

OLYMPUS

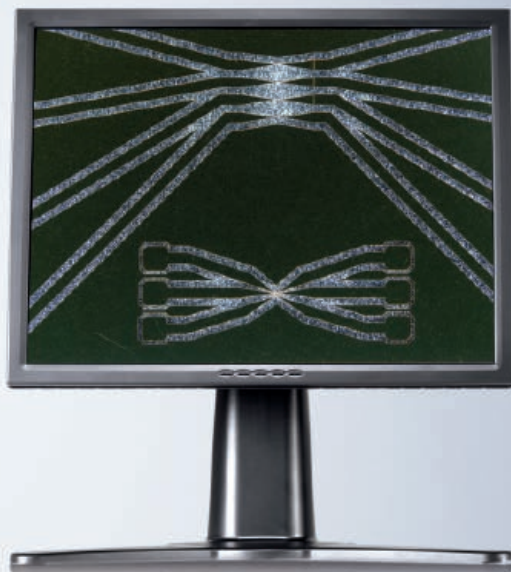
Your Vision, Our Future

Stereo Microscopes

SZX2

SZX10/SZX16 for Materials Science

The Stereo Standard



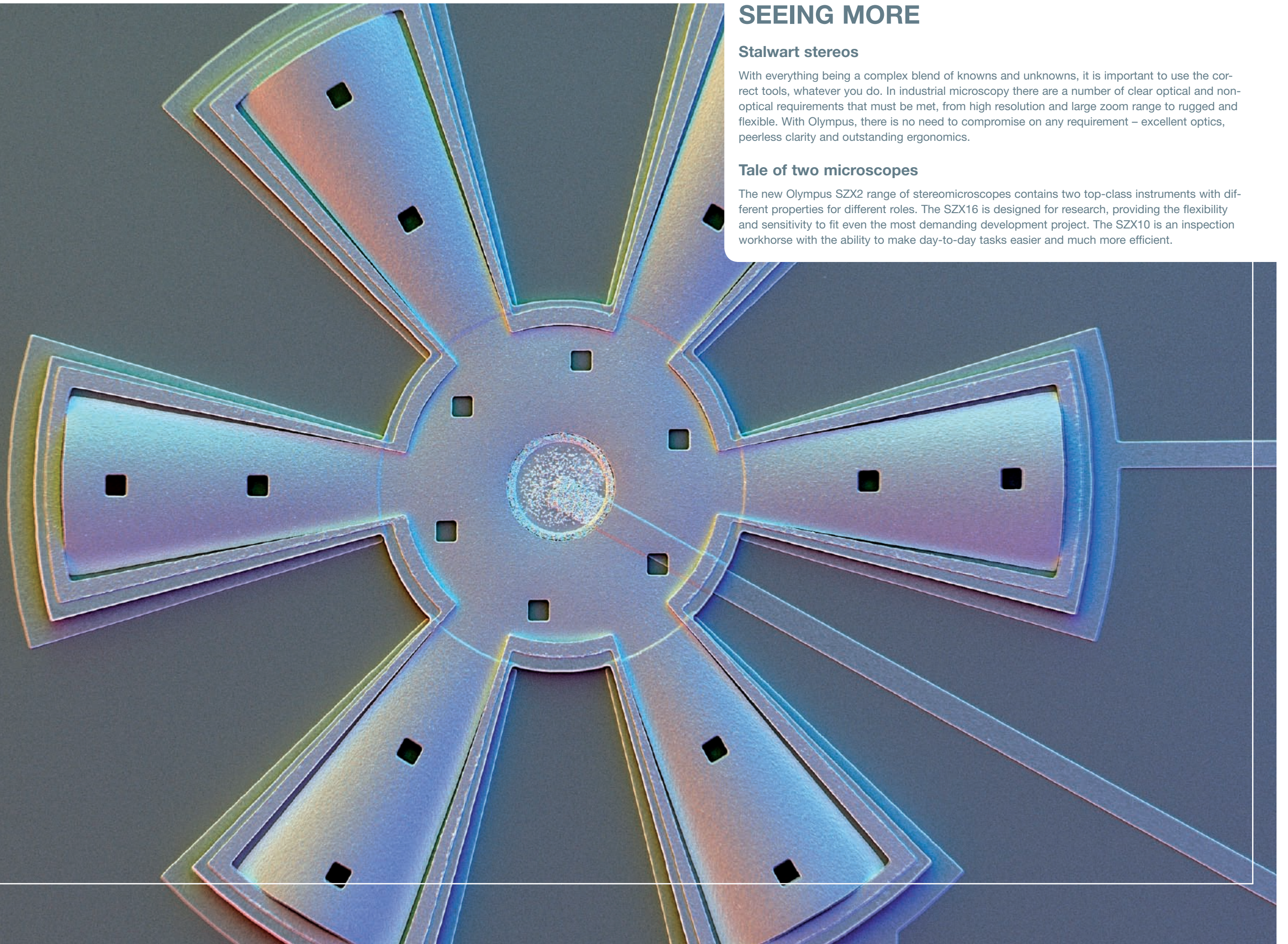
SEEING MORE

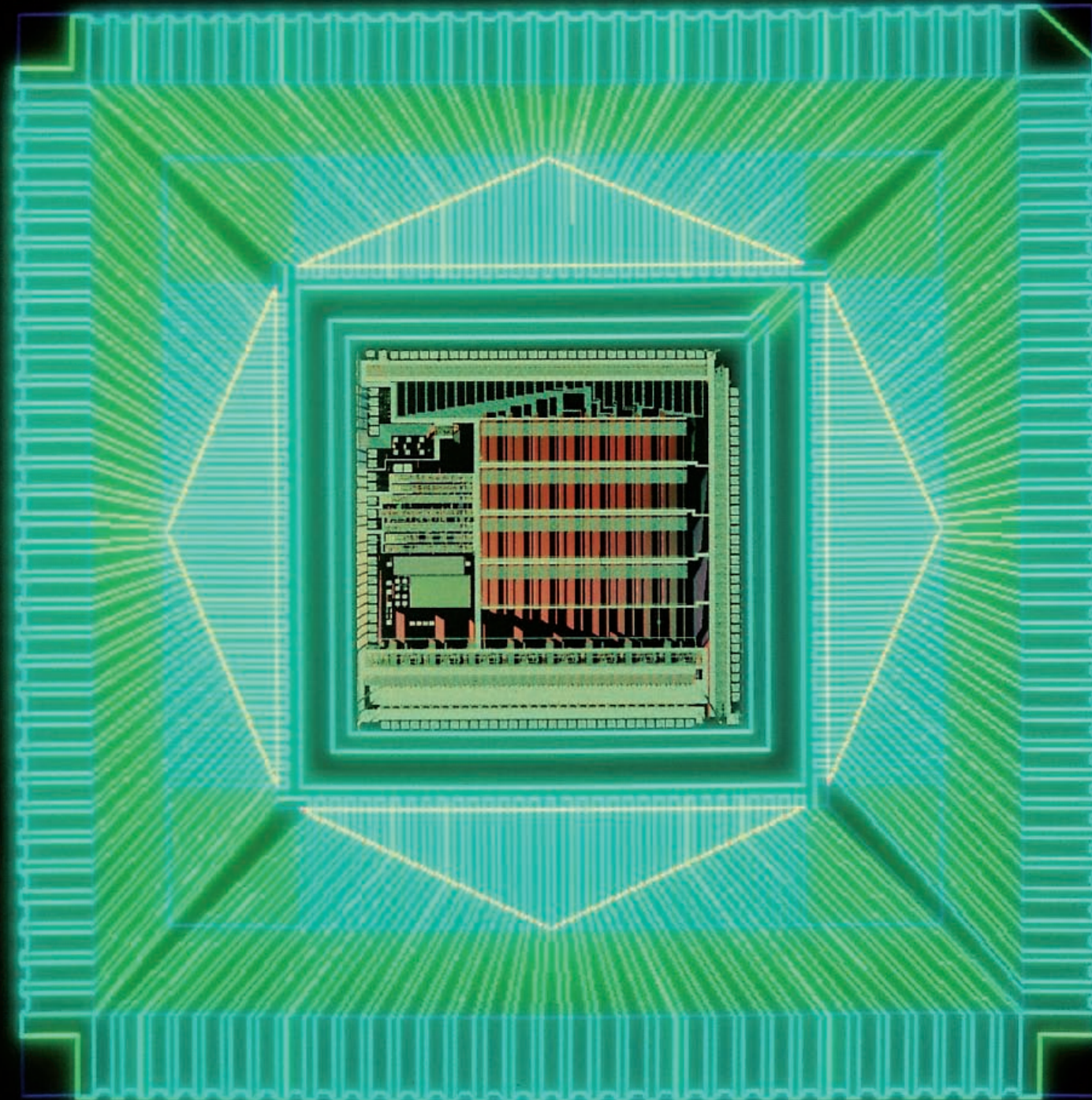
Stalwart stereotypes

With everything being a complex blend of knowns and unknowns, it is important to use the correct tools, whatever you do. In industrial microscopy there are a number of clear optical and non-optical requirements that must be met, from high resolution and large zoom range to rugged and flexible. With Olympus, there is no need to compromise on any requirement – excellent optics, peerless clarity and outstanding ergonomics.

