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# Axiovert 200 MAT
## Brawn and Brains





**Unrivalled Performance in Materials Microscopy**

ZEISS

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# Brawn and brains. A perfect combination.

**With Axiovert 200 MAT, Carl Zeiss is providing professionals in materials microscopy with the high-performance tool they need to be successful in a wide range of diverse applications. From analyzing microstructures to measuring particles and grain size, the Axiovert 200 MAT provides you with maximum performance and flexibility for all areas of materials R&D, quality control, and failure analysis. Developed specifically for the industrial market, the Axiovert 200 MAT is a powerful combination of the highlights that materials microscopists have been waiting for: high-performance optics, easy use, innovative techniques, sophisticated features, unshakable stability and an investment for the future. And all of this with your choice of a manual or motorized stand. In a nutshell: Axiovert 200 MAT is the best player in the arena of materials microscopes. A player you'll want to have on your team since this high-end inverted materials microscope combines the benefits of brawn with an impressive array of brainy features and options.**






high-performance optics • easy use • innovative techniques • sophisticated features • unsha



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kable stability • investment for the future



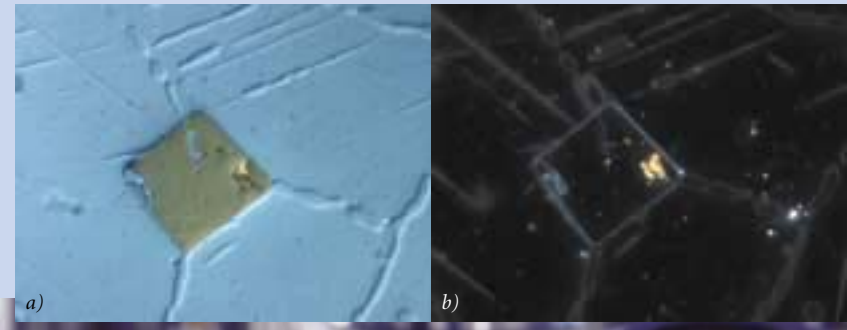
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# Brilliant optics.
# A new light on the subject.

**Sophisticated optics – that's what Carl Zeiss stands for. With the development of the EC Epiplan Neofluar series, we have set new standards in performance. Whether high contrast or precise imaging: the innovative EC materials objectives make the most of what optics have to offer. Axiovert 200 MAT: designed in all its details for the specific optical demands of materials applications.**

### High-performance optics: perfect for materials

Transmission, homogeneity and correction – the whole range of optics has been tailored to the requirements of materials applications. The result: precision and color-fidelity in your images as well as significant increases in quality and performance. A further plus for the optics: the proprietary Light Trap, which eliminates stray light.




*Case hardened steel C 15 with inclusion, unetched (EC Epiplan-Neofluar 50x/0.80): a) in DIC b) in darkfield.*





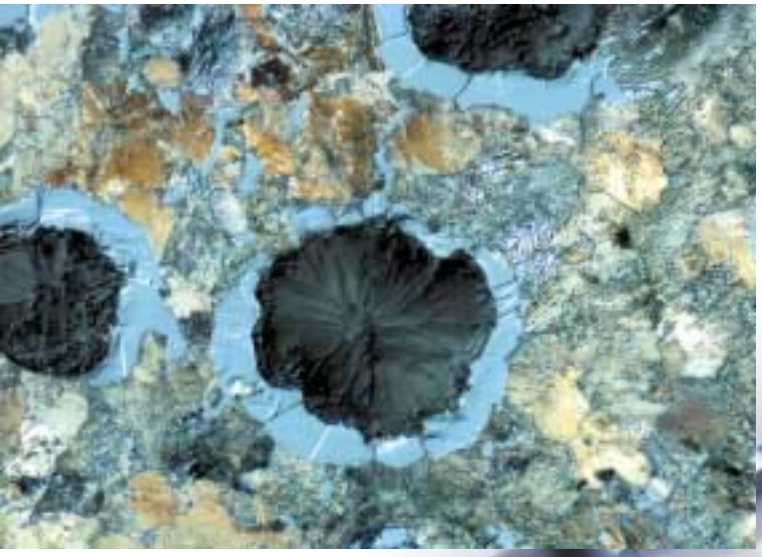
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**EC Epiplan-Neofluar objectives: the best in color and contrast**

Outstanding contrast and excellent imaging – all provided by the **E**nhanced **C**ontrast Epiplan-Neofluars. Based on ICS optics, these objectives offer the finest quality available. For example, with long working distances and high numerical apertures – ideal for easy manipulation and high-resolution structures. Rich contrast makes these objectives perfect for capturing clear, sharp images for post processing and subsequent analysis. An outstanding basis for the use of high-resolution digital cameras.

**5 and 6 position flexibility: the turrets**

Convenience and comfort for a wide range of requirements – with its 6 position nosepiece, Axiovert 200 MAT provides you with ample room for the objectives you use in your daily work. As a result, you no longer have to change objectives – and you save time. The same thing is true for the reflector turret. With its 5 positions, all contrasting modules are safely in place and – with a simple twist of the reflector turret – easy to switch after use.



*Cast iron with spherulitic graphite – spherulite in pearlitic phase. Contrasting technique: DIC (EC Epiplan-Neofluar 20x/0.50). Photo: E. Helmke, Institute for Welding Engineering, Technical University Braunschweig.*



*The EC Epiplan-Neofluars from Carl Zeiss are the finest available in materials microscopy.*



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# Professional techniques. Analytically precise.

