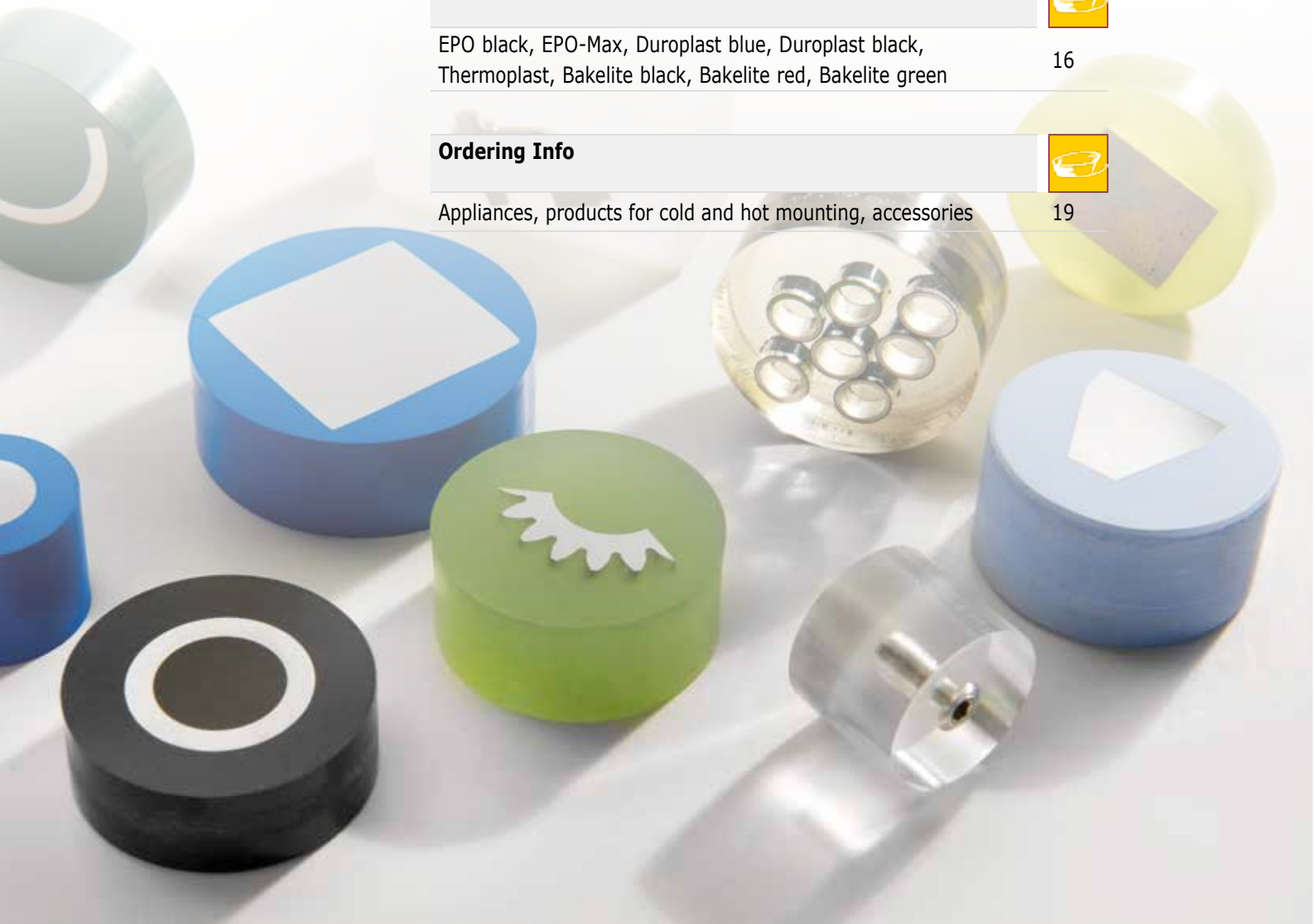
ADVANCED MATERIALOGRAPHY

MOUNTING GUIDE

Hot Mounting | Cold Mounting | Accessories

part of VERDER scientific

Mounting



General Information

When is mounting necessary?

» Samples are too small for grinding/polishing and hardness testing (low load/micro hardness): sample surface is enlarged by mounting, and thereby simplifies handling
» Simultaneous automatic preparation of larger sample quantities
» Preparation of coatings & layer thickness measurements
» Protection of edge zones
» For fragile and / or porous samples

The Process

Samples for a materialographic examination can be mounted using hot or cold mounting techniques. Both methods should ideally complement each other and should not be seen as competing processes.

Choice of Mounting Process

Pressure and heat can damage the microstructure of the sample, which might cause faulty results. Therefore, the mounting process has to match the characteristics of the material to be mounted. The mounting material itself is secondary. In general, process and method have to be adapted to the examination aim and laboratory conditions.

Comparison of Mounting Processes

	Cold mounting (Moulding at room temperature)	Hot mounting (Pressing at about 180°C)
Materials	All materials, porous materials, materials with undercuts, voids, cracks, vias, etc., temperature-sensitive materials	Solid materials, temperature-insensitive materials
Appliances	Lab fume cupboard, pressure unit, infiltration set	Hot mounting press
Mounting mateial	Methyl-methacrylates Polyester resins Epoxy resins	Phenolic resins Acrylic resins Epoxy resins
Fillers	Copper, ceramics, graphite, nickel, dyes	
Temperature	35 °C - 120 °C	150 °C - 200 °C
Required time / process	5 min. - approx. 24 h	5 - 15 min.
Handling	2 to 3-component material (powder, liquid) - precise work is required	1-component material (granulate) - easy handling
Odour development	Working in fume cupboard recommended	No odour development
Reproducibility	Moderate	Good
Mould selection	Many moulds and sizes	According to hot mounting press
Mounting moulds	Silicone rubber, PTFE, PP	-
Costs	Low investment costs / high follow-up costs	High investment costs / low follow-up costs

Parameters to be considered during mounting

Sample material	Mounting resin
Temperature and pressure resistance	Curing time
Number of samples	Edge retention, shrinkage
Size and geometry	Transparency yes/no
Hardness	Hardness
Examination aim, examination task	Processing

General Information

The following parameters have to be considered in order to avoid the formation of edge gaps between sample material and mounting material:

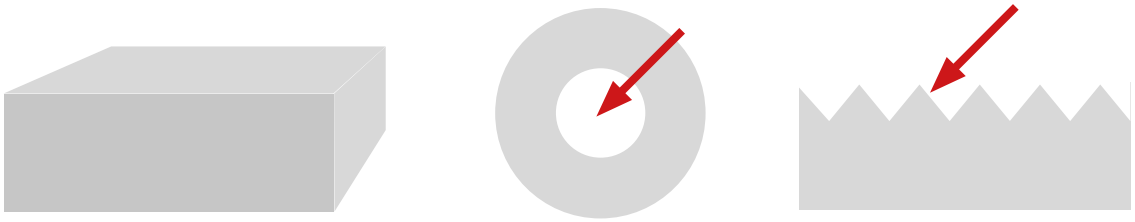
» Sample geometry
» Arrangement of samples in the mounting mould
» Arrangement of samples in the mounting mould
» Polymerization behaviour and hardness of the resin
» Thermal conductivity of sample material:
the risk of gap formation increases the faster the mounting material cools down (take special care with methyl acrylates!)

GOOD TO KNOW!

