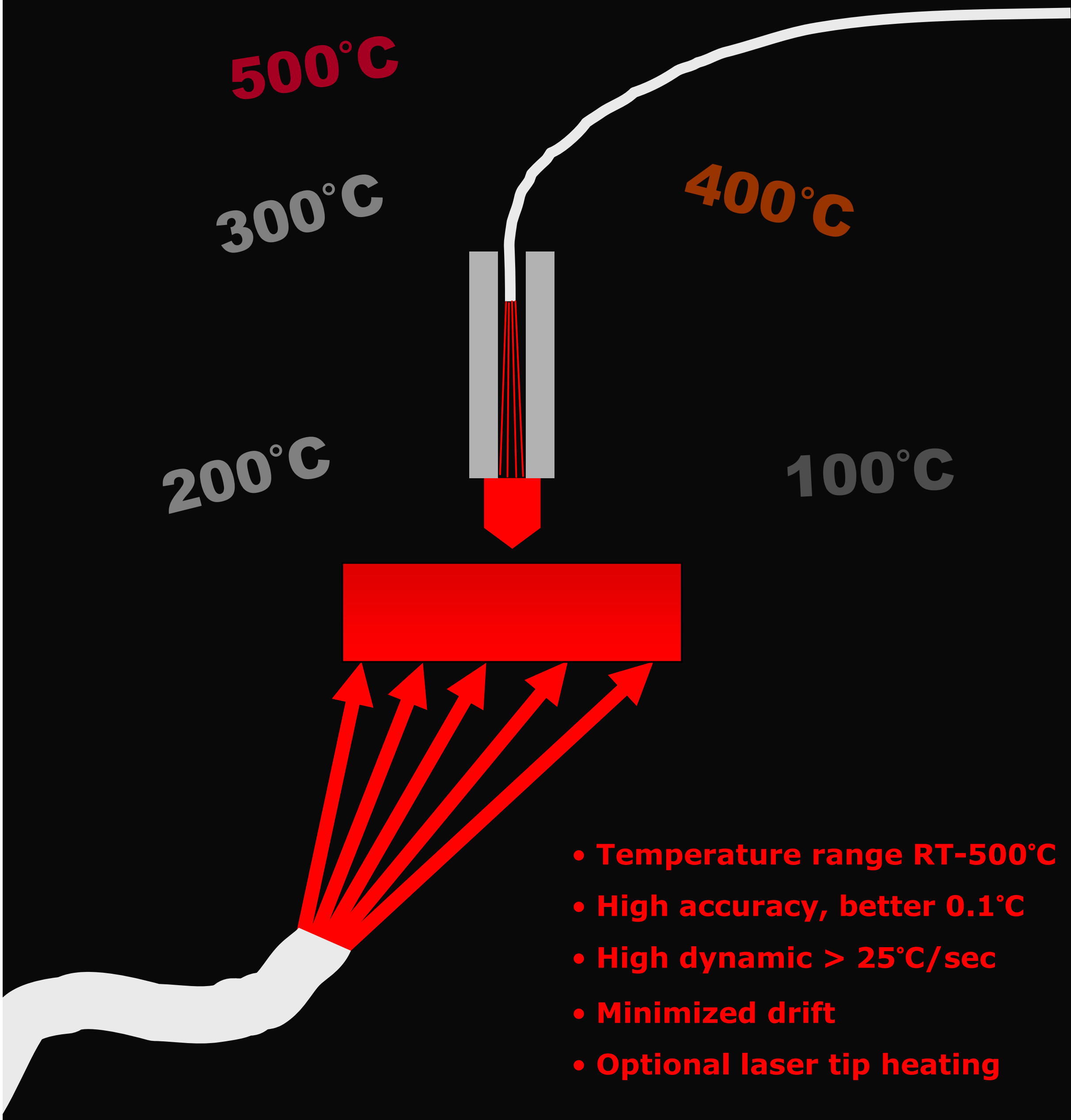
nano-Lab tools

nano-Lab



- Temperature range RT-500°C
- High accuracy, better 0.1°C
- High dynamic > 25°C/sec
- Minimized drift
- Optional laser tip heating