**A wide range of innovative contrasting techniques and highly precise measuring techniques provide for the most rigorous examination of your materials. Take advantage of Axiovert 200 MAT's large capacity: a specimen area offering unlimited height as well as high-precision measuring into the nanometer range. Excellent results guaranteed.**

### All measuring techniques: impressive in quality and quantity

From the micrometer range with simple linear gauges down to the nanometer range with complex interferometric measurements – Axiovert 200 MAT is equipped for all important measuring techniques in x, y and z. The Carl Zeiss metrology program contains a wealth of benefit-driven features, for example, a digital micrometer eyepiece. In addition, hardness can be tested with the microhardness testing feature MHT 4/10. Axiovert 200 MAT is ideal for:

- Structure analysis
- Grain size analysis
- Particle analysis
- Pore and crack testing
- Step height measurement
- Surface analysis (roughness, smoothness)

### TIC: advances in measurement

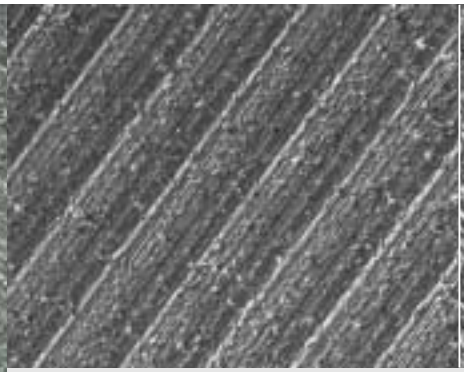
Totally new standards in measuring techniques – with the help of circular light polarization, it is easy to measure step heights, whereby the interference pattern direction can be adapted to the specimen (see figures). With a measuring range of about 5 µm. With clearly defined levels, precision up to 20 nm may be achieved! TIC – **T**otal **I**nterference **C**ontrast: an innovative technique, easy to use and attractive in price.

### Contrasts: versatility is standard

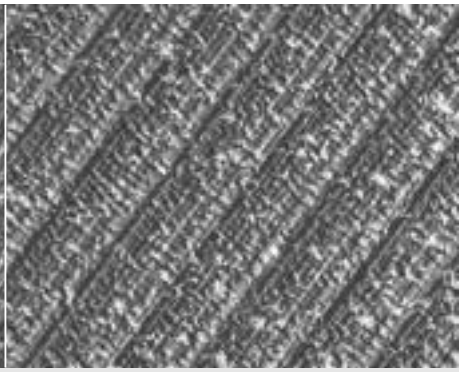
Reflected light or transmitted light? You decide. In reflected light you can use brightfield, darkfield, and DIC. In transmitted light, brightfield, darkfield, DIC, and phase contrast provide the best results. The contrast-maximized imaging of phase, amplitude, and phase/amplitude specimens is outstanding. A unique feature is the 5 position reflector turret, which you can equip according to your needs. With reflectors for brightfield, darkfield, DIC or qualitative polarization. And changing between the various methods takes only a slight twist.

*DIC and C-DIC: If two structures run vertical to one another, it is now possible for the first time to image both structures simultaneously without rotating the stage.*





**Linear DIC**

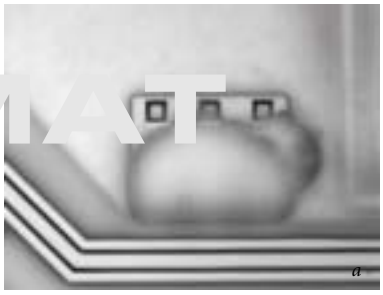


**C-DIC**

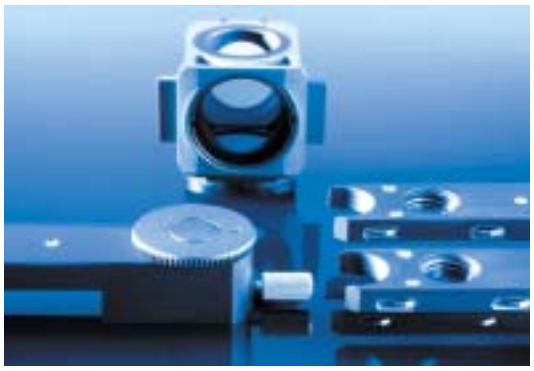


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# Axiovert 200 MAT



## C-DIC and TIC



*C-DIC and TIC – two innovative techniques for your success in materials microscopy.*

## C-DIC – high-contrast innovations

Axiovert 200 MAT provides a new optical polarization technique that operates with circular polarized light (Circular DIC) in contrast to conventional DIC. Trend-setting in materials microscopy, circular polarization with DIC solves a familiar imaging problem. With the innovative C-DIC technique, sample structures that were visible only in a certain direction can now be seen in their entirety – regardless of their orientation and without rotating the sample stage. You simply adjust the knob on the DIC slider for complete and high-contrast imaging of all specimen structures. All information about the specimen is rendered visible, contrasts are sharper – and your workflow is substantially more efficient.

## DeepView – extended depth of focus in real time

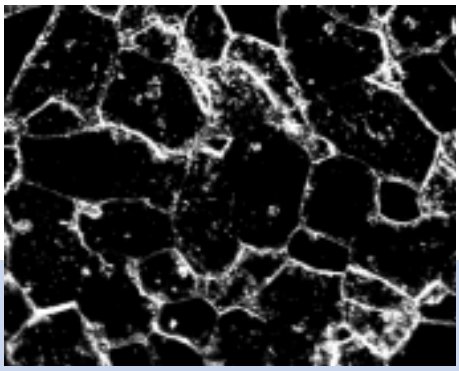
Depth of focus together with high resolution of specimen details – many users would appreciate having these properties available in one objective. Classical light microscopy limits the contrast the camera can record. With DeepView, you can capture images with high depth of focus while retaining diffraction-limited quality. The prerequisites for this are high-performance: a wavefront modulator in the form of a small slider together with a powerful system comprising modern microscope, camera, software, and computer technology.

DeepView
Not longer available
Nicht länger erhältlich

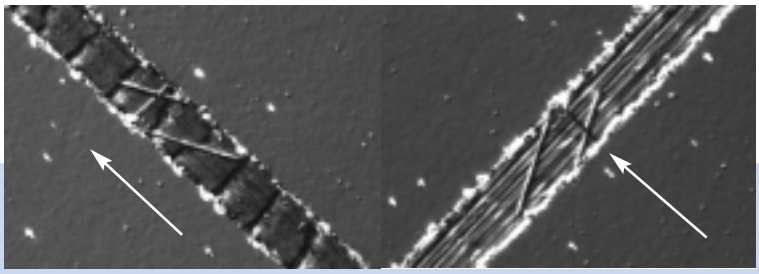
## DeepView




**D.L. Barton, J.A. Walraven, E.R. Dowski Jr., R. Danz, A. Faulstich, and B. Faltermeier "Implementation of Wavefront Coding Imaging Systems for MEMS Analysis", ISTFA 2002, Phoenix.*



**Darkfield** *(Fig. 3)*



**Linear DIC**

**Linear DIC**

*Rotated stage.*

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# Clever details.
# Focusing on your convenience.

**Axiovert 200 MAT is rigorously designed to provide easy operation. The fully motorized version, Axiovert 200 M MAT, offers you the full potential of work-saving options. Both stands place highest priority on ergonomy. You can feel this when you work with the controls, which are all conveniently located on the front of the stand. And you can feel it with such optional features as the ergotube and removable LCD display. What other comfort and convenience Axiovert 200 MAT offers can be summarized in 4 points:**

### Coded or motorized Optovar revolver: an eye on efficiency

New solutions.Until now the software could neither automatically recognize magnification settings nor automatically blend scale bars into the image. Both Axiovert 200 MAT and Axiovert 200 M MAT provide you with the solution. Both stands can communicate the total magnification. The measuring software is always informed about current microscope settings. The advantages for you: precise use of scale, faster and error-free work.

### Mechanical or electronic Focus Stop: focused on you

The integrated Focus Stop ensures that focusing cannot go beyond a level pre-defined by the user. This protects the front lens of the objective and prepared specimens from accidental damage – an important plus in performance, particularly when various users are operating the microscope.

### LCD display: a glowing example

All parameters in view: Axiovert 200 MAT's LCD display indicates all important microscope settings, such as

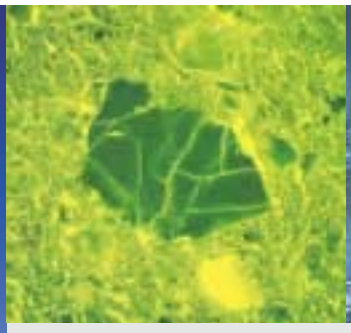
- magnification
- contrasting technique
- lamp intensity
- post-magnification

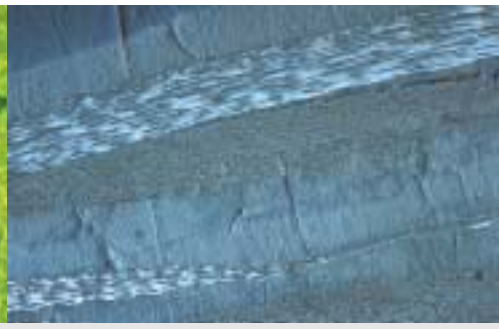
In addition, Axiovert 200 MAT enables you to measure heights with a convenience and ease you will appreciate. Both stands can be easily programmed via the menu on the LCD display – without a PC. Another unique feature: if you are concerned about large specimen use, simply detach the removable LCD display, and attach it to another area which is clearly visible.

**LCD display**



**Epodye fluorescence**







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# Axiovert 200 MAT

**Light Manager:**
**intelligently managed**

Conventionally, lamp intensity has to be manually adapted to every change of objective or contrasting technique. As a consequence, many processes cannot be automated. The proprietary Light Manager in Axiovert 200 MAT provides the solution. Axiovert 200 M MAT stores up to 30 different levels of illumination (6 objectives x 5 reflector positions). The manual version of Axiovert 200 MAT is capable of storing 18 levels (6 objectives x 3 Optovar positions).

**Ergotube**






*a) Multilayer ceramic SMD condenser in darkfield. (EC Epiplan-Neofluar 5x/0.13 HD DIC)*

*b) Low-phosphate slag in DIC. (EC Epiplan-Neofluar 20x/0.50 DIC)*





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# The digital imaging system. Unsurpassed as a team.

**A great team player: Axiovert 200 MAT, together with camera and software, is a powerful imaging system. In addition, it is a perfect example of the Carl Zeiss philosophy, which can be summarized as: We provide our customers with complete solutions which are tailor-made for their work in research and practice. Complete solutions with microscopes, digital cameras, software and technical support that meet the toughest requirements and the highest standards.**

### Cameras: a question of need

The Axiovert 200 MAT phototubes can accept all types of cameras – both analog and digital. The digital cameras of the Axiocam family are ideal for materials. Perfect for microscanning: the AxioCam HR. With its extremely high scanning resolution at low objective magnifications, this camera provides you with both a large field of view and high resolution. An interesting alternative in terms of price: the AxioCam MR. With resolution, quality and sensitivity far surpassing that of video cameras, both of these digital cameras from Carl Zeiss guarantee needle-sharp and brilliant images in color or B&W. Thanks to their compact design and optimal adaptation to microscope and software, these cameras are the "resolution solution" for the Axiovert 200 MAT.

### AxioVision: intelligence for materials image documentation

AxioVision sets standards in image processing, image analysis and archiving. Thanks to its consistent modular architecture, this innovative software solution is equally suitable both for basic digital imaging and expandable to meet sophisticated high-end applications of materials microscopy. AxioVision provides a wealth of advantages: freely configurable menus, reliable reproducibility, automatic storage of complete processes, and finally, the superior ZVI Carl Zeiss image format that links image and imaging parameters. AxioVision is based on an uncompromising philosophy of excellence: the highest possible performance, easy operation, extreme flexibility, and consistent integration into Carl Zeiss microscope and camera systems. A homogeneous solution with functions that are 100% effective – right from the start.