Sample Geometry

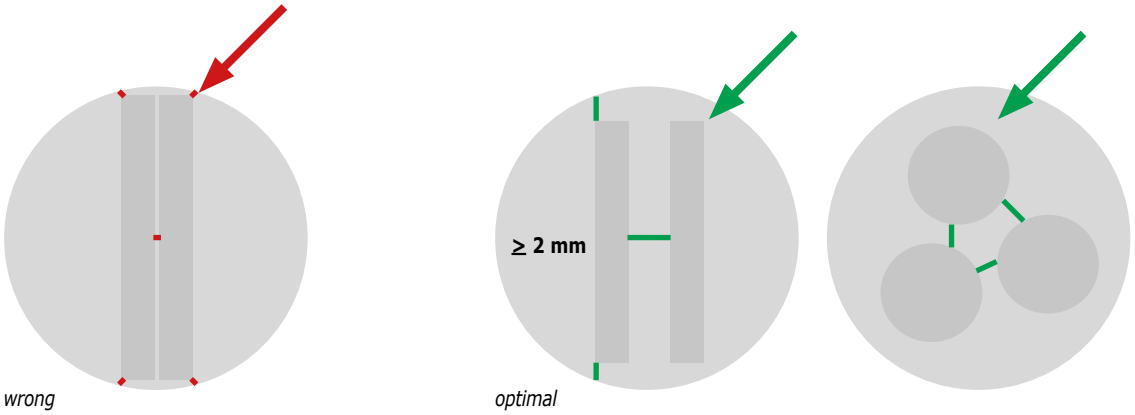
Sample geometry and arrangement of the samples and/or the distances of the samples to the mounting mould can lead to different results.
Insufficient separation between the individual samples or to the edge of the mould can cause gap formation and result in cracks (try to keep a distance of approx. 2-3 mm).

Geometry



simple *difficult*

Distance sample - mounting mould / sample - sample



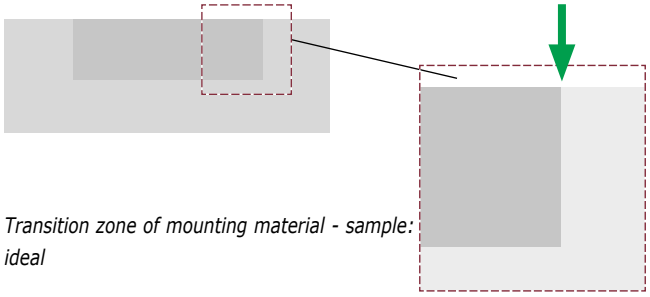
wrong *optimal*

Application-Related Information

Hardness
Correct preparation with edge retention and protected edge zones needs the use of a mounting resin with a suitable hardness.

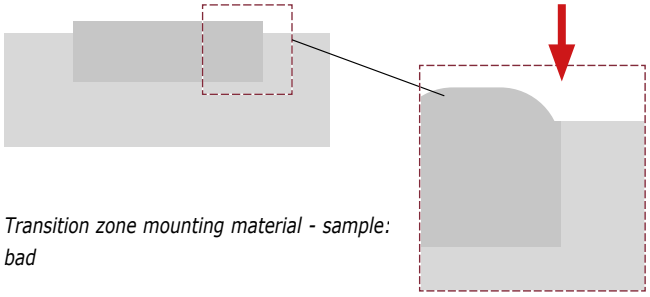
Transition zone of mounting material and sample

Same hardness of sample and mounting material



Transition zone of mounting material - sample: ideal

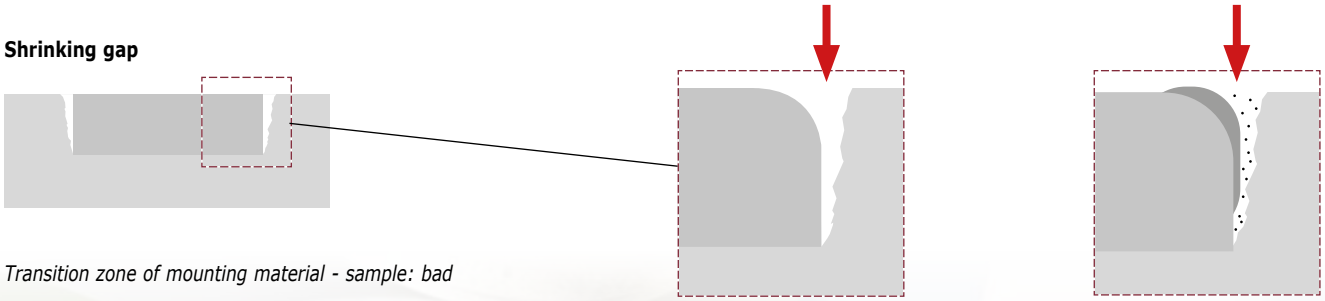
Different hardness between sample and mounting material



Transition zone mounting material - sample: bad

Gap formation
Mounting should show minimized gap formation. Gaps at edges and rounded edges increase the risk of contamination with dirt and abrasives or polishing particles; this can cause deterioration of preparation results.
Subsequently flowing etching agent or cleaning alcohol might cause falsifying re-etchings or discoloration in the edge areas.

Shrinking gap



Transition zone of mounting material - sample: bad

Cold Mounting

Cold mounting refers to all mounting methods apart from mounting in a hot mounting press.

In the cold mounting process, the mounting materials consist of two or three components (liquid-liquid or liquid-powder), are well mixed on an epoxy or acrylic basis and poured without exposure to heat and temperature in provided mounting moulds.

Prepared / mechanically workable samples are produced within a time range from a few minutes to several hours, depending on resin type and mounting method. Adding of fillers can influence hardness, shrinking behaviour and contrast. Cold mounting is particularly recommended for pressure and temperature sensitive samples.

Epoxy resin, polyester resin and methyl-methacrylate are used as resins for cold mounting.
The many variations of resin types, mounting methods and the possibility of embedding different cross sections make cold mounting ideal for such a wide range of applications.

Before mounting, the right method and mounting material should be decided on a basis of the characteristics of sample material & mounting resin.

Note: High investment costs for a hot mounting press are often pointed out when selecting the hot mounting method.

High investment costs are also needed for daily cold mounting of large numbers of samples - and additional investment in expensive materials as well as a lab fume cupboard!

Selection of Cold Mounting Moulds

Cold mounting moulds are available in PTFE, silicone, polypropylene and polyethylene. All cold mounting moulds are reusable. Moulds with removable bottom make it easier to detach the sample from the mould.

PTFE
High mechanical stability is ideal for automatic grinding and polishing.

Silicone
Silicone moulds lose their round shape and turn oval after beeing used several times. This can result in disadvantages for automatic individual pressure preparations.

When polyester resins are used, sticky places can occur at the edge of the sample as a reaction of mounting material in combination with the silicone mould.