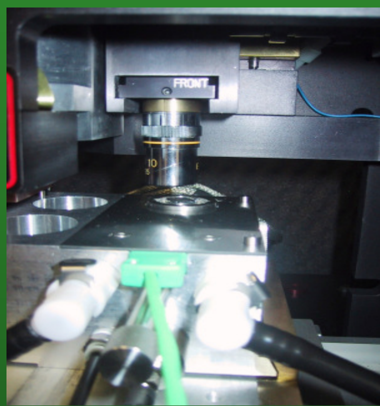
SURFACE

Laser Heater for Nanoindentation

High Power Diode Laser – The Perfect Heater for Nanoindentation

Nowadays materials science requires the detailed knowledge of mechanical properties of materials even on the nano scale, and also the temperature dependence of these properties.
Nanoindentation is the method of choice to determine Young's modulus, hardness, strain rate sensitivity, and more on the nanoscale with high accuracy.
Temperature dependent nanoindentation measurements are troublesome, because the high accuracy with sub-nanometer resolution of the nanoindentation technique can be adversely affected by the variation of the ambient temperature. Conventional heaters introduce thermal drift into the measurement, because the heater is not only heating the sample, but also the indentation machine – accurate results are very difficult to achieve.
To overcome these difficulties, SURFACE has developed a *Laser Heater System* for sample sizes of up to 15 mm in diameter and up to 3 mm thickness, using the latest available infrared diode laser technology. Laser heating confines the heated area to the sample or substrate itself, no additional heated parts exist. The infrared laser radiation is transferred to the substrate backside via an optical fiber and additional optical components, which are integrated into a sample holder matching the standard holder of the nanoindentation system. The sample holder itself is optimized for highest mechanical and temperature stability. It is water-cooled and temperature controlled, and functionally optimized materials are used to further reduce the thermal drift of the system.

Large temperature range and minimized drift based on the limitations of the heated surface



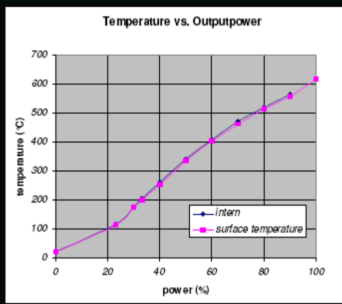
Fully compatible with Agilent/MTS XP and G200

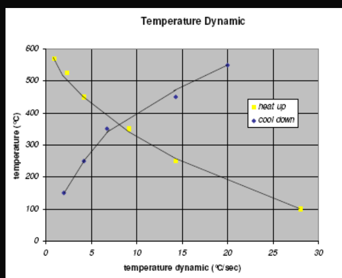
Laser Heating Offers New Features

The system is using a fixed thermocouple with 100 µm diameter, mounted into the non-IR-absorbing substrate holder plate.

The substrates are attached to the holder with a special paste, and the laser heats up the substrate only. The graph at the right shows the difference of this TC to a TC fixed directly to the substrate surface. The difference is only 3˚C at 500˚C (Si substrate, 0.5 mm thick).

Another advantage are the rapid heating and cooling rates made possible by the minimal heated mass. Depending on the temperature the rate can reach over 25˚C/s for heating and cooling. This offers new and interesting possibilities in dynamic material testing.





Tip Heating – The Ultimate Accuracy

When investigating materials with low thermal conductivity and highly temperature dependent mechanical properties, the influence of a cold tip to the measurement of heated samples cannot be neglected. So as additional add-on for the Agilent XP nanoindenter head a laser heated indenter tip is available. A thin optical fiber is installed inside the hollow shaft of the XP head and heats a special tip with integrated thermocouple.

Specifications:

Laser:	CW
Wavelength:	808 nm
Output power:	40 W
Optical fiber:	600 µm, 3m long
Temperature sensor:	TC K-type
Controller:	19“ 3HU enclosure digital PID loop
Cooling:	water bath chiller

For Agilent/MTS Nanoindenter XP/G200
Option: **Tip heater**

Wave length:	808 nm
Optical fiber:	100 µm, 1 m long
Temperature sensor:	TC K-type
Controller:	digital PID loop
Special tip:	Berkovich, with integrated TC

SURFACE

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