Your Vision – Our Mission

Leica MZ16 and motorized MZ16 A High-tech Stereomicroscopes

See 0.6-micron structures, save 80% more time

Leica
MICROSYSTEMS

From Vision to Reality

VISION

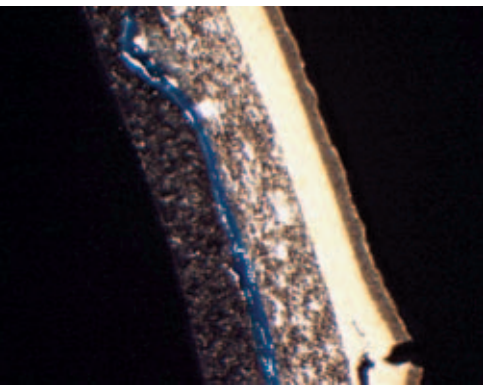
C. elegans female tail,
visual magnification of 230×

Vision fuels progress. Vision brings human creativity and innovation to blossom and prepares the world for the future. Mankind's courage, vision, intelligence, idealism and will, have taken us to the moon, brought global communication to the world and given us the ability to transplant human body organs to save lives. Glancing into the laboratories of scientists and engineers gives us hope and a glimpse of the future. With the decoding of the human genome, for example, medical professionals see great opportunity to better understand and one day find cures for illnesses like cancer, Alzheimer's and Parkinson's disease. In the largest research laboratory of the world, the International Space Station, scientists are growing perfect crystals using microgravitation, which may lead to new medicines, materials and electronic products. Even the revolutionary vision of one day returning the ability to walk to the disabled by implanting nanosize microchips is beginning to take shape thanks to the interdisciplinary collaboration of technology and science.

The road there

Turning vision into reality requires the right tools and human vision. Leica Microsystems feels a commitment to participate. You can take great steps toward your goals with the world's first stereomicroscope with motorized zoom and the highest resolution in stereomicroscopy. You can observe, prepare and manipulate living, intact specimens in a wide field of vision, three-dimensionally and with great depth of field. Then, using the same device, you can immediately analyze details and reactions at a resolution of 840 line pairs/mm at 230× magnification. For the first time ever, 0.6-micron structures can now be observed with a stereomicroscope. Laboratory trials using the Leica MZ16 and MZ16 A stereomicroscopes (Patents filed) have shown that the processes of presorting, classifying, characterizing, and analyzing can take one-fifth the time they used to. You will gain time for important things, thanks to motorized functions.

Leica MZ16 and MZ16 A – bringing your vision of the future to the present.



Forensic analysis of a car paint cross-section, visual magnification of 230×

"Visions are nothing more than strategies for action. Not only do we need courage for such visions, we also need the strength and the will to bring them into being."
Professor Dr. Roman Herzog, 6th President of the Federal Republic of Germany


N
ISSION

The Vision:

Viewing Down to 0.6 Micron

Leica MZ16 highlights:

- 100% apochromatic optic system
- Magnification with 2× Planapo objective: 230×
- Resolution of 840 Lp/mm with 2× Planapo objective
- Visible structural widths: 600 nm
- Zoom 16:1
- Motorized focus (optional)
- Variable ErgoTube™
- Objective nosepiece for 1× and 2× Planapo objectives
- Double iris diaphragm

Leica MZ16 A highlights:

- 100% apochromatic optic system
- Magnification with 2× Planapo objective: 230×
- Resolution of 840 Lp/mm with 2× Planapo objective
- Visible structural widths: 600 nm
- Motorized zoom 16:1
- Motorized focus (optional)
- Automated measurement
- Display: magnification, measuring sections, selection menu
- PC data transfer
- Objective nosepiece for 1× and 2× Planapo objectives
- Double iris diaphragm

Learning from a fly

Since Thomas H. Morgan, the father of gene research (1933 Nobel Prize in Medicine), brought the drosophila into his laboratory in 1908, the fruit fly has become one of the most genetically studied, completely sequenced organisms ever. In many cases, its genes are coincidental with the genes of humans. This is why the drosophila offers an ideal model for studying gene functions and diseases in humans.