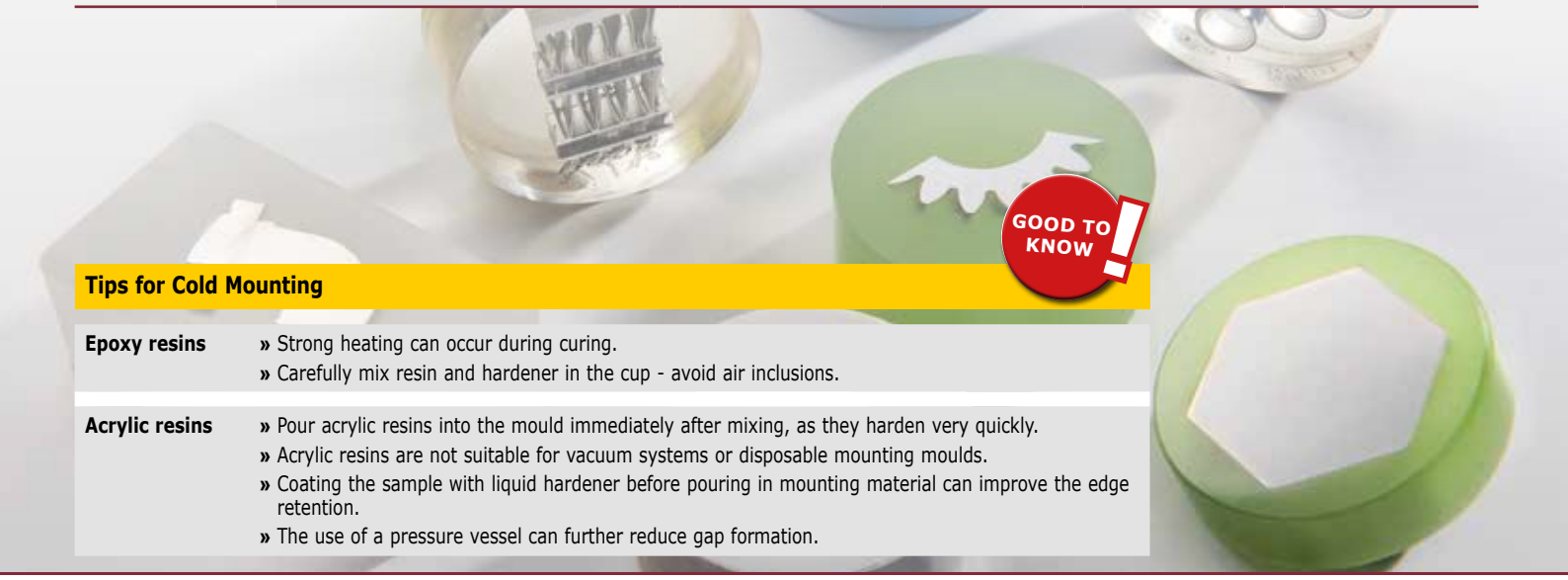
Polypropylene und polyethylene
In older moulds the removable bottom is often no longer flat. When several small parts are mounted in one sample, different grinding planes can be ground unintentionally at the same time, depending on the position of the individual sample.

Suitability of the mounting mould

Methods	Mounting material	PTFE opaque	Polypropylene PP transparent	Polyethylene PE transparent/ opaque	Silicone rubber opaque
Cold mounting	Methacrylates, polyester	xxx	xx	x	xx
Vacuum	Epoxy resins	-	xx	xx	-
Pressure	Methacrylate	xxx	xx	x	xx
Light curing	Modified methacrylates	-	xxx	xx	-

xxx - very well suited xx - well suited x - less suitable - not suitable

	Epoxy resins	Modified polyester resins	Methacrylates			
Product	**KEM 90**	**KEM 35**	**KEM 15 plus**	**KEM 20**	**KEM 30**	**KEM 60 (MMA-free)**
Basis/filler	epoxy resin	methyl-methacrylate/ ceramics	methyl-methacrylate/ styrene	methyl-methacrylate	methyl-methacrylate	tetrahydrofurfuryl 2-methacrylate / mineral filler
Hardness (shore)	79	87	85	84	85	85
Mechanical workability	satisfactory (tends to smear)	very good	good	good	good	good
Removal rate (grindability)	high	very low	very low	medium	medium	low
Chemical stability	good – satisfactory (heated etchants)	good – satisfactory (heated etchants)	good	good	good	good
Transparency	very good	none, opaque	none	good (after curing under pressure) otherwise moderate	none, opaque	none, opaque
Curing time/ temperature	16-24 h, RT up to approx. 60 °C	10-15 min., approx. 85-100 °C	25 min., approx. 100-130 °C	15 min., approx. 100-120 °C	approx. 5 min., approx. 95-110 °C	8-10 min., approx. 90-115 °C
Infiltration with vacuum	yes	no	no	no	no	no
Curing under pressure	no	no	no	yes	yes	no
Dosing	weight-% (balance)	volume-% (dosing spoon)	volume-% (dosing spoon)	volume-% (dosing spoon)	volume-% (dosing spoon)	weight-% (balance)
Application	porous samples, samples with low hardness, target preparation	edge examination, material with higher hardness	mounting with high edge retention, edge examination, medium-hard to hard materials	transparent mountings (pressure vessel), target preparation	semi-transparent mountings, routine work, soft to medium-hard materials	universal usage



Tips for Cold Mounting

Epoxy resins

» Strong heating can occur during curing.
» Carefully mix resin and hardener in the cup - avoid air inclusions.

Acrylic resins

» Pour acrylic resins into the mould immediately after mixing, as they harden very quickly.
» Acrylic resins are not suitable for vacuum systems or disposable mounting moulds.
» Coating the sample with liquid hardener before pouring in mounting material can improve the edge retention.
» The use of a pressure vessel can further reduce gap formation.

Process Support

The mounting process can be supported by different methods. Characteristics of the respective sample material have to be considered.

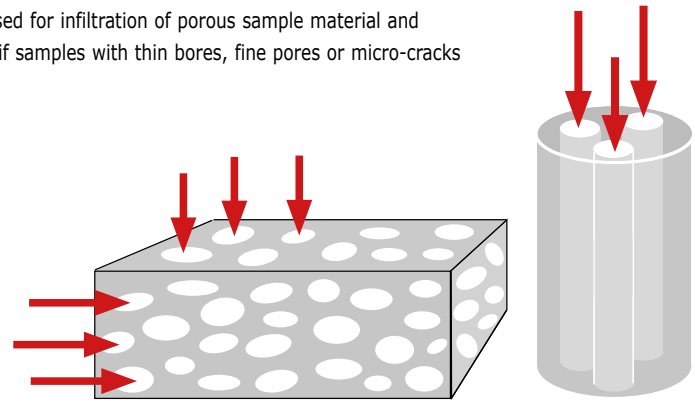
Vacuum Process

Mounting under vacuum is only possible with **epoxy resins**.

Therefore, a vacuum appliance is required.

Infiltration unit

This method is used for infiltration of porous sample material and for optimization, if samples with thin bores, fine pores or micro-cracks are mounted.



Scheme: infiltration of porous material or thin bores

To achieve an optimal mounting or infiltration, a vacuum can be applied (venting of the sample before casting the epoxy resin). **Warning:** vacuum which is set too high and applied too long, influences the polymerization and might cause uneven curing, leading to different results.

The dosage of epoxy resins should be strictly complied with and therefore always be carried out according to weight-% (laboratory balance).

Errors and causes	
Mounting material too brittle or too soft	Mind exact dosage of resin and hardener.
Strong bubble formation in the mounting material	Vacuum too long and/or too high; recommendation: 0.6-0.8 bar, about 2-3 min.
Infiltration not complete	Leave vacuum on longer.

GOOD TO KNOW

Colouring of Samples

Epoxy resins can be coloured by additives.
This is an advantage compared to other mounting materials.

Pressure Processes

Mounting with pressure is only possible with **methyl-methacrylates**.

A simple pressure appliance / technomat for compressed air connection (approx. 5-6 bar) is required.

Methacrylates without a filler additive cure transparently under pressure. The formation of microbubbles is avoided by the application of a pressure of 2-2.5 bar.

The dosage of MMAs can be handled generously, i.e. the dosage by volume-% (dosing spoon) is sufficient.

Errors and causes	
Bad transparency	Mixing time too long. Insertion into pressure appliance too late. Pressure too low. Mixing ratio wrong.

