

TegraSystem



**The proven label for
efficient and reproducible
specimen preparation**

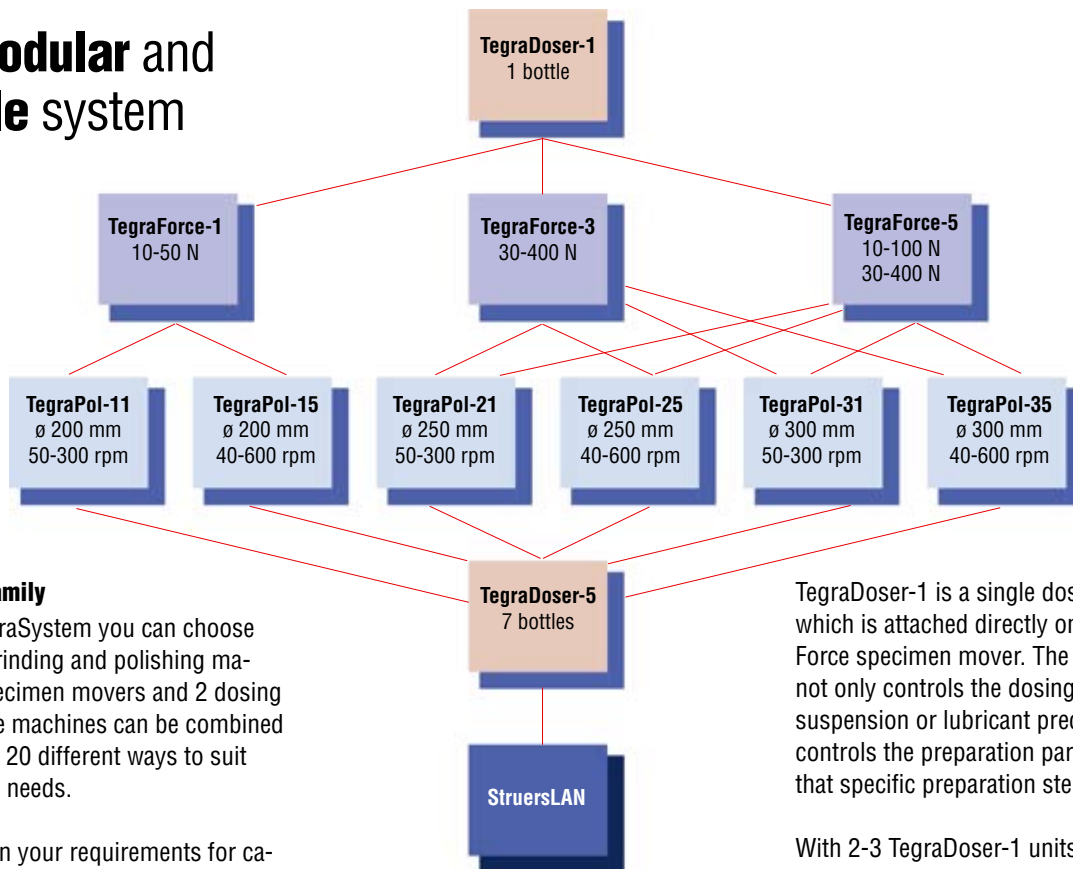


The TegraSystem is designed as a flexible modular system, which you can combine to fulfil your specific needs. Use a single element or several. Expand and adapt the modules to meet your developing needs. With the TegraSystem you will gain the benefits of efficiency, reproducibility and network integration. And you will enjoy the reliability of proven technology from the market leader.

- Modular and flexible system that can be adapted to fit your specific needs
- High efficiency and reproducibility is ensured due to precise control of all preparation parameters
- Consumable costs are reduced and specimen throughput is increased due to improved efficiency
- Easy to operate with large graphical display and pre-installed preparation methods
- LED light illuminates the preparation area
- The emergency switch stops all moving parts in case of an emergency
- Networking allows you to share your methods and improve efficiency and standardization
- Preparation methods can be downloaded from the Internet and used immediately
- Preparation methods are automatically recalculated to suit different system sizes
- Only one power, water and air connection is necessary to supply the whole system
- Durable and proven technology ensures years of trouble-free operation



The modular and flexible system



The Tegra family

With the TegraSystem you can choose between 6 grinding and polishing machines, 3 specimen movers and 2 dosing systems. The machines can be combined in more than 20 different ways to suit your specific needs.