The top illustration shows the rope-ladder nervous system of the embryo of the drosophila melanogaster fruit fly. In the early stages of embryonic development, the neural stem cells and neuroblasts delaminate and produce daughter cells. With the Leica MZ16 and MZ16 A, you can see every individual 1.2 to 1.4-micron-sized neuron. Researchers want to clarify how the neuroblasts and their daughter cells receive (specification) and specify (differentiation) their individual identities. Using various marker techniques, an antibody in the second illustration, individual cells of the embryonic central nervous system and their cell progenitors are characterized by their specific gene expression samples.

Viewing expressed genes

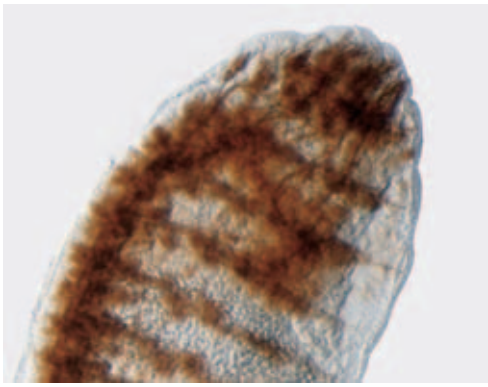
More than half of the known human genes, that in mutated form cause disease, are conserved in the drosophila genome. Understanding the biological development processes and their evolution is of practical importance for basic biomedical research. With in-situ hybridization (ISH), researchers can observe nucleic acid sequences in the biological specimen directly, as well as when and where a gene is activated/expressed. The third illustration shows the stomach through ISH. The Leica MZ16 and MZ16 A stereomicroscopes offer excellent observation of the gene expression at high resolution, great depth of field and excellent contrast.

Microscopic helpers in the search for oil

In micropaleontology, minute skeletons of prehistoric organisms are the guiding fossils for recognizing oil deposits in the Earth. Trial drillings provide samples that are analyzed mineralogically and geochemically. Their fossil contents are paleontologically examined to determine the ages and chronology of the rock layers.

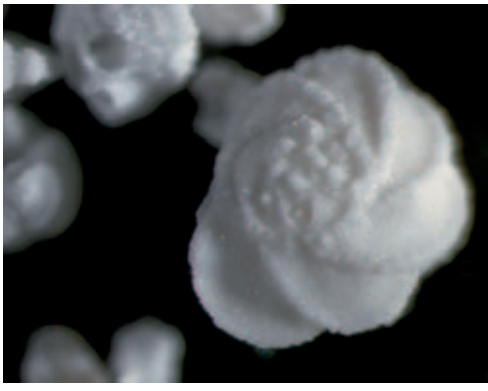
Observe the microfossils that were documented using a Leica MZ16 and a Leica DFC500 digital camera. These minute 1.5-micron microstructures, which are used to determine age and assign it to a period of time in the history of the Earth, are clearly visible. They teach us the exciting history of the oceans, the continents and the climate 60 – 70 million years ago and provide clues to potential oil deposits.

Rope-ladder nervous system of a drosophila embryo, expressed by antibodies.



Each individual 1.2 to 1.4-micron-sized neuron is visible at 230× magnification

Drosophila, expression sample from genes represented through in-situ hybridization



Microfossils: These microstructures, which are about 1.5 microns in size, are clearly observable

Leica Design by Christophe Apothéloz

ERG

The Vision:

