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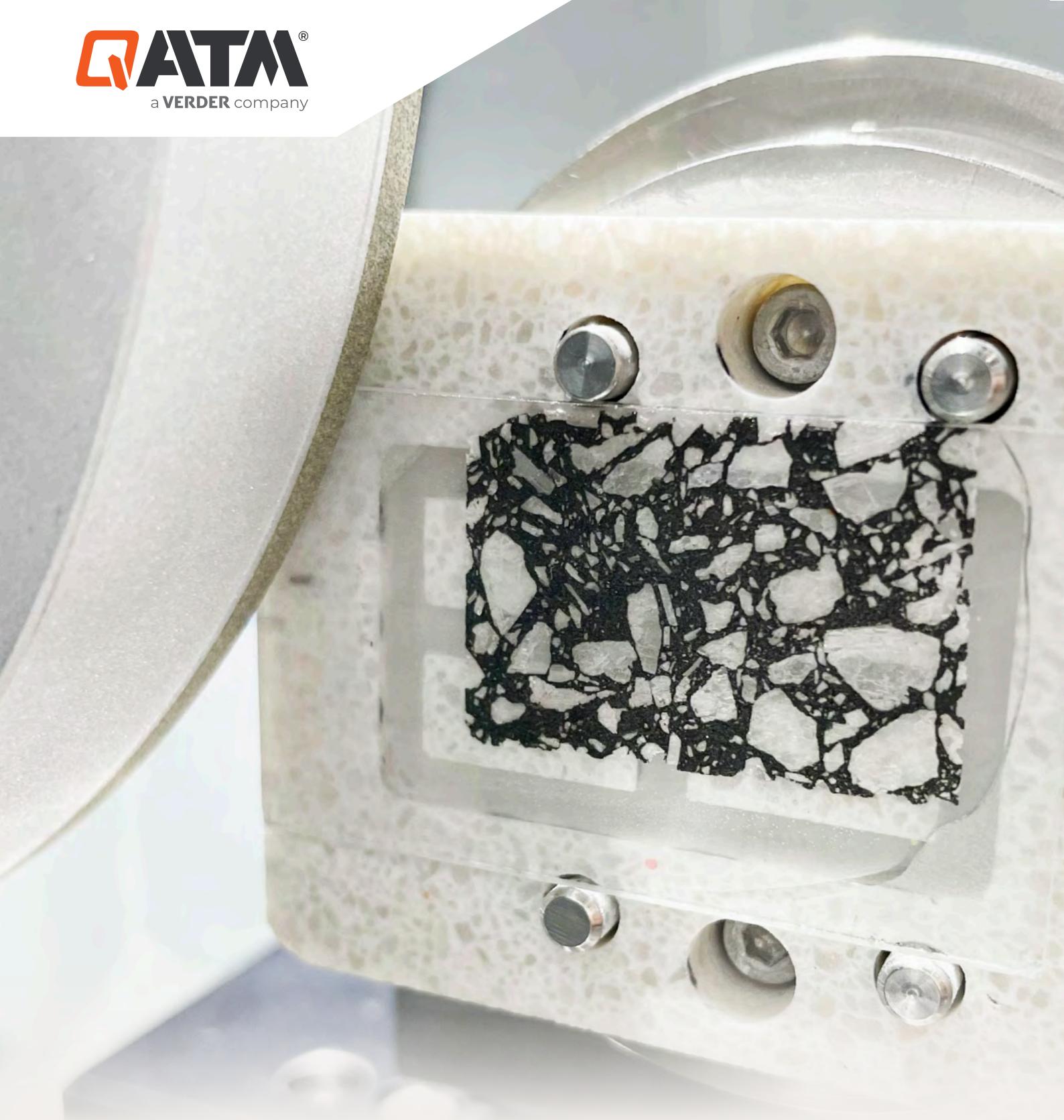