Depending on your requirements for capacity, the workflow in your lab and the number of different materials you have to prepare, a TegraSystem solution is available that meets your specific demand for capacity and flexibility at the same time. Truly a customized solution.

Reproducibility is the key

In all materialographic specimen preparation, being able to reproduce preparation results that are exactly the same every time is crucial to success. Many factors have an influence on your ability to achieve the necessary reproducibility, and many of these can be controlled by employing automated preparation equipment like the TegraSystem.

Ensuring reproducibility and efficiency

Your workload and need for flexibility should determine the size of your TegraSystem. However, no matter how many or few specimens you need to prepare, the investment in a TegraForce specimen mover will be beneficial. The operator avoids the often tedious manual preparation tasks, and since the TegraForce specimen mover controls the force applied precisely, specimens are prepared exactly the same way every time, independent of operator skills. For labs with many specimens, specimen movers are the only way to ensure cost-effectiveness since up to 12 specimens can be prepared simultaneously.

Adding a TegraDoser-5 dosing system further improves reproducibility, efficiency and cost-effectiveness. With the ability to store and recall preparation methods, this dosing system yields exactly the same preparation results every time the preparation procedure is performed. The high level of automation also allows for unattended preparation, thus improving the lab efficiency by giving the operator free time for other tasks. Cost-effectiveness is further increased by automating and controlling consumable consumption.

The innovative approach

The modular concept lets your TegraSystem grow and develop with your needs and challenges. For the lab with few specimens or repetitive preparation of the same material every day, the TegraDoser-1 is an innovative approach to automated preparation.



TegraDoser-1 is a single dosing unit, which is attached directly onto the TegraForce specimen mover. The dosing unit not only controls the dosing of diamond suspension or lubricant precisely, but also controls the preparation parameters for that specific preparation step.

With 2-3 TegraDoser-1 units it is possible to run an entire preparation method simply by exchanging the dosing unit. Reproducibility is ensured since the preparation parameters are exactly the same every time. The necessary investment is low in relation to the benefits achieved.

Combined with the all-in-one diamond suspensions from Struers, this solution allows for unattended preparation and ensures high quality and cost-effective preparation results.

The Tegra Family of high quality specimen preparation equipment can be configured efficiently in a variety of ways and is ideal for all levels of specimen throughput requirements. The TegraSystem combines ease of operation with extreme flexibility and gives you the highest degree of reproducibility – even in the most challenging working environment.

As you will see on the following pages, the TegraSystem holds unique advantages for fast, efficient and cost-effective grinding and polishing in a safe and healthy working environment.

The TegraPol grinding and polishing machines

The TegraPol grinding and polishing machines are a series of sturdy, reliable and powerful machines, based on proven technology and designed for preparation of all types of materialographic specimens.

- TegraPol is available in 3 disc sizes to meet all capacity requirements
- Can be used for manual preparation or be equipped with specimen mover and dosing system
- Available in 2 speed versions for standard specimen preparation and special applications
- Easy and straightforward operation
- TegraPol automatically detects connected units, no configuration is necessary
- TegraPol power supplies all connected units
- Sturdy and powerful design ensuring years of trouble-free operation

Large variety in size and capability

The TegraPol machines are available with 3 different disc sizes meeting all requirements for capacity.



The 300 mm TegraPol

The 300 mm machines are sturdy, single disc units designed for intensive use and for the preparation of many or large specimens. TegraPol-31 has a speed range from 50-300 rpm, where TegraPol-35 has a wider range from 40-600 rpm, specifically designed for preparation of materials requiring higher flexibility in speed.



The 250 mm TegraPol

TegraPol-21 and TegraPol-25 are single disc units with 250 mm disc size, designed for all standard applications. TegraPol-21 has a lower variable speed from 50-300 rpm, whereas TegraPol-25 yields variable speed from 40-600 rpm.