Cut Time by 80%

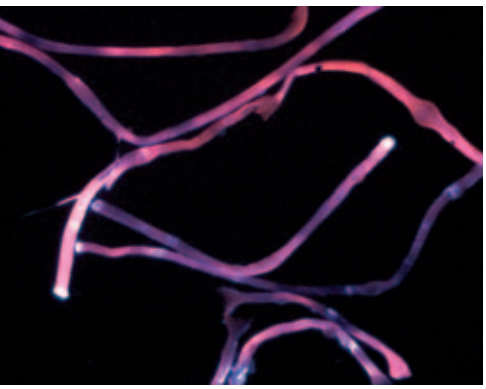
230× magnification, resolution of 840 Lp/mm
It was never before possible to observe three-dimensional objects with a stereomicroscope at 230× magnification at resolutions as high as those offered by the Leica MZ16 and MZ16 A stereomicroscopes. With the objective nosepiece, objects can be sampled in very little time within a magnification range of 7.1× to 230× at a resolution of up to 840 Lp/mm. This can save you a great deal of time, for example, when selecting gene-manipulated C. elegans, because you no longer have to switch to a light microscope with interference contrast to accurately identify the mutated tail sections (see image on page 2).

Motorized functions – bringing new meaning to ergonomics
The vision of an entirely ergonomic stereomicroscope is a reality at Leica Microsystems. The new Leica MZ16 A is the first stereomicroscope with motorized zoom, which like the optional motorized focusing system, can be operated easily, quickly and precisely – with fine, gentle finger movements, foot pedal, or computer control. You drive from the lowest to the highest zoom factor, including 11 preset and 5 customizable positions, at maximum tempo. This means you save time and energy, and become more productive than ever before.

Digital display
The Leica MZ16 A is the first stereomicroscope that immediately displays the actual magnification with every zoom adjustment while taking into account the eyepiece, objective, coaxial reflected light and measurements. For example, you can adjust the motorized zoom with ultrahigh precision at high magnifications. The system automatically takes care of calibration.

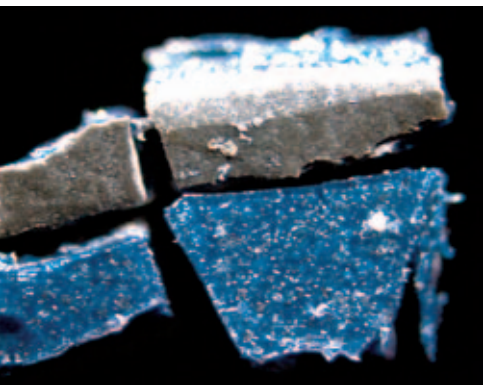
Automatic measurement
You adjust the magnification so that the desired line segment in the object corresponds to the reference distance in the eyepiece – the Leica MZ16 A immediately displays the measurement in mm, inches or thousandths of an inch. It is that easy.

A Clue for Every Crime



Polyester fibers in blue fluorescence excited by the Leica fluorescence module

Animal hair with suspicious blood attached to it



Paint particles, left: incriminated, right: original material

The search for clues with adhesive strips

A taxi is on the sidewalk. Just behind it lies a victim on his side. The driver's window is shattered and shards of glass, coins and a deformed bullet are scattered on the pavement. Police fence off the area around the site. Cameras flash. Specialists in white overalls pack tiny particles into plastic bags, collect splattered blood samples and make molds of footprints. The position of each item of evidence is recorded with meticulous accuracy, numbered, sketched and photographed. Trace evidence is gathered from every millimeter of the victim and the area using a special particle lifting tape. All the microtraces gathered, such as fibers from clothing or hair, can eventually determine the murderer. Of all the material evidence collected, fibers and hair are highly valued.

Police inspector with a microscope

Examining the particle lifting tape and sorting the microtraces gathered at the scene of the crime takes place in a forensic laboratory using a stereomicroscope (reflected light, polarization, fluorescence). This is because an overview and a large field of vision, three-dimensional image and great depth of field are necessary during the first stages of the examination. Furthermore, this often time-consuming, tedious task requires exceptional accuracy, as the results of the examinations, comparisons and analyses carry great weight in reaching a verdict – guilty or not guilty. This phase has been improved and shortened significantly with the Leica MZ16 and MZ16 A stereomicroscopes. The vegetable, animal and chemical fibers in question can be more accurately and quickly identified – before high technologies, like microspectral photometry, Fourier-transformed infrared spectroscopy (FTIR), chromatography and scanning electron microscopy (SEM), come into the process.

The result is a testimonial report that photographically documents all examinations from the very beginning, and now provides either incriminatory or non-incriminatory evidence.

