

## **NEW LAM-formula-02 – Precision without compromises**

The grinding and polishing system for  
materialographic samples



## Making the invisible visible ...

Two of the most important aspects of materialographic testing are causal research and investigating the safety of materials. The aim of materialographic testing is always to produce reliable information regarding the character of or changes in the samples under investigation. Material properties, alloys, bonding between coats or the influence of external forces, the hidden aspects of a surface or of bonded materials, all of this and more must be made visible up to the smallest particle.

The area of new materials has been undergoing some interesting developments in recent years. Increasingly thinner coatings and extreme differences in hardness within just one single sample now require the employment of special individual preparative methods. Optimum surface preparation is of vital importance when it comes to deriving information about a material when performing material tests. The properties of a material can only be reliably determined if samples are processed to the highest quality standards. The reliability of materials is of utmost importance – because they form the basis of the future success of a product.

Heraeus Kulzer is more than a reliable partner when it comes to competence in surface and materials testing. We have been developing innovative systems for materials testing for decades. Our main objective – to offer products to the highest quality standards – is the driving force behind our motivation to further develop our test materials and procedures. This is also why many of our well-known customers rely on Heraeus Kulzer's systems to provide reliable information regarding materials and hence to ensure the success of their products.

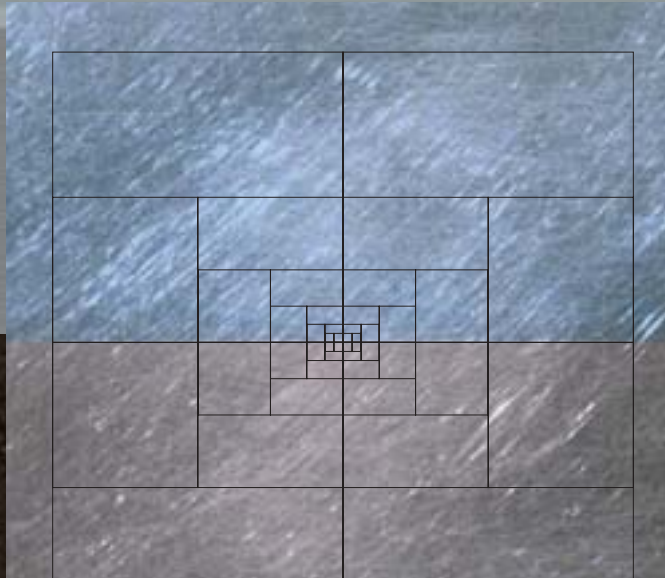
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12-1  $\mu\text{m}$



- Heraeus Kulzer has perfected a high-quality system for your material tests which offers all of the following advantages:
- Suitable for a broad range of applications in materialography
  - High cost-efficiency due to fewer operating cycles, i.e. lower time expenditure and lower material consumption
  - Significant improvement in the quality of the prepared samples and hence better and clearer informational value
  - System components can be combined as required depending on the preparation method used
  - High product service life (discs, foils, cloths)
  - Increased level of safety during application due to colour coding of products



# Reliability

## NEW LAM formula-02

### Less effort and better results ...

**NEW LAM formula-02 is a system with excellent characteristics: Before a new sample is ready for testing, a range of different processes must be performed. Heraeus Kulzer has been working on the development of the NEW LAM system over a period of several years to be able to offer customers a perfectly balanced as well as cost-efficient solution to these processes. This task has now been successfully accomplished with the NEW LAM formula-02. All of the NEW LAM components perfectly complement each other, and, with the CAMEO Platinum range, we are also offering a range of pre-grinding discs that can be perfectly integrated into the NEW LAM system. We are offering a sophisticated range of components which allows to prepare nearly all materials efficiently for surface testing.**

**Heraeus Kulzer's consistently high product quality is assured and constantly improved through strict quality standards.**

An overview of Heraeus Kulzer's products: We offer a clearly structured and comprehensive laboratory program with high-quality solutions for all requirements regarding precision surface preparation. You, the customer, profit from efficient methods and an individual step-by-step program.

The result: A reduction of the processes required for sample preparation and less material consumption – an efficient system that produces high-quality metallographic specimens.

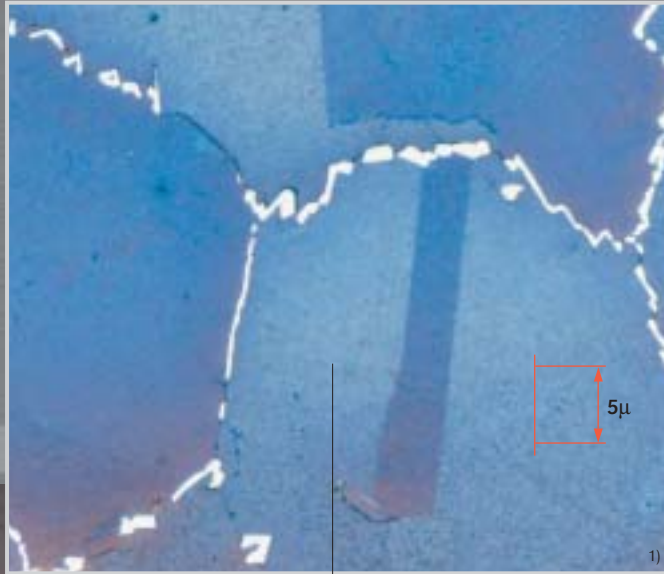
**Unequaled system performance that guarantees perfect quality**