The 200 mm TegraPol

If you are preparing a limited number of specimens and still have high requirements to preparation quality, the 200 mm single disc machines are the perfect solution. TegraPol-11 is a unit covering all basic requirements with a speed of 50-300 rpm, whereas TegraPol-15 has a higher speed range from 40-600 rpm



For TegraPol-11 / -15 a disposable bowl liner is available to facilitate cleaning of the machine considerably.



The oval opening on the TegraPol machines grants easy access when exchanging consumables. At the same time it allows to place the specimen holder or specimen mover disc in the best possible position over the preparation disc to achieve optimum preparation results.



Emergency stop

Added equipment is automatically detected

As soon as a TegraForce or a TegraDoser is connected, the TegraPol automatically detects which unit has been connected and no configuration is required. The operation of the whole system is carried out on the TegraPol. A large graphical display ensures easy and straightforward operation.

In the TegraSystem, the TegraPol is the only machine connected to the power mains. All other units are supplied directly from the TegraPol. The advantage here is of course the limited need for power outlets at your facilities. The power supply for all connected equipment is only 24 V.

Emergency stop

All TegraPol machines are equipped with an emergency stop, for immediate stopping of all moving parts in case of an emergency

Environmentally-friendly recirculation system

A recirculation cooling unit can be connected to the TegraPol grinding/polishing machines. Controlled from the TegraPol, it is started and stopped automatically. Polluted debris from the preparation can be collected safely and the cooling water is utilised repeatedly. This reduces pollution and waste of water and eliminates the risk of corrosion of specimens by ordinary tap water.



Recirculation System

The TegraForce specimen movers

Mounting a specimen mover on the TegraPol is the first step towards automatic preparation. The precise control of all preparation parameters including the force is necessary to ensure reproducible preparation results. This is only obtained by electronic force control and, on TegraForce; the force on the specimens can be exerted very precisely. Both single specimens and specimens in holders can be prepared on the TegraForce specimen movers and the advantages are many:

- High reproducibility through precise control of preparation parameters
- Preparation of single specimens with individual force applied – flexibility is maintained and there is no need for dummy specimens
- Preparation of large or large amounts of specimens in holders saves time and increases volume

Preparation of single specimens

When single specimens are inserted in a specimen mover plate, the force is applied individually to each specimen. With this outstanding feature there is no need for dummy specimens. If your workflow demands short response-times you will benefit greatly from the individually applied force and maintain maximum flexibility. The preparation of individual specimens starts with grinding using fine grain sizes. There is no need for coarse pre-grinding since each specimen is levelled and ground independently. Very low force (10 N) can be applied on the individual specimen allowing for preparation of very fragile materials.

Using specimen holders

If a large amount of material has to be removed specimens have to be clamped in specimen holders. When using specimen holders the force is applied centrally, guaranteeing perfect planeness of all specimens. The use of specimen holders makes large numbers of specimens easier to handle and easier to clean, which

all adds up to a higher throughput and a more cost-efficient preparation.

The small specimen mover – TegraForce-1

TegraPol-1 is designed to be mounted on a TegraPol-11 or TegraPol-15 and is suitable for preparation of both single specimens and specimens clamped in a specimen holder. 1, 2 or 3 specimens of up to 40 mm/1½” diameter can be fine ground and polished individually. For high removal rate or when plane grinding is required, the 120 mm diameter specimen holder where 3 specimens are prepared simultaneously is used.

The strong specimen mover – TegraForce-3

TegraForce-3 is a high capacity specimen mover for preparation of specimens in a specimen holder only. This makes it suitable for the preparation of a large volume of specimens as well as large specimen sizes. The TegraForce-3 is a powerful machine with the capacity to prepare all materials, including plane grinding of hard materials.