B

FORENS

FORENSIC

Of Mice and Men

BIOMED

Biomedical research examines complex development stages and their influences on model organisms like worms, flies and mice. While these forms of life may at first appear to have nothing in common with humans, geneticists continue to find segments of genetic information that have lasted unchanged through millions of years of constantly diverging evolution. Programmed in the genetic substance of model organisms are illness-causing genes that are inherited through reproduction. Researchers promise new treatments in the long term for Alzheimer's patients and those who suffer from chronic pain.

Caenorhabditis elegans, the laboratory pet

A particular success in the story of genetics is this discrete, one-millimeter long ground-dweller. Its 19,099 genes were the first of any animal genome to be completely sequenced. The fact that the structure of about every other gene belonging to this worm shows stark similarities to human genes gives great importance to the study of this living laboratory animal. The C. elegans male helps researchers understand the Kallmann syndrome gene. The main characteristics of the Kallmann syndrome are genetically conditioned hypogonadotropic hypogonadism (delayed puberty due to decreased hormonal functions of the gonads) and anosmia (the loss of the sense of smell). Studying mutants of the Kallmann gene homolog of the worm, researchers now hope to get to the bottom of the molecular mechanism responsible for this condition. With the Leica MZ16 and MZ16 A stereomicroscopes, the mutant genes can be classified five times faster than before.

The mouse: A close relative

Medical research places much hope in the mouse Mus musculus, as it possesses highly concentrated hereditary dispositions closely related to those of humans. Its genome is not much smaller than the human genome. The classic example of a highly concentrated gene is "Pax 6", which plays a central role in the control of eye development. It is identical in humans, mice and drosophila. The more gene sequences become known, the clearer it becomes which hereditary dispositions are responsible for congenital developmental disorders.

Categorizing mutants of C. elegans in overview, 230× magnification, see page 2

Complete view of Mus musculus

Details of the lens eye visible at a larger depth of field


POWER
CONTROL 1
CONTROL 2
Leica
PLANAPO 1.6x

The Vision:

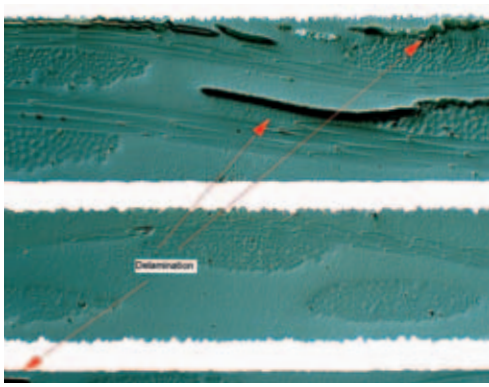
12 Million Pieces of Information

These days, the scientific community communicates through a global data network faster, and at greater distances than ever before. We can now utilize and connect between knowledge sources from the entire world at the same time. In the future, ambitious researchers from varied fields around the world will work cooperatively for new creative solutions – to benefit all people.

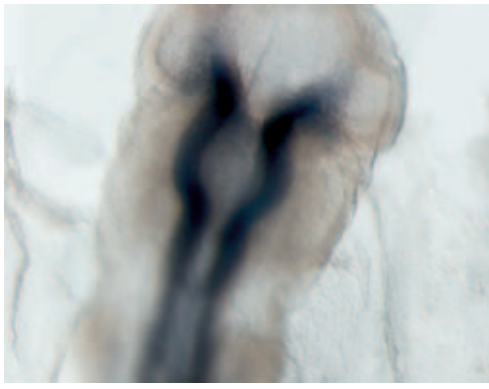
Interface to the virtual knowledge exchange
Leica Microsystems specializes in optical data gathering and digital data storage. All of the application images in this brochure were taken using Leica DFC digital camera systems – without complicated preparation, or loss of time... plug and play with top results. Leica cameras range from the standard digital camera for universal use to the high-end camera for scientific microscopy, medicine, biotechnology, metrology, materials analysis and quality assurance.

