Z-scan time of a few seconds provides high-speed and simple operation.

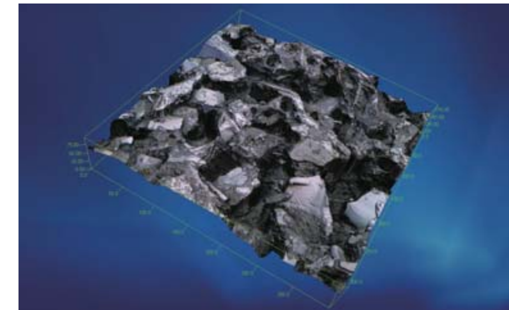


Conditions：Objective lens: 50×, Scan: 8 μm, Scan time: 3 seconds, Measurement mode: High-speed 4 levels (V resolution 1/2)

◎3D measurement time required to measurement : 9 seconds

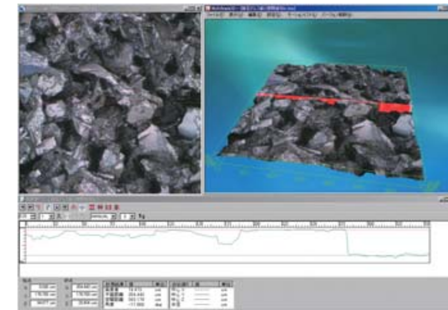
Average height: 75 μm, Viewing field: 360 μm×360 μm

●Grind rock before dressing



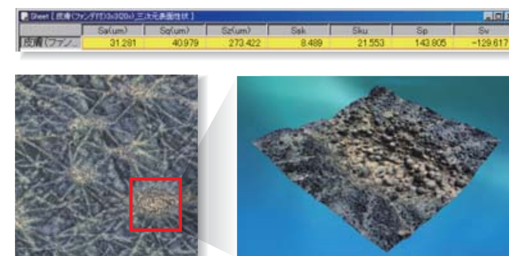
◎Profile measurement

Patterns of complicated shape can be measured. Profiling along the red measurement line is displayed as a waveshape. Also, curvature measurement and angle measurement are available.

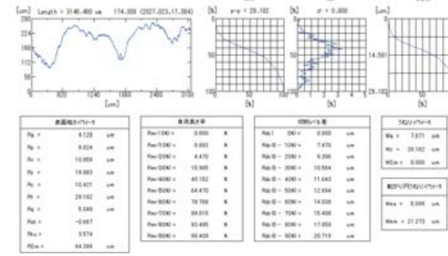


◎3D surface roughness measurement (global standard)

●Skin (coverd by foundation)



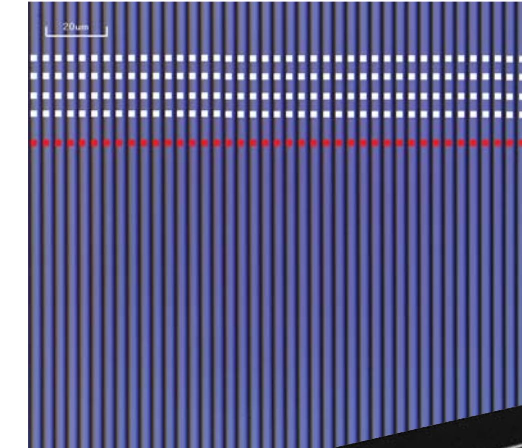
◎2D surface roughness measurement

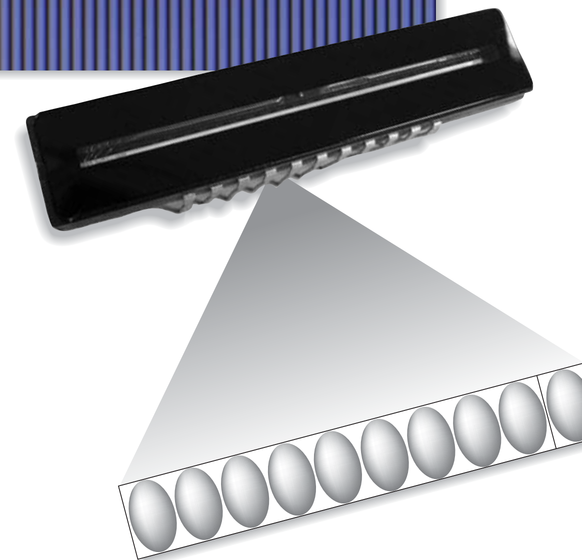


Highly stable accuracy for line width measurement

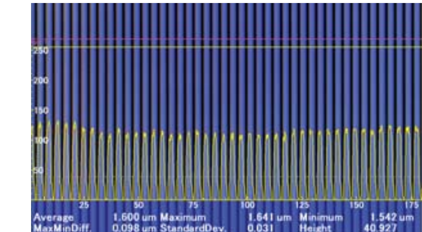
Width measurement repeatability is excellent because a line sensor with very stable device separation dimension that hardly changes over time is employed.

