TriPod Polishing Fixture

User's Guide

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User's Guide

The equipment should only be used for its intended purpose and as detailed in the User's Guide.
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Table of Contents **Page**

1. Getting Started

Checking the Contents of the Case

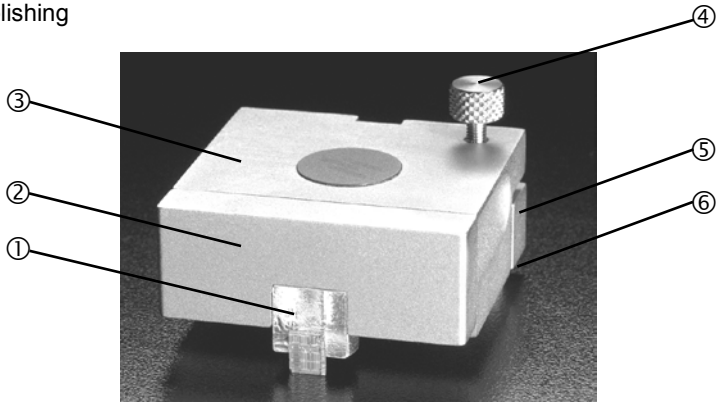
The following can be found in the TriPod case:
1 TriPod Polishing Fixture-X or -P, complete
10 Sample mounts, aluminium
1 Allen key (Fixture-P only)
1 User's Guide

Getting Acquainted with TriPod Polishing Fixture

Take a moment to familiarise yourself with the location and names of the TriPod Polishing Fixture components.

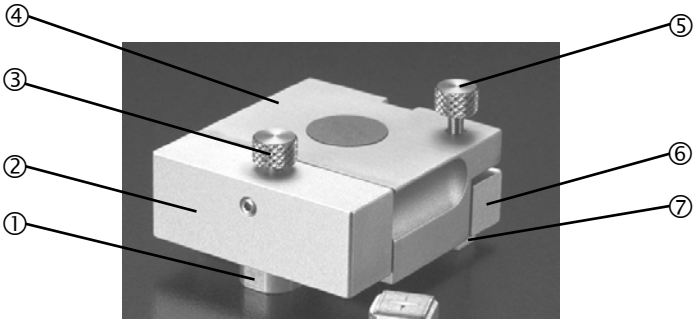
There are two models available:
TriPod Polishing Fixture-X for the preparation of cross-sections
TriPod Polishing Fixture-P for parallel polishing (de-layering).

TriPod Polishing Fixture-X



① Sample mount
② Spring-loaded front end beam
③ Body
④ Angle screw: finger screw for adjusting the angle of the sample face
⑤ Back end beam
⑥ TriPod supports (2 pcs.)

TriPod Polishing
Fixture-P



① Sample mount
② Spring-loaded front end beam
③ Height screw: finger screw for adjusting the height of the sample mount
④ Body
⑤ Angle screw: finger screw for adjusting the angle of the sample face
⑥ Back end beam
⑦ TriPod supports (2 pcs.)

Required Equipment

Grinder/Polisher: Variable speed grinder/polisher with 200mm/ 8" discs, such as LaboPol-4, LaboPol-5 or Tegramin-20.
Frequent changes of grinding/polishing surfaces with a single polisher will increase preparation time therefore three grinder/polishers are recommended.

Power: 120 or 220 volts.

Water: Supply of clean water and a drain.

Microscopes: To check the progress of the sample preparation.

Accessories and Consumables

A complete list of accessories and consumables can be found in the *TriPod brochure*.
Several interchangeable 200 mm/ 8" discs are recommended; a disc for each step in the process.

> ***Note:***
> Exchanging grinding papers and cloths is very simple when using the MD-System as the same MD-Disc is used; only one disc is needed to cover all steps.

Using Al_2O_3 or Diamond Films

- Mount a 200 mm /8" glass disc on a blank preparation disc using the self-adhesive tape supplied.
  Alternatively, use Struers' MD-Gekko to secure the glass disc onto the preparation disc (a single MD-Gekko can be used for multiple glass discs).
- Apply the Al_2O_3 or Diamond film by dropping a small amount of water on the glass face and smoothing the film on using a flat plastic card.