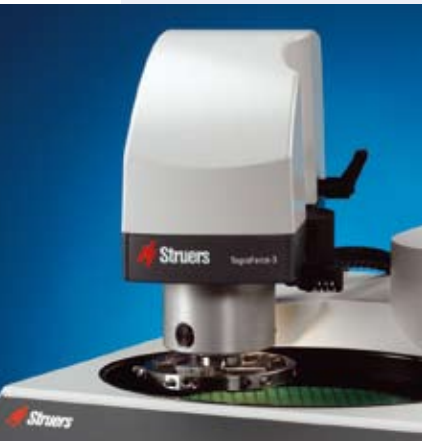
The multipurpose specimen mover – TegraForce-5

TegraForce-5 is designed to handle both single specimens and multiple specimen preparation. Up to 6 single specimens can be inserted in a specimen mover plate, where the force is applied individually to each specimen. For multiple specimen preparation the use of specimen holders makes large numbers of specimens easy to handle and easy to clean, which all adds up to a higher throughput and a more cost-efficient preparation.

The TegraForce-5 is fully automatic. When specimens clamped in a holder are prepared, the TegraForce-5 is automatically moved up as soon as the preparation step is finished, while it stays down if single specimens are being prepared. Additionally, a guiding system has been developed to position the specimen mover in the same position over the preparation disc every time.



TegraForce-1



TegraForce-3



TegraForce-5



General features of TegraForce

TegraForce-3 and TegraForce-5 can be used on both the 250 mm and 300 mm TegraPol, depending on the holders used. On the 250 mm TegraPol disc, 140 mm diameter holders or specimen mover discs should be used, and on the 300 mm TegraPol disc, holders up to 160 mm can be used. The lifting capacity of both of these machines is about 5 kg / 11 lbs. Thus even the heaviest specimens can be prepared.

To avoid damage when the preparation is started, the specimen holder or the pressure feet are lowered at reduced force. After a few seconds, the force applied to the specimens is slowly raised to the pre-set value.

On TegraForce the force can be reduced automatically towards the end of the preparation, resulting in lower material removal and smaller scratches. This saves time on the following preparation steps, since the amount of deformation to be removed is minimised.

All TegraForce are equipped with LED illumination. While providing extra light to the preparation area, LED's grant very long lifetime and minimum power consumption, making them most environment-friendly.

Accessories

Struers offers a wide range of accessories to all the TegraForce specimen movers. The TegraForce units are compatible with all Struers specimen holders and specimen mover plates, enabling specimens of any size or shape to be prepared. For the manufacture of your own special specimen holder designs, Struers can deliver holders and specimen mover plates without holes.

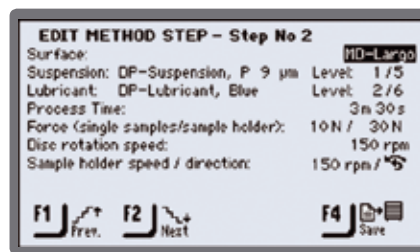
Please refer to separate brochure for comprehensive information on specimen holders and specimen mover plates.



LED illumination

The TegraDoser-5 dosing system

Data management and
method details on
TegraDoser-5



Adding an automatic dosing system to your TegraSystem gives you complete control of the entire preparation process and thus the quality of your preparation results and the costs involved.

- Built-in database with 10 pre-programmed Metalog Guide methods
- Built-in database with up to 200 methods leaves you in complete control
- Easy programming and large graphic display
- Excellent reproducibility
- Cost saving specimen preparation
- High-quality peristaltic pumps guarantee exactly the same dosing every time
- No vaporization or spray mist
- Automatic recalculation of method parameters when exchanged between different machines
- Automatic dosing of Oxide Polishing Suspensions
- Configuration according to your needs



Control the quality of your results

Manual dosing always implies certain variations in the amounts of abrasives and lubricants being dosed, and in the intervals between each dosing. TegraDoser-5 ensures that exactly the same amount is dosed each time – no matter how many times a preparation sequence is carried out.

But TegraDoser-5 is much more than just a dosing system. The built-in database can contain up to 200 preparation methods that can be stored and recalled at any time. This gives you full control of all preparation parameters and methods, regardless of which technician, machine or laboratory performs the job. Exactly repeatable settings give reliably reproducible results and frees resources from routine checks and repeats.

On a large graphical display preparation methods can easily be programmed and edited, whereas the method is selected and started at the TegraPol.

No vaporization or spray mist

The peristaltic pumps on the TegraDoser transport both suspensions and lubricants to the polishing cloth. In other dosing systems the suspension is vaporized and sprayed onto the cloth, resulting in an unhealthy spray mist. With the TegraDoser the liquid is dosed exactly where you want it on the cloth, improving preparation quality and improving the working environment.