*Thanks to its perfectly integrated system, Axiovert 200 M MAT provides you with the professional basis you need for modern digital imaging.*





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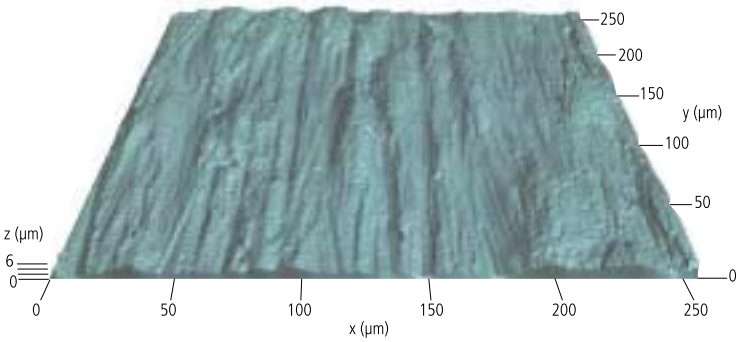
# Laser scanning. High performance included.

**With laser light in the blue-green spectrum, a superb confocal system, and innovative, powerful software, the LSM 5 PASCAL is setting new standards in the non-contact analysis of materials surfaces. Whether as a complete system or as an upgrade option – together with Axiovert 200 M MAT and the high-performance EC Epiplan-Neofluar objectives, the LSM 5 PASCAL from Carl Zeiss is expanding the horizon for new and exciting research results as well as for reliable routine applications in research and industry.**

### Reflection mode: precision from µm to mm

LSM 5 PASCAL was developed for workgroups confronted with demanding tasks in materials research and industry. In reflection mode, this system is particularly suited for 2D and 3D analysis of structured surfaces with differences in height ranging from submicrometers to millimeters.

*Brushed metal surface.*




Low-reflection or semi-transparent materials can be as precisely examined as, for example, chrome or gold surfaces. For these applications, LSM 5 PASCAL offers the functions of a fast and modern 3D profilometer.

### Fluorescence mode: brilliant results

In fluorescence mode, LSM 5 PASCAL provides unique information on the chemical composition, mechanical strain or structural contamination of, for example, polymer and fiber materials. Autofluorescent inclusions, phases or particle collections can be imaged and analyzed up to several hundred micrometers deep in the interior of a semi-transparent matrix. Deep voids or cracks can be visualized and measured with the help of fluorescent dyes.




*Laser scanning systems from Carl Zeiss are setting new standards in the non-contact analysis of materials surfaces.*



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## Technical data

# Compare and decide

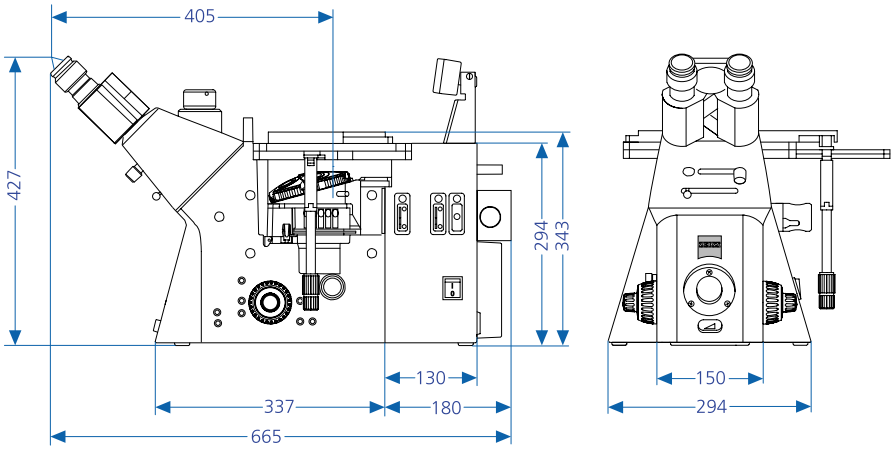
| | Axiovert 200 MAT | Axiovert 200 M MAT |
|---|---|---|
| **Microscope stand** | Highly stable pyramid shape and low center of gravity for vibration-free work, min. 6 adaptation options (12 drilled holes) e.g. for micromanipulators | |
| | Optovar revolver 3x encoded | Optovar revolver 3x motorized |
| | 6x objective nosepiece for HD DIC, encoded | 6x objective nosepiece for HD DIC, motorized |
| **z-Focus** | Harmonic Drive Ratio coarse:fine = 50:1 | Motorized Harmonic Drive<br>Min. step size: 25 nm Ratio coarse:fine = 10:1<br>Individually adjustable for every objective |
| **Optics** | ICS optics for finest image quality: special application objectives with long working distance | |
| **Objectives** | Reflected light: Epiplan, Epiplan-Neofluar, EC Epiplan-Neofluar<br>Transmitted light: Achroplan, Plan-Neofluar<br>Special: LD-Epiplan, LD-EC Epiplan-Neofluar (reflected light objective with long working distance) | |
| **Contrasting techniques** | Reflected light: brightfield, darkfield, DIC in linear and circular polarized light, polarization contrast, fluorescence<br>Transmitted light: brightfield, darkfield, DIC in linear polarized light, phase contrast | |
| **Modules** | Polarization optical shearing interferometer (TIC) to measure reflected light-phase objects(levels, differences in height), MHT 10, DeepView | |
| **Illumination**<br>Reflected light | 12V, 100W halogen<br>HBO 50W mercury vapor short arc lamp<br>HBO 100W mercury vapor short arc lamp<br>XBO 75W xenon lamp | |
| Reflected light/filter slider | 3 positions for filters with 25 mm diameter | |
| Diaphragm slider | Optional, centerable for aperture and luminous field diaphragms for Köhler illumination in reflected light | |
| Reflector turret | 5 positions, manual, exchangeable on both sides | 5 positions, manual or motorized, exchangeable |
| Light Trap | High contrast, minimized stray light | |
| Push&Click filter cube | Fast and precise change of filter cubes | |
| Adjusting aid | Easy, eye-protecting adjustment of illuminators | |
| Transmitted light | 6V, 30W<br>12V, 100W<br>LCD-display, light manager | |



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Weight:
**Axiovert 200 MAT**
approx. 20 kg
(depending on equipment)

**Axiovert 200 M MAT**
approx. 35 kg




| | Axiovert 200 MAT | Axiovert 200 M MAT |
|---|---|---|
| **Tubes** | | |
| Binocular tube | With shutter to avoid stray light from overhead sources | |
| Phototube | With shutter and built-in, focusing Betrand optics | |
| Ergotube | With shutter and built-in, focusing Betrand optics | |
| **Eyepieces** | | |
| PL 10x/23 | 23 mm field of view, budget model, sufficient if cameras are used for observation | |
| E-PL 10x/23 | 23 mm field of view. For high-quality observation | |
| **Stages** | | |
| Mechanical stage | Plane surface, large travel range: 130 x 85 mm with application-oriented specimen holders | |
| Sliding stage (Z) | For precise and free positioning, especially in micromanipulation (e.g. for transgenic techniques) | |
| Scanning stage, motorized | Travel range: 120 x 100 mm with specimen holders (like mechanical stage) | |
| Specimen stage (250 x 230 mm) | With object guide for right and left, travel range: 130 x 85 mm, with various specimen holders | |
| **TV ports** | | |
| Sideport | Splitting: | |
| 2x left | 100%vis:0%doc/0%vis:100%doc | ———— |
| 3x left | 100%vis:0%doc/50vis:50doc/0%vis:100%doc | Like Axiovert 200 MAT, motorized |
| 3x right | 100%vis:0%doc//50vis:50doc/0%vis:100%doc | Like Axiovert 200 MAT, motorized |
| 3x right + left | 100%vis:0%doc/0%vis:100% l./0%vis:100% r. | Like Axiovert 200 MAT, motorized |
| Front port | Adapter for digital cameras, optional<br>Adapter for SLR cameras, optional | |
| Base port | Optional, interface 60 for digital cameras | |
| Dual video adapter | For every interface 60, with 2 ports (one adjustable in x,y,z) and exchangeable beam splitter | |
| **Condenser** | | |
| N.A. 0.55 WD** = 26 mm | For H, Ph1, Ph2, Ph3, DIC, manual* | For H, Ph1, Ph2, Ph3, DIC, motorized |
| N.A. 0.8 WD** = 7 mm | For H/DIC, Ph1, D, manual* | |
| N.A. 1.4 oil imm. | For H, Ph, DIC, manual* | |
| N.A. 0.9 WD** = 1.0 mm | For H, D, Ph, DIC, manual* | |

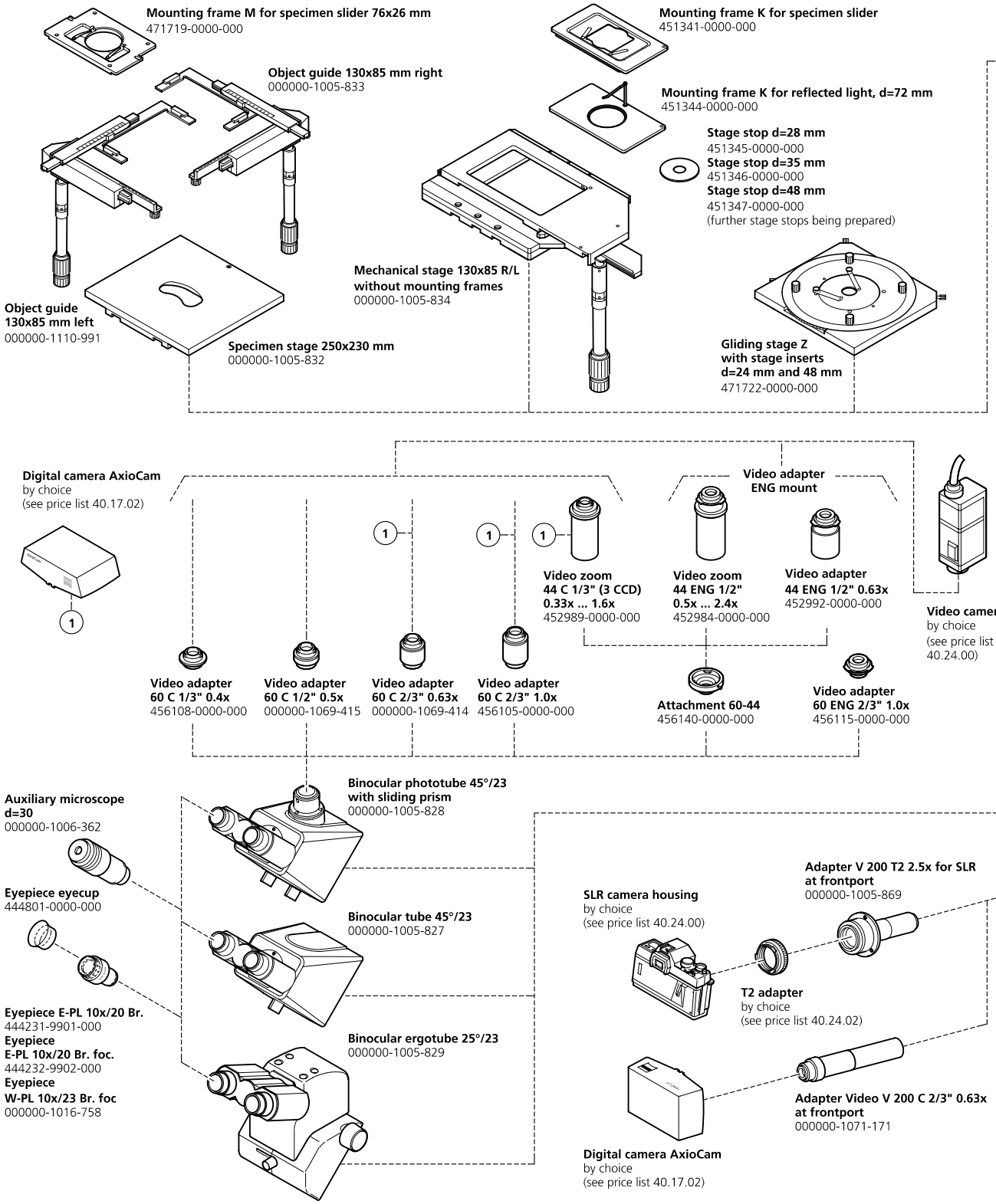
**WD = working distance

* Can also be used with Axiovert 200 M MAT  Additional specifications available upon request.