With true 12 megapixels, the Leica DFC500 is the professional digital camera, the superlative for analysis, measurements and advanced processing of high-quality image data. With a dynamic range of 700:1, the Leica DFC290 is the ideal documentation camera for professional microscopy. The Leica DFC300 FX (color camera) and DFC350 FX (monochrome camera) are specialists for digital fluorescence microscopy.

Data for viewing and analysis
The Leica Application Suite (LAS) not only optimizes the capture, analysis and processing of digital images in the life sciences, clinical settings and industrial applications, it is also outstandingly well-integrated in the complete Leica system. Leica Microsystems QWin is a modular image analysis application for quantitative microscopy in industrial and scientific applications that is available in five versions to suit a range of customer requirements and budgets. Finally, Leica IM1000 is a modular software package for image capture, processing, measurement, output, image exchange and data backups.



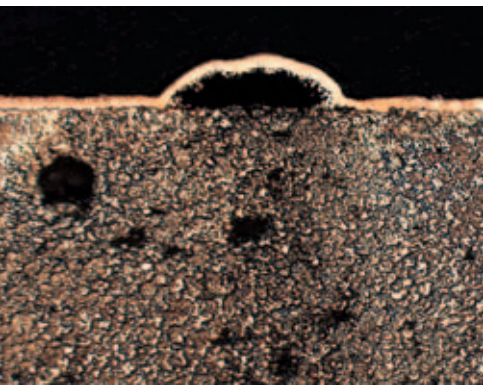
EDM board, delamination in first and third layers, 230× visual magnification



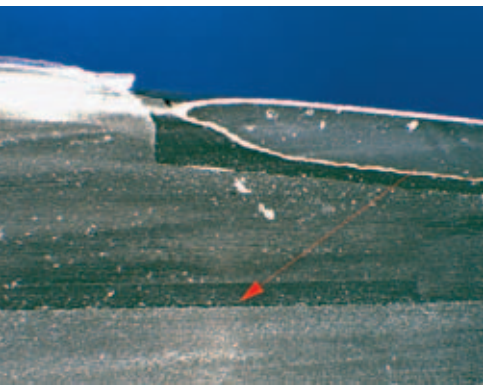
Gene expression in a chicken embryo

Leica DC digital camera system on a Leica MZ16 A with motorized zoom and motorized focus

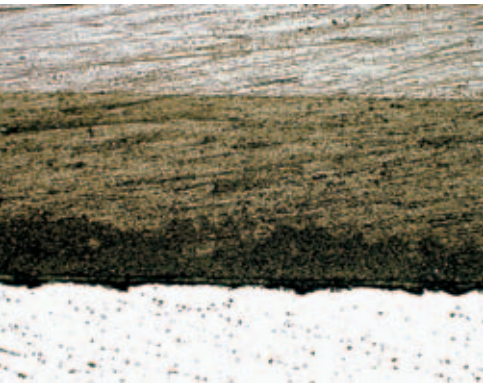
3-liter Automobiles, Lighter Rockets, Faster Airplanes



Cast magnesium, copper coating detachment from base material, visual magnification 230×



Circuit board material: separation in the adhesive layer between glass and plastic



The same material at 230× magnification

Around the world, materials scientists are working with lighter materials and new designs to create lighter and more efficient automobiles. As early as the legendary VW Beetle, 20 kilograms of the lightest metal construction material, magnesium, hit the street. At that time, however, the magnesium alloys failed because of production difficulties and were soon forgotten. Today we finally have new methods for processing magnesium alloys.

At this moment, magnesium is experiencing a renaissance. Because 100 kilograms less in vehicle weight equals about 0.6 liters less fuel for every 100 kilometers, experts prophesy that the light-metal alloy may become the material of the 21st century. Many are counting on a decrease in the weight of vehicle designs of up to 50 percent, if parts such as the steering column, the steering wheel, the gear casing and the multi-shell intake manifolds are manufactured using this rediscovered, light construction material. Very recently, development engineers have even been experimenting with a magnesium engine.