Tale of two microscopes

The new Olympus SZX2 range of stereomicroscopes contains two top-class instruments with different properties for different roles. The SZX16 is designed for research, providing the flexibility and sensitivity to fit even the most demanding development project. The SZX10 is an inspection workhorse with the ability to make day-to-day tasks easier and much more efficient.

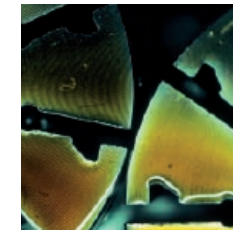




HERE TODAY, HERE TOMORROW

Whatever you want: the SZX2 range

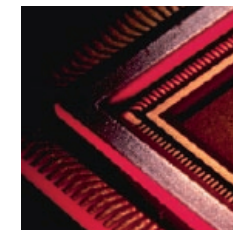
Whether you are doing an everyday task or something that has never been done before, you can be confident that an Olympus microscope is perfect for you. With a strong heritage and many ground-breaking advances, Olympus knows how to get the most out of your samples – the SZX2 proves this principle.



Tailored to your needs

6–11

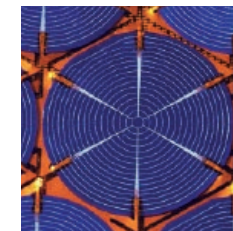
Someone else's clothes will not always fit you and the same is true of microscopes. With Olympus you can buy the stereomicroscope that fits your needs, whilst still allowing you the flexibility to expand.



Perfectly balanced

12–17

Everything works better when all components are perfectly balanced. For microscopes this means making sure that the user can work with the equipment easily to get the most out of the sample.



The bigger picture

18–23

Choosing a stereomicroscope is an important task. Different processes require different tools, and Olympus can provide a solution for each one of them.

Your success. Our goal

Olympus is dedicated to making state-of-the-art microscopes and accessories to support your work on all levels. We are proud of our capabilities in R&D and manufacturing, matching them with our attentive customer support. As a result, our goal is your success, both now and in the future.

TAILORED TO YOUR NEEDS

Highly advanced and extremely flexible

Whatever your need you can be sure that you will always see more with an Olympus microscope. Superior optics and ergonomic designs are included as standard across the range. So whether you specify an advanced routine stereomicroscope with superior documentation capabilities or a fully fledged research stereomicroscope with a world-leading zoom range, you are in good hands.

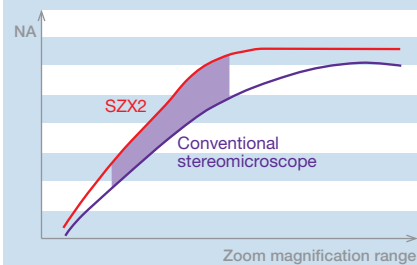


A SZX16

Research stereomicroscope

**B Highest NA at all magnifications**

Up to 22% more resolution

**C Stereo objective**

SDF PLAPO 2XPFC



UNLIMITED POTENTIAL

With products and components getting smaller and more complex, the microscopes used during R&D and inspection procedures need to be more flexible and capable of identifying the finest detail across a wide range of magnifications.

A new resolution

A The SZX2 series is designed using the parallel light paths of the Galilean (or telescope) optical system. The SZX16 research microscope takes this one step further with its larger lenses made from the latest glass materials available, enabling significantly increased numerical apertures (NA) and therefore superb clarity. As a result, the Olympus SZX16 has a maximum resolution of 900 linepairs per millimetre (NA = 0.3). Effectively, you can clearly resolve two points only 1.11 μm apart.

Extract more information

B Stereomicroscopes, by their very design, increase resolution as magnification is increased using the zoom optics, and the SZX2 series has the highest NAs across the entire zoom range. Users, though, tend not to work with the zoom linearly. Instead they spend more than 85% of their time in the medium magnification range. The advanced optical design of the Olympus SZX2 zoom optics increases NA in this part of the range quicker than ever before, enabling the user to see 20% more detail, clarity and information.

From all to small

Whilst the excellent optics of the SZX16 have improved the clarity of the images, they have also extended the zoom range, enabling much greater flexibility. With a world-leading 16.4:1 zoom ratio and parfocal objectives, the SZX16 can go from 3.5x to 230x without the need to interrupt the user's view of the sample – peerless. This represents an effective zoom ratio of 65.7:1.

The top range

Out of the six apochromatic corrected objectives available, 0.3x and 0.8x are optimised for maximising the working distance. 0.5x, 1.0x, 1.6x and 2.0x are all parfocal and therefore, when used with the optional two-position nosepiece, it is possible to change objectives without needing to look. Also, refocusing is minimised, only requiring corrections within the 1 mm range. This significantly reduces the time required for complex investigations where quick changes from a large overview to finest detail are required.

Working on the limits

C Up to now, it has been impossible, using a stereomicroscope, to see details in the μm range whenever a sample is covered with a thick plastic layer (e.g. DVDs), glass (e.g. freezing or heating chambers for the investigation of the thermal behaviour of materials) or water (e.g. electronic structures on biochips). This phenomenon is due to aberrations caused by the different refractive indices between the air and the plastic, glass or water. To combat this, Olympus has introduced a correction ring, which enables fine manipulation of the objective lens to compensate for these differences. With this technique, sharp and crisp images can be obtained even through 5 mm of water. This is the first time such a facility has been used on a stereomicroscope objective.

Enhanced 3D

With the optical system used in the SZX16, there is an enhanced 3D effect which makes three-dimensional objects more vibrant, enabling the user to discern finer details. This works even at the highest magnifications when stereomicroscopy usually comes to its limits, facilitating the interpretation and description of structures, and making the manual manufacture of prototype microassemblies easier than ever.

Optimised for eyes and camera

Whilst our two eyes appreciate the stereoscopic view generated by a stereomicroscope, a single camera does not. On the SZX2 range though, a small movement of the objective means the image is sent via a single, axial light path. This produces an image for documentation which eliminates differences in x-y resolution, and enables a perfectly focused image over the complete field of view. This is a tremendous improvement in stereomicroscope-based digital documentation.

Highly versatile

D The addition of the Olympus DP71 camera produces the ultimate low-magnification imaging system for stereomicroscopes. Therefore, whether you are developing new microelectromechanical system (MEMS) components or trying to assess old masters' painting techniques, you will be able to see more and record more using the SZX16.

D Comfortable and digital

Tilting trinocular observation tube with the DP71 camera

**E SZX16**

Research stereomicroscope system

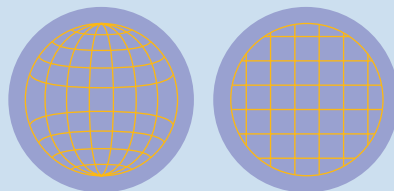


A SZX10

Advanced routine stereomicroscope

**B DF plan objectives**

Distortion-free images up to the edge of the field of view

Conventional
stereomicroscope

SZX10

C Large working distance

More space to work



ANYTHING BUT ROUTINE

Certain tasks carried out on a day-to-day basis are far from routine and a basic stereomicroscope will not provide the flexibility required to complete the procedure properly. For such applications, Olympus has developed the SZX10 advanced routine stereomicroscope.