CUTTING | MOUNTING | GRINDING AND POLISHING | THIN SECTIONS

PREPARATION GUIDE FOR GEOLOGY AND MINERALOGY

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HEAT TREATMENT | ELEMENTAL ANALYSIS | MATERIALOGRAPHY & HARDNESS TESTING
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WE ENABLE PROGRESS FOR THE BENEFIT OF MANY

VERDER SCIENTIFIC is composed of leading laboratory equipment companies active in sample preparation and analysis for quality control as well as research & development purposes. As trusted solution partner, VERDER SCIENTIFIC enables thousands of companies to ensure economic, technological and environmental progress by mastering their scientific applications. Together, we make the world a healthier, safer and more sustainable place.

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KNOW EXACTLY WHAT'S INSIDE – WITH PRECISION YOU CAN TRUST

RELIABLE QUALITY STARTS WITH PRECISION

When it comes to mining and material extraction, precision and reliability are essential. QATM's materialographic solutions enable you to achieve consistent, high-quality sample preparation for accurate analysis. From rocks and ores to powders and fossils, our advanced equipment ensures every step of the process is optimized to maintain the integrity of your materials.

Why choose QATM?

- **Damage-free preparation:** Prevent cracks, fractures, and material loss during cutting and mounting.
- **Optimized processes:** Ensure smooth, flat surfaces for detailed grinding and polishing.
- **Versatility:** Perfect for brittle, porous, or soft materials with specialized mounting systems.
- **Reliability:** Consistently achieve accurate results for geological and mineralogical analysis.
- **Efficiency:** Save time and resources with equipment tailored for your specific needs.

SECURE WHAT YOU DO. WITH QATM, YOUR ANALYSIS IS IN SAFE HANDS.

OPTIMIZE YOUR MINING PROCESSES WITH QATM'S ADVANCED MATERIALOGRAPHIC SOLUTIONS

Materialographic sample preparation is an essential step in the qualitative and quantitative analysis of geological and mineralogical samples. Whether you want to analyze rocks, ores, minerals or fossils, you need a reliable and precise method to cut, mount, grind and polish your samples. With QATM equipment and consumables, you can optimize this process and achieve high-quality results.

In this guide, we present some of our most important products and applications for materialographic sample preparation for geology and mineralogy. You will find a brief description of the features and benefits of our cutting machines, mounting systems and grinding and polishing machines, as well as some examples of typical samples that you can prepare with our equipment and consumables.

The preparation process begins with cutting of a representative sample from starting material. The correct selection of the cutting process ensures the production of a sample without damage and with a flat surface that facilitates the subsequent process steps. An incorrectly selected or performed cutting process can lead to irrevocable damage to the sample. Brittle, porous or broken samples should be impregnated with suitable mounting materials before sectioning to prevent damage during cutting.

For powders or so-called 'soft rocks', it must be ensured that the samples are sufficiently deagglomerated and that the powder particles are securely enclosed by the mounting material to prevent them from breaking out later.

CUTTING

QATM offers a wide range of cut-off machines for different materials, shapes and sizes. You can choose between manual, semi-automatic and fully automatic cut-off machines, all of which are equipped with powerful motors, robust housings and advanced safety features. With the cutting machines from QATM, you can cut your samples quickly and cleanly without damaging or deforming them.

QATM cutting machines are ideal for separating geological and mineralogical samples, such as

- Rock samples, such as granite, basalt, sandstone, limestone, marble, slate, quartzite, gneiss, etc.
- Ore samples, such as iron ore, copper ore, zinc ore, gold, silver, platinum, etc.
- Mineral samples, such as feldspar, quartz, calcite, pyrite, tourmaline, beryl, topaz, etc.
- Fossil samples, such as fossilized plants, animals, bones, shells, etc.

Our cut-off machines can be equipped with various cut-off wheels suitable for the hardness, density and sensitivity of your samples. You can choose between diamond, CBN, corundum or silicon carbide cut-off wheels, all of which offer a high cutting speed, precision and service life. Our cutting machines also have an effective coolant supply that cools and lubricates your samples during cutting to prevent thermal damage and dust formation.

Precision cut-off machine Qcut 200 A

- **Various operating modes, including grinding mode with diamond cup wheels**
- **Cross feed**
- **'Zone cutting' function**
- **Integrated honing device for diamond cutting discs**
- **Integrated database for cutting processes**

Qprep Diamond precision cut-off wheels

For cutting hard materials, QPREP Diamond precision cut-off wheels are the optimal choice, as they cut materials such as ceramics without smearing. The bond is made of bronze. The diamonds can be "dressed" to take full advantage of the cutting performance of the diamond particles again after a longer period of use.

PRODUCT ADVANTAGES

- Diamond as abrasive enables cutting of hardest materials
- Separates hard material without smearing
- The dressing functionality of our QATM cut-off machines
  ensures that the diamonds always maintain maximum cutting performance

RECOMMENDED APPLICATIONS

- Cutting hard and brittle materials such as ceramics and glass
- Cutting of mineral samples like rocks
- Cutting of specimens with brittle plasma coating

MOUNTING

QATM offers various solutions for mounting and impregnating your rock samples, depending on your preferences and requirements. You can choose between hot and cold embedding, as well as between different mounting materials, such as epoxy resins or acrylates. With the mounting systems from QATM, you can stabilize, protect and prepare your samples for the subsequent preparation process.

Our mounting systems are ideal for mounting geological and mineralogical samples, e.g:

- Rock samples that exhibit high hardness, porosity or fissuring, and that require uniform support and a good edge connection.
- Ore samples that have a high density, heterogeneity or sensitivity, and which require good filling and low shrinkage.
- Mineral samples that have a high transparency, color or structure and that require a clear view and low discoloration.

The most common method for mineralogical samples is cold mounting with epoxy resins. For thin sections, but also for thin sections of powdered samples, low-viscosity epoxy resins are used to fill pores and cracks well and, in the case of powders, to enclose them well with mounting material. The refractive index of these mounting materials should be similar to that of glass in order to avoid distorting the results later during light microscopic analysis.

The curing time of these epoxy resins is between three and 24 hours.

Hot mounting

- Hot mounting is carried out in hot mounting presses at high pressures and temperatures.
- Thermosetting mounting materials for high hardness and thermoplastic mounting materials for transparent mountings are available as hot mounting materials.
- Hot mounting provides the best edge retention and planarity and is ideal for wet chemical etching.

Cold mounting

- QPREP cold mounting materials are suitable for heat- or pressure-sensitive samples.
- Cold mounting uses chemical reactions to cure the mounting material, with acrylic resins, epoxy resins, and polyester resins available.
- The selection is based on properties such as reaction time, removal rate, and hardness.
- Cold mounting can be used for a variety of sample materials and shapes in various sizes.

UV mounting

- UV mounting materials consist of filler-free modified acrylic resins.
- They are cured under UV irradiation within a narrow wavelength range and require specially designed equipment.
- The UV initiators present in the resin absorb UV radiation for the initiation of the reaction.
- UV mounting is the fastest method without the need for high pressures or external heat.
- The 1-component systems used do not require mixing, result in transparent mountings, and enable safe work in the laboratory.

Pores and cracks must be filled with the mounting material under vacuum with the aid of the QATM vacuum impregnation device. The samples to be mounted are placed in the vacuum container, which is then evacuated with the help of the connected vacuum pump. The pores and cracks are emptied of air and the low-viscosity mounting material can then penetrate the cavities under vacuum. After filling the molds with mounting material, the vacuum container can be vented and the samples can be removed for curing.

For polished specimens, it has proven useful to initially mount only a layer approx. 5 mm thick and then fill the specimen to a workable height in a second step after any specimen labeling.