●2.6 μm line & 1.4 μm space



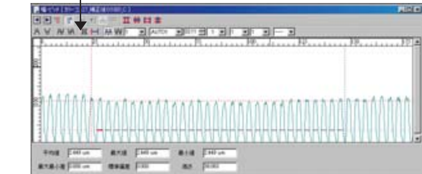


●Overlay function of graphs



●Width pitch graph

Selection button for Line width, Space width, Pitch width, Reciprocal pitch width, Total width, Manual measurement, Total line width, Total space width.



●Statistical value sheet

Sheet [カラーコン27_補正後(X100)_C_幅・ピッチ]

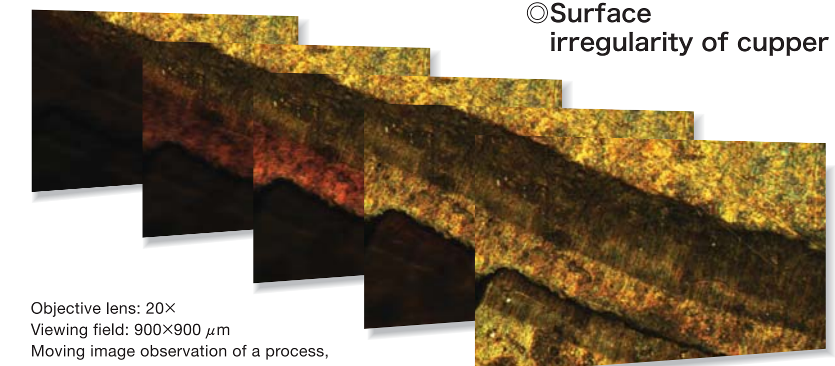
	平均値	最大値	最小値
WSS1-1	2.449	2.449	2.449
WSS1-2	2.451	2.451	2.451
WSS1-3	2.418	2.418	2.418
WSS1-4	2.431	2.431	2.431
WSS1-5	2.391	2.391	2.391
WSS1-6	2.409	2.409	2.409
WSS1-7	2.435	2.435	2.435
WSS1-8	2.387	2.387	2.387
WSS1-9	2.373	2.373	2.373
WSS1-10	2.390	2.390	2.390
WSS1-11	2.351	2.351	2.351

Statistical values such as measurement data, average, standard deviation of 30 line and space pairs.

Image acquirement function

Moving image acquirement function is the most suited tool for in-situ observation. This function displays its greatest force in recording of moving images and observation of dynamic behavior of samples. Moving image of 1024×1024 pixels is recorded in AVI format at the rate of 15 frames /second. High image quality is preserved even for a long time observation.

◎Surface irregularity of cupper



Objective lens: 20×
Viewing field: 900×900 μm
Moving image observation of a process, acquired by a moving focus memory

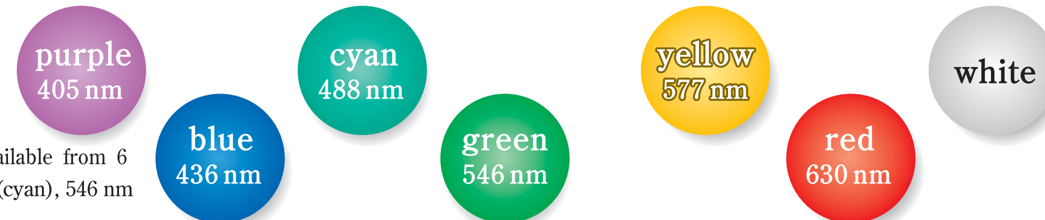
Option group that powerfully supports the main body function

Options (WIDE)

Wave

Wavelength Selectivity

Light selection most suited to sample observation is available from 6 monochromatic lights, 405 nm (purple), 436 nm (blue), 488 nm (cyan), 546 nm (green), 577 nm (yellow) and 630 nm (red) .

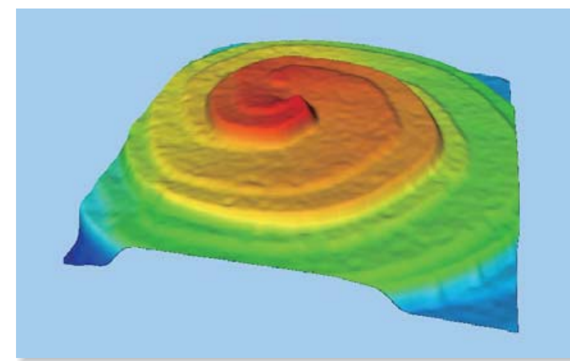


Interferometer

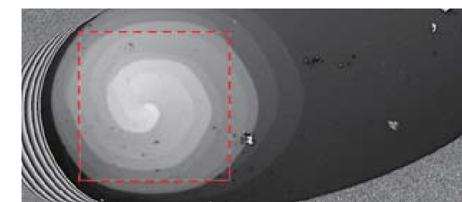
Mirau / Linnik Interferometer

Integrated confocal interferometer function makes it possible to measure in vertical direction over huge dynamic range from nano-level to milli-level.