Mounting with Light-Curing Resins

Mounting is only possible with **modified methyl-methacrylates**.

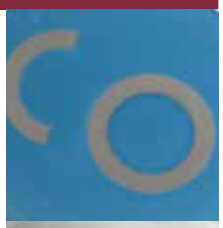
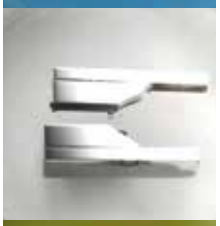
A closed and secured polymerization appliance is required. Polymerization takes place through UV light at 350-400 nm, or blue light. Irradiation intervals can be used to control time and temperature of the curing process.

The procedure is limited by the fact that sufficient polymerization can only take place where light can penetrate.

With this method, dosing is not necessary as it is only one component or one component in different polymerization states (thin liquid/viscous).

Regarding hardness, the procedure cannot be applied to all preparation tasks.

Errors and causes	
Insufficient or no curing	Check lamps - blue light, ultraviolet light. Use only transparent forms/moulds. Curing time is too short.
Only partial areas of the sample are hardened	Not enough light penetration.

Mounting material	Recommended application	
KEM 15 plus	methyl-methacrylate, blue, opaque, high edge retention 2-component system: powder + liquid (1,5:1 [Vol.-%]) » for mountings with high edge retention, edge examination, medium-hard to hard materials » CT: approx. 20 min.	
KEM 20	methyl-methacrylate, transparent (pressure appliance) 2-component system: powder + liquid (recommendation 2:1 [Vol.-%]) » for transparent mounting (pressure vessel), targeted preparation » CT: approx. 12 min.	
KEM 30	methyl-methacrylate, green, transparent 2-component system: powder + liquid (2:1 [Vol.-%]) » for semi-transparent mountings (pressure vessel), routine work, soft to medium-hard materials » CT: approx. 5 min.	
KEM 35	methyl-methacrylate, light green, opaque, good edge retention 2-component system: powder + liquid (1.5:1 [Vol.-%]) » for mountings with good edge retention, edge examination, medium-hard to very hard materials » CT: approx. 12 min.	
KEM 60 (MMA-free)	base tetrahydrofurfuryl-2-methacrylate with mineral filler, red, opaque 2-component system: powder + liquid (2:0,9 [weight-%]) » universal usage » CT: 15-18 min.	
KEM 90	epoxy resin, clear, transparent 2-component system: resin + hardener (2:1 [weight-%]) » suitable for vacuum impregnation, sensitive and brittle materials » CT: approx. 16 - 24 h	

GOOD TO KNOW!

Methyl-Methacrylate

Methyl-methacrylates may outgas over a longer period of time - this can delay the curing time!

	Mounting material	Recommended application
	**Technovit 4000 SET**	methyl-methacrylate, white, opaque 3-component system: powder + liquid 1 + liquid 2 (3:2:1 [Vol.-%]) » for mountings with good edge retention, edge examination, medium-hard to hard materials » CT: approx. 8 min.
	**Technovit 4004** Alternative: **KEM 20**	methyl-methacrylate, transparent (in pressure appliance bubble-free) 2-component system: powder + liquid (2:1 [Vol.-%]) » for transparent mountings (pressure vessel), target preparation » CT: approx. 12 min.
	**Technovit 4071** Alternative: **KEM 30**	methyl-methacrylate, green, transparent 2-component system: powder + liquid (2:1 [Vol.-%]) » for semi-transparent mountings (pressure vessel), routine work, soft to medium-hard materials » CT: approx. 4 - 6 min.
	**Technovit 5000**	methyl-methacrylate, copper-brown (bubble-free in pressure appliance) 2-component system: powder + fluid (20 g:13 ml [Weight-%]) » conductive, for SEM examinations » CT: approx. 7 min.

CT = Curing time

Characteristics of cold mounting material

	Material	Characteristics	Application	Transparency	Edge retention	Gap formation	Curing time
KEM 20	methyl-methacrylate	transparent (curing under overpressure)	transparent mountings, targeted preparation	xxx	x	medium	<15 min
KEM 30	methyl-methacrylate	semi-transparent (curing under overpressure)	routine mountings, soft to medium-hard materials	x	x	medium	<5 min
KEM 35	methyl-methacrylate	light green, opaque, good edge retention	edge examinations, medium-hard to very hard materials	-	xx	very low	<15 min
KEM 15 plus	methyl-methacrylate	blue, opaque, high edge retention, high hardness	edge examinations, medium-hard to hard materials	-	xxx	very low	<20 min
KEM 60	methacrylate	red, opaque, MMA-free	universal applications	-	x	medium	<20 min
KEM 90	epoxy resin	transparent, low viscosity	sensitive and brittle materials, vacuum impregnation	xxx	xxx	very low	<24 h

xxx - very well suited xx - well suited x - less suitable - not suitable

Hot Mounting Process

The hot mounting process means that materialographic samples are melted and compacted in finished ground resin granulate inside a closed cylinder.
This process is controlled in a hot mounting press and the samples are encapsulated in a plane-parallel manner. The parameters selected - temperature, pressure and time - depend on the machine specifications themselves and mounting material/resin.

The hot mounting technique ensures high edge retention, protects the sample edges and is suitable for a high sample volume. However, it is not suitable for heat- or pressure-sensitive samples.

In case of electronic components (solders/composites) or pressure-sensitive material, e.g. wires or sheets with small cross-sections, the time of pressure application can be controlled in order to minimize the risk of false mounting.
In the hot mounting process, the samples are placed in the press cylinder of the mounting press on the lower ram, which is then filled with special resin granulates (diverse bakelites, duroplasts or thermoplastics).
The granulates are melted under pressure and heat, so that all cavities of the mounting mould are filled.
Hot mounting means the sample is mounted with minimum gap formation, depending on mounting material. After cooling it is ready for further preparation.
Combined with respective mounting material, our hot mounting presses are extremely popular by their very high edge retention and high sample throughput.

The benefits

» No direct contact with chemicals
» Good edge retention
» High degree of hardness of the mounting material
» High plane parallelism
» Easy sample marking by engraving, labelling

Some Useful Tips

Anti-stick agent

Before starting the mounting process, a thin layer of anti-stick agent (silicone paste, spray) can be applied on the wall of the mould to prevent a sticking of the sample. CAUTION: Application of anti-stick to lower ram may cause gaps by creeping.

Distance from the cylinder wall

The distance of the sample from the cylinder wall should be at least 3 mm in order to avoid cracks in the mounting material. This applies in particular for samples with sharp edges.

Clean samples

During hot mounting, small, thin samples can be fixed in position with mounting aids.

Clean samples

The best results are achieved with clean, dry and grease-free samples. They should therefore be cleaned with alcohol or another degreasing liquid before mounting.

Preheating

In the case of porous and/or pressure-sensitive samples, such as minerals, etc., the mounting material can be heated and softened before applying pressure. Preheating with the special programs in the OPAL mounting presses is also recommended when using thermoplastic mounting materials, as e.g. Thermoplast.

Temperature-sensitive samples

For all mounting materials, the mounting temperature can be reduced to 150 °C for temperature-sensitive materials. The heating time increases when the temperature is reduced.
If possible, highly temperature-sensitive and porous samples should not be hot mounted under pressure. In this case, a cold mounting process is better suited.

Hot Mounting Material

Adding of fillers influences hardness, shrinking behaviour and mechanical workability.
The Duroplast group cures at a higher temperature in the range of 130–180 °C.