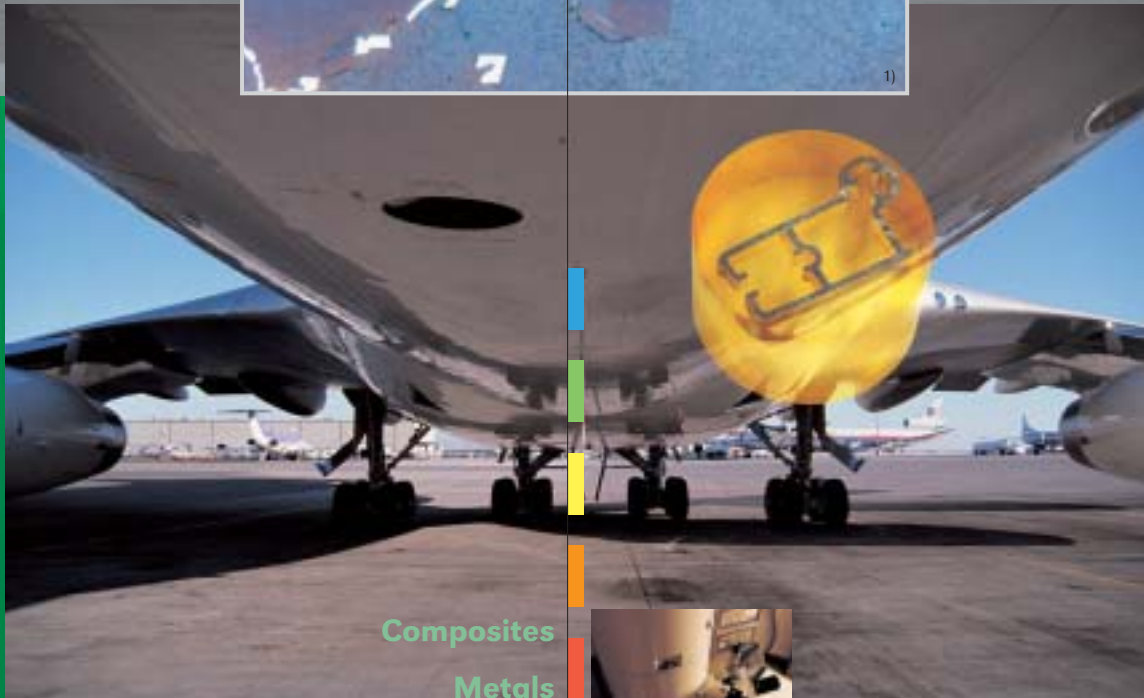


# NEW LAM formular-02

*Microscope scan: Stainless, austenitic steel with a minimum of 17% chrome. Area of application: aircraft construction for parts that are subjected to a lot of stress such as undercarriages. The image shows a brittle Sigma-Phase in the austenitic structure of a high-alloy steel. The increase in volume that occurs during the formation of a Sigma-Phase gives rise to internal cracks, which means that, due to the embrittlement, optimum quality cannot be assured.*



*Efficient sample preparation can provide a lot of information regarding the quality of a material and its response when practically applied. Defects or sources of danger, e.g. due to the undesired formation of phase separations, material fatigue or fatigue loading, can therefore be eliminated right from the outset. The advantages for developers and quality assurers are obvious: reliable information and perfect results!*



Composites

Metals

Alloys

Coatings

Fibre composites

Particulate composites

High-tech materials



# With safety

## It's the result that counts ...

Samples that have been prepared with the NEW LAM formula-02 system perfectly replicate original surface structures. No material is exchanged and the results are therefore true to the original.

The insights gained regarding the structure of a material when using the NEW LAM formula-02 system for sample preparation are without equal when it comes to reliability and informational value. The surfaces are structurally stable, do not include broken components and no foreign bodies and the thickness of individual layers in the peripheral zone can be measured with precision. The NEW LAM formula-02 removes surfaces very gently and without distorting or eliminating any structures. Due to the excellent edge definition, layers can be recognised with great precision under the microscope. Even samples that have not been embedded can – form and size permitting – be processed with the NEW LAM formula-02 system and are excellently defined in comparison to conventional metallographic specimen preparations.



**Steel coating**  
(200:1)

**PRE GRINDING**  
CAMEO DISK Platinum 1

**FINE GRINDING**  
CAMEO DISK silver or  
NEW LAM Classic blue  
BioDiamant liquid blue  
Time: 5 min

**POLISHING**  
Polishing disc orange  
BioDiamant liquid yellow  
Time: 2-3 min

Polishing disc orange  
BioDiamant liquid red  
Time: 5 min



**Glass body soldered into steel shell** (500:1)

**PRE GRINDING**  
Diamond grinding disc 20 µ  
or CAMEO Platinum 2

**FINE GRINDING**  
CAMEO DISK Gold  
BioDiamant liquid green  
Time: 3 min

**POLISHING**  
Polishing disc orange  
BioDiamant liquid yellow  
Time: 3 min

Polishing disc orange  
BioDiamant liquid MM 140  
Time: 2 min

Polishing disc red  
Final liquid  
Time: 1 min

# Precision witho





**CFRP**  
(200:1)

**PRE GRINDING**

Diamond grinding disc 20 μ  
or CAMEO DISK Platinum 2

**FINE GRINDING**

NEW LAM classic blue  
BioDiamant liquid green

Time: 5 min

**POLISHING**

Polishing disc orange  
BioDiamant liquid yellow

Time: 5 min

Polishing disc orange  
BioDiamant liquid MM 140

Time: 10 min



**Circuit board with VIAS**  
(500:1)

**PRE GRINDING**

CAMEO DISK Platinum 1 or  
CAMEO DISK Platinum 2

**POLISHING**

Polishing disc orange  
BioDiamant liquid yellow

Time: 3 min

**POLISHING**

Polishing disc red  
BioDiamant liquid red

Time: 1 min



**Metal sandwich: steel,  
bronze, aluminium,  
unetched** (150:1)

**PRE GRINDING**

180 grit SiC paper

**FINE GRINDING**

NEW LAM classic green  
BioDiamant liquid green

Time: 5 min

**POLISHING**

Polishing disc orange  
BioDiamant liquid yellow

Time: 3 min

Polishing disc orange  
BioDiamant liquid MM 140

Time: 4 min

Polishing disc red  
BioDiamant liquid MM 140

Time: 1 min



**Lead, tin plated**  
(500:1)

**PRE GRINDING**

320 grit SiC paper  
600 grit SiC paper  
1200 grit SiC paper

**POLISHING**

Polishing disc orange  
BioDiamant liquid yellow

Time: 3 min

Polishing disc orange  
BioDiamant liquid red

Time: 4 min

Polishing disc red  
Final liquid (low-pressure)

