

Operating and Safety Instructions – High Pressure Torsion - HPT

Users who are allowed to operate the HPT-machine must have attended an extensive instruction by one of the following contact persons (CPs):

Prof. E. Schafler, Dr. D. Setman, Dr. M. Kerber

- Each time a user plans to operate the HPT-machine, one of the aforementioned CPs has to be contacted in advance and the machine has to be booked via the booking system.

General instructions

- Before starting an experiment (or even planning) do check usability of the anvils you're intending to use (quality of surface, edges of cavity,...).
- Register your experiment to the HPT-logbook
- Check the position of the lower micro-switch for the height of the anvils – if necessary align it.
- **NEVER change the position of the upper micro-switch**
- Before moving lower anvil/piston up, **close the protection window**.
- Start the HPT-program on the desktop-PC and define your desired experimental parameters (pressure, rotation speed, number of cycles, file name ...).
- Make a pre-pressure of about 6-10 bar monitored by the HPT-program – the green lamp at the machine flashes (=ready).
- When committing the experiment to the machine-control-system, do not stay close to the protection window.
- **Open the protection window** only when the deformation has been **completed**.
- Clean the machine (experimental chamber, lower piston) from any dirt and rubbed-off sample parts.
- **In case of danger press the “emergency-off”-button!**

Working with high temperatures (induction heating)

- Follow all instructions given above.
- Mount the cooling ring for the lower anvil/piston and connect the water cooling pipes to the supply.
- Adjust the transmission coil centred to the anvils (axially and vertically).
- Adjust the pyrometer to hit the lower part of the upper anvil using the integrated laser - do not hit the coil!
- Switch on the induction control unit. If the “Water ready” lamp does not light, open the valves in the rear side of the unit.

- **Check** whether any **leaking** of water is observable, especially at the transmission unit and the cooling ring at the lower anvil/piston
- Start the temperature control program “??” and define the desired temperature. Start the heating with 5% power and increase this value in steps of 5% to a maximum value of 55%. Each change gets only valid after pressing “submit-write??”
- Stop the heating when the deformation experiment is finished but before the lower anvil drives down!
- **The anvils are hot!** Wait cooling or use **protective gloves** and **forceps** to remove the anvils.

Working with low temperatures (liquid nitrogen)

- **Always wear protection clothing (goggles, gloves and coat) when working with liquid nitrogen!**
- Attach the container to the lower anvil
- After the lower anvil/piston is in upper position (=pre-pressure) start to fill liquid N₂ slowly into the cone with pipe in order to cool the anvils.
- Start the deformation experiment only when the strong evaporation of nitrogen has finished. During the experiment re-fill liquid N₂ to hold its level in the container.
- **The anvils are extremely cold!** Wait warming or use **protective gloves** and **forceps** to remove the anvils.
- After the equipment has warmed up, remove all condensed water from the whole machine especially from the lower anvil-holder and piston

Inform a CP for any problems, damages, absence of parts and anvil restoration.

Finally we remind you of the general lab and workshop rules of the University Vienna that any work out of the operating times Mo-Fr 8-20 h needs the presence of a second person that **is visual and calling range**, or at least a regular contact (phone call, -SMS, etc.) with a second person.

I declare to have fully understood the operating and safety instructions and to follow them strictly.

Date of instruction:

Instructor:

Name and Signature: