

APPLICATION NOTE: GEOLOGICAL THIN SECTION PREPARATION LP70



1: LP70 Multi-station Precision Lapping & Polishing System

System Specifications LP70

The Logitech LP70 multi-station, precision, lapping & polishing system has been designed for the successful lapping and polishing of high-throughput geological thin sections. With four workstations as standard, the LP70 has the output capacity to produce approximately >500 standard thin sections per week.

Logitech's unique automatic lapping plate flatness control system helps increase the level of precision achieved with each of these processing systems. By removing the need to spend valuable time on process plate maintenance, the automatic lapping plate flatness control system ensures that the plate maintains its pre-set shape throughout the lapping process. The operator simply sets the desired shape via the Graphical User Interface (GUI), thereafter, the system prevents the plate from straying outwith a 0.5 micron resolution without need for further operator intervention.

The LP70 can operate with four PLJ2 precision jigs (or three with one automatic plate flatness monitor) or two large format PLJ7 precision jigs (or two with one automatic plate flatness monitor). This system is ideal for R&D through to production level environments.

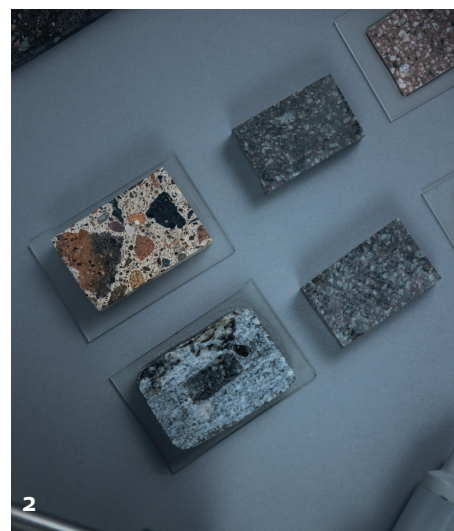
Introduction

Logitech has been manufacturing precision machine systems for the production of geological thin sections for nearly 60 years. Logitech systems are recognised as the worldwide standard for thin section preparation of geological materials such as rock, coal, concrete and soils.

Machine systems are based on a number of standard precision lapping, polishing, and cutting machines which, when combined with the appropriate accessories, deliver optimum thin section results.

Application Requirements

In many areas of geological study, such as mineralogy, petrography or sedimentology, there is a need for samples to be examined microscopically. This is normally carried out using transmitted polarised light, creating the need for thin sections of known and exact thickness. Reflected light microscopy is also widely used for certain applications which require the surface of the sample to be flat and highly polished in order to achieve optimal results. The increasing use of electron microscopes is also contributing to the need for high quality sections and thin sections of a wide range of materials.



2: Logitech offer versatile systems to accommodate different material types

Highly automated features of the LP70 allows for easy process repeatability in uniformity and thickness across each individual section. Through this method, ultra thin sections can be produced to a final desired thickness as thin as 10 μm .

IU30 Impregnation Unit

The IU30 is ideal for impregnating large samples and multiple small samples where the material types are too soft or friable for processing from the raw state, and for laboratories with a high volume requirement for impregnated material. It is a self-contained unit designed to meet the needs of researchers to encapsulate and impregnate specimens with synthetic resins. The IU30 allows both sample and resin to be evacuated separately and enables resin to be delivered to the sample while both remain under vacuum. Admission of air to the sample chamber then causes the specimen to be impregnated with resin under atmospheric pressure.

WG6 Polishing System

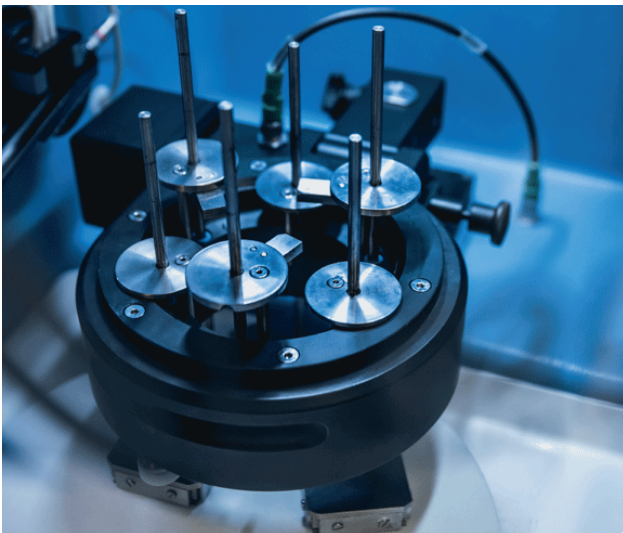
Based on the LP70 machine, the WG6 is a versatile, high precision polishing system ideally suited to polishing geological samples. It can be used to polish sections, ultra-thin sections and many more mounts of any sample material, and will routinely produce highly uniform thickness, relief free samples. The LP70 can hold two WG6 polishing heads, allowing for the process of up to 12 samples at the one time (6 per head).