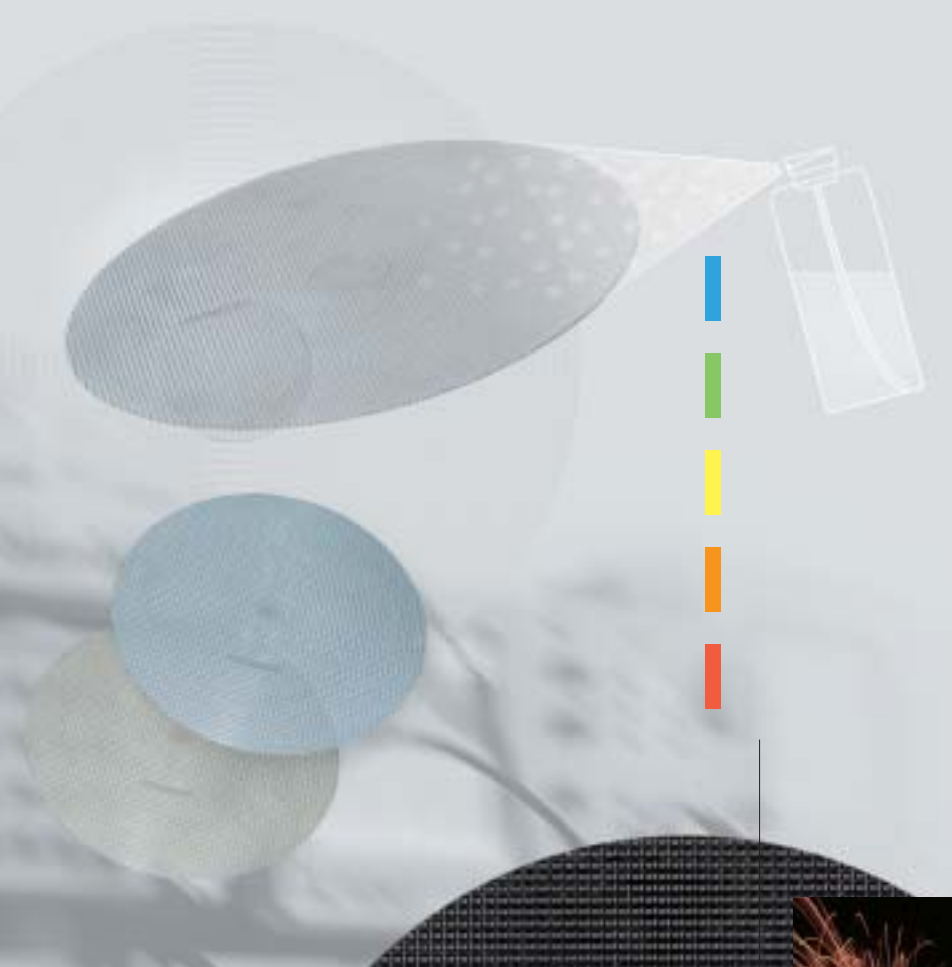
Time: 1 min



ut compromises



# Heraeus Kulzer's components and their special characteristics



The high quality system



# NEW LAM formula-02

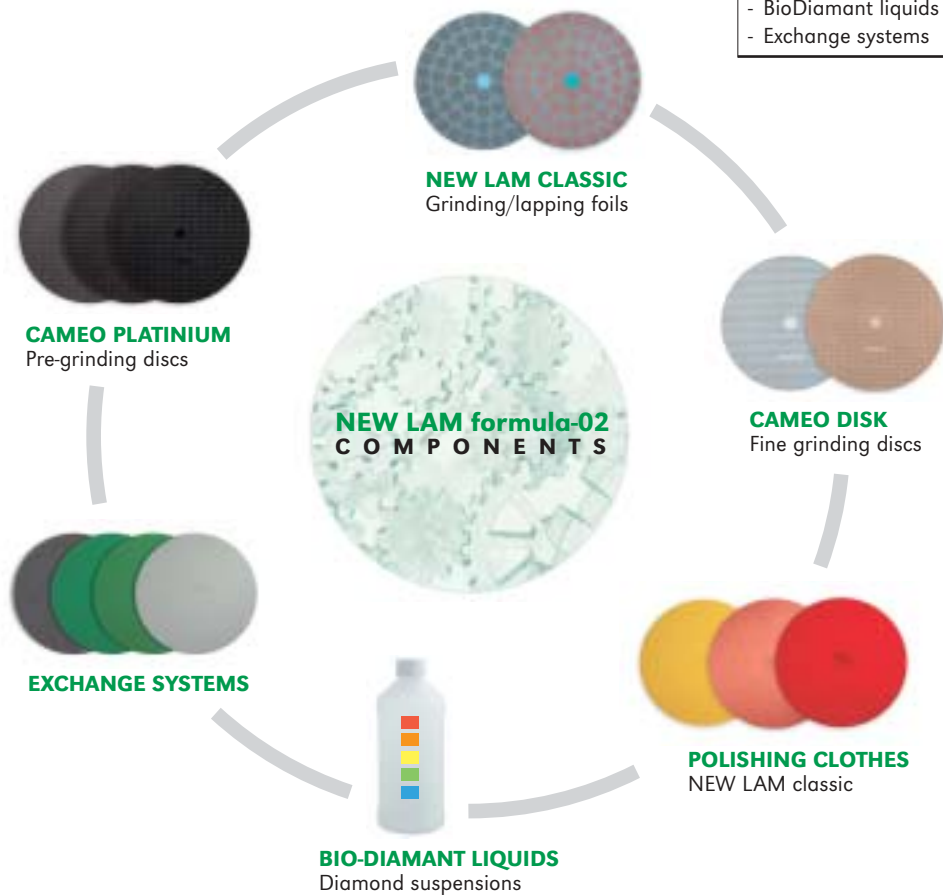
The flexible system for professional results

The NEW LAM formula-02 concept unites components from the classic NEW LAM system with CAMEO DISK's and the new BioDiamant liquids. The concept behind the NEW LAM formula-02 system is to combine different process steps within an "open system" to offer users a comprehensive range of products made up of few individual components.

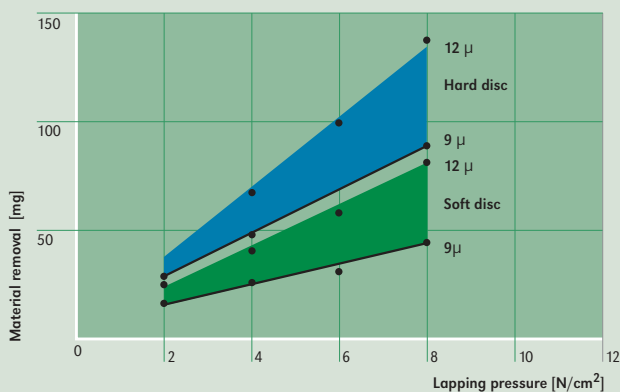
The way in which the individual components can be combined within the system offers users time and cost efficient solutions for nearly all areas of application.

## Die NEW LAM formula-02 Components

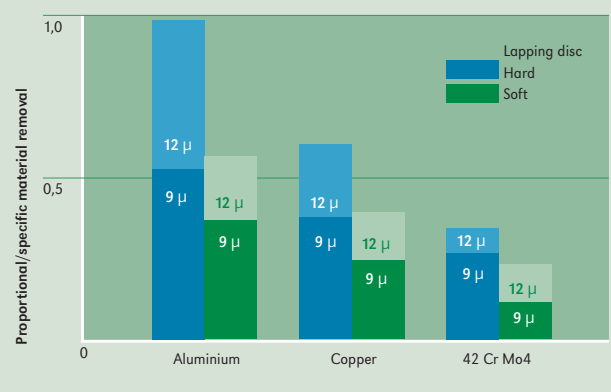
- CAMEO DISK Platinum type 1, 2, 3 pre-grinding discs
- NEW LAM classic grinding/lapping foils blue and green
- CAMEO DISK fine grinding discs silver and gold
- Polishing cloths NEW LAM classic and special cloths
- BioDiamant liquids
- Exchange systems



Material removed when fine grinding aluminium



Material removed when fine grinding metallic materials



# CAMEO DISK Platinum

The first step that is undertaken when samples are prepared is to flat or pre-grind their surface. Depending on the sample type and its material properties, pre-grinding is performed with conventional SiC paper. With its diamond-coated platinum discs, Heraeus Kulzer provides a system that saves a lot of time when performing this process and one that ensures that material is removed evenly.

CAMEO DISKS Platinum are pre-grinding discs that replaces a large number of individual SiC papers and ensures that every material is ideally prepared for subsequent processing steps.

### Application

The properties of the diamond-coated disc enable a high level of material to be removed when working on a surface with an even structure and enables subsequent grinding and polishing procedures to be performed within the shortest time.

Due to its unique surface structure, the CAMEO DISKS Platinum are suitable for pre-grinding metallographic and mineralogical samples such as medium-hard to very hard materials. The range of materials that can be processed with the CAMEO DISK Platinum includes steel, hard metal, ceramics parts and various composites.

### Properties

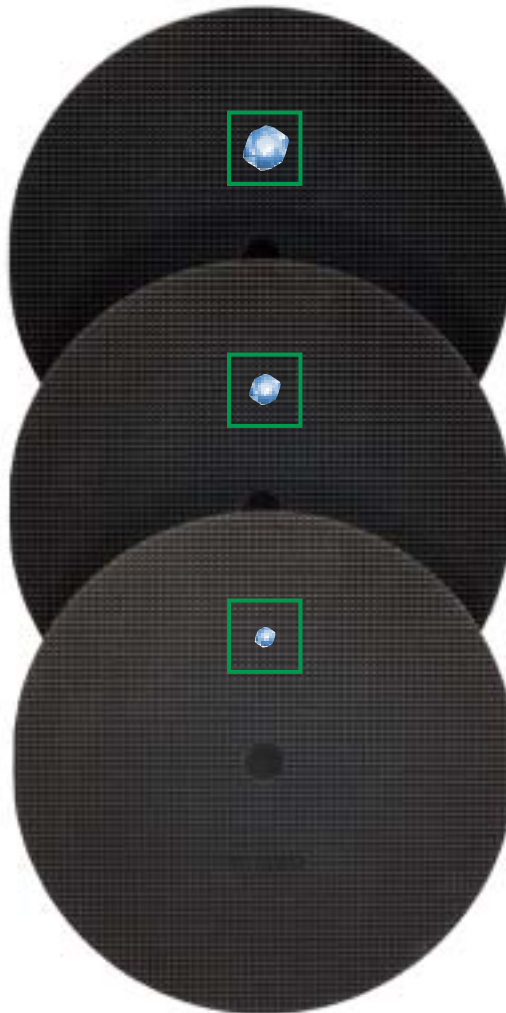
- CAMEO DISK Platinum Type 1 corresponds to grit-size 60
- CAMEO DISK Platinum Type 2 corresponds to grit-size 300
- CAMEO DISK Platinum Type 3 corresponds to grit-size 600

### Diameter

200 mm, 230 mm, 250 mm, 300 mm

### Advantages

- long service life
- fast and even material removal
- suitable for nearly all materials
- easy to clean
- MS-Disc compatible
- replaces a large number of SiC papers
- less and faster changeover times
- low stock requirements