> ***Important***
> Ensure that the films are perfectly plane on the glass disc, with no air bubbles or dirt under the surface.

Nitrogen: Dry nitrogen (or a supply of aerosol cans) is required to blow samples dry.

2. Operation

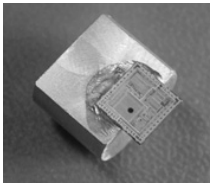
Cutting a Sample

- Cut a piece of silicon roughly 5mm/ 0.25" square that includes the intended target. (Wider pieces can be polished, but the additional area reduces effective pressure, decreases removal rates thus increasing grinding time).

Mounting the Sample

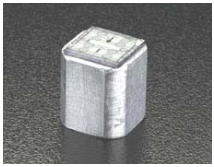
- Heat a sample mount to 75°C.
- Apply a dot of Struers TriPod Wax.

Fixture-X



- Mount the sample in cantilever fashion on the sample mount.
  Ensure that the target cross section line extends beyond the end of the mount.

Fixture-P



- Mount the sample onto the sample mount. Reheat the sample mount if necessary so that there is a thin, even layer of wax under the sample.

Mounting into the TriPod Polishing Fixture

- Insert the sample mount with sample into the TriPod Polishing Fixture by pulling out the spring loaded front end beam.

Adjusting the Angle of the Sample Face

The angle of the sample face can be adjusted using the angle screw.
To check that the sample is flat when using TriPod Polishing Fixture-P, place the fixture with mounted sample on a mirror and adjust the angle screw until the sample is flat and parallel.

Height Adjustment (Fixture-P only)

The height of the sample face can be adjusted using the height adjustment screw.

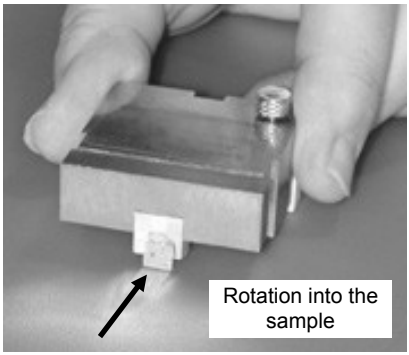
Preparation Method The following table gives an overview of a recommended preparation process.

Polishing Fixture-X For grinding steps use either SiC paper or abrasive film.

		Preparation Media	Switch to next paper/ film when specimen surface is this far from target line	Disc Rotation Speed rpm	Approx time sec.
Pre-grind		Grit P800 SiC Paper/ 30 µm Diamond film	>40 µm	60-100	
Grinding Step	1	Grit P1200 SiC Paper/ 15 µm Diamond film	22 µm	60-100	20-30
	2	Grit P2400 SiC Paper/ 6 µm Diamond film	12 µm	60-100	30-60
	3	Grit P4000 SiC Paper/ 3 µm Diamond film	7 µm	60-100	30-60
	4	1 µm Al_2O_3 film/ 1 µm Diamond film	3 µm	60-100	60
Fine Grinding Step	1	0.3 µm Al_2O_3 film/ 0.5 µm Diamond film	2µm	30	60
	2	0.1 µm Diamond film	1-1.5 µm	30	60
Polishing Step	1	0.05 µm Al_2O_3 film	0.9-1.4	30	30
	2	0.05 µm Al_2O_3 film	Until any streaks from metal or polysilicon lines are removed	30	30-60
Final Polishing (Reverse direction)		0.05 µm Al_2O_3 film		30	20-30
	or	0.04 µm OP-S on MD/OP-Chem or MD/OP-Nap		50	30
	or	0.1 µm DP-Suspension on MD/DP-Nap or MD/DP-Dac		50	30

Grinding and Polishing Using the TriPod Fixture

- Maintain a low but continuous flow of water.
- Hold the polishing fixture by its sides near the back (TriPod support end) between thumb and finger.
- Lower the fixture and sample, TriPod end first, to the rotating disc. The disc rotation is into the sample.