Choose between 3, 4, 5 or 6 pumps for diamond suspensions/lubricant both with and without the pump for Oxide Polishing Suspensions.

Control your consumables costs

With the help of TegraDoser the dosing of suspensions and lubricants can be adjusted to the exact amount necessary for the preparation method in question. This will result in substantial savings on the consumables account. And TegraDoser also enables the operator to attend to other tasks during the preparation process – the dosing is automatically taken care of.

Automatic recalculation of preparation methods

A preparation method always needs to be adapted to the disc size of the grinding and polishing machine employed. As an example, the amount of suspension and lubricant that has to be applied on a 200 mm disc system is much less than the amount needed for a 300 mm disc system, simply because the surface area is smaller. The TegraSystem takes complete care of these required adjustments. Since the TegraSystem automatically detects the connected machines and units it can also automatically recalculate preparation methods to fit all system sizes. This ensures that preparation quality and reproducibility is maintained when preparation methods are being exchanged between machines, colleagues and labs.

Automatic dosing of Oxide Polishing Suspensions

The use of peristaltic pumps also makes it possible to include the dosing of oxide polishing suspensions in an automatic dosing unit. No other separate dosing units offer this feature. In addition, when working with oxide polishing suspensions, water is automatically applied onto the polishing cloth before and after the preparation. This ensures that the cloth is prepared prior to the polishing and that both specimens and cloth are cleaned afterwards.

TegraDoser-5 can be equipped with up to 7 peristaltic pumps, 6 for diamond suspensions or lubricants and 1 for Oxide Polishing Suspensions.

The TegraDoser-1 dosing system

If your specimen preparation only involves one method or a small number of specimens, the TegraDoser-1 concept can increase the automation level drastically at a low investment cost.

- High reproducibility and cost-efficiency is ensured due to precise dosing
- Individual ID settings let you dedicate one dosing unit for each preparation step
- Entire preparation methods can be run just by exchanging dosing units
- Especially well-suited for Struers all-in-one diamond suspension products allowing unattended specimen preparation

The single dosing unit TegraDoser-1 is attached directly onto the TegraForce and its built-in peristaltic pump enables precise control of the applied amount of suspension – your guarantee for constant dosing levels and high reproducibility.

The dosing levels are equivalent to the dosing levels of TegraDoser-5 and can be taken over directly. With the peristaltic pump the dosing levels are absolutely reproducible and all types of lubricants and diamond suspensions can be used.

Run an entire method with no programming at all

TegraDoser-1 is equipped with a small switch, which allows 10 different ID settings. The TegraPol recognizes the ID setting of each TegraDoser-1 and automatically recalls all the parameter settings related to the specific preparation step, which was run the last time the TegraDoser-1 in question was used. In this way, you can dedicate a TegraDoser-1 unit to each preparation step, and an entire preparation method can be run without any programming, simply by exchanging TegraDoser-1 units. This not only facilitates operation it also provides higher security because of increased reproducibility.

Innovative all-in-one diamond products

Struers has developed innovative all-in-one DiaPro and DiaDuo diamond suspensions which combine diamond suspension and cooling lubricant into one product. This not only facilitates easy-of-use but also ensures that the consumables costs are kept under control. These products are extremely well-suited for the TegraDoser-1 dosing system as they will allow for unattended specimen preparation.

For more information about Struers diamond products, please ask for separate product brochures.



The winning combination of DiaPro and TegraDoser-1 lets you control the entire preparation method just by changing the dosing unit

The **StruersLAN** networking module

The TegraDoser-5 can be equipped with a StruersLAN module. This allows you to connect your TegraSystem to your company network or to a single PC.

- Easier programming of preparation methods from any connected PC in the company
- Preparation methods can be exchanged between machines, colleagues and labs
- Standardisation and efficiency is improved instantly
- Preparation methods and consumables lists can be downloaded from the Internet and used immediately

Networking simplifies programming

The StruersLAN module is a network card, which works according to the Ethernet standard, used worldwide in data communication. By providing the TegraDoser-5 with the StruersLAN module, the TegraSystem can be connected to a single PC or directly to the company's LAN network (Local Area Network), allowing the TegraSystem to be accessed from all the connected PCs.