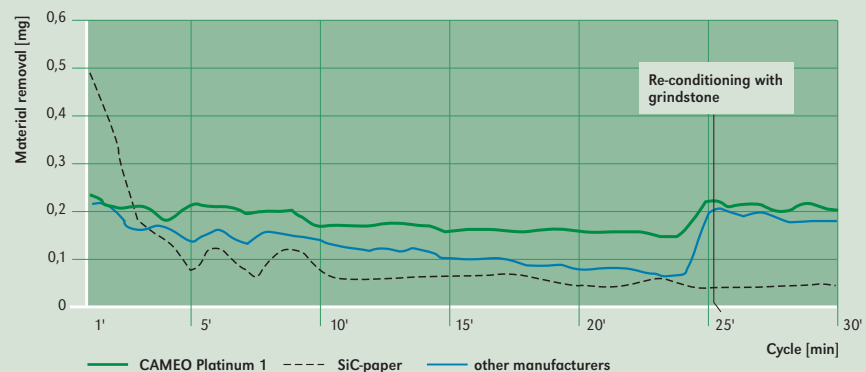


**1** CAMEO DISK Platinum Type 1 corresponds to grit-size 60

**2** CAMEO DISK Platinum Type 2 corresponds to grit-size 300

**3** CAMEO DISK Platinum Type 3 corresponds to grit-size 600

CAMEO DISK Platinum – abrasion capacity

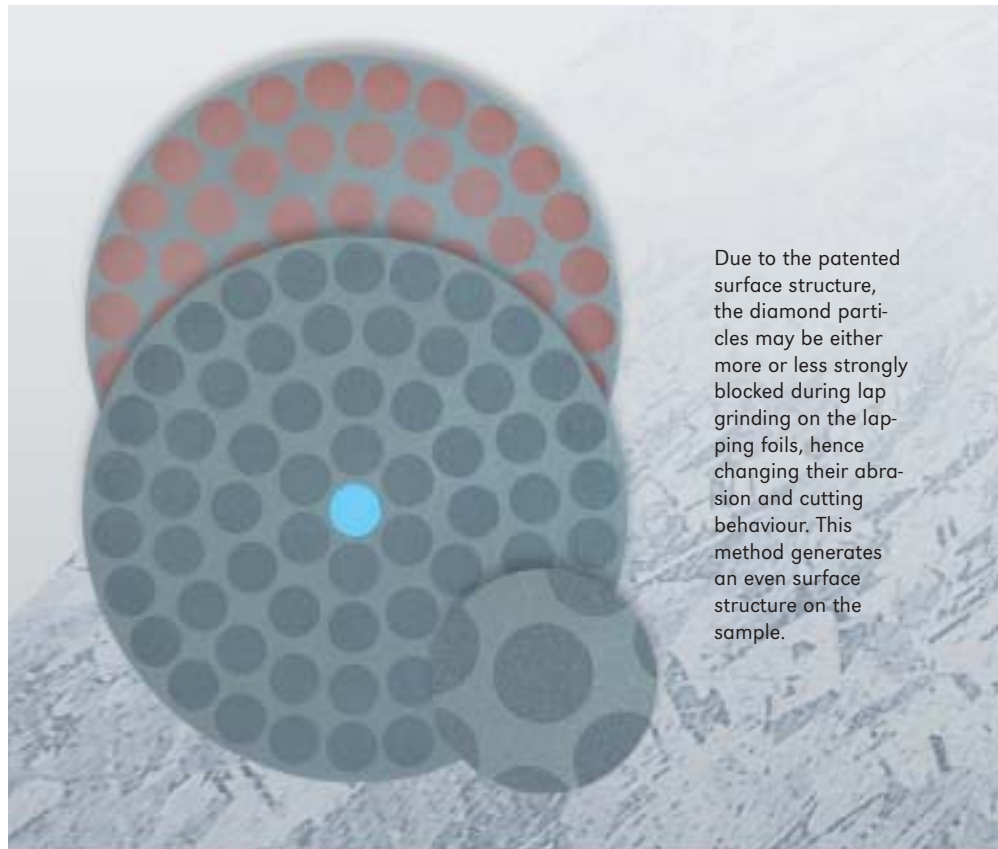
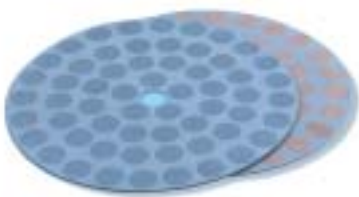


## NEW LAM classic blue/green lapping foils

The patented NEW LAM classic lapping foils consist of a composition of synthetic resin-bound powdered metal with cylindrical, although softer, powdered metal inserts. NEW LAM classic can be used for a broad range of applications in materialographic surface preparation. The self-adhesive lapping foils can be directly applied to a carrier disc or can be used in combination with Heraeus Kulzer's exchange systems. The NEW LAM classic lapping system consists of two different lapping foils. The blue lapping foils has a hard surface and serves to remove material fast. The green lapping foils has a softer surface and is suitable for carefully removing material and is especially suitable for sensitive materials.

### Advantages

- can be used for a broad range of applications in metallography
- extremely long service life
- very cost-efficient due to the few materials required
- high-quality preparations - high informational value

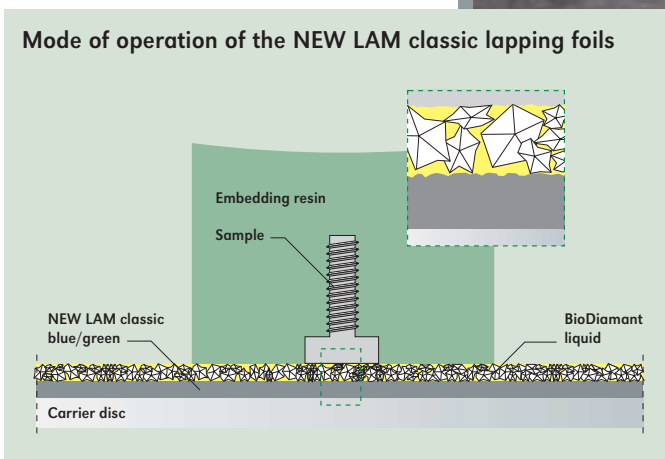


Due to the patented surface structure, the diamond particles may be either more or less strongly blocked during lapping on the lapping foils, hence changing their abrasion and cutting behaviour. This method generates an even surface structure on the sample.

### Mode of action of the NEW LAM classic lapping foils

Ceramics, zirconium Aluminium-oxide <i>Pre grinding with Platinum 1</i>						
Hard metals Composites <i>Pre grinding with Platinum 1</i>						
Soft steel, stainless steel Austenitic and ferritic steel <i>Pre grinding with Platinum 1</i>						
Non-ferrous metals Cast-aluminium <i>Pre grinding with Platinum 2</i>						
Titanium-alloys <i>Pre grinding with Platinum 2</i>						
BioDiamant Liquids:						
NEW LAM classic blue/green						

### Mode of operation of the NEW LAM classic lapping foils





## CAMEO DISK silver/gold

The CAMEO silver and gold disks are a new type of fine grinding disks with a highly constant stock removal rate

The CAMEO silver and gold discs are a new type of fine grinding disks with a highly constant material removal rate. CAMEO DISK replace all pre-grinding processes for which 240-4000 grit abrasive paper is normally used. The patented honeycomb pattern of the CAMEO DISK optimises the effectiveness of the sprayed-on BioDiamant liquids by ensuring that they are continuously and evenly distributed. The CAMEO method guarantees optimum flatness for all types of samples.

### The CAMEO DISK is available in two different versions:

- CAMEO DISK silver for medium-hard to very hard materials (>200 HV)
- CAMEO DISK gold for soft and non-ferrous materials

### Advantages

- easy to handle
- cost-efficient – one CAMEO DISK replaces a whole pallet of 240-4000 grit SiC paper
- the patented surface profile ensures even material removal
- the CAMEO micro-container "meters" the applied abrasive agent and noticeably reduces the consumption of abrasive agent in comparison to other systems
- the discs have been developed for use on machines as well as for manual application. CAMEO DISK's are compatible with all systems
- the stock removal rate of the CAMEO DISK's is unsurpassed and enables samples to be prepared fast and with perfectly flat surfaces.
- efficient – The CAMEO method enables a vast range of diamond suspension with different grit-sizes to be employed. This means that different materials can be prepared by using just one disk.