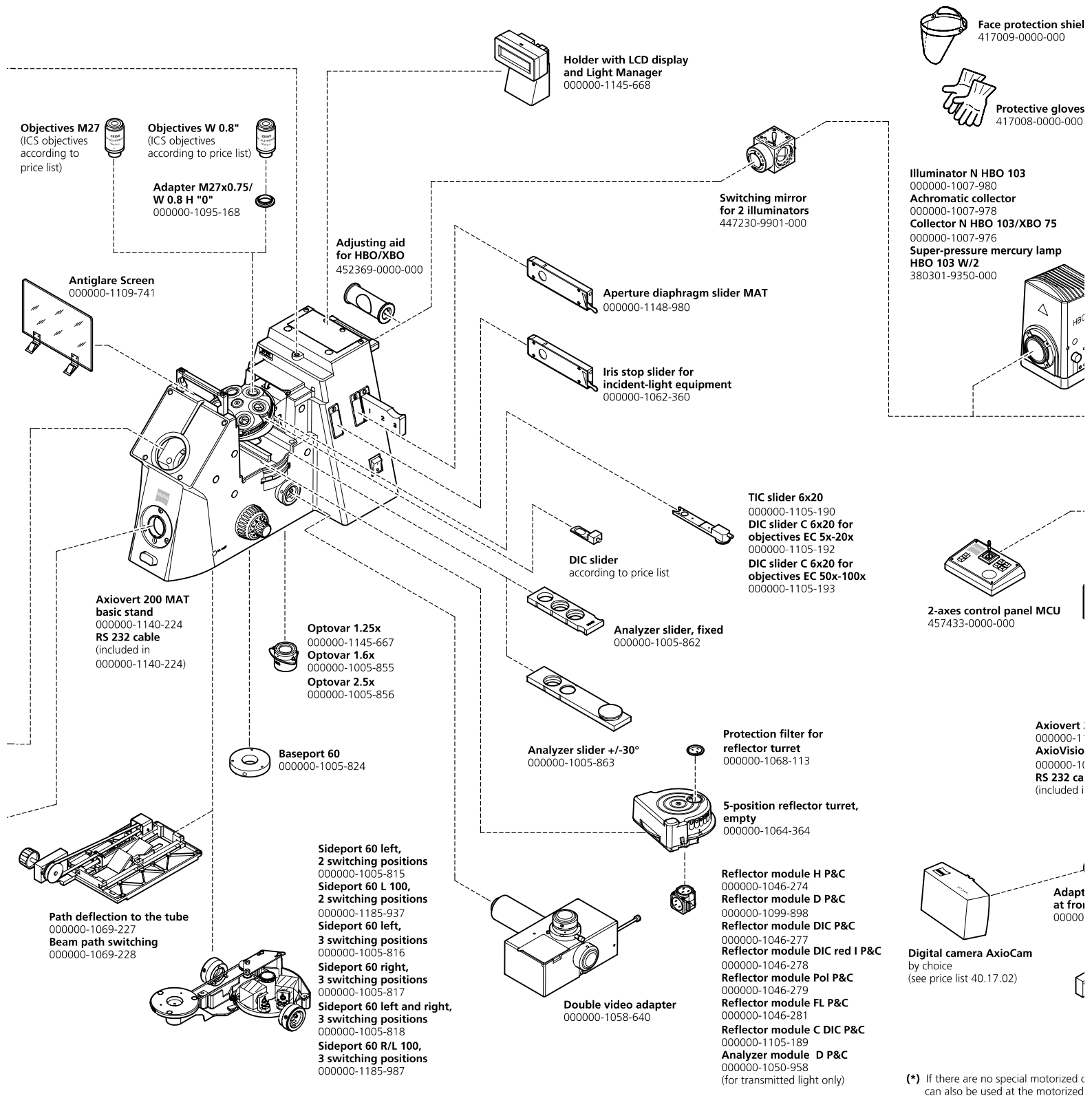
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# Axiovert 200 MAT





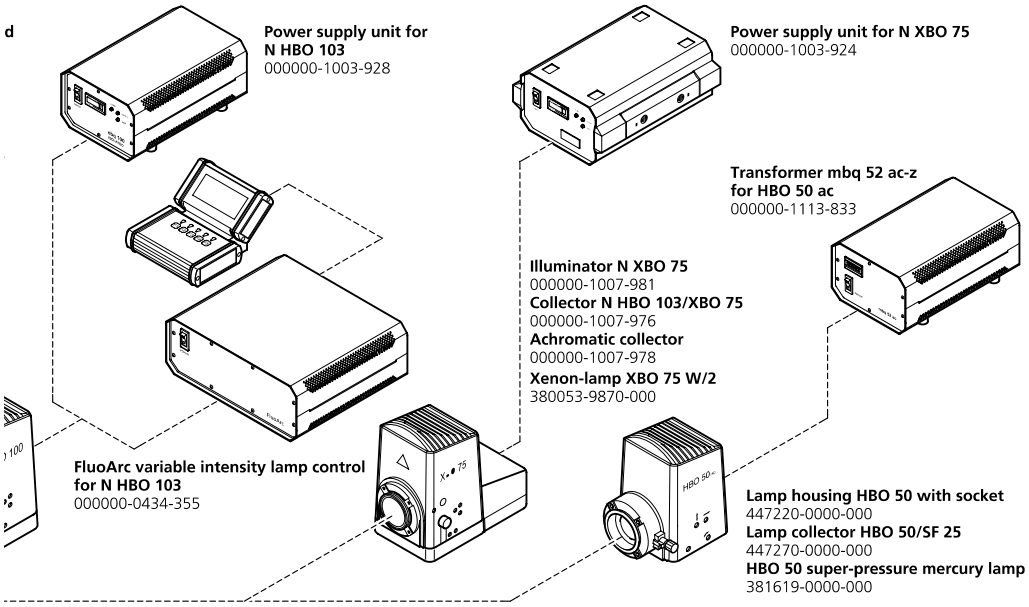

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(*) If there are no special motorized c
can also be used at the motorized