- Allow the fixture to exert the pressure of its weight onto the sample. (A dark strip will appear on the SiC paper as material is removed).

Fixture-X

- Check whether the ground surface is parallel to the desired cross section line. If needed, adjust the angle of the ground surface with the angle screw.

Fixture-P

- Continue until the required amount of material has been removed; this may be until the area of interest is exposed.
- Clean the sample with running water between each step.

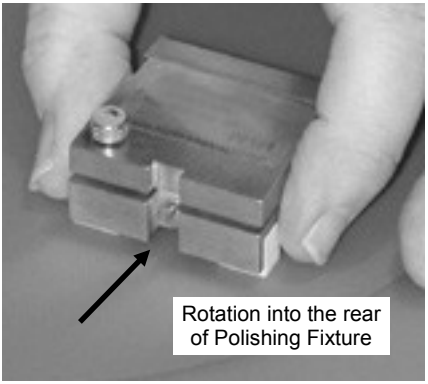
Final Polishing Step

A final polishing step can be performed to obtain a superior surface finish.

Soft Materials (Si, Al_2O_3 and oxides)

- Polish with 0.05 µm Al_2O_3 film for 30-60 seconds.
- Reverse polish by holding the polishing fixture between thumb and finger such that the wheel rotates into the TriPod support end of the fixture.

Fixture Held in Reverse Direction on 0.05 µm Al_2O_3



- Lower the sample to the wheel, support end first, and polish for 30 seconds.

> ***Important***
> Do not do reverse polishing with larger grit sizes or if any sample layer has an adhesion problem.

Soft Materials (Si, Al_2O_3, oxides) Chemical Etch

- Polish for 30 seconds or less with 0.04 µm OP-S on MD/OP-Chem or MD/OP-Nap cloths.

Samples Containing Other Materials e.g. Tungsten

- Use DP-Suspension 0.1µm on MD/DP-Nap cloth or MD/DP-Dac napless cloth.

After the Final Preparation Step

- Rinse with a copious flow of water and blow dry with nitrogen.
- Inspect, clean by rolling a cotton tip saturated with soapy water over the polished surface and top.

Parallel Grinding and Polishing: Polishing Fixture-P

- Begin grinding using a 3 µm diamond film for 30 seconds.
- Clean the sample with running water and check progress under a microscope. Adjust the angle, height and orientation of the sample if necessary.
- Continue grinding with the 3 µm or smaller abrasive (1, 0.5 or 0.1 µm), checking periodically; clean the sample with running water between each step.
- Decrease the abrasive size until the area of interest is achieved using a 0.1µm abrasive film.
- Should a superior polishing finish be required, polish with a 0.05 µm film or 0.1 µm diamond suspension.
- Inspect, clean by rolling a cotton tip saturated with soapy water over the polished surface and top.
- Finally, rinse with a copious flow of water and blow dry with nitrogen.

General Tips

The procedures described above involve several short steps. Satisfactory results can be obtained using fewer steps and grinding for longer. However, the procedure will be tedious if overall grind time is increased by using fine grit to remove material slowly.

Additionally, if grinding time is excessive, material removal rate may decrease as grinding/polishing media wears and be difficult to judge.

Do not use worn out grinding media. Be aware that there will be an increase in removal rate when going from worn to fresh media. Fresh, finer grit grinding/polishing media may have a faster removal rate than coarser, worn media.

3. Accessories

Please refer to the *TriPod brochure* for details of the range available.

4. Consumables

Please refer to the *TriPod brochure* for details of the range available.

5. Maintenance

Keep the TriPod Polishing Fixture clean, especially around the front end beam.
After use over a longer period, the two TriPod supports of Teflon will become worn and need to be replaced.

6. Spare Parts

Spare Part	**Spare Part No**
Finger screw	14380208
Slotted screw for back end beam	2TI10303
Springs for front end beam	2GF10040
Springs for back end beam	2GF10041

7. Technical Data

Positioning range	+/- 1.5^{o}	
Dimensions (h x w x d)	19 x 44 x 44 mm	
Weight	Fixture-X	270 g
	Fixture-P	300 g

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