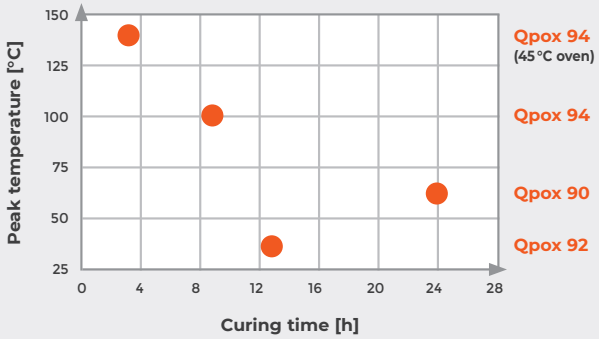
To avoid bubble formation, the samples can be stored for two hours under 2 bar overpressure after filling the mounting mold with the mounting material.

Alternatively, a light-curing mounting material (Qprep UV50 & UV55) can also be used for mounting. Due to the higher viscosity of these mounting materials, complete impregnation of cracks and pores cannot usually be achieved.

Powdered samples can also be mounted in a hot mounting press under pressure and temperature. Common sample diameters are Ø 25 to 30 mm, and larger sizes are possible.

Specimens intended for grinding & polishing can be prepared directly after mounting, and specimens intended for thin sections must be processed further.

Epoxy resins comparison chart



GRINDING AND POLISHING

QATM offers an extensive range of grinding and polishing machines for your samples, equipped with modern technology, high performance and easy operation. You can choose between manual, semi-automatic and fully automatic grinding and polishing machines, compatible with a wide range of grinding and polishing wheels, abrasives and polishing agents. With QATM's grinding and polishing machines, you can bring your samples to the desired surface quality.

Our grinding and polishing machines are ideal for grinding and polishing geological and mineralogical samples, such as:

- Rock samples that have high hardness, heterogeneity or texture, and that require a smooth, flat and reflective surface.
- Ore samples that have a high density, mineralogy or metal content and that require a fine, uniform and high-contrast surface.
- Mineral samples with high transparency, color or texture that require a clear, clean and detailed surface.

Our QPREP consumables program offers various grinding and polishing wheels that are suitable for materials of different hardness, density and sensitivity. You can choose between aluminum oxide, silicon carbide or diamond grinding pads and various polishing cloths, as well as different diamond pastes, sprays or suspensions that offer high removal rates, precision and quality. Our grinding and polishing machines also have an intelligent control system that allows you to automatically adjust the grinding and polishing parameters, such as speed, pressure, time and direction of rotation.

BULK SAMPLES

Polished sections are prepared for light microscopic evaluation and for analytical procedures in the scanning electron microscope. After mounting the powder sample or solid samples in epoxy resin as described above or by hot mounting, the actual sample preparation can be carried out in accordance with 'normal' materialographic sample preparation methods. Manual or semi-automatic preparation devices such as the QATM Qpol 300 A1/A2 are used for this purpose. For larger sample volumes, however, preparation is also carried out on fully automatic preparation systems such as the Qpol 250 BOT or the Qpol 300 BOT using central pressure.

For example, the preparation can be carried out according to the following suggested method.

PREPARATION SUGGESTION

STEP	MEDIUM		rpm	rpm	Single pressure N	min
Pre-Grinding	GALAXY RED P120	H_2O	100	◄► Counter Rotation	20	Until plane
Grinding	GALAXY GREEN P320	H_2O	100	►► Synchronous Rotation	20	5:00
Grinding	GALAXY BLUE P600	H_2O	100	►► Synchronous Rotation	20	5:00
Pre-Polishing	GALAXY PHI	Dia-Complete Poly, 6 µm	100	►► Synchronous Rotation	25	5:00
Polishing	GALAXY DELTA	Dia-Complete Poly, 3 µm	100	►► Synchronous Rotation	25	5:00
Final polishing	GALAXY IOTA	Dia-Complete Poly, 3 µm	100	►► Synchronous Rotation	25	5:00

Qprep diamond grinding wheels from the Galaxy series are used for the grinding process, particularly in fully automatic preparation systems.