The SZX10 – naturally

A Whenever something goes for advanced inspection, it is more than likely that you know what you expect your sample to look like. You know the expected dimensions, colours and surface properties, and the completely natural view of the sample provided by the SZX10 therefore makes any differences clearly visible. As with the SZX16, the SZX10 is designed on the principles of the Galilean system, but focuses more on presenting perfectly natural views of the sample rather than on reaching the absolute physical limit in resolution. However, the SZX10 still achieves a remarkable resolution of 600 line pairs per millimetre, enabling the visualisation of structures down to just 2 µm in size.

A square is a square

B Correcting distortion errors on stereo microscopes is extremely difficult, since the two separate light paths do not impinge the sample surface perpendicularly. Unlike other stereomicroscopes in this class, the SZX10 provides almost perfect, distortion-free images. This is achieved, optically, by carefully balancing resolution, working distance, chromatic correction, astigmatism and the stereo angle. Thus, a “doming effect” which normally bends straight lines does not occur on the SZX10, meaning that a square shape will be reproduced exactly.

More in focus

In order to make the SZX10 a real inspection tool, the optical system has not only been designed for perfect shape and colour reproduction, but also for maximum depth of field (DOF). Thus, with the SZX10, samples can be observed with up to twice the DOF of the resolution-optimised SZX16. This reduces the need for refocusing and makes tasks like soldering much easier.

Room to work

C A large working distance is important whenever the bottom structures of a large sample, such as turbine blades, have to be inspected. A large working distance also facilitates sample exchange, as well as any sample manipulation required. The SZX10 offers a choice of eight objectives to suit even extreme requirements.

Distortion-free

The DFPLAPO1x distortion-free planapochromatic corrected objective has a working distance of 81 mm. For situations where increased working distances are required without a loss in NA, the SZX-ACH1x has a WD of 90 mm. The 1.25x objective is also available as either DFPLAPO or SZX-ACH. The objective line-up is completed by 0.5x, 0.75x, 1.5x and 2x distortion-free, achromatic corrected DFPL objectives.

Unique functionality

To further enhance the functionality of the SZX10, it can be equipped with a two-position revolving nosepiece. This makes it possible to switch easily between two objectives – a unique feature in this class of stereomicroscopes.

For your eyes only

D The SZX10 provides a uniquely high level of optical convenience, which helps users to avoid eye fatigue – invaluable wherever strain-free, concentrated work is required. Moreover, the innovative ComfortView eyepieces in combination with the well-selected stereo angle, allow natural, agreeable vision, thus considerably reducing the time required for adjusting the microscope. Your eyes focus more quickly on the stereo image while your head and eyes enjoy more freedom of movement – without forfeiting the 3D effect.

Document everything

Let others see what you can by creating an imaging system based on the SZX10. With a trinocular head fitted to the SZX10, the objective in use can be moved slightly to utilise the axial pathway. This provides a perpendicular view, allowing the user to perform precise measurements and create perfect digital proof of your findings.

D

Exceptionally comfortable for the eyes

E SZX10

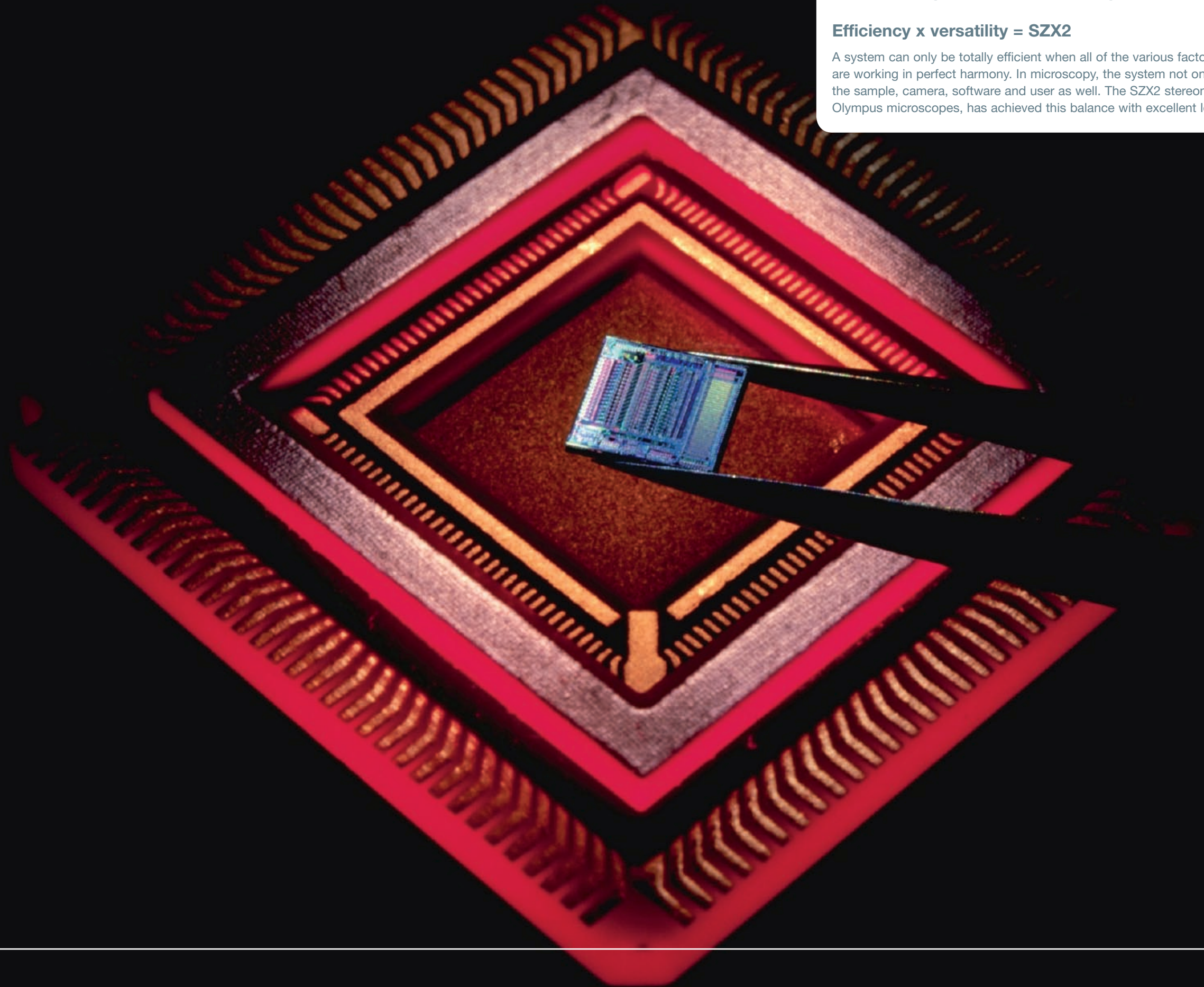
Imaging station



PERFECTLY BALANCED

Efficiency x versatility = SZX2

A system can only be totally efficient when all of the various factors important to its operation are working in perfect harmony. In microscopy, the system not only includes the microscope, but the sample, camera, software and user as well. The SZX2 stereomicroscope range, as with all Olympus microscopes, has achieved this balance with excellent levels of comfort and flexibility.





A Ergonomic features allow convenient working positions

IN THE COMFORT ZONE

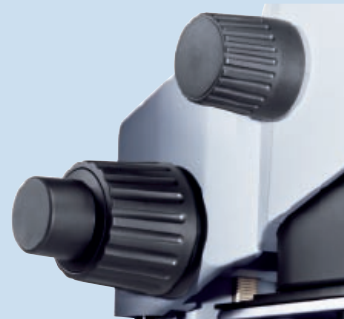
Using any piece of equipment or being in one position for too long can lead to high levels of stress and fatigue. For stereomicroscopy, the eyes are also often fixed in one position for long periods in an effort not to lose the image, leading to eye strain and increasing the potential for head and neck aches. With the SZX2 range though, a plethora of ergonomic features have been included to allow a much more restful experience. This not only makes finding and retaining the stereo image easier, but reduces the chance of missing important features.