### An example of a sample preparation using the CAMEO silver and gold disks

Cast iron  
GGG, GGL  
Pre-grinding with  
Platinum 1



Hard and  
medium-hard steel  
Pre-grinding with  
Platinum 1



Porous ceramics  
Pre-grinding with  
Platinum 2



Medium-hard steel,  
Stainless steel  
Pre-grinding with  
Platinum 1



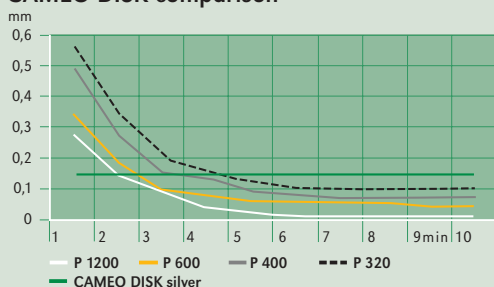
Aluminium alloys  
Pre-grinding with  
Platinum 2



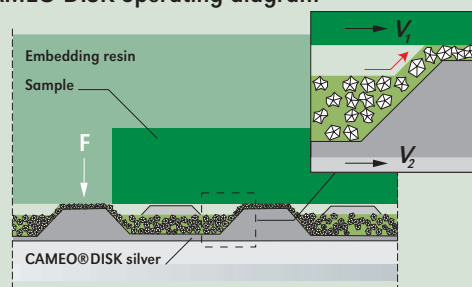
BioDiamant Liquids: ● 12 μm ● 9 μm ● 6 μm ● 3 μm ● 1 μm ● Final Liquids  
CAMEO DISK silver/gold Polishing cloths yellow / orange / red



### CAMEO DISK comparison



### CAMEO DISK operating diagram



## NEW LAM classic Polishing cloths

### Applying the CAMEO DISK

The CAMEO DISK's are used for fine-grinding soft to very hard metallographic samples. The choice between using the CAMEO DISK silver or gold depends on the material properties of the sample. Together with the BioDiamant liquids and the corresponding polishing clothes of the NEW LAM formula-02 system, CAMEO DISK's guarantee fast sample preparation with optimum surface flatness and excellent finishes.

### Automatic preparation

In order to ensure that the samples are perfectly flat and that material is removed evenly when using the CAMEO DISK, the specimen holder is positioned in such a way that the sample protrudes a few millimetres (max. 1/3 of the sample's diameter) over the active working face of the disc on the inside and outside.

### Manual preparation

When using the CAMEO DISK's manually, it must be ensured that the discs are applied evenly. In order to ensure that the discs wear evenly, the samples are moved from the edge of the disc to the middle during the grinding process.

### Polishing agent

The CAMEO DISK's are used in conjunction with the diamond liquids. When using the CAMEO DISK silver, it is recommended to use 12-6  $\mu\text{m}$  diamond liquids. The CAMEO DISK gold should be used in conjunction with diamond liquids between 12-3  $\mu\text{m}$ . When selecting the diamond liquids, the properties of the sample material must be taken into consideration. The diamond liquids must be sprayed-on at regular intervals.

### Cleaning

In order to preserve the efficiency of the CAMEO DISK's, it is recommended to clean the respective disc every time after use under running water with a brush and dry it by using compressed air.

### Polishing cloth yellow

A hard cloth made of synthetic fibres. This cloth is predominantly used to pre-polish ductile materials such as titanium and when using the blue (12  $\mu\text{m}$ ) or green (9  $\mu\text{m}$ ) BioDiamant liquids.

### Polishing cloth orange

This is a medium-hard cloth made of natural fibres that can be used on a broad range of materials. This cloth is used in conjunction with the yellow (6  $\mu\text{m}$ ), orange (3  $\mu\text{m}$ ), red (1  $\mu\text{m}$ ) and the MM 140 (1  $\mu\text{m}$ ) BioDiamant liquids.

### Polishing cloth red

This is a soft cloth with a flocked synthetic fibre surface for final polishing. This cloth is used in conjunction with the red (1  $\mu\text{m}$ ) BioDiamant liquid and the Final liquid. Also suitable for etch polishing.

Depending on the model, these cloths can easily be placed on and removed from the different exchange systems – fast and without creasing or leaving behind residues.

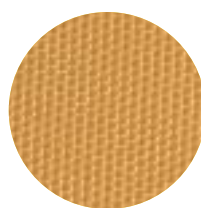
All NEW LAM classic polishing cloths are available with self-adhesive or metallic backs for direct adaptation to magnetic systems. By providing these different surface properties, this system enables customers' to reduce their assortment of cloths to just a few.

### Note

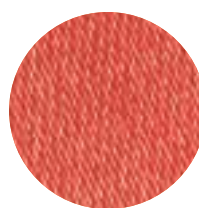
Our product range includes the most important MM-range polishing cloths for long-standing standardised preparation procedures. Supplied upon request.

### Cleaning

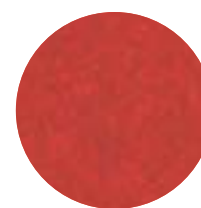
The cloths can be cleaned under running water and by using a little washing-up liquid.



Synthetic fibres



Natural fibres



Synthetic flocking

## BioDiamant liquids

### The BioDiamant liquids and their different grit sizes:

BioDiamant blue	= grit size	12 $\mu\text{m}$	●
BioDiamant green	= grit size	9 $\mu\text{m}$	●
BioDiamant yellow	= grit size	6 $\mu\text{m}$	●
BioDiamant orange	= grit size	3 $\mu\text{m}$	●
BioDiamant red	= grit size	1 $\mu\text{m}$	●
Final liquid	= grit size	0,05 $\mu\text{m}$	



The colour-coding helps user to select the correct liquid even in the most hectic of times.



BioDiamant liquids are abrasive agents that contain diamond grit. They not only efficiently meet the high quality standards associated with abrasive agents but also all of the relevant health regulations and are environmentally friendly.

### Advantages

- more efficient than conventional diamond suspensions
- perfectly suitable for use on machines or for manual application
- high diamond concentration
- low grit-size distribution
- Non-toxic

All of Heraeus Kulzer diamond liquids, including the BioDiamant liquids, are used without additional lubricating agents, and therefore ensure consistent and reproducible quality and significantly reduce expenditures. This furthermore ensures that the same high number of diamonds is applied every time the liquid is used and that the suspension is not diluted in any way.