Qprep GALAXY diamond grinding disc

QPREP GALAXY diamond grinding discs are equipped with specially arranged elements, which contain resin-bonded diamond grains, on a stainless-steel metal carrier. They are used for planar and fine grinding of medium-hard and hard materials. The color-coded grinding discs cover the FEPA grain sizes P80 to P1000. The color coding for the individual grain size ranges can be found in the application table.

PRODUCT ADVANTAGES

- High stock removal
- Short processing times
- High planarity

RECOMMENDED APPLICATIONS

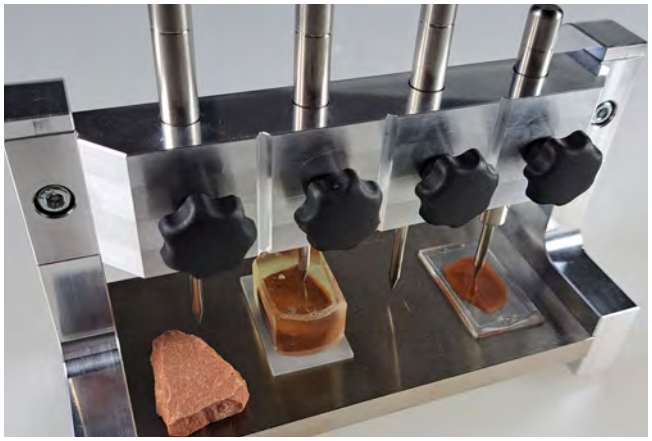
- Steel with medium and high hardness
- Cast iron (CJS / CJL)
- Composites
- Hard metal
- Glass

THIN SECTIONS

Samples intended for thin sections are ground flat after cutting and mounting. Depending on the material, an abrasive grain size of 65-75 µm can be used. Grinding is carried out with low contact pressure, low speed and good cooling. The sample should be checked under a stereomicroscope after each preparation step. Coarse scratches should be avoided.

After the sample has dried, it is glued to a glass slide with the ground side. The adhesive used is either Qpox 90, 92 or 94 or Qprep 50UV or 55UV with light curing. To avoid detachment or bubble formation, the sample should be pressed on with the QATM thin section press.

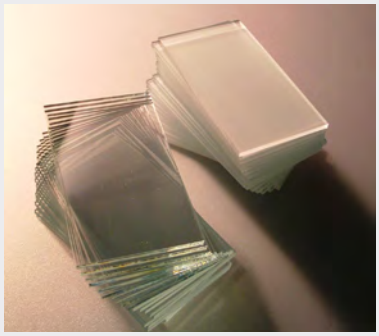
The glass slide to which the sample is glued must have a defined or known thickness for subsequent analysis procedures; if necessary, it should be pre-ground to a defined thickness. One side of the slide should be roughened for better adhesion of the adhesive. The QATM glass slides fulfill both the requirement for a defined thickness and the requirement for a roughened surface.

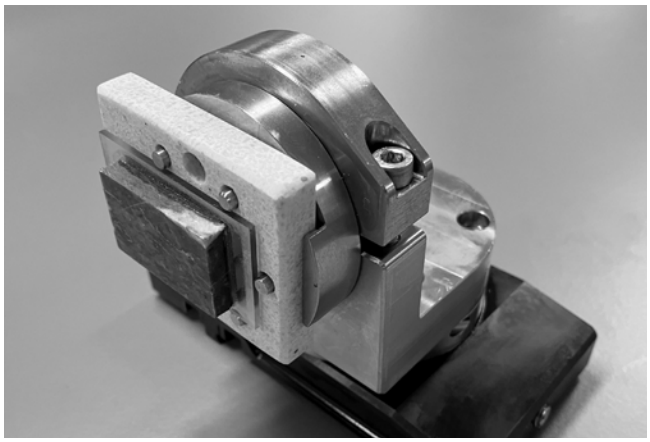


Bonding jig

Glass slides for thin sections

- Low-stress glass to prevent glass breakage
- Glass thickness >1.5 mm also to prevent glass breakage
- Uniform glass thickness with low tolerances (±0.05 mm)
- For low removal (time and costs) during surface grinding
- Ground edges (90°) to prevent injuries and chipping
- Defined refractive index
- Matting through selected (grain size) sandblasting process (optional)