Observe from anywhere

A E With some stereomicroscopes used whilst seated and some from standing positions, the SZX2 range can be fitted with various binocular and trinocular observation tubes, enabling comfortable viewing from either. Occasionally though, an observation tube capable of both is needed. Olympus has developed the ergo-tube for this very purpose. This tube can be moved between 5° and 45° (to horizontal), enabling excellent personalisation – essentially fitting the microscope to a multitude of users and not vice versa.

B Fine focus

Precise and smooth focusing even at high magnifications



C LED base SZX2-ILLT

Easy access to four different contrast methods



Functional yet beautiful

The SZX2 range is both ergonomically and aesthetically pleasing. All the components have been designed to provide the perfect optical system, with the ultimate in user comfort and stylish design. The controls are easy to reach and use and the frame is solid, providing fine control of all functions. The zoom body design provides much easier access to the zoom controls and its shorter length enables a lower eye-point, making it possible to utilise larger working distance objectives without losing a comfortable position.

The fine (focus) difference

B The focus drive is probably the most frequently used control on a stereomicroscope. Therefore, Olympus has paid the utmost attention not only to making it easy and comfortable to access, but also to making its operation as precise and smooth as possible. The SZX2-FOF fine focus unit has a planetary gearbox inside which is absolutely backlash-free and enables a smooth operation not previously possible. Furthermore, the sensitivity has been more than doubled compared to previous models, ensuring that focusing, even at the highest magnifications, is effortless: another first from Olympus.

Flat and flexible

C Traditionally, transmitted-light sources for stereomicroscopy have required stands with bases over 80 mm in height. This can lead to pain in the arms as well as an unfavourable posture due to the increased eyepoint. The SZX2-ILLT LED transmitted-light illuminator with its 41 mm height is not only half as thick as conventional light bases, but also provides excellent contrast possibilities with the four-position contrast turret allowing brightfield, darkfield, oblique and polarised-light illumination. The oblique illumination is achieved via an innovative optical sheet with microlamel-lae, providing absolutely even contrast over the entire field of view.

Optical comfort

D E In general, we do not think about how our eyes and brain work together to produce the rich information associated with our 3D world. For stereomicroscopy though, the whole optical magnification process can place this system under pressure, producing eye strain and headaches, and subsequently making it difficult to maintain a 3D image or in some cases preventing long-term use of the microscope. Olympus has taken every possible measure to make the eyes feel comfortable. Besides the unique ComfortView eyepieces allowing increased movement of the eyes without losing the 3D effect, the convergence angle between the eyepieces has been optimised on SZX2 observation tubes for more relaxed vision.

D ComfortView eyepieces

Easier stereo observation and less eye strain



E Tilting trinocular tube

5–45° movement range



A Axial imaging

Objective position for perfect digital documentation

**B LED ring light**

With eight controllable segments

**C Remote control**

for LED illumination



DIGITAL ALL THE WAY

Power is nothing without control; with the SZX10 and SZX16, both are in plentiful supply. In fact, the system is designed with traceability in mind and is therefore perfect for applications where everything needs to be documented.

Take the axial path

A The Olympus SZX2 stereomicroscopes are the perfect tools for showing clear detail from macro to micro and therefore make excellent imaging systems. For documentation purposes though, it is not acceptable to place a camera on one of the two oblique light pathways, since the recorded image needs to be taken from directly above the sample. For this reason, by utilising the revolving nosepiece, each Olympus objective can be rotated to a second position, providing a single axial pathway perpendicular to the surface of the sample.

12 million pixels

Let others see what you can by creating an imaging system based on the SZX2. Olympus offers a broad range of digital cameras from digital SLRs to the super high-resolution DP71 camera with a maximum resolution of more than 12 million pixels, allowing you to perfectly tailor your system to your applications.

An illuminating difference

Beside a good stereomicroscope to capture the image, digital documentation in stereomicroscopy needs a good illumination unit to provide the right contrast. Whether you need reflected or transmitted light, Olympus offers the most advanced LED-based illumination systems, providing constant colour temperature and homogeneous illumination over the full field of view.

Full control

B C For reflected light, Olympus provides eight-segment ring-lights with 80 LEDs. Each segment can be switched on and off remotely. This enables very easy control of both the level and direction of contrast. At the touch of a button you can change from a full-circle ring-light providing homogeneous illumination to a single segment enabling strong contrast. Furthermore, the memory buttons mean you can store settings so that returning to those conditions is precise and highly reproducible.

Homogeneous

For transmitted light, Olympus offers a completely novel and innovative technology, which introduces absolutely homogeneous contrast for transparent specimens. As well as being only 41 mm thick, it is the first LED-based illumination system that allows easy access to four different contrast methods.

Best choice

D The turret enables quick and easy selection of brightfield, darkfield or oblique illumination and a free position can be fitted with a polarised light filter. Oblique illumination is provided by a completely unique system of microlamellae on a glass insert, which channel the light in a specific direction. A small control knob enables fine control of the level of contrast. This is the first oblique contrast technique for stereomicroscopes which produces homogeneous contrast across the complete field of view, resulting in perfect conditions for digital documentation.

Extract more

With the latest image analysis technologies, advanced SZX2 optics and motorised enhancements, an imaging system based on the SZX2 range gives you precise results more quickly. This also greatly expands the amount of information you can glean from your samples.

The third dimension

While our eyes can enjoy the three-dimensional view a digital camera can not. In order to share and discuss your findings with your colleagues more effectively therefore, the SZX2 range offers the ability to create images with 3-D navigation possibilities. The optional motorised Z-drive, with a resolution of 1 µm, can be directly controlled by the Olympus analySIS imaging software allowing the capture of precise 3-dimensional images.

3D image-processing

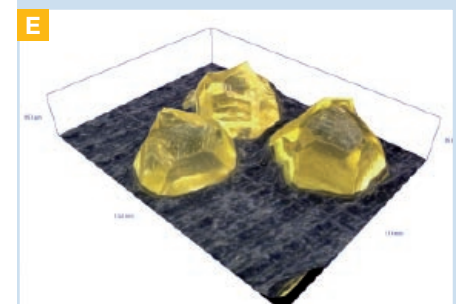
E Once the bottom and top surfaces of the 3D structure have been defined by focusing on the respective surfaces, the analySIS imaging software does the rest for you. The result is an image that you can tilt and rotate during explanations and discussions of your findings, making them much more exciting and effective. In addition you can also create a virtual flight over the samples surface and store it as an 'avi' file.

Multidimensional measurements

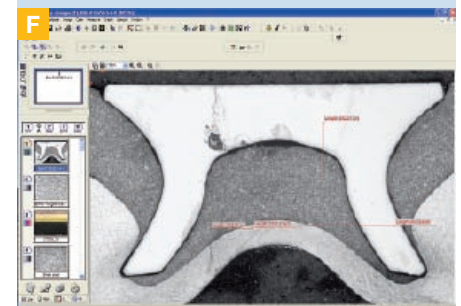
F G If your work requires more than qualitative descriptions, the SZX2 allows you to perform precise 2D as well as 3D measurements. Once the analySIS software is calibrated with a standard, you are ready to use the intuitive and interactive interface to measure manually or automatically for repetitive tasks. With the zoom click stop engaged, it is possible to return to exactly the same magnification power again and again. Moreover, 3D measurements can be performed on images acquired using the precise motorised focus.

Automated analytical tasks

The SZX2 microscopes are a perfect base for the automation of routine analytical tasks, such as residue analysis on filters. Combined with a high-speed scanning stage, a fast digital camera and the analySIS Filter Inspector, the SZX2 range will give you a precise residue analysis report in accordance with the latest industrial standards – automatically.