Thermoplastics melt at temperatures of 130–180 °C and cure during the cooling phase. In comparison to Duroplasts this significantly increases the cooling time depending on the diameter of the mounted sample.

Characteristics of Hot Mounting Material

Mounting material	Recommended application	Basis / filler	Hardness (shore D)	Removal rate (grindability)
Bakelite (black, red, green)	routine mountings, soft to medium-hard materials, good for filling up	phenolic resin/ wood flour	92	medium
EPO black	high edge retention, edge examination, medium-hard to hard materials	epoxy resin/ mineral and glass fibre	93	very low
EPO-Max	high edge retention, edge examination, medium-hard to hard materials easy cleaning of mould and ram due to low adhesion	epoxy resin/mineral	93	very low
Duroplast black	conductive, SEM examinations, electrolytic polishing	phenolic resin/ graphite	89	medium
Duroplast blue	high edge retention, edge examination, soft to medium-hard materials, recommended for grinding stones	diallylphtalate/ glass fibre	92	low
Thermoplast	transparent mounting, target preparation, sensitive materials, well-suited for filling up, marking	acrylic resin	86	medium

GOOD TO KNOW

Parameters	Bakelite	EPO	Duroplast	Thermoplast
Polymerization range	120 – 200 °C	130 – 180 °C	130 – 190 °C	130 – 195 °C
Heating time	5 – 8 min*	5 – 8 min*	5 – 8 min*	5 – 8 min*
Cooling time	5 – 8 min*	5 – 8 min*	3 – 6 min*	7 – 10 min*
Pressure	150 – 250 bar*	150 – 250 bar*	150 – 180 bar*	160 – 195 bar*

** depending on the diameter of the mould assembly: the larger the diameter of the mould, the more pressure and time must be applied*

Errors and causes

Mounting material is coarse-grained and rough. Discoloration when cleaning with ethanol.	Sample too high. Not enough granulate. Mounting material not cured. Check temperature.
Gap formation despite of mounting material with high edge retention.	Check pressure/temperature settings. Sample has not been cleaned before mounting. In case of a two-layer mounting: check sample arrangement (cause: fine-grained filling granulate can seep through granulate with high edge retention).
Milky stains and/or cracks when using acrylic resin.	Check cooling temperature (often too low).

The Opal Hot Mounting Presses

The hot mounting presses OPAL mount samples in a very short time - fully automatic, fully hydraulic and water-cooled. The OPAL 410 is fitted with the proven ATM bayonet closure, whereas the fully automatic sliding closure of Opal 480 allows quick and easy opening/closing of the mould assembly.

The wide range of round (from 25.2 to 70 mm) and rectangular (30x60 and 40x60 mm) mould assemblies enables optimum moulding.

The mould assemblies are easy to change. Spacers in different sizes allow for time-saving double mounts.

The appliances are environmentally friendly, operating noise is minimized and, thanks to the powder-coated aluminium construction, very robust and durable. The infinitely variable cooling curve allows you to get very low water consumption with a longer cooling time.

The clear LCD operation panel of OPAL 480 is user-friendly. Up to 18 free configurable mounting processes can be stored and retrieved at any time.

In addition to standard operation, three additional pressure methods can be selected:

1. Pressure increases in parallel with the pre-heating phase (ideal for mounting hollow samples)
2. Pressure increases after the pre-set temperature is reached (e.g. to produce almost gap-free mounts of complex geometries)
3. Pressure increases during cooling (e.g. to prepare transparent samples)

Comparison of characteristics

Opal 410	Opal 480
Automatic hot mounting press	**Automatic hot mounting press**
» Fully hydraulic pressing process	» Fully hydraulic pressing process
» Automatic water cooling (with water saving function)	» Automatic water cooling (with water saving function)
» Bajonet closure	» Sliding closure
	» Fully automatic, electronic control
	» Large, clearly arranged LCD display and optimized user interface
	» 18 programs to save with free configuration
	» 3 different modes for pressure to select
Mould assembly	**Mould assembly**
Ø 25.2 mm (approx. 1")	Ø 50 mm
Ø 30 mm	Ø 60 mm
Ø 32 mm	Ø 70 mm
Ø 31.75 mm (1¼")	30x60 mm
Ø 38 mm	40x60 mm
Ø 40 mm	

Opal 410

Opal 480

Opal-X-Press

The modular design of the innovative hot mounting press Opal X Press allows fast and simultaneous mounting of different materialographic samples. In order to suit specific customer requirements with regard to material and size of different samples, the appliance can be optimally configured after selection of the Opal X-Press 2 or 4 variant.

The basic appliance includes a control panel and an integrated pressing unit and can be upgraded with 1 or 3 additional pressing units Opal P-50. These are separated from the base device and can be added later. Thus, it is possible to process samples of up to 4 different diameters in one device at the same time.

The Opal X-Press allows fast mountings with low power consumption and a very high ease of use.

GOOD TO KNOW

Mould assemblies with chamfer

When mounting samples for subsequent manual preparation, it is recommended to use mould assemblies with chamfer.
Chamfered samples are easier to handle as they do not tilt during manual grinding and polishing and will not damage the polishing cloth.

Characteristics

Opal X-Press

Modular hot mounting press (2-4 pressing units according to the equipment)

- » Fully hydraulic pressing process
- » Automatic water cooling (with water saving function)
- » Sliding closure with one-hand closure system
- » Dust Guard: during filling of mould removal of fine dust with connected vacuum cleaner
- » Dirt trap catches excess mounting material
- » 7" touch display with innovative control software
- » High flexibility due to customized preheating function, cooling modes, maintenance tasks
- » User accounts with definable access rights
- » Housing made of solid, powder-coated steel construction

Mould assemblies

- Ø 25.2 mm (approx. 1")
- Ø 30 mm
- Ø 1¼" (~32 mm)
- Ø 1½" (~38 mm)
- Ø 40 mm
- Ø 50 mm

Opal X-Press 4

	DUROPLASTS					THERMOPLAST
	Phenolic resin	Phenolic resin	Dialylphtalate		Epoxy resin	Acrylic resin
Product	Bakelite black, red, green	Duroplast black	Duroplast blue	EPO black	EPO-Max	Thermoplast
Routine examinations of soft to medium-hard materials **Samples without edge zones** **Mounting of sample material**	xxx	–	–	–	–	–
Examination of material with high hardness **Hard edge layers** **Difficult geometries**	x	–	xxx	xxx	xxx	–
All examinations **Planar grinding with corundum or SiC grinding stones**	–	–	xxx	–	–	–
Soft materials **Targeted preparation** **Thin sections**	x	–	–	–	–	xxx
SEM examinations **Electrolytic polishing**	–	xx	–	x	x	–

GOOD TO KNOW

Tips for Hot Mounting

For better edge retention and minimized shrink gaps, the mounted samples should be cooled down to room temperature under pressure before they are removed from the mounting press.

The cause for insufficiently cured mounted samples can be too much moisture in the mounting material. Therefore, always make sure that the container is properly closed after use.

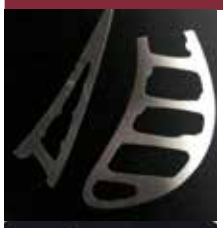
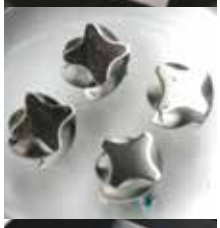
Warning: Although double mountings are possible with each mounting press, the finished samples are too flat if the press cylinder height is too low. Samples that are too flat are difficult to handle or cannot be used for automatic preparation (normal height 15 mm).