After the adhesive has hardened, the sample is now 'pre-thinned' by cutting. To do this, the glass slide is clamped in a vacuum clamping device, which is available for the QATM Qcut 150 A and Qcut 200 A. The sample is now pre-cut to a thickness of 300 to 1000 µm while maintaining plane parallelism. The thickness to be achieved depends on the material, the mounting and the cutting machine.

The sample is then ground to a final thickness. This grinding process can be carried out on the QATM Qcut 150 A or 200 A precision cutting machines. The vacuum clamping device described above is then also used for clamping. Qprep diamond cup wheels of various grit sizes are used for grinding.

Qprep Diamond cup grinder

If a specimen with parallel faces is desired after precision cutting the use of a diamond cup wheel for further processing is recommended. Used in our precision cutting machines Qcut 150 M, Qcut 150 A and Qcut 200 A with vacuum specimen holder, the QPREP diamond cup grinder enable the user to achieve optimum planar parallelism with high surface quality and reproducibility.

PRODUCT ADVANTAGES

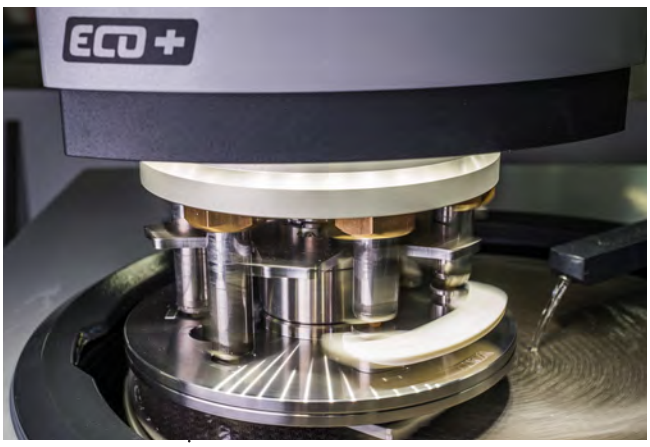
- Planar parallel sample preparation
- Stock removal with high accuracy
- High degree of reproducible accuracy

RECOMMENDED APPLICATIONS

- Target preparation
- Defect analysis
- Thin section technology
- Petrographic examinations

This grinding process can be carried out on the QATM Qcut200A with optimum reproducibility thanks to the high-precision automatic Z-axis. Polishing the resulting thin sections is usually not necessary.

The grinding process can also be carried out on the QATM Qpol 300 A1 grinding and polishing machine, for example. Specimen holders for preparation in single or central pressure mode are available for this purpose. Preparation in single contact pressure is particularly flexible here. The specimens are pressed down particularly evenly using two pressure stamps. Silicon carbide abrasive papers with different abrasive grain sizes are available for grinding and, if necessary, polishing. Abrasive papers can be used for all minerals and ores. They offer optimum grinding results for soft and sensitive samples.



Qprep diamond grinding wheels with different bond types offer higher stock removal, excellent flatness of the samples and low relief formation.

For mineralogical samples, diamond grinding wheels with a resin or metal bond are mainly used.

Qprep POLARIS H diamond grinding disc

QPREP Polaris H is a grinding disc on a zinc-plated metal carrier for pre- and fine grinding of hard materials. The backside of the product is coated with a high-quality non-slip print. The grinding disc is equipped with diamonds bonded in hard synthetic resin. The functional back print provides secure adhesion to the magnetic foil.