The WG6 seamlessly integrates with the LP70 software to allow for abrasive feed, sample loading, speed of rotation and direction of rotational control independent from the plate rotational speed.

Incremental loads of up to 1.4 kg may be placed on each individual drive rod of the WG6 polishing head to assist with the polishing process. The parameters listed and more can be finely controlled via the LP70 GUI; this allows operators to truly maximise the process conditions for each material being polished and ensures the highest quality of results.



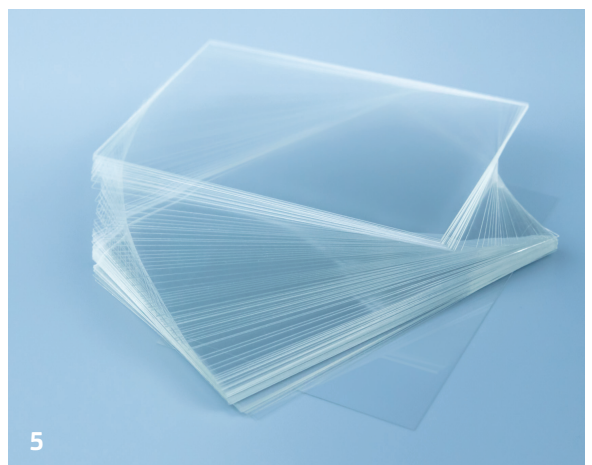
4: IU30 Impregnation Unit



3: WG6 Polishing Head

Consumable Products

Logitech offers an extensive range of certified consumable products, carefully developed to work in unison with our range of sample processing systems and machinery. Our own research and analysis provides us with the expertise to achieve the best results from Logitech equipment using diverse material processing applications. Utilising Logitech's Consumable range with your Logitech system will enable you to achieve optimal performance and maximise the life span of your Logitech equipment.



5: Glass Microscope Slides

Lapping and Polishing Trials

Lapping and polishing trials were undertaken on the LP70 processing 'granite rock' using our 8-step standard geological thin section preparation route. These results were then compared to trials of older, less automated machines to determine the advantage of using a more automated and highly controllable system.

In both lapping stages it is apparent from the data in Table 1 below that the LP70 is capable of producing improved material removal rates (MRR) in comparison to top plate speeds of up to 100rpm (in comparison to 70rpm on the older system), and driven-jig-roller arm technology the older system (LP50). These improvements are due to top plate speeds of up to 100rpm (in comparison to 70rpm on the older system).

Greater control is also achieved via metered abrasive feed, driven-jigarms and automatic plate flatness control.

Final stage polishing was also undertaken in these geological thin section trials. These trials were set up using a WG6 Polishing Head, and again using Logitech Vacuum Chuck Mounting Blocks for sample retention.

As you can see from the results in Table 2 below, there is once again significant improvement at higher plate speeds. Material Removal Rates (MRR) are also improved when utilising the WG6 Polishing Head in comparison to the Vacuum Chuck Mounting Blocks. This improvement is due to the WG6's ability to rotate independently at speeds of up to 50rpm, and increments of up to 1.4kg may be placed on each drive rod of the WG6 head to aid the polishing process.