Thermoplast and Duroplast black

In electrolytic applications, electrically non-conductive Thermoplast is used in combination with Duroplast black. To begin with, a small amount of Thermoplast is applied on the sample and then the missing amount of mounting material is filled up with black Duroplast. This results in an electrically conductive body with a non-conductive preparation surface.

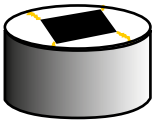
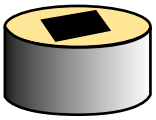
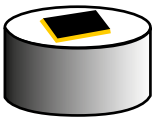
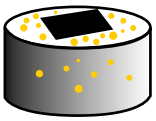
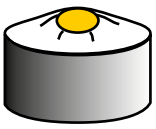
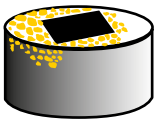
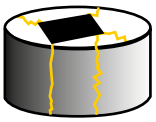
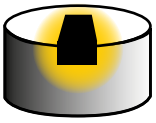
EPO black, EPO-Max and Duroplast blue/black

In order to achieve a cost reduction, EPO black, EPO-Max and Duroplast blue/black can be used together with bakelites. The sample is covered with a small amount of the desired mounting material and then filled up with the cheaper bakelites.

	Mounting material	Recommended application
	**EPO black**	epoxy resin with high edge retention » very high hardness » contains a high proportion of glass and mineral filler
	**EPO-Max**	epoxy resin with high edge retention » very high hardness » easy cleaning of mould and ram due to low adhesion » with a proportion of mineral filler
	**Duroplast blue**	diallylphtalate with high edge retention » general purpose, edge examination, hard material, very well suited for grinding stones » high hardness » very low shrinkage » contains a high proportion of glass filler
	**Duroplast black**	phenolic resin for SEM examinations and electrolytic polishing » medium hardness » conductive, contains graphite particles
	**Thermoplast**	acrylic resin for transparent mounts » ideal for target preparations, sensitive samples » low to medium hardness
	**Bakelite black**	phenolic resin for general purpose, routine mountings » medium hardness » contains wood flour
	**Bakelite red**	phenolic resin for general purpose, routine mountings » medium hardness » contains wood flour
	**Bakelite green**	phenolic resin for general purpose, routine mountings » medium hardness » contains wood flour

ATM GmbH · Emil-Reinert-Str. 2 · 57636 Mammelzen · Germany
Telephone: +49 (0) 26 81 / 95 39-0 · Fax: +49 (0) 26 81 / 95 39-20 · E-Mail: info@atm-m.com · www.atm-m.com

Solution-oriented procedure

Problem		Cause	Solution
Edge cracks		Sample with sharp edges or sample mounted too close to sample edge.	If possible, round off edges and mount sample with distance of at least 3 mm to the edge.
Bulging		Cooling time too short.	Increase cooling time, check cooling water intake.
Dull surface finish		Heating time too short.	Extend heating time.
Gap between sample and mounting material		Wrong mounting material or sample too large.	Use mounting material with low shrinkage, if possible, cut up sample.
Porosity		Temperature too high (hot mounting material). Proportion of hardener too high (KEM 90).	Lower heating temperature. Check dosage.
Blastering		Cooling time too short or heating temperature too high.	Increase cooling time, check cooling water supply, lower heating temperature.
Individual grains visible on mounting * *Only in case of warm curing mounting materials*		Curing of mounting material without pressure.	Increase pressure during heating, check pressure cylinder.
Inner cracks *(Thermoplast)*		Heating time too short.	Extend heating time, extend cooling time.
"Cottonball effect" in centre of mount *(Thermoplast)*		Heating time too short.	Extend heating time, extend cooling time.

Remarks

GOOD TO KNOW

A longer mounting time can avoid bulging or mountings that are too soft.
Incorrectly melted or milky mounting material means that temperatures and pressure are too low during mounting. The temperature and pressure values set on the mounting press should always correspond to the recommended values for the mounting material used. In general, two-layer mountings are possible.

Ordering Info

Item No.	Unit	Description
		Infiltration set
		» for cold mounting and hardening using vacuum **» recommended for Epoxy resin**
Z6510000	1 Pcs.	Desiccator incl. non-return valve, vacuum pump, hose and pressure gauge
		Infiltration unit
		» for cold mounting, pouring and hardening using vacuum
M6500001	1 Pcs.	Infiltration unit, 230 V/50 Hz, vacuum pressure 0.8 bar, W 330 x H 270 x D 300 mm (including desiccator with mechanic dosing and vacuum pump, rotating disc for 8 silicon mounting cups Ø 50 mm or 9 PTFE-mounting cups Ø 40 mm, 10 mixing cups)
		110 V/60 Hz on request
		Pressure unit
		» for bubble free hardening of methylmethacrylates (e. g. for Technovit 4004, KEM 20), compressed air required
92002281	1 Pcs.	Pressure equipment, dimensions: D 340 x W 340 x H 255 mm

ATM GmbH · Emil-Reinert-Str. 2 · 57636 Mammelzen · Germany
Telephone: +49 (0) 26 81 / 95 39-0 · Fax: +49 (0) 26 81 / 95 39-20 · E-Mail: info@atm-m.com · www.atm-m.com

Ordering Info

Item No.	Unit	Description
		Cold mounting material methylmethacrylate
		CT = curing time
		KEM 15 plus, blue, opaque, high edge retention **2-component system: powder + liquid (1.5:1 [Vol.-%])** **» for mounting with high edge retention, edge examination** **» medium-hard to hard materials**
95012019	1 Pcs.	KEM 15 plus, SET including 1 kg powder, 500 ml liquid, 40 mixing cups, 40 mixing sticks, 2 dosing spoons
95011628	1 kg	KEM 15 plus, powder, blue, opaque, CT: approx. 20 min
95011630	10 kg	KEM 15 plus, powder, blue, opaque, CT: approx. 20 min
95011629	500 ml	KEM 15 plus, liquid
95011631	5 l	KEM 15 plus, liquid
		KEM 20, transparent (pressure appliance) **2-component system: powder + liquid (2:1 [Vol.-%])** **» for transparent mounting (pressure vessel), target preparation**
95012020	1 Pcs.	KEM 20, SET including 1 kg powder, 500 ml liquid, 40 mixing cups, 40 mixing sticks, 2 dosing spoons
92002467	1 kg	KEM 20, powder, transparent, CT: approx. 12 min
92002469	5 kg	KEM 20, powder, transparent, CT: approx. 12 min
92002468	10 kg	KEM 20, powder, transparent, CT: approx. 12 min
92002470	500 ml	KEM 20, liquid
92002471	1 l	KEM 20, liquid
92002472	2,5 l	KEM 20, liquid
		KEM 30, green, transparent **2-component system: powder + liquid (2:1 [Vol.-%])** **» for semi-transparent mounting (pressure vessel), routine work** **» soft to medium-hard materials**
95012021	1 Pcs.	KEM 30, SET including 1 kg powder, 500 ml liquid, 40 mixing cups, 40 mixing sticks, 2 dosing spoons
92004080	1 kg	KEM 30, powder, green, transparent, CT: approx. 5 min
92004082	5 kg	KEM 30, powder, green, transparent, CT: approx. 5 min
92004081	500 ml	KEM 30, liquid
92004083	1 l	KEM 30, liquid
92002540	2.5 l	KEM 30, liquid
		KEM 35, light green, opaque, good edge retention **2-component system: powder + liquid (1.5:1 [Vol.-%])** **» for mounting with good edge retention, edge examination** **» medium-hard to very hard materials**
95012022	1 Pcs.	KEM 35, SET including 1 kg powder, 500 ml liquid, 40 mixing cups, 40 mixing sticks, 2 dosing spoons
92002473	1 kg	KEM 35, powder, light green, opaque, CT: approx. 12 min
92002474	5 kg	KEM 35, powder, light green, opaque, CT: approx. 12 min
92002512	10 kg	KEM 35, powder, light green, opaque, CT: approx. 12 min
92002475	500 ml	KEM 35, liquid
92002476	1 l	KEM 35, liquid
92002477	2.5 l	KEM 35, liquid