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d

**Power supply unit for N HBO 103**
000000-1003-928

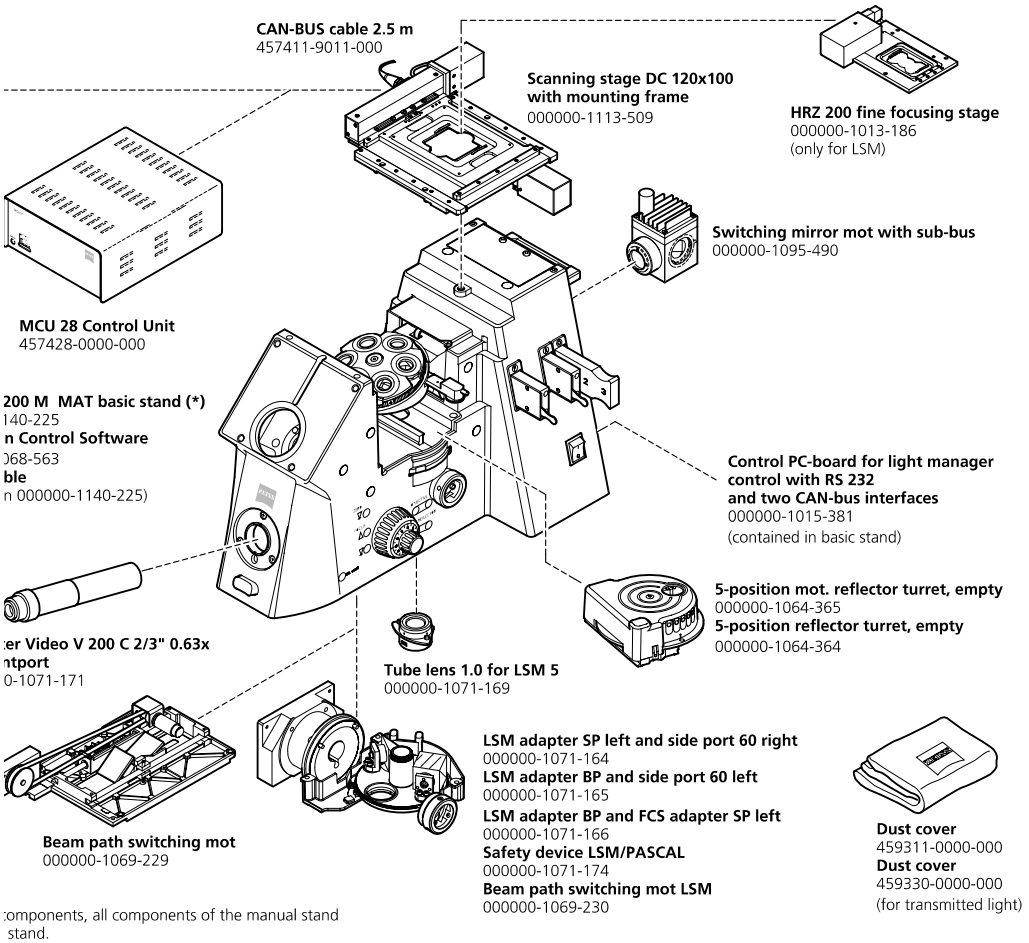
**Power supply unit for N XBO 75**
000000-1003-924

**Transformer mbq 52 ac-z for HBO 50 ac**
000000-1113-833

**Illuminator N XBO 75**
000000-1007-981
**Collector N HBO 103/XBO 75**
000000-1007-976
**Achromatic collector**
000000-1007-978
**Xenon-lamp XBO 75 W/2**
380053-9870-000

**FluoArc variable intensity lamp control for N HBO 103**
000000-0434-355

**Lamp housing HBO 50 with socket**
447220-0000-000
**Lamp collector HBO 50/SF 25**
447270-0000-000
**HBO 50 super-pressure mercury lamp**
381619-0000-000



**CAN-BUS cable 2.5 m**
457411-9011-000

**Scanning stage DC 120x100 with mounting frame**
000000-1113-509

**HRZ 200 fine focusing stage**
000000-1013-186
(only for LSM)

**Switching mirror mot with sub-bus**
000000-1095-490

**MCU 28 Control Unit**
457428-0000-000

**200 M MAT basic stand (*)**
140-225
**n Control Software**
068-563
**ble**
n 000000-1140-225)

**Control PC-board for light manager control with RS 232 and two CAN-bus interfaces**
000000-1015-381
(contained in basic stand)

**5-position mot. reflector turret, empty**
000000-1064-365
**5-position reflector turret, empty**
000000-1064-364

**er Video V 200 C 2/3" 0.63x ntport**
0-1071-171

**Tube lens 1.0 for LSM 5**
000000-1071-169

**LSM adapter SP left and side port 60 right**
000000-1071-164
**LSM adapter BP and side port 60 left**
000000-1071-165
**LSM adapter BP and FCS adapter SP left**
000000-1071-166
**Safety device LSM/PASCAL**
000000-1071-174
**Beam path switching mot LSM**
000000-1069-230