PRODUCT ADVANTAGES

- High stock removal
- Particularly high planarity with high surface quality
- Long lifetime

RECOMMENDED APPLICATIONS

- Metal materials of higher hardness > 500HV
- Fiber reinforced plastics
- Composites
- Ceramics
- Rocks

Qprep VEGA diamond grinding disc

QPREP Vega is a grinding disc on a zinc-plated metal carrier for planar and pre-grinding of hard materials. On the back side the product is coated with a high-quality non-slip print. The grinding disc is equipped with diamonds bonded in nickel. The functional back print provides secure adhesion to the magnetic foil.

PRODUCT ADVANTAGES

- High stock removal
- Particularly high planarity
- Very long lifetime

RECOMMENDED APPLICATIONS

- Hard ferrous materials
- Composites
- Ceramics
- Rocks
- Possible to grind unmounted samples
- Especially recommended for manual preparations

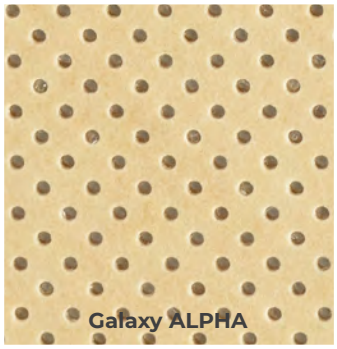
With this grinding process, the sample, glued to the glass slide is carefully ground to a final thickness of 20 to 30 µm. Pores or cracks opened by 'pre-thinning' (cutting to 300 - 700 µm thickness) must be closed before grinding. A suitable medium such as Qpox 94 should be used for this purpose. The final thickness of the sample depends on the material and the task. One criterion for the correct thickness is the inherent color of the material. For example, quartz is always white. If there is a yellowish tinge, the sample is still too thick. For easier assessment, the QATM sample holders for individual prints have an opening in the middle to allow the colors to be assessed without removing the samples. The grinding process can be completed with a grit size of 22 to 18 µm.

For an examination in reflected light, polishing must then be carried out. The following polishing cloths can be used for this purpose.

POLISHING CLOTHS

Polishing cloth	Suggested grain size	Abrasive	Properties	Application
Galaxy PHI	9 - 1 µm	Diamond	Medium hard chemical fiber cloth	Medium hard chemical fiber cloth
Galaxy ALPHA	15 - 3 µm	Diamond	Very hard, perforated chemical fiber cloth	High lifetime and stock removal
Galaxy DELTA	9 - 3 µm	Diamond	Medium hard silk cloth	Suitable for pre- & intermediate polishing
Galaxy IOTA	3 - 0.05 µm	Diamond, oxide suspension	Short flocked, soft synthetic cloth	Suitable for end polishing as well as fine polishing with fine polishing suspension


Galaxy PHI


Galaxy ALPHA


Galaxy DELTA


Galaxy IOTA

EQUIPMENT AND CONSUMABLES FOR GEOLOGY AND MINERALOGY

CUTTING

M1870020	Qcut 150 A base machine 200-240 V, 50/60 Hz
M1870021	Qcut 150 A base machine 100-120 V, 50/60 Hz
Z1870020	Table attachment, manual cutting of sample materials
M1891000	Qcut 200 A base machine 200-240 V, 50/60 Hz
M1891001	Qcut 200 A base machine 100-120 V, 50/60 Hz
Z1870028	Vacuum clamping unit, suitable for clamping glass slides 28 mm x 48 mm
01870288	Vacuum holder
Z2236031	Easy-clamping base S with rotating unit, horizontal support for quick clamping of various small clamping devices
Z2236033	Easy Adaption vertical, vertical support for quick clamping of various small clamping devices
Z1304600	Vacuum pump 230 V / 50 Hz
92006368	Diamond cut-off wheel B200 Ø200 x 12.7 mm, Glass, ceramics, rocks
95017564	Diamond cup grinder Ø150 x 21.5 x 12.7 mm D252
95015123	Diamond cup grinder Ø150 x 21.5 x 12.7 mm D151
95017562	Diamond cup grinder Ø150 x 21.5 x 12.7 mm D126
95015122	Diamond cup grinder Ø150 x 21.5 x 12.7 mm D64
95017563	Diamond cup grinder Ø150 x 21.5 x 12.7 mm D12