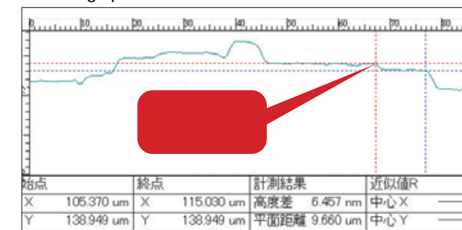
◎Sample: SiC Measurement time: 2 seconds Viewing field: 90 μm



◎Interference image



●Profile graph

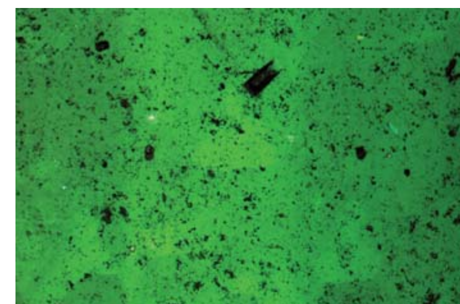


DIC

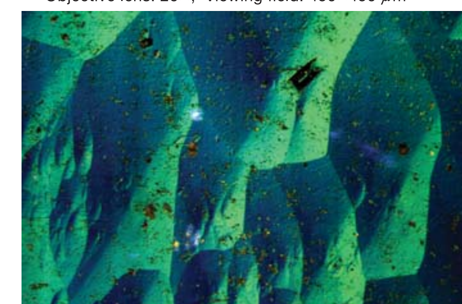
Differential Interference Observation

Differential interference observation function that observes sample surface irregularity of nano-level can be equipped. Moreover, polarization microscope function can be implemented when Nomarski prism is taken off.

◎Confocal image of silicon carbide
Objective lens: 20×, Viewing field: 450×450 μm



◎Confocal differential interference image of silicon carbide
Objective lens: 20×, Viewing field: 450×450 μm



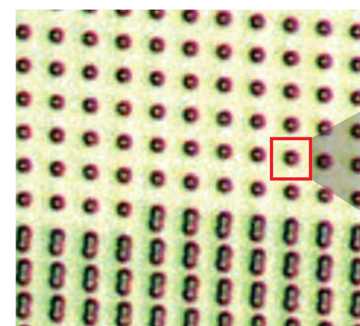
Exceed

AFM (Atomic Force Microscope)

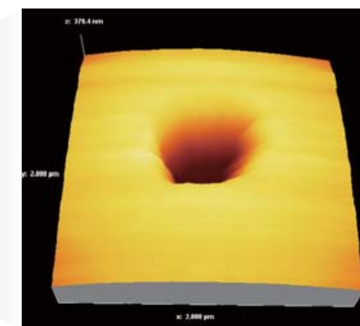
Integration of AFM with H1200 makes it possible to seamlessly observe from nano-scale to milli-scale.

Scan range: XY 20×20 μm, Z 2 μm or less

◎Confocal image of a photonic crystal
Objective lens: 100×, Zoom: 3×, Viewing field: 45×45 μm



◎AFM measurement of a photonic crystal
Scanning range: 2×2 μm



Compatible with large size electric stage

The head part works independently and operation of the head installed in some other inspection tool is possible. The structure of the head is designed to be suited for observation of large samples. Moreover, light source unit consists of separate unit, considering light source maintainability and light source is replaced very easily.

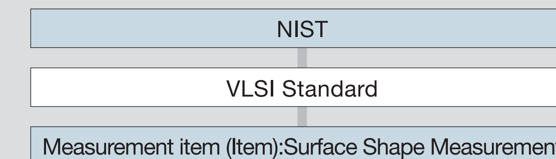
Calibration Edifice (World standard)

Drawing of linage definition for international standard

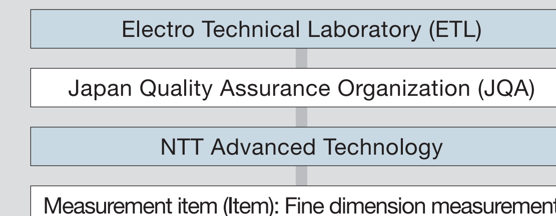
◆Traceability edifice of confocal microscope

Lasertec makes equipment corrections referencing the metrology standard traceable to the National Metrology Standard under the edifice described below.

◎United States Metrology Standard



◎National Standard



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