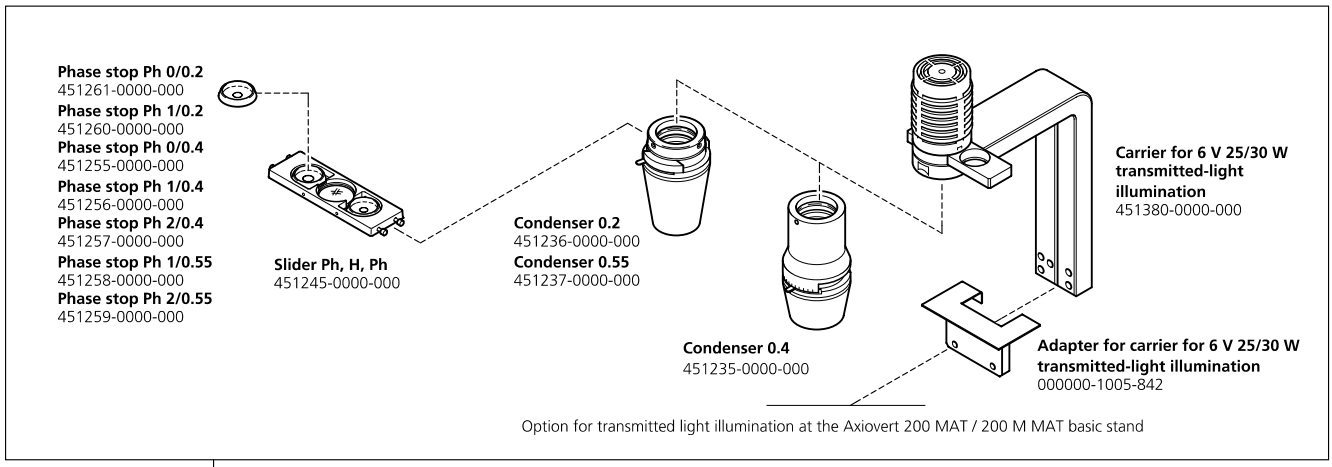
**Beam path switching mot**
000000-1069-229

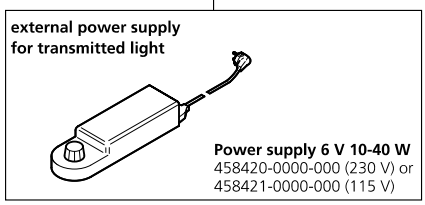
**Dust cover**
459311-0000-000
**Dust cover**
459330-0000-000
(for transmitted light)

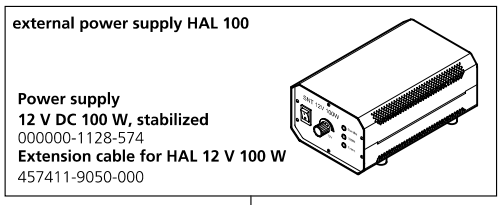
components, all components of the manual stand
stand.

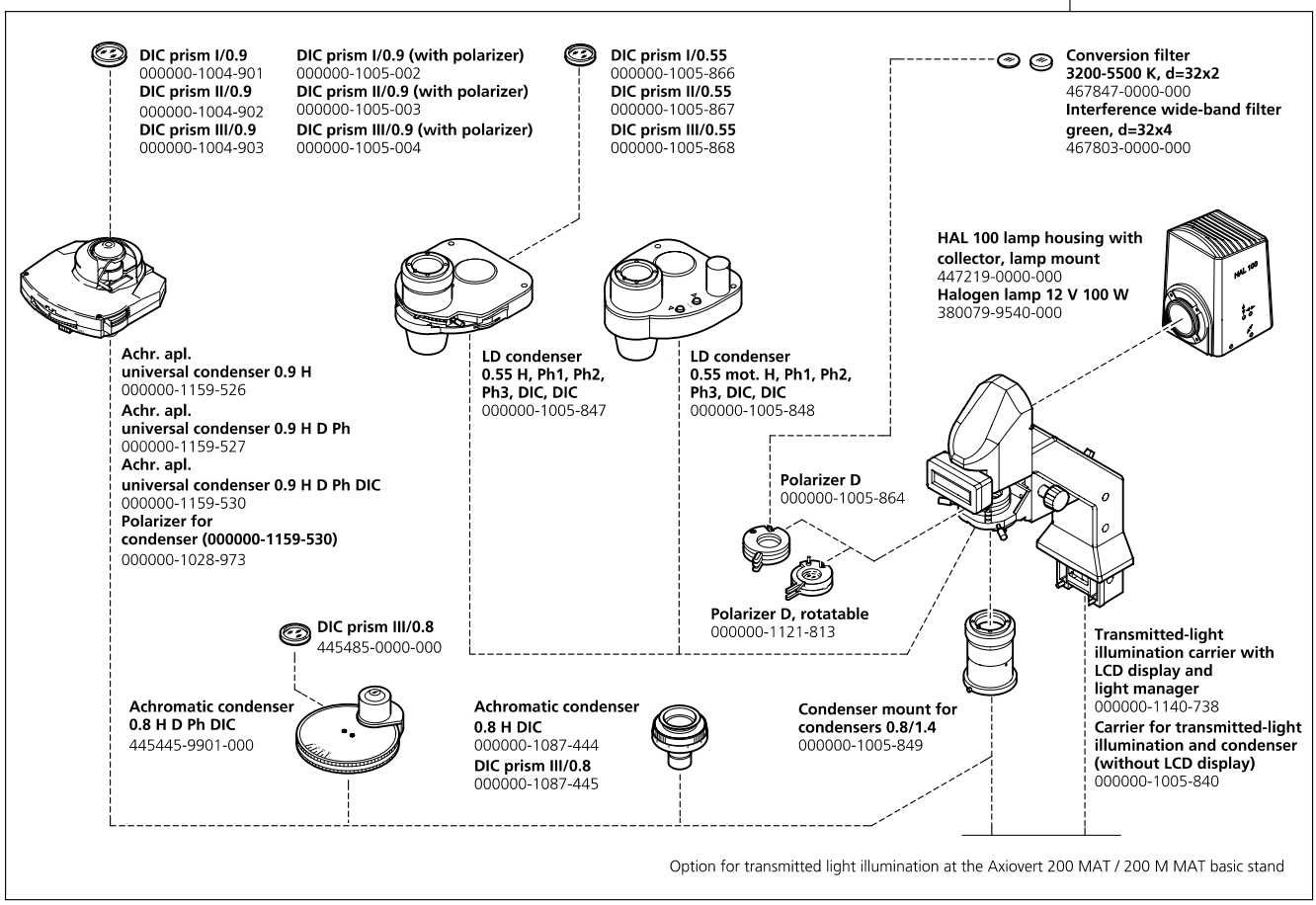


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