In both cases programming of preparation methods is made extremely easy, because a complete keyboard is available. Also copy and paste functions, rename, delete, insert, - in short - all the functions usually available on a PC are available here too. The program is based on the same functions as the Windows™ Explorer.

Networking lets you share your knowledge

Do you want to share your preparation method with a colleague, another lab in your company or even another company? With the TegraSystem this is possible. All TegraSystem modules connected to the same network can be accessed by PCs connected, and preparation methods can easily be copied directly from one machine to another. Differences in machine size and set-up are not a problem since the TegraSystem

automatically recalculates all preparation parameters when a method is transferred from one system to another.

Even when the TegraSystems are not connected to the same network, preparation methods can be exchanged. Simply export the preparation method, send it attached to an e-mail and import it into another TegraSystem without any problems.

Networking improves standardisation and efficiency

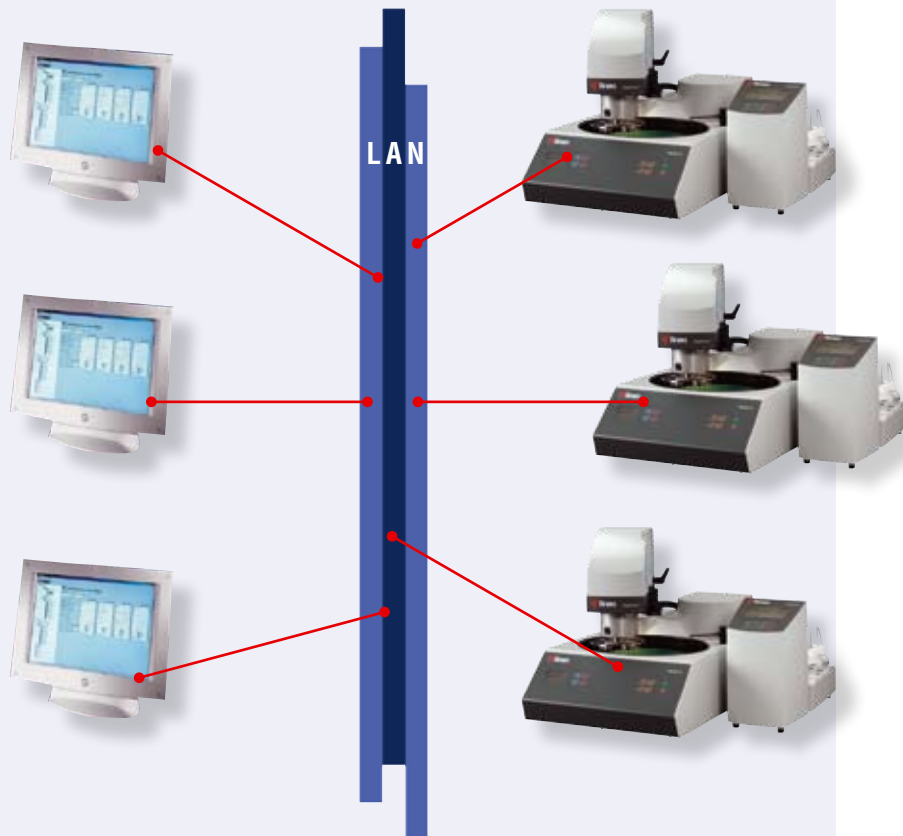
The networking possibilities greatly improve visibility and efficiency. Preparation methods can easily be made accessible on all the TegraSystems in the lab. Redundant work performed in different labs within the company can be eliminated. A central lab can standardise company methods and easily transfer them to TegraSystems in all satellite labs, ensuring consistent settings throughout the organisation. As soon as a method is approved, it can be transferred and made accessible instantly. Even specimen preparation performed at sub-suppliers can be standardised. The possibilities are numerous as required to match the different needs in modern companies.