The material of the 21st century

The use of magnesium is not limited to the automobile industry. Airplane, train and rocket engineers also see the potential to lower weight and save fuel. Because they are very resistant to catching fire, magnesium alloys can run the gamut of airplane components, all the more so because these metals do not give off any poisonous gases in fire situations. Magnesium is conquering other fields of application like chain saws, bicycles, household devices and cell phone cases and appears ready to rob plastic of its number 1 rank.

In materials testing, materials examination, damage analysis and research, nondestructive testing processes are needed. With the Leica MZ16 and MZ16 A stereomicroscopes, microscopic quality analysis of surfaces, fracture surfaces, polished metal samples and thin sections can be quickly accomplished, saving significant time.

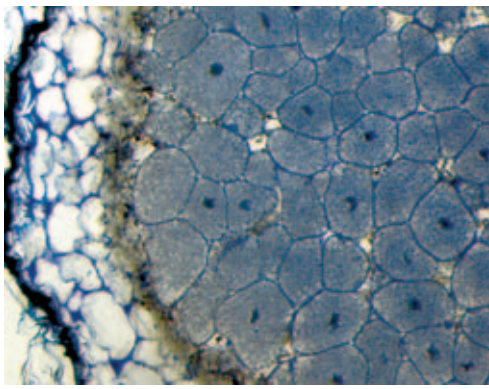
More Resistant, Efficient, and Environmentally Sound

Worldwide, there are more than 800 million undernourished people. Supplying food to a continually growing world population is one of the greatest challenges of the future. "Green" biotechnology pursues the goal of breeding grains and vegetables with greater resistance against destructive viruses, insects, fungi, cold and drought. The objects of research are chiefly plant materials, like biological cellular systems. The knowledge gained in recent years can be applied as the fundamental source for new, future-oriented visions. Examples include: food plants that naturally produce herbicides, and endure salt water, droughts and cold, as well as staple foods that fulfill the human vitamin and mineral requirements and protect against disease. An increase, for example, in vitamin A content would protect against blindness in malnourished children.

Root nodules

Growth without fertilizer

Every gardener knows that many plants cannot thrive well without fertilizer. Fertilizers contain a large portion of nitrogen, a nutrient that plants depend on. Plants, however, are not capable of utilizing the vast amount of nitrogen found in the air. Certain ground bacteria, on the other hand, can. Rhizobia is one such bacteria, with which many plants, such as clover, peas and beans (legumes), share a symbiotic relationship. If we inoculate seedlings with rhizobia, the seedlings grow better because these bacteria are always there to supply them with sufficient nitrogen. During this symbiosis, these plants develop nitrogen-fixating root nodules. Rhizobia establish themselves within the nodules, take the gaseous nitrogen out of the air and convert it into ammonium. This is referred to as biological or symbiotic nitrogen fixation.



Plant transport system cross-section

Using the Mexican bean as an example, researchers are studying the nitrogen cycle. How are the metabolic mechanisms in the two symbiotic partners interwoven? How are the processing and transport of the fixated nitrogen regulated, thus achieving a well-coordinated cooperative effect? Can these processes be optimized and can the efficiency of nitrogen fixation be increased? Can we design rhizobia phyla that are able to fixate nitrogen more efficiently, thus resulting in improved plant growth without the need for chemical aids? With the Leica MZ16 and MZ16 A stereomicroscopes, the geometry and shape of the entire rhizobium can be assessed, after which the thin sections can be accurately analyzed at top magnification and resolution.

Digital display on MZ16 A

The Vision:

Limitless Diversity

Objective nosepiece

Motorized focus

Leica MATS heating stage

A top-rate stereomicroscope has to easily adapt to every application in the fields of natural science and technology. You can profit from the vast accessories program for all imaginable analysis, training and documentation tasks – today, or at any future time. Following are a few examples. Other modules are listed in the M1-116-1 brochure.

Total information
The objective nosepiece lets you switch quickly between the 1× and the 2× Planapo objectives, without wasting time exchanging parts. In no time at all, you can achieve an overview of the entire object in a 29.6mm field of vision, in relief and with a large depth of field, and then you can accurately inspect details at a maximized 230× magnification and high resolution without having to adjust the focus.