In order to assure the high quality of an abrasive agent, its individual components, such as lubricating agents, consistency, form and size of diamond particles, must be ideally adapted to one another. The tight tolerance regarding grit size distribution has a particularly decisive influence on the quality of the liquids. BioDiamant abrasive agents fulfil all of these requirements.

In addition to the colour-coded liquids, Heraeus Kulzer also supplies the special MM 140 liquid, an unpigmented abrasive agent, and a diamond paste, the Diamant stick. All BioDiamant liquids can be sprayed-on by using the dosing devices of grinding machines, or by using manually operated spray bottles.

BioDiamant liquids are biodegradable and non-toxic. Thanks to the tightly graded grit sizes, the different BioDiamant liquids complement each other perfectly.

### Why chose BioDiamant?

The development and manufacture of biodegradable products is becoming an increasingly important issue, not least because of companies endeavour to meet environmental guidelines.

This endeavour, however, goes hand in hand with a belief that biodegradable products do not pose any threats to health. Organic molecules can, however, be environmentally friendly and still be toxic for humans.

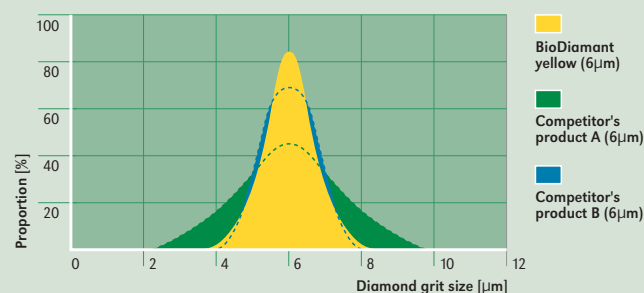
Many abrasive agents contain additives that guarantee that the product is highly efficient. Some of these additives (e.g. Glycol-ether) are toxic – even when used in small quantities – and contain harmful substances. Glycol-ethers, for example, are liquid substances that are hydrophilic (water-soluble) as well as lipophilic (oil-soluble). These are excellent solutions that enable manufacturers to combine substances that can usually not be mixed with one another. Glycol-ethers are highly biodegradable, but also highly toxic.

**In an endeavour to avoid the risks associated with handling abrasive agents on a daily basis by touching them and inhaling their vapours, Heraeus Kulzer has managed to replace Glycol-ethers with a totally non-toxic substance by developing the BioDiamant products. All of the components of the BioDiamant products comply with the European 1999/45/EC and 2000/59/EC standards.**

We have therefore achieved our aim of offering highly efficient products to our customers that do not pose any threats to health or the environment.

The safety of this product is well documented by its name: BioDiamant

### Grit size distribution of diamond particles





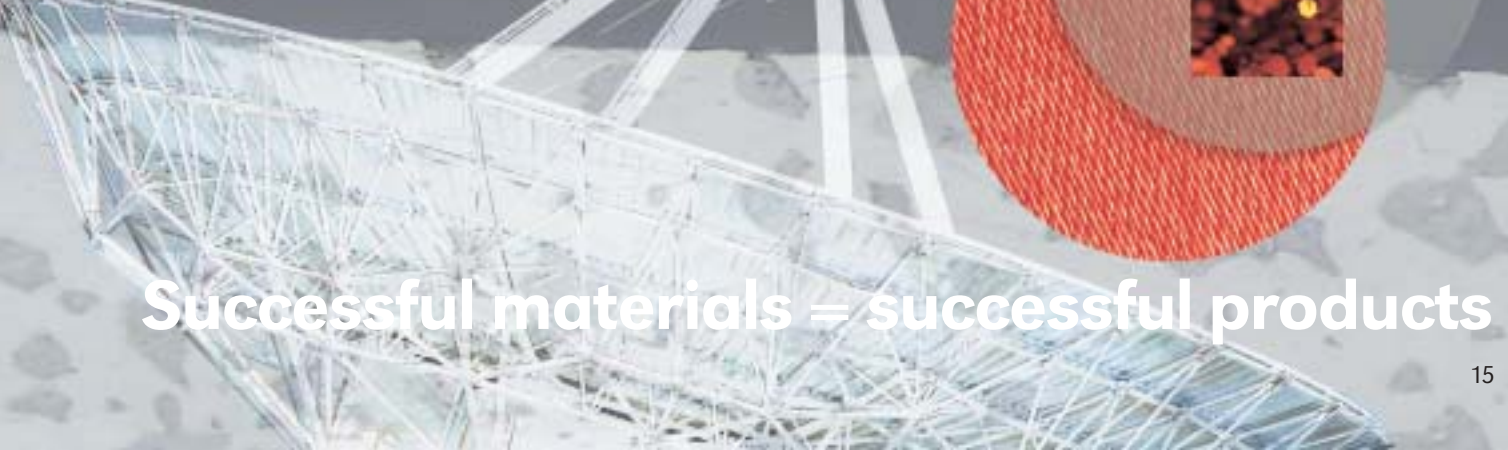
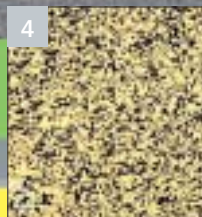
1/2  
*Sigma Phase in high-alloy steel. Austenitic stainless steel with a minimum of 17 % chrome. Area of application: aircraft construction, for components that are exposed to a lot of stress*



3  
*Nickel alloy: Embrittled rehenium-rich precipitation in the dendritic/interdendritic matrix of a monocrystalline nickel-base alloy. Area of application: aerospace*