Ordering Info

Item No.	Unit	Description
		Cold mounting material MMA-free
		CT = curing time
		KEM 60, red **2-component system (MMA-free): powder + liquid (2:0.9 [weight-%])** **» universal usage**
95013184	1 kg	KEM 60, powder, red, CT approx. 8–10 min.
95013185	5 kg	KEM 60, powder, red, CT approx. 8–10 min.
95013186	10 kg	KEM 60, powder, red, CT approx. 8–10 min.
95013187	500 ml	KEM 60, liquid
		Cold mounting material epoxy resin
		CT = curing time
		KEM 90, clear, transparent **2-components-system: resin + hardener (2:1 [weight-%])** **» suitable for vacuum infiltration e.g. porous materials**
92002484	500 ml	KEM 90, resin, clear, transparent, CT: approx. 16–24 h
92002485	250 ml	KEM 90, hardener
		Cold mounting material methylmethacrylate
		CT = curing time
		Technovit 4000 SET, white, opaque **3-component system: powder + liquid 1 + liquid 2 (3:2:1 [Vol.-%])**
92001683	1 Pcs.	Technovit 4000 SET (750 g / 500 ml / 250 ml), white, opaque, CT: approx. 8 min
92001684	1 Pcs.	Technovit 4000 SET (1.5 kg / 1 Ltr. / 500 ml), white, opaque, CT: approx. 8 min
	Alternative: **KEM 20**	**Technovit 4004, transparent** **2-component system: powder + liquid (2:1 [Vol.-%])**
92001688	1 kg	Technovit 4004, powder, transp. (bubble-free in pressure appl.), CT: approx. 12 min
92001689	2 kg	Technovit 4004, powder, transp. (bubble-free in pressure appl.), CT: approx. 12 min
92001691	500 ml	Technovit 4004, liquid
92001692	1 l	Technovit 4004, liquid
	Alternative: **KEM 30**	**Technovit 4071, green, transparent** **2-component system: powder + liquid (2:1 [Vol.-%])**
92001695	1 kg	Technovit 4071, powder, green, transparent, CT: approx. 4–6 min
92001696	2 kg	Technovit 4071, powder, green, transparent, CT: approx. 4–6 min
92001698	500 ml	Technovit 4071, liquid
92001699	1 l	Technovit 4071, liquid
		Technovit 5000, copper-brown **2-component system: powder + liquid (1.55:1 [Vol.-%])** **» conductive, for SEM examinations**
95004058	1 kg	Technovit 5000, powder, copper-brown (bubble-free with pressure vessel), CT: approx. 7 min
95004059	500 ml	Technovit 5000, liquid
		» Download of Safey Data Sheets at http://www.atm-m.com/products/consumables

Ordering Info

Item No.	Unit	Description
		Cold mounting moulds
		Silicon rubber round, beveled edge **» reuseable** **» not suitable for light curing**
92002511	1 Pcs.	Silicon rubber round, Ø 25 mm / H 23 mm
92002504	1 Pcs.	Silicon rubber round, Ø 30 mm / H 25 mm
92002505	1 Pcs.	Silicon rubber round, Ø 32 mm / H 25 mm
92002506	1 Pcs.	Silicon rubber round, Ø 38 mm / H 25 mm
92005567	1 Pcs.	Silicon rubber round, Ø 40 mm / H 30 mm
92005568	1 Pcs.	Silicon rubber round, Ø 50 mm / H 30 mm
		Silicon rubber square, beveled edge **» reuseable** **» not suitable for light curing**
92002509	1 Pcs.	Silicon rubber square, 55 x 30 mm / H 22 mm
92002510	1 Pcs.	Silicon rubber square, 70 x 40 mm / H 22 mm
		Polypropylen round **» reuseable** **» for light curing** **» with exchangeable bottom**
92001719	1 Pcs.	Polypropylene round, Ø 25 mm / H 27 mm
92001710	1 Pcs.	Polypropylene round, Ø 30 mm / H 27 mm
92001711	1 Pcs.	Polypropylene round, Ø 40 mm / H 27 mm
		PTFE round, beveled edge **» reuseable** **» not suitable for light curing** **» with exchangeable bottom**
92002513	1 Pcs.	PTFE round, Ø 25 mm / H 23 mm
92002514	1 Pcs.	PTFE round, Ø 30 mm / H 25 mm
92002515	1 Pcs.	PTFE round, Ø 32 mm / H 25 mm
92002516	1 Pcs.	PTFE round, Ø 38 mm / H 25 mm
92002517	1 Pcs.	PTFE round, Ø 40 mm / H 30 mm
92002518	1 Pcs.	PTFE round, Ø 50 mm / H 30 mm
92002519	1 Pcs.	PTFE round, Ø 70 mm / H 30 mm

Ordering Info

Item No.	Unit	Description
		Accessories for mounting
92002660	90 ml	Silicon paste, anti-stick agent
92002661	200 ml	Silicon spray, anti-stick agent
92004441	1 Stck.	Brass brush for cleaning of hot mounting press
92002658	1 Stck.	Funnel for hot mounting material
92001715	100 Pcs.	Mixing cups, disposable, 180 ml
92004360	1 Pcs.	Silicon mixing cup, reusable
92001717	100 Pcs.	Mixing sticks (wood)
92002623	100 Pcs.	Plastic mounting aid Ø 30 mm, gap 1 mm
92002625	100 Pcs.	Plastic mounting aid Ø 30 mm, gap 2 mm
92002624	100 Pcs.	Plastic mounting aid Ø 30 mm, gap 3 mm
92002715	1 Pcs.	Square bottle with screw-top for approx. 1 ltr. mounting material
92002657	100 Pcs.	Angle adapter for angled polishing, 10°
92001716	10 Pcs.	Dosing spoon for hot and cold mounting material, 13 ml
92001779	10 Pcs.	Dosing spoon for cold mounting material, 20 ml
92001781	10 Pcs.	Dosing spoon for cold mounting material, 13 ml
92002662	100 Pcs.	Steel clip for for aligning thin samples in mould
92002663	100 Pcs.	Plastic clip for aligning thin samples in mould, transparent
92002707	100 Pcs.	Plastic clip for aligning thin samples in mould, black
92002708	100 Pcs.	Plastic clip for aligning thin samples in mould, red
92002709	100 Pcs.	Plastic clip for aligning thin samples in mould, grey

Ordering Info

Item No.	Unit	Description
		Hot mounting material
		Bakelite black, phenolic resin for general purpose **» medium hardness** **» contains wood powder** **» very convenient material for filling**
95011981	1 kg	Bakelite black
95011982	5 kg	Bakelite black
95011983	10 kg	Bakelite black
		Bakelite red, phenolic resin for general purpose **» medium hardness** **» contains wood powder**
95011984	1 kg	Bakelite red
95011985	5 kg	Bakelite red
95011986	10 kg	Bakelite red
		Bakelite green, phenolic resin for general purpose **» medium hardness** **» contains wood powder**
95011987	1 kg	Bakelite green
95011988	5 kg	Bakelite green
95011989	10 kg	Bakelite green