MOUNTING

M0800002	Qpress 50-4 (basic unit, 230 V) type 1+3
M0800003	Qpress 50-4 (basic unit, 110 V) type 1+3
M0800004	Qpress 50-2 (basic unit, 230 V) type 1+1
M0800005	Qpress 50-2 (basic unit, 110 V) type 1+1
M0770000	Opal 410 base machine
M0761000	Qmount base machine 100-240 V 50/60 Hz
M6500001	infiltration device, 230 V / 50 Hz, 0.8 bar
95016569	Qprep Pressure pressure unit
95017722	Bonding jig
95017315	Cold mounting material Qpox 90, Set
95017316	Cold mounting material Qpox 92, Set
95017538	Cold mounting material Qpox 94, Set
95016840	UV-mounting material Qprep UV 50
95017495	UV-mounting material Qprep UV 55
95011990	Hot mounting material EPO Black
95011981	Hot mounting material Bakelit Black
95017713	Slide 48x28 mm, cutted edges, clear
95017714	Slide 48x28 mm, ground edges, clear
95017715	Slide 48x28 mm, cutted edges, matted
95017716	Slide 48x28 mm, ground edges Kanten, matted
95017717	Coverslip 24x24 mm
95017718	Coverslip 24x40 mm
95017719	Slide box for 25 slides, wood
95017720	Slide box for 50 slides, wood
95017721	Slide box for 100 slides, wood
95017723	Cover medium, xylene free
95017724	Hand-held sample holder for thin sections
95017725	Holder for thin sections 76x32 to 48x28 mm for microscopy

GRINDING AND POLISHING

M5631060	Qpol 300 M1 base machine 200-240 V / 50/60 Hz
M5631065	Qpol 300 M1 base machine 100-120 V / 50/60 Hz
M5631101	Qpol 300 A1-ECO+ base machine 200-240 V
M5631106	Qpol 300 A1-ECO+ base machine 100-120 V
M5805050	Qpol 250 BOT base machine 230 V / 50 Hz
M5805051	Qpol 250 BOT base machine 110 V / 50 Hz
On request	Qpol 300 BOT base machine
M565100	Qpol Vibro base
Z5446091	Sample holder Geology, single pressure, incl. 3x sample holder insert 'Giessener format' 48x28 mm
Z5651021	Sample holder QpolVibro for thin sections 48x28 mm
95004314	GALAXY diamond grinding disc red 300 mm
95004315	GALAXY diamond grinding disc green 300 mm
95004316	GALAXY diamond grinding disc blue 300 mm
95012741	GALAXY – PHI 300 mm, polishing cloth
95001409	GALAXY – ALPHA 300 mm, polishing cloth
95001415	GALAXY – DELTA 300 mm, polishing cloth
95001421	GALAXY – IOTA 300 mm, polishing cloth
95011842	DIA-COMPLETE POLY 6 µm, diamond suspension
95011841	DIA-COMPLETE POLY 3 µm, diamond suspension
95011840	DIA-COMPLETE POLY 1 µm, diamond suspension

Further consumables for cutting, embedding, grinding and polishing can be found in our extensive consumables catalog.

CONTACT US TODAY

If you would like to find out more about materialographic sample preparation for geology and mineralogy, or if you are interested in our products, please do not hesitate to contact us. We will be happy to advise you and provide you with a customized offer that meets your needs and budget. You can contact us by phone, e-mail or via our website. We look forward to your inquiry.

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