D Contrast selection wheel
SZX2-ILLT for four contrast inserts

3D view generated by overlaying height and image data



Interactive distance measurement

G Zoom click stop

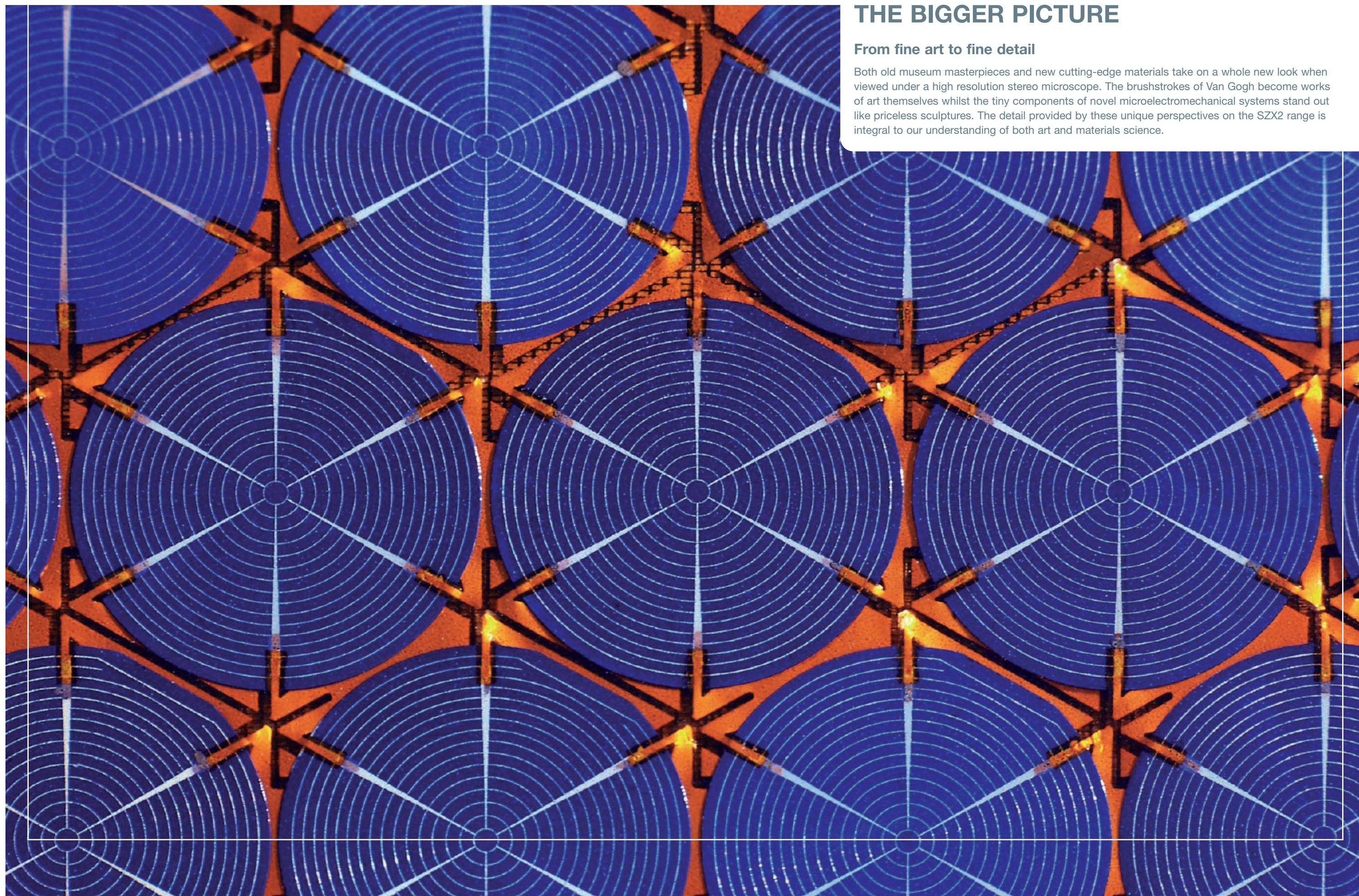
For precise zoom retrieval

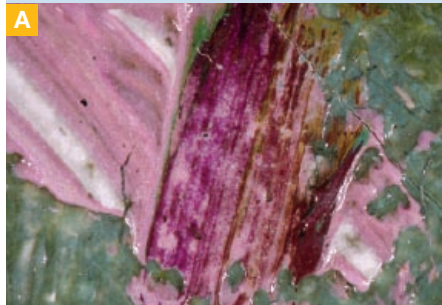


THE BIGGER PICTURE

From fine art to fine detail

Both old museum masterpieces and new cutting-edge materials take on a whole new look when viewed under a high resolution stereo microscope. The brushstrokes of Van Gogh become works of art themselves whilst the tiny components of novel microelectromechanical systems stand out like priceless sculptures. The detail provided by these unique perspectives on the SZX2 range is integral to our understanding of both art and materials science.





Gustave Caillebotte, 'Jardin à Trouville'.

In the 19th century, new pigments like this vivid purple tone broadened artists' palettes*



Vincent van Gogh, 'Drawbridge' (1888), oil on canvas.

Microscopic detail showing the artist's brisk brushstrokes which formed the paste-like paint like a relief.*



Gustave Caillebotte, 'Jardin à Trouville' (ca. 1882), oil on canvas.

This microscopic detail shows the wet-on-wet application of the colours*

IN THE RESTORATION WORKSHOP

Today's modern museums are not just places where priceless collections are displayed; they also offer adventures via extensive and frequently changing exhibitions and themes. As a result, the restoration workshops associated with museums not only have to preserve and conserve these irreplaceable 'stocks' but also have to take responsibility for loaning the pieces. This involves meticulous checks and documentation of the condition of the art both on its way in and out.

SZX2: A stroke of genius

Stereomicroscopes are key to the workshop's operations since they are used for surveying pictures and determining the state of preservation. With their 3D view, stereomicroscopes are also valuable tools for repair jobs, for example when string ends need to be glued to close a tear in the canvas. Beside these classic restoration tasks, today's restorers also carry out scientific exploration far beyond standard history of art questions, e.g. investigating painting materials and techniques.

Unexplored secrets of Impressionist masters

More than 100 years have passed since masters like Van Gogh, Monet, Gauguin and many others painted the pictures which laid the foundations for the development of modern art. Stereomicroscopy is an important method of collecting proof of their innovative Impressionistic painting techniques, a direct reflection of their chosen materials and working styles. Microscopic analysis can also give a new perspective on the origin and history of paintings by differentiating between natural ageing effects and changes deliberately instigated as part of the artist's art.

Exploring painting tools

A In the 19th century, new paints were introduced which enhanced the Impressionists' palettes as well as their repertoire of techniques. For example, new pigments became available, such as the strong pink used by Gustave Caillebotte in his 'Jardin à Trouville' giving the flowers a unique appeal which was previously impossible. Before this it was necessary to mix red and blue. Using stereomicroscopic analysis, it is possible to differentiate between types of pigments. This means that researchers can retrace the development, distribution paths and usage of paints by the different artists.

The stories a brushstroke can tell

B A detailed investigation using line illumination makes brushstrokes clearly visible and allows a much closer look into painting techniques. The shape of the strokes not only gives hints concerning the brushes used but also enables researchers to estimate the speed the artist used to create the effect. This enables us to understand the working style of different artists better, revealing which details were the result of careful planning and which were spontaneous. For example, looking at the detail of 'The Drawbridge' painted in 1888 by Vincent Van Gogh, it is clearly visible how Van Gogh created relief-like structures in the soft paint using fast brushstrokes.

Seeing the details

C A further but different example lies in the details of Caillebotte's 'Jardin à Trouville'. He painted 'wet-on-wet' with careful brush movements, recognisable by the soft brush curves and the parallel, multicolour brush lines.



Where did Caillebotte paint 'Laundry Drying'?

D 'Laundry Drying' is a marvellous picture by Gustave Caillebotte. It shows a scene of washing drying in the summer breeze and allows the beholder to feel as if they are there in person. Did he feel this breeze when he painted the picture in 1892? Detailed stereomicroscopic investigations on each square centimetre of the picture reveal proof which no one else has seen before. A foreign object in the paint hardly recognisable to the naked eye; is it a brush hair, dirt or something else? A closer zoom and it is clear that it is a tree bud. This leads us to wonder whether it is from one of the trees on the painting: did Caillebotte paint this picture outside despite its huge size?



Gustave Caillebotte, 'Laundry Drying' (ca. 1892), oil on canvas.