Expiry date of consumable

	Product designation	Expiry date
		Years
Hot mounting	Bakelite	2
	EPO black, EPO-Max	2
	Duroplast	2
	Thermoplast	2
Cold mounting	Methacrylates as e.g. KEM 15 plus, 20, 30, 35, 60	2
	Epoxy resin KEM 90	1
	Mounting moulds	2
	Releasing agent	2
Miscellaneous	Ethanol and acetone	2

Ordering Info

Item No.	Unit	Description
		Hot mounting material
		EPO black, epoxy resin, high edge retention **» very high hardness** **» contains a high proportion of glass and mineral filler**
95011990	1 kg	EPO black
95011991	5 kg	EPO black
95011992	10 kg	EPO black
		EPO-Max, black, epoxy resin, high edge retention **» very high hardness** **» easy cleaning of mould and ram due to low adhesion** **» with mineral filler**
95013811	1 kg	EPO-Max
95013812	5 kg	EPO-Max
95013813	10 kg	EPO-Max
		Duroplast blue, diallylphthalate, high edge retention **» general purpose and especially for grinding stones** **» high hardness** **» contains a high proportion of glass fiber**
95011999	1 kg	Duroplast blue
95012000	5 kg	Duroplast blue
95012001	10 kg	Duroplast blue
		Duroplast black, phenolic resin for SEM examinations and electrolytic polishing **» medium hardness** **» conductive, contains graphite particles**
95011993	1 kg	Duroplast black
95011994	5 kg	Duroplast black
95011995	10 kg	Duroplast black
		Thermoplast, acrylic resin for transparent mounts **» ideal for targeted preparations** **» low to medium hardness**
95011996	1 kg	Thermoplast
95011997	5 kg	Thermoplast
95011998	10 kg	Thermoplast

Remarks

"The indicated expiry dates represent the minimum shelf life of the ATM consumables. Complete functionality of the products is guaranteed inside this period in time. Reaching the expiry date does not cause a loss in the functionality of the products. This means they can be used after the date. **Correct storage** is essential to ensure full functionality of the products. It has to be ensured that the consumables are not exposed to strong temperature changes and high humidity.
When outside temperatures are very high, delivery of the liquids of KEM 15, 20, 30, 35 and 60 is restricted. For further information please read the data sheet. The consumables and their packaging should not be opened unless for direct use e.g. cut-off wheels are hygroscopic and cold mounting materials can react with oxygen. This might influence the functionality in the long term. Please, in your interest, ensure you have fresh supplies, do not order too much.
The **expiry date** starts **from shipping date**.
Complaints are checked by our quality management and application team.
Our general terms and conditions remain unaffected by this."

Ordering Info

Item No.	Unit	Description
		Accessories
		Description
92002630	200 g	Cotton wool
92008773	100 Pcs.	Sample cleaning wipes
92004428	300 ml	Sample protection laquer, spray (conservation of samples)
92004265	1 Pcs.	Sample dryer, wall fastening model, with proximity sensor
A5810355	1 Pcs.	Sample drying unit for set up on table
95008893	100 Pcs.	Nitrile gloves, conforms to EN 420, EN 374, size M
95007658	100 Pcs.	Nitrile gloves, conforms to EN 420, EN 374, size L
9500208	100 Pcs.	Nitrile gloves, conforms to EN 420, EN 374, size XL
		Storage of samples
		Description
		Storage systems for readily prepared samples
92002898	1 Pcs.	Disc cabinet 320 x 320 mm, for discs Ø 300 mm with 6 drawers
92002717	1 Pcs.	Disc cabinet, 290 x 290 mm, for discs Ø 200 and 250 mm with 5 drawers
95012025	1 Pcs.	Desiccator cabinet 310 x 525 x 375mm
95012026	1 Pcs.	Shelf for desiccator cabinet
92002684	1 Pcs.	Desiccator, DM 250, with cover and basket, DURAN® clear glass
95002659	1 Pcs.	Desiccator, DM 150, with cover and basket, DURAN® clear glass
92002868	1 kg	KC-drying pearls, for use with desiccator
A7500417	1 Pcs.	Sample box, 320 x 320 x 58 mm for 56 Samples Ø 25-32 mm
A7500418	1 Pcs.	Sample box, 320 x 320 x 58 mm for 25 Samples Ø 38-50 mm
		Cleaning Aids
		Description
		» für universelle Anwendung, zur intensiven Reinigung der Probe vor dem Einbetten
95004662	1 l	Ethanol, 99% denatured
92004510	1 l	Aceton, chemically pure
		Pane cleaning for fume cupboard
		Description
		Pane cleaning set in suitcase
Z7510002	1 Pcs.	» Pane wiper magnet » 2x 30 pcs. cleaning cloths
95006797	1 Pcs.	Pane wiper magnet
95006798	30 Pcs.	Cleaning cloths for glass

Index	page
A	
Acetone	26
Accessories for hot and cold mounting	23
Acrylic resin, hot mountig material	17, 26
Angle adapter	23
Anti-stick agent	23
B	
Bakelite green, red, black	17, 24
Brass brush	26
c	
Cleaning cloths for glass	26
Cold mounting material	10, 20
Cold mounting moulds	6, 22
D	
Desiccator, desiccator cabinet	26
Disopsable gloves	26
Dosing spoon	23
Drying pearls for desiccator	26
Duroplast blue, black	17, 25
E	
Epo	25
Epoxy resin, cold monting material	10, 21
Epoxy resin, hot monting material	17, 25
Ethanol 99.9%	26
F	
Funnel	23
H	
Hot mounting material	17, 24-25
I	
Infiltration unit	8, 19
Infiltration set	19
K	
	10, 20
KC-drying pearls	26
KEM	10, 20-21
L	
Laboratory accessories	26
M	
Methyl-methacrylates, cold mounting material	10, 20-21
Mixing cup	23
Mixing sticks	23
Mountig moulds	6, 22
P	
Pane cleaning set/fume cupboard	26
Pane wiper magnet	26
Phenolic resin, hot mounting material	17, 24
Plastic mounting aids	23
Polypropylene, mounting moulds	6, 22
Pressure appliance	9, 19
Protection gloves/Nitrile	26
PTFE mounting moulds	6, 22
S	
Sample box	26
Sample cleaning wipes	26
Sample drying unit	26
Sample protection lacquer	26
Silicone paste, spray	23
Silicone rubber mounting moulds	6, 22
Steel clip	23
Storage systems for samples	26
T	
Technovit	11, 21
Thermoplast	17, 25
W	
Wall dryer with proximity sensor	26

ATM GmbH · Emil-Reinert-Str. 2 · 57636 Mammelzen · Germany
Telephone: +49 (0) 26 81 / 95 39-0 · Fax: +49 (0) 26 81 / 95 39-20 · E-Mail: info@atm-m.com · www.atm-m.com

ADVANCED MATERIALOGRAPHY

Sign up for our newsletters!

You will occasionally receive exclusive information on seminars/webinars, applications and product news.

Subscribe now:

www.atm-m.com/newsletter
(You may unsubscribe any time)

ADVANCED MATERIALOGRAPHY

ATM Qness GmbH
Emil-Reinert-Str. 2
57636 Mammelzen
Germany

Phone +49(0)2681/9539-0
Fax +49(0)2681/9539-20
E-Mail info@qatm.com
Internet www.qatm.com

part of VERDER scientific