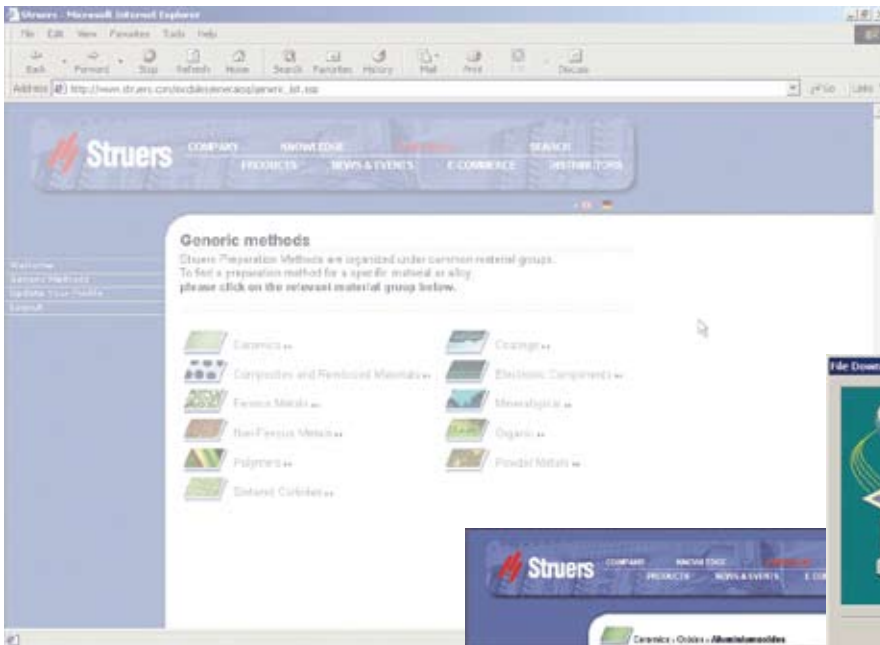
Download of methods from the Internet

With a TegraSystem and StruersLAN networking possibilities, you benefit from the Internet tools provided by Struers. Hun-

dreds of different preparation methods can be downloaded directly from Struers e-Metalog on the Internet in a format that is compatible with the TegraSystem. The methods can be employed instantly or adjusted to fit your specific application.

Also available from our homepage is the consumables table used by the TegraSystem. Whenever we release new grinding discs, polishing cloths, diamond suspension etc. the list will be updated and is immediately available for download. The advantage of this list lies in the built-in interaction between the consumables. If you e.g. select SiC as abrasive, the lubricant is automatically set to water and it will not be possible to select a suspension or a lubricant.





Hundreds of different preparation methods can be downloaded directly from Struers e-Metalog on the Internet.

Full network integration

State-of-the-art communications technology gives you the potential to synchronise machine settings and preparation methods throughout your laboratory network. You can implement changes the moment they are approved. Using a central database simplifies the standardisation processes and keeps you in full control.



The flexibility of the TegraSystem allows you to tailor the system to meet your exact demands. Use a single element or several. Grow and adapt the modules to meet your developing needs. Gain the benefits of reproducibility and efficiency – in other words, let the TegraSystem revolutionize your world of sample preparation.



State-of-the-art communications technology gives you the potential to synchronise machine settings and preparation methods throughout your laboratory network.

Grinding/Polishing machine	TegraPol-35	TegraPol-31
Disc diameter	300 mm / 12"	
Disc speed	40 - 600 rpm	50 - 300 rpm
Rotational direction	CCW	
Power supply	200-240 V / 50-60 Hz	
Motor Power continuous / max	750 / 1125 W	550 / 825 W
Automatic torque control	Yes	
Emergency stop	Yes	
Touch Pad control	Yes	
Graphical display for easy selection of preparation methods	Yes	
Soft start with pre-dosing	Yes	
Controlled acceleration and deceleration	Yes	
High speed drying of preparation disc, Spin Function @ 600 rpm	Yes	
Max. torque at disc	>40 Nm	>30 Nm
Compatible with Struers MD-system	Yes	
Automatic detection of connected equipment	Yes	
Connection of a polishing head	TegraForce-5 or TegraForce-3	
Maintenance management	Diagnostic and time used	
Service features	Machine test and self diagnostic	
Width, Depth, Height and Weight	500 mm / 725 mm / 330 mm / 45 kg	500 mm / 725 mm / 330 mm / 43 kg