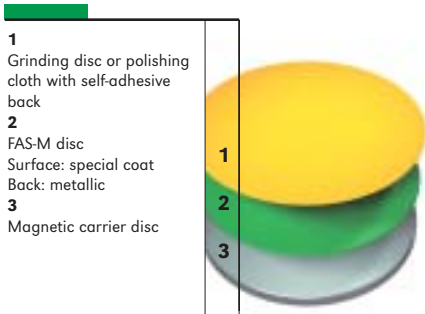
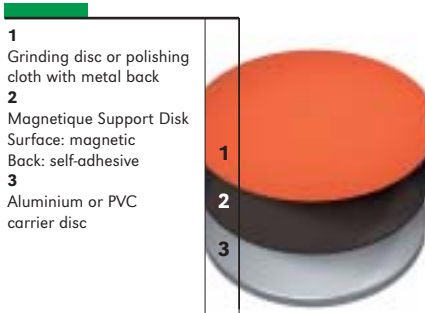
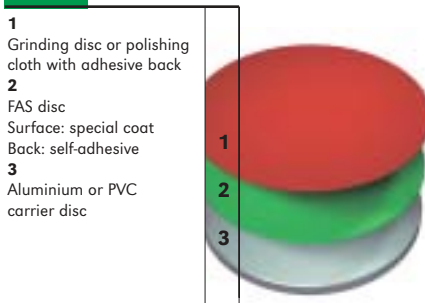
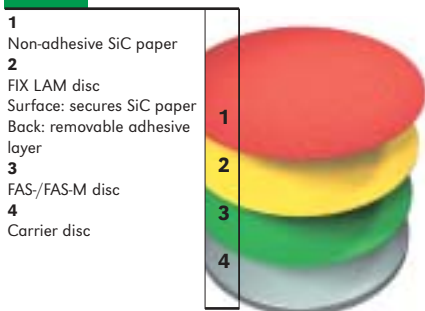


4  
*Bearing metal*



**Successful materials = successful products**

## Exchange systems



Depending on your requirements, you can now use self-adhesive products in areas that were previously reserved for magnetic products or change gluing systems into magnetic systems. The exchange systems meet all requirements and are indispensable when it comes to efficiently employing grinding media and polishing cloths' and films.

### The FAS and FAS-M disc

The FAS disc is a special anti-adhesive disk that is suitable for all gluing systems. The FAS-M has the same surface properties as the FAS and can be used on all magnetic systems. This means that self-adhesive disks can easily be integrated into magnetic systems.

### Advantages

- enables self-adhesive grinding media and polishing cloths as well as diamond grinding discs to be exchanged fast
- thanks to the anti-adhesive coating, this special surface allows all grinding and polishing media to be exchanged fast and for a nearly unlimited number of cycles without leaving any adhesive residues
- environmentally friendly and cost-efficient, because it removes the need for cleaning as well as cleaning agents



### Exchanging grinding media fast and safely with

- FAS/FAS-M
- FIX LAM
- Magnetique Support Disk

### A new addition to the FAS/FAS-M: The FIX LAM

FIX LAM is a special adhesive film for securing non-self-adhesive SiC papers on carrier discs or FAS and FAS-M discs. FIX LAM is a good alternative to expensive self-adhesive SiC paper.

### Magnetique Support Disk

The Magnetique Support Disk can be used to transform your gluing system into a magnetic exchange system within minutes. This disc is glued onto a conventional carrier disc. The surface, on which all discs and cloths with metal backs will work without problems, is magnetic. The Magnetique Support Disk is suitable for all systems.



## Accessories

### Magnetique Support Disk

Self-adhesive back  
Magnetic surface

### FAS-M disc

Special surface coat  
Metal backside

### FAS disc

Special surface coat  
Self-adhesive backside

### FIX LAM

Secures SiC papers on FAS/FAS-M  
Self-adhesive surface



### BOX LAM

The BOX LAM is the ideal grinding media and polishing cloth organiser. The smooth drawers offer storage for different preparation disc with a diameter of 300 mm. The transparent front cover protects the drawers from becoming dirty.

Self-adhesive cloths and discs can be stored in the drawers without requiring backing film and can be easily removed again when required.





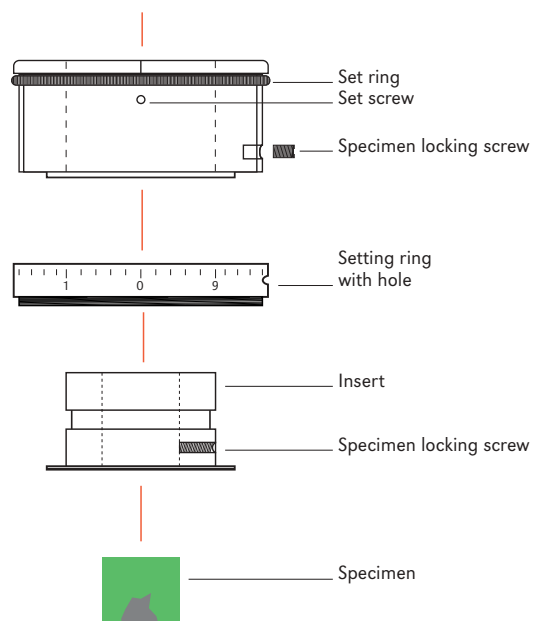
## Specimen holder

The manual specimen holder is an important aid for target preparations. It reduces the danger of over-grinding and the number of microscopic controls to a minimum.

The manual specimen holder is designed for polished sections as well as for thin sections (holder or insert H). Thin sections can be fixated with "Canada Balm" or a drop of water or oil.

It is possible to achieve a defined rate of material removal by using the vernier adjustment at the setting ring of the specimen holder. The setting ring prevents specified values from being changed during the grinding processes. The ceramic ring guarantees that material is securely removed to the required extent and prevents over-grinding. This system ensures that all of the growing requirements of target preparation in metallography, mineralogy and histology are met to perfection.

The specimen holder can be used for many conventional sample diameters (40 mm = standard, 32 mm, 30 mm, 25 mm = special). By using different adapters (32mm/30mm/25mm) the standard specimen holder can be applied for a correspondingly diverse range of applications.



## TECHNOVIT&Co

Heraeus Kulzer – a comprehensive range of technical resins

In addition to grinding and polishing media, Heraeus Kulzer also offers a comprehensive range of technical resins and accessories that meet all requirements. Heraeus Kulzer's product range includes classic cold embedding resins as well as the new-generation light curing high-tech polymers and warm embedding resins. We furthermore offer a comprehensive range of moulding products for indirect surface testing.

Heraeus Kulzer's decades of experience and the continuous further development of its products and materials guarantees that they always meet the highest quality standards.

The expertise of the people who work in our research and development laboratories, as well as in the area of application technology, enables us to find individual solutions to application-specific problems.

► **Please get in touch to request an information brochure for our Technovit resins!**



**Technovit – a brand that has been guaranteeing high-quality resins for decades.**



**New LAM formula02 –  
Precision without compromises**  
The grinding/polishing system for  
materialographic samples

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