Effortless focusing
Frequently repeated, subtle motor tasks such as focusing place high demands on the musculo-skeletal system. The motorized focusing system lets every apparatus be adjusted up and down effortlessly and provides accurate focusing at high magnification, using hand, foot or computer controls.

Living cells need warmth
Temperature-sensitive samples such as living cells die when the temperature drops. This danger is addressed by the Leica Thermocontrol System, MATS. Leica MATS provides lifesaving, absolutely uniform temperature across the entire table surface and monitors and controls the temperature reliably.

Features

Optical data	Leica MZ16	Leica MZ16 A
Zoom	16:1 manual	16:1 motorized
Data with standard optics (objective 1× / eyepieces 10×)		
– Zoom range	7.1× – 115×	7.1× – 115×
– Resolution	max. 420 Lp/mm	max. 420 Lp/mm
– Working distance	55mm (Planapo), 60mm (Plan)	55mm (Planapo), 60mm (Plan)
– Field of view	∅ 29.6mm – 1.8mm	∅ 29.6mm – 1.8mm
Maximum values (based on optics combination)		
– Magnification	920×	920×
– Resolution	840 Lp/mm	840 Lp/mm
– Visible structural width	0.6 micron	0.6 micron
– Numerical aperture	0.14	0.14
– Field of view	∅ 57.5mm	∅ 57.5mm
Working distances	135mm (Plan 0.5×) 112mm (Plan 0.8×) 97mm (Planapo 0.63×) 19mm (Planapo 1.6×) 15mm (Planapo 2×)	135mm (Plan 0.5×) 112mm (Plan 0.8×) 97mm (Planapo 0.63×) 19mm (Planapo 1.6×) 15mm (Planapo 2×)
Optics carrier		
100% apochromatic optic system	CMO (Common Main Objective) lead-free	CMO (Common Main Objective) lead-free
Specific surface resistance (housing)	2×10^{11} Ω/mm² centimeter, discharge time <2 seconds from 1000V to 100V	2×10^{11} Ω/mm² centimeter, discharge time <2 seconds from 1000V to 100V
Motorized zoom		controlled by touch pads, hand switch, foot pedal or PC
Digital display		displays the objective, eyepiece magnification, total magnification, field of view and measurement values
Automated functions		– computes the total magnification, absolute or user-defined – computes the measurements, can be calibrated
Switchable zoom rasters	11 for repetitive tasks	11 for repetitive tasks
Double iris diaphragm for increasing the depth of field	integrated	integrated
Optics carrier rotation in microscope carrier	360°	360°
Accessories		
Standard objective	Planapo 1×	Planapo 1×
Additional objectives	Planapo 2×, Planapo 1.6×, Planapo 0.63× Plan 1×, Plan 0.8×, Plan 0.5×	Planapo 2×, Planapo 1.6×, Planapo 0.63× Plan 1×, Plan 0.8×, Plan 0.5×
Objective nosepiece for Planapo 1× and 2×	quick magnification change 7.1× – 230× parfocal	quick magnification change 7.1× – 230× parfocal
Binocular observation tubes, ergonomics	– apochromatic ErgoTube™ 10°–50° with synchronous eye distance adjustment – various ergonomic accessories (optional)	– apochromatic ErgoTube™ 10° – 50° with synchronous eye distance adjustment – various ergonomic accessories (optional)
Eye distance	55mm – 75mm	55mm – 75mm
Wide-angle eyepieces for eyeglass wearers	10×, 16×, 25×, 40× with eyecups	10×, 16×, 25×, 40× with eyecups
Manual coarse/fine focus	focusing drive 185mm, adjustable ease of movement	focusing drive 185mm, adjustable ease of movement
Motorized focus	controlled by hand, foot or PC	controlled by hand, foot or PC
Microscope carrier AX for stereo or vertical observation	for convergence-free mapping	for convergence-free mapping
PC connection		via RS232 serial interface or USB

Detailed technical specifications in brochure M1-116-1.

Winner 2005

Innovationspreis der deutschen Wirtschaft
The World's First Innovation Award

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