Microscopic detail with 40x magnification showing a tree bud embedded in the paint*

IN THE HIGH-TECH LAB

Microelectromechanical systems (MEMS) are around us everywhere, but they are so microscopically small that we never notice them – we just see, feel or hear the results of their presence. For example, MEMS are used to control of our cars' airbags, where they sense the acceleration forces. Also, in projection systems, thousands of movable MEMS micromirrors guide the light to the wall – what we see is just a thrilling movie.

Microsystems with a human touch: sensing, thinking, acting

MEMS are a combination of electronics and micromechanics manufactured with technologies commonly used in the microelectronics field. MEMS are reducing power consumption as well as the weight and size of products. They are also improving the performance of systems, and lowering their manufacturing cost. Unlike microelectronics, MEMS are not only small but also have distinct 3-dimensional shapes with resultant structures in the one to two-digit micrometre range. Therefore, high-end stereomicroscopes are playing an increasing role in the research lab and manufacturing areas whenever quick results are needed in order to tune the manufacturing parameters. For example, the Olympus SZX16 with its enhanced 3D view can be used to investigate structures from the centimetre range down to micrometre level with its advanced optical components. This makes it an ideal tool for MEMS development and manufacturing.

Three microfingers

A For the precise mounting and manipulation of microdevices, vacuum pickers are commonly used to pick flat devices. However, for the grasping of pillar-like objects, jaw grippers are the tool of choice. For micromanufacturing though, object sizes in the micrometre range make this a more complex task. At this level, the adhesion forces are stronger than the gravitational forces and it becomes difficult to drop off an object once grasped. Common technologies used to get around this problem are based on electrostatic interactions of comb-like silicon structures. A new technology based on shape memory alloys (SMA), is the latest MEMS invention making it possible to manufacture microgrips in a batch process. These are able to hold fibres with a thickness of just a few tens of micrometre, in a defined position using only three microfingers.

“Program” the memory at 600 °C

A The picture to the left is taken using the SDFPLAPO1X objective on the SZX16 and show the three fingers of an SMA microgrip, holding a 35 µm fibre. The two outer fingers, holding the fibre from the bottom, are static and manufactured using silicon. The middle finger is made from a thin film composite deposited by DC-magnetron sputtering and structured by photolithographic techniques. The composite consists of a shape memory alloy (SMA) and a substrate with a different thermal expansion coefficient. The function of the microgripper is achieved by thermal heat treatment at 600 °C.

The electric grip

The unique property of an SMA deposited onto a substrate is its ability to release the thermally induced film stress in the composite due to martensitic transformation. Once cooled, the gripper can be activated by an electric current, which warms the SMA layer and opens the gripper. Removing the current allows the SMA layer to cool down again and the finger closes. Due to the very low thermal capacity of the metal layer, the heat quickly dissipates and opening/closing cycles only take a few seconds. Thus microfibres, largely used for telecommunication, can be assembled more precisely and quickly, resulting in cost-efficient, high-speed communication.

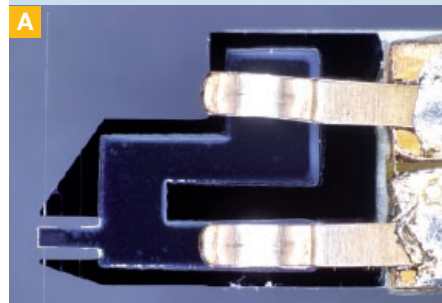
Image E courtesy of Stiftung caesar, Bonn, Germany.

Sensing biochemical reactions

Viral epidemics such as HIV/AIDS are affecting the world's population with greater regularity. Therefore, fast and cheap viral determination is needed more acutely today than ever before. As a result, researchers around the world are constantly working on the development of new devices which are cheap to manufacture but which are efficient to use and provide precise results. One approach involves interdigitated capacitors (IDC), which can be used to detect antigens, antibodies, proteins, or DNA fragments.

Inter-digitated capacitors

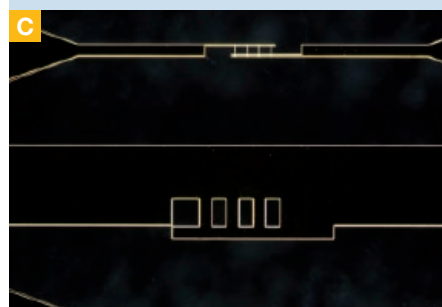
B D IDCs feature a sensing electrode as well as a reference electrode. The sensing part shown in the picture consists of three gold electrodes with separation of just 1.1 µm. Utilising the Olympus SZX16 and darkfield illumination, the gap between the electrodes can be clearly seen, which is a unique property of the SZX16. These sensing electrodes are able to detect small molecules attached to them based on changes of the dielectric properties, making it possible to highlight interactions, e.g. between proteins on cell membranes with a specific molecule. With an electrode separation of 10 µm the reference electrodes are much larger. Due to their reduced surface-to-volume ratio compared to the sensing electrodes, the reference electrodes are suited to monitoring the larger changes in the fluid, like bulk changes of the ion concentration. Thus background environmental effects can be eliminated from the measurements and results are much more reliable. The biggest challenge with such fine electrodes is controlling the manufacturing parameters in order to minimise tolerances and to increase the repeatability of the devices.