Polishing head	TegraForce-5
Single specimens	Yes, 1 - 6 specimens
Specimen holder	Yes, up to 12 specimens
Rotational speed	50 - 150 rpm
Rotational direction	CCW + CW
Motor Power continuous / max (power supplied from TegraPol)	115 / 173 W
Force per specimen, single specimens / specimen holder	10 - 100 N / 30 - 400 N
LED lighting	Yes
Lifting capacity for specimen holders	5 kg
Connection of dosing system	TegraDoser-5 or TegraDoser-1
Identical Start and Stop position of polishing head	Yes
Soft start function	Yes
Force reduction	Yes
Automatic lift-off after preparation	Yes
Locking of polishing head	Automatic
Push button for quick release of specimen holders	Yes
Guide for positioning of polishing head	Yes
Fixed stop position of polishing head	Yes
Service features	Machine test and self diagnostic
Width, Depth, Height and Weight	180 mm / 389 mm / 572 mm / 18 kg

Dosing unit	TegraDoser-5
Precise dosing with peristaltic pumps	Yes
Number of pumps	Up to 7 pumps
Handles lubricant, suspension and all-in-one suspensions	Yes
Handles OP-suspension	Yes
Integrated automatic cleaning function	Yes
Graphical display for programming of preparation methods	Yes
Integrated database	10 Metalog Guide methods and 200 user methods
ID switch for parameter step control	-
Download of preparation methods from Internet (Struers e-Metalog)	Yes
Possibility to program methods via PC	Yes
Access to consumables list	Yes
Width, Depth, Height and Weight	200 mm / 210 mm / 380 mm / 8.5 kg (excl. bottle tray)

TegraPol-25		TegraPol-21		TegraPol-15		TegraPol-11	
250 mm / 10"				200 mm / 8"			
40 - 600 rpm		50 - 300 rpm		40 - 600 rpm		50 - 300 rpm	
CCW				CCW			
200-240 V / 50-60 Hz				200-240 V / 50-60 Hz			
550 / 825 W		370 / 555 W		370 / 555 W		180 / 270 W	
Yes				Yes			
Yes				Yes			
Yes				Yes			
Yes				Yes			
Yes				Yes			
Yes				Yes			
Yes				Yes			
>30 Nm		>20 Nm		>20 Nm		>10 Nm	
Yes				Yes			
Yes				Yes			
TegraForce-5 or TegraForce-3				TegraForce-1			
Diagnostic and time used				Diagnostic and time used			
Machine test and self diagnostic				Machine test and self diagnostic			
430 mm / 715 mm / 325 mm / 35 kg		430 mm / 715 mm / 325 mm / 33 kg		410 mm / 670 mm / 315 mm / 25 kg		410 mm / 670 mm / 315 mm / 23 kg	

TegraForce-3		TegraForce-1	
No		Yes, 1 - 3 specimens	
Yes, up to 12 specimens		Yes, 3 specimens	
50 - 150 rpm		50 - 150 rpm	
CCW + CW		CCW + CW	
115 / 173 W		35 / 53 W	
- / 30 - 400 N		10 - 50 N / 30 - 150	
Yes		Yes	
5 kg		-	
TegraDoser-5 or TegraDoser-1		TegraDoser-5 or TegraDoser-1	
Yes		Yes	
Yes		Yes	
Yes		Yes	
No		No	
Manual		Manual	
Yes		No	
Yes		Yes	
Yes		Yes	
Machine test and self diagnostic		Machine test and self diagnostic	
180 mm / 389 mm / 572 mm / 17 kg		140 mm / 311 mm / 445 mm / 7 kg	

TegraDoser-1	
Yes	
Single pump	
Yes	
-	
-	
-	
-	
Yes	
-	
-	
-	
120 mm / 50 mm / 240 mm / 550 g	





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Struers' equipment is in conformity with the provisions of the applicable International Directives and their appurtenant Standards. (Please contact your local supplier for details).

Struers' products are subject to constant product development. Therefore, we reserve ourselves the right to introduce changes in our products without notice.

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