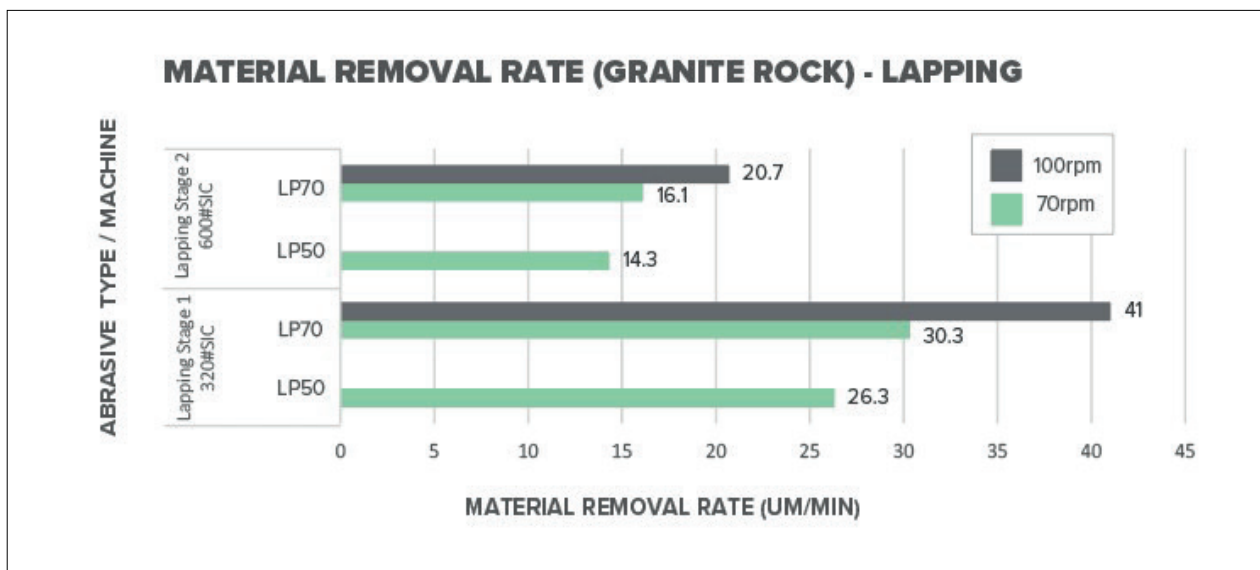


Table 1. Results from the lapping trials of granite rock on both the LP70 and LP50 shows significant improvement due to higher plate speeds

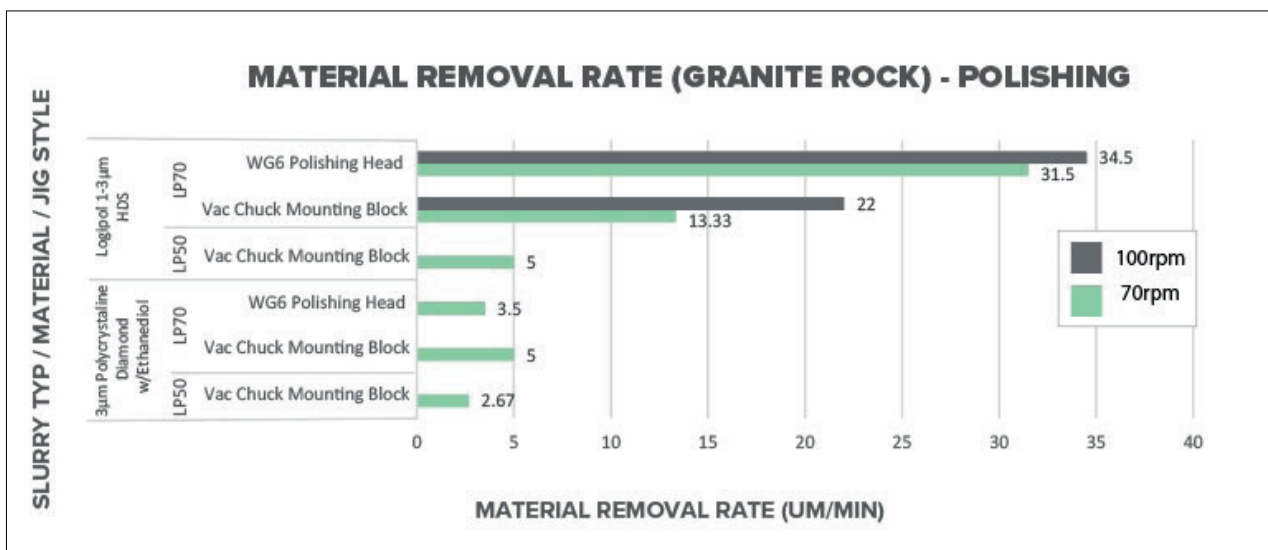


Table 2. Polishing trials again show improvement in MRR with higher plate speeds, they also show that the combined benefits from both WG6 and LP70 allow for maximum MRR