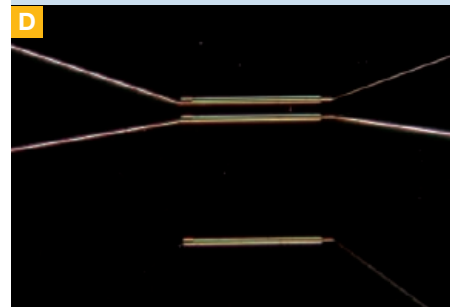
Microfingers



Interdigitated capacitors



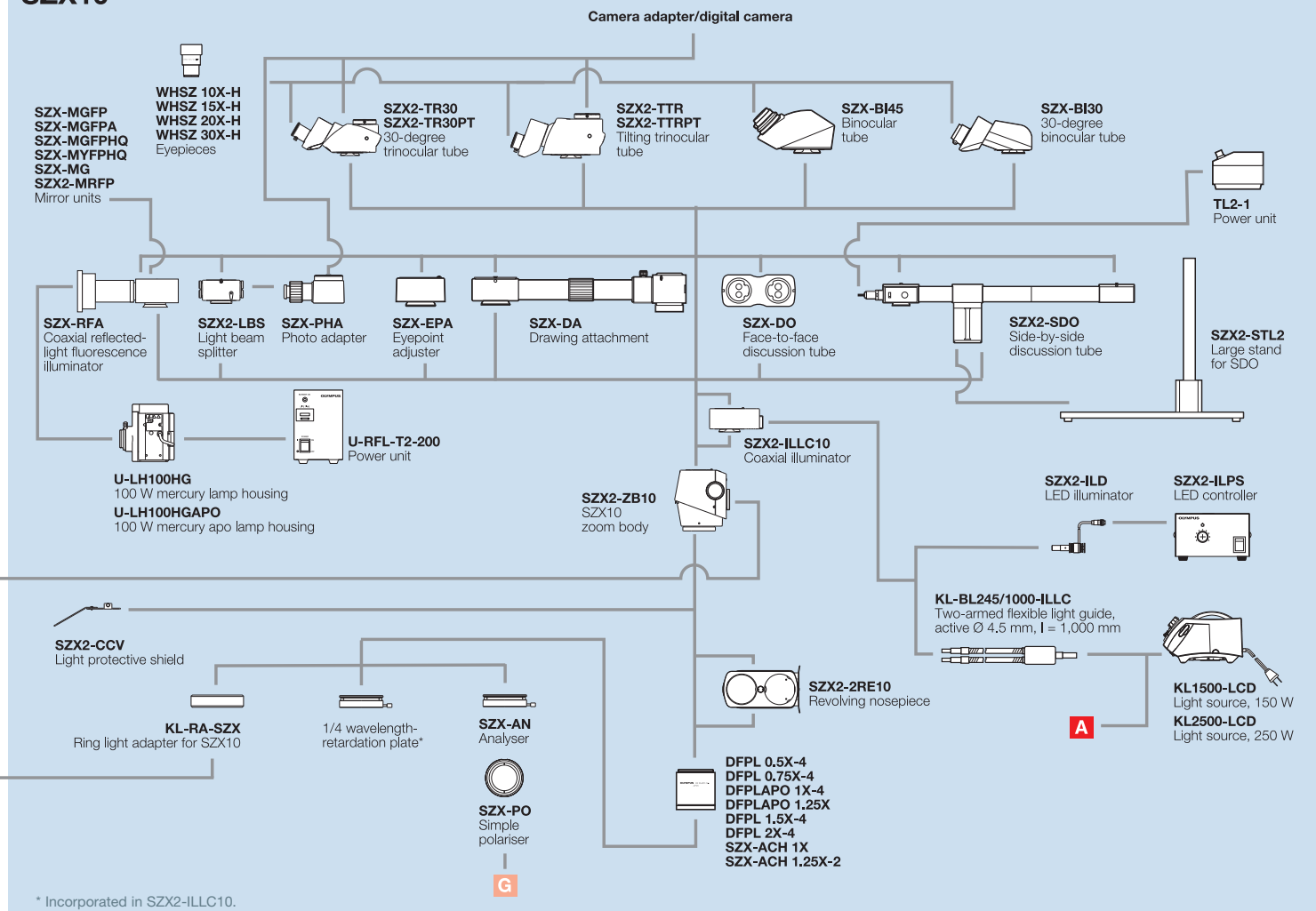
Impedance sensors



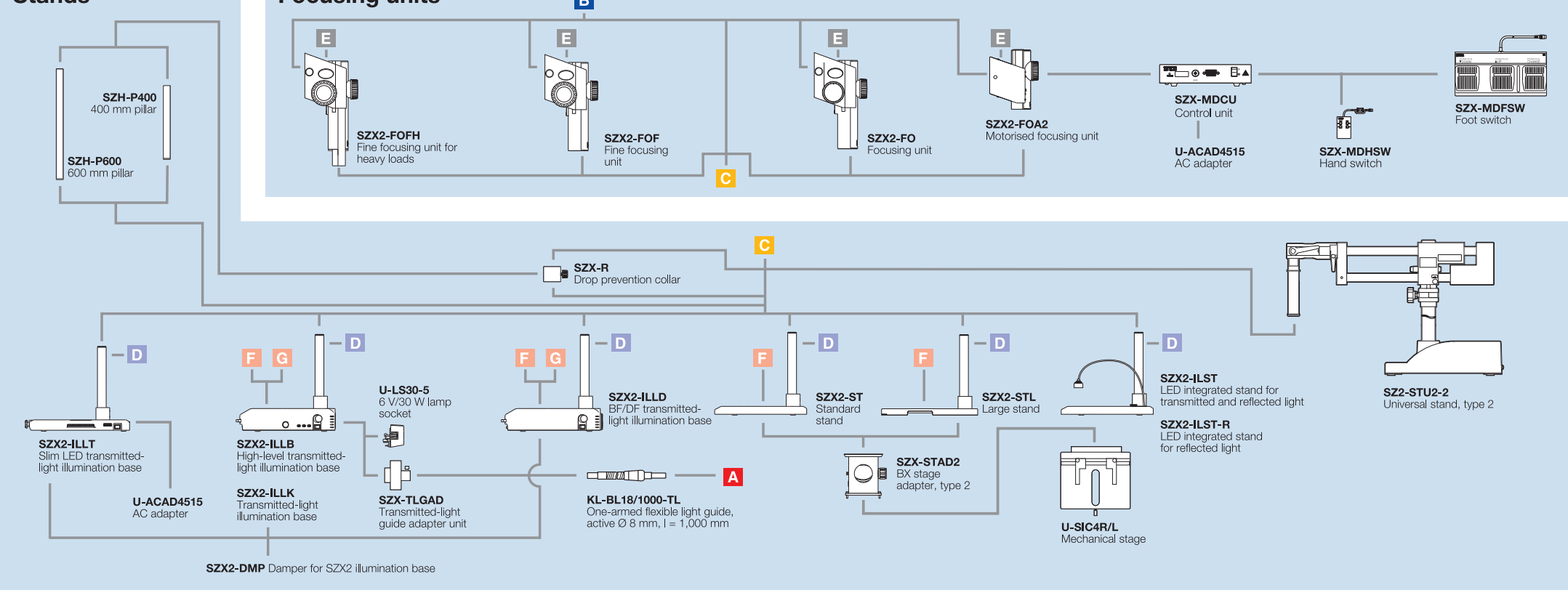
Inter-digitated capacitors



SZX10



Focusing units



SZX2 specifications

Zoom bodies		
	SZX2-ZB16	SZX2-ZB10
Zoom ratio	16.4	10
Zoom range	0.7–11.5	0.63–6.3
Click stop positions	0.7/0.8/1/1.25/1.6/2/2.5/3.2/4/5/6.3/8/10/11.5	0.63/0.8/1/1.25/1.6/2/2.5/3.2/4/5/6.3
Aperture stop	Integrated	Integrated

Focusing units				
	SZX2-FOFH	SZX-FOF	SZX-FO	SZX-FOA2
Type	Coarse/fine focus	Coarse/fine focus	Coarse focus	Motorised coarse/fine focus
Movement range	80 mm	80 mm	80 mm	75 mm
Stroke	36.8 mm/0.77 mm per rotation	36.8 mm/0.77 mm per rotation	21 mm per rotation	1.5 mm/0.3 mm per second, resolution 1 µm
Load capacity	10 to 25 kg (built-in counterbalance)	5 to 20 kg (built-in counterbalance)	Max. load: 10 kg	0 to 18.0 kg (built-in counterbalance)

Observation tubes				
	SZX2-TR30	SZX2-TR30PT	SZX2-TTR	SZX2-TTRPT
Type	Trinocular observation tube	Trinocular observation tube	Tilting trinocular tube	Tilting trinocular tube
Tilt angle	30°	30°	5° to 45°	5° to 45°
Light path selection, position 1	100% observation	100% observation	100% observation	100% observation
Light path selection, position 2	50/50% observation/camera	0/100% observation/camera	50/50% observation	0/100% observation/camera
Interpupillary distance adjustment	52–76mm	52–76mm	52–76mm	52–76mm
Eyepieces	ComfortView WHSZ series	ComfortView WHSZ series	ComfortView WHSZ series	ComfortView WHSZ series

Stands				
	SZX2-ST	SZX2-STL	SZX2-ILST	SZX2-ILST-R
Type	Reflected-light stand	Large reflected-light stand	Transmitted/reflected white light	Reflected white light
			LED illumination stand	LED illumination stand
Base dimensions	284 (W) x 335 (D) x 31 (H) mm	400 (W) x 350 (D) x 28 (H) mm	284 (W) x 335 (D) x 31 (H) mm	284 (W) x 335 (D) x 31 (H) mm
Pillar height	270 mm	270 mm	270 mm	270 mm

Transmitted-illumination bases				
	SZX2-ILLT	SZX2-ILLB	SZX2-ILLK	SZX2-ILLD
Type	Universal illumination base for transmitted light	Oblique illumination transmitted-light base	Brightfield transmitted-light illumination base	Darkfield transmitted-light illumination base
Illuminant	White-light LED	6 V, 30 W halogen	6 V, 30 W halogen	6 V,30 W halogen
Contrast methods	Brightfield, enhanced brightfield, darkfield, oblique illumination (four position cassette turret)	Brightfield and oblique illumination	Brightfield and oblique illumination (by tilting mirror)	Brightfield and darkfield
Illuminated area	Brightfield: Ø 63 mm, darkfield/oblique: Ø 35 mm	Ø 40 mm	Ø 40 mm	Brightfield: Ø 40 mm, darkfield: Ø 35 mm
Base height	41 mm	80 mm	80 mm	80 mm
Pillar height	270 mm	270 mm	270 mm	270 mm

Fluorescence illuminators		
	SZX2-RFA16	SZX2-RFA
Type	Near-vertical fluorescence illuminator with focusing unit	Coaxial fluorescence illuminator
Fluorescence filter positions	Five sets of excitation/emission filter sliders are mountable (turret)	Three fluorecence filter cubes are mountable (slider)
Excitation balancer	Slot for one excitation balancer	-
Focus drive type	Coarse/fine focus	-
Movement range/stroke	69 mm movement range, stroke per rotation 36.8 mm (coarse), 0.77 mm (fine)	-
Load capacity	2.7–15.0 kg	-

SZX10 objectives					
	Numerical aperture	Max. resolution (lp/mm)	Max. resolution (µm)	Working distance (mm)	Parfocal distance (mm)
DFPL0.5X-4	0.05	149	6.71	171	216
DFPL0.75X-4	0.075	224	4.47	116	164
DFPLAPO1X-4	0.1	298	3.36	81	137
SZX-ACH1X	0.1	298	3.36	90	119
DFPLAPO1.25X	0.125	373	2.68	60	123
SZX-ACH1.25X-2	0.125	373	2.68	68	110
DFPL1.5X-4	0.15	447	2.24	45.5	109.5
DFPL2X-4	0.2	596	1.68	33.5	123

Eyepiece observation		
	WHSZ10X-H (Field number 22)	
	Total magnification	Field diameter (mm)
DFPL0.5X-4	3.2x31.5x	Ø 69.8–Ø 7.0
DFPL0.75X-4	4.7x–47.3x	Ø 46.6–Ø 4.7
DFPLAPO1X-4	6.3x–63x	Ø 34.9–Ø 3.5
SZX-ACH1X	6.3x–63x	Ø 34.9–Ø 3.5
DFPLAPO1.25X	7.9x–78.9x	Ø 27.9–Ø 2.8
SZX-ACH1.25X-2	7.9x–78.9x	Ø 27.9–Ø 2.8
DFPL1.5X-4	9.5x–94.5x	Ø 23.3–Ø 2.3
DFPL2X-4	12.6x–126x	Ø 17.5–Ø 1.7

Camera observation			
	1/2 inch (U-TV 0.5XC) (chip size 4.8 x 6.4 mm*)	2/3 inch (U-TV 0.63XC) (chip size 8.8 x 6.6 mm*)	2/3 inch (U-TV 1X) (chip size 8.8 x 6.6 mm*)
	Field size (mm)	Field size (mm)	Field size (mm)
DFPL0.5X-4	40.6 x 30.5–4.1 x 3.0	44.3 x 33.3–4.4 x 3.3	27.9 x 21.0–2.8 x 2.1
DFPL0.75X-4	27.1 x 20.3–2.7 x 2.0	29.6 x 22.2–3.0 x 2.2	18.6 x 14.0–1.9 x 1.4
DFPLAPO1X-4	20.3 x 15.2–2.0 x 1.5	22.2 x16.6–2.2 x 1.7	14.0 x 10.5–1.4 x 1.0
SZX-ACH1X	20.3 x 15.2–2.0 x 1.5	22.2 x 16.6–2.2 x 1.7	14.0 x 10.5–1.4 x 1.0
DFPLAPO1.25X	16.3 x 12.2–1.6 x 1.2	17.7 x 13.3–1.8 x 1.3	11.2 x 8.4–1.1 x 0.8
SZX-ACH1.25X-2	16.3 x 12.2–1.6 x 1.2	17.7 x 13.3–1.8 x 1.3	11.2 x 8.4–1.1 x 0.8
DFPL1.5X-4	13.5 x 10.2–1.4 x 1.0	14.8 x 11.1–1.5 x 1.1	9.3 x 7.0–0.9 x 0.7
DFPL2X-4	10.2 x 7.6–1.0 x 0.8	11.1 x 8.3–1.1 x 0.8	7.0 x 5.2–0.7 x 0.5

SZX16 objectives					
	Numerical aperture	Max. resolution (lp/mm)	Max. resolution (µm)	Working distance (mm)	Parfocal distance (mm)
SDFPLFL0.3X	0.045	135	7.41	141	210
SDFPLAPO0.5XPF	0.075	225	4.44	70.5	135
SDFPLAPO0.8X	0.12	360	2.78	81	140
SDFPLAPO1XPF	0.15	450	2.22	60	135
SDFPLAPO1.6XPF	0.24	720	1.39	30	135
SDFPLAPO2XPFC	0.3	900	1.11	20	135

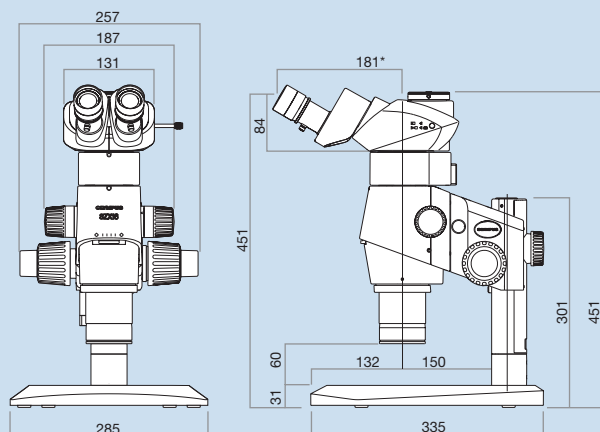
Eyepiece observation		
	WHSZ10X-H (Field number 22)	
	Total magnification	Field diameter (mm)
SDFPLFL0.3X	2.1x–34.5x	Ø 104.8–Ø 6.4
SDFPLAPO0.5XPF	3.5x–57.5x	Ø 62.9–Ø 3.8
SDFPLAPO0.8X	5.6x–92x	Ø 39.3–Ø 2.4
SDFPLAPO1XPF	7x–115x	Ø 31.4–Ø 1.9
SDFPLAPO1.6XPF	11.2x–184x	Ø 19.6–Ø 1.2**
SDFPLAPO2XPFC	14x–230x	Ø 15.7–Ø 1**

Camera observation			
	1/2 inch (U-TV 0.5XC) (chip size 4.8 x 6.4 mm*)	2/3 inch (U-TV 0.63XC) (chip size 8.8 x 6.6 mm*)	2/3 inch (U-TV 1X) (chip size 8.8 x 6.6 mm*)
	Field size (mm)	Field size (mm)	Field size (mm)
SDFPLFL0.3X	61.0 x 45.7–3.7 x 2.8	66.5 x 49.9–4.1 x 3.0	41.8 x 31.4–2.6 x 1.9
SDFPLAPO0.5XPF	36.6 x 27.4–2.2 x 1.7	39.9 x 30.0–2.4 x 1.8	25.1 x 18.9–1.5 x 1.1
SDFPLAPO0.8X	22.9 x 17.1–1.4 x 1.0	25.0 x 18.7–1.5 x 1.1	15.8 x 11.8–0.9 x 0.7
SDFPLAPO1XPF	18.3 x 13.7–1.1 x 0.8	19.9 x 15.0–1.2 x 0,9	12.5 x 9.4–0.7 x 0.5
SDFPLAPO1.6XPF	11.4 x 8.6–0.7 x 0.5	12.4 x 9.3–0.8 x 0.6	7.8 x 5.9–0.5 x 0.3
SDFPLAPO2XPFC	9.1 x 6.9–0.6 x 0.4	10.0 x 7.5–0.6 x 0.5	6.3 x 4.7–0.4 x 0.3

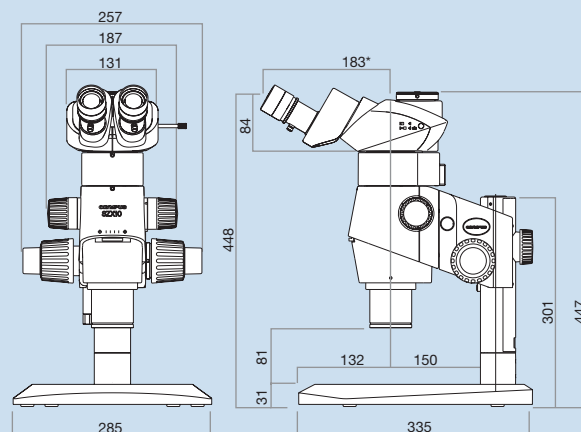
* Actual chip size might vary depending on the manufacturer. ** Some vignetting may occur at low magnifications.

SZX2 dimensions

SZX16



SZX10



Dimension unit: mm. * This dimension may vary according to the interpupillary distance.

The manufacturer reserves the right to make technical changes without prior notice.

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