TA Instruments, 159 Lukens Drive, New Castle, DE 19720
Telephone: (302) 427-4000 • Fax: (302) 427-4001
E-mail: info@tainstruments.com
www.tainstruments.com

HM 867 Heating Microscope

HM 867 and MorphometriX: the heating microscope system for the most demanding R&D and process laboratories.

Result of over twenty years of R&D of optical instruments for the study of the thermo-mechanical behavior of materials, HM 867 enables scientists to optimize the thermal cycles of industrial processes by analyzing samples and identifying their characteristic shapes.

The large and highly responsive furnace, motorized and PC-controlled, offers an unmatched ease of operations over a wide range of temperatures. With a maximum temperature scanning rate of 80°C/min, it has a built-in purge gas system that enables the user to test specimens in air, oxidative, reductive and protective atmosphere.

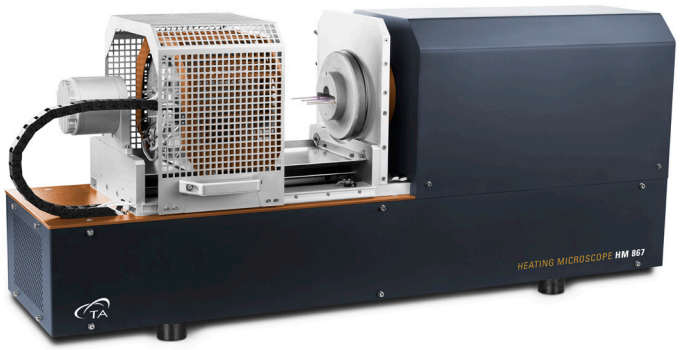
HM 867 precise micro-stepper motors enable, PC-controlled operations on XYZ axis, including camera and furnace positioning. Also, to guarantee maximum performance and stability throughout the temperature range, the optical bench is equipped with a HD CMOS-based camera, with a dynamic temperature thermostat control system, and with a base machined in a thermally ultra-stable material.

The optional DTA sensor and Flash heating and cooling broaden HM 867 versatility and make of it the most innovative tool for R&D and production laboratories.

In Flash mode, once the furnace temperature reaches the pre-set value, the sample is automatically introduced in (or removed from) the kiln so to be heated (or cooled) up to 200°C/sec.

Misura 4 Thermal Analysis software

A complete software suite with a Client/Server architecture, Misura 4 software is structured in "Apps". Through the App "Instrument Control" is possible to set up analytical methods with an unlimited number of segments of unlimited duration and complexity

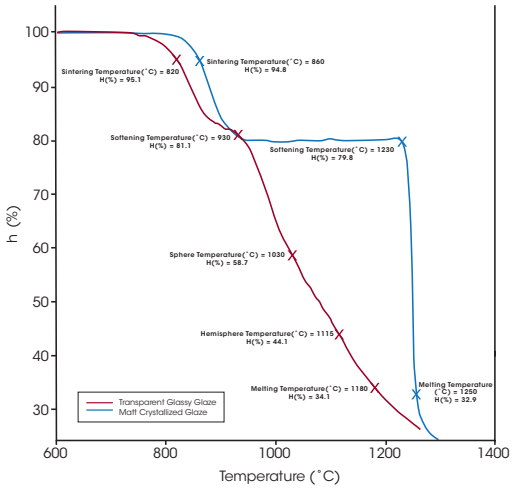


HM 867 Heating Microscope

MorphometriX is the innovative image analysis engine at the core of Misura 4 software suite. It translates the intuitive concept of shape into rigorous mathematical parameters having consistent physical foundations, and it goes far beyond the classical geometrical parameters like height, width, perimeter, etc, or the caracteristic shapes as for instance softening, sphere, halfsphere or melting. Taking advantage of the unmatched acquisition rate of up to 7 fps, **MorphometriX** pattern-matching recognizes materials' transformations with a precision superseding the eye of the human operator, and automatically precisely identifies in real-time specimen's characteristic shapes and temperatures. Also, with its algorithms to correct for possible sample asymmetries, Morphometrics make the results invariant towards the most common sample preparation and positioning issues.

With **MorphometriX** the advanced user is able to design next generation materials teaching the software how to recognize unknown shapes and behaviour and, based upon results, optimize the analytical method in real-time.

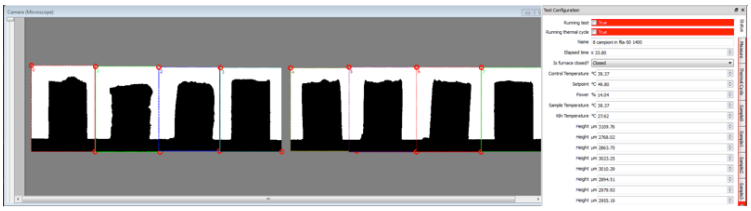
The browser-like interface makes then easy to organize, search and access test files and archived images. The **MorphometriX** results can be plotted and further analysed with advanced mathematical tools. Additional data can be integrated to calculate theoretical viscosity of materials according to V.F.T. equation, and the surface tension with the sessile drop method. Comprehensive reports can be interactively generated and rendered as vector PDF files; single or multiple frames can be selected and exported in web or video format (.AVI) for presentations; raw data can be imported and exported in CSV format.



Comparison between fusibility curves of two different glazes: the blue curve refers to a crystallizing glaze, the green curve to a glassy glaze. The thermal behaviors are substantially different: the glassy glaze is characterized by the typical gradual melting of glass-based materials, with no defined melting temperature but consecutive transitions from powders into a liquid state. On the contrary, due to the chemical composition, the crystallizing glaze experiences a prolonged plateau, representing the temperature interval that is needed to achieve a full crystalline lattice. Melting temperature, as for common crystals, is in fact instantaneous.

TA Instruments, 159 Lukens Drive, New Castle, DE 19720
Telephone: (302) 427-4000 • Fax: (302) 427-4001
E-mail: info@tainstruments.com
www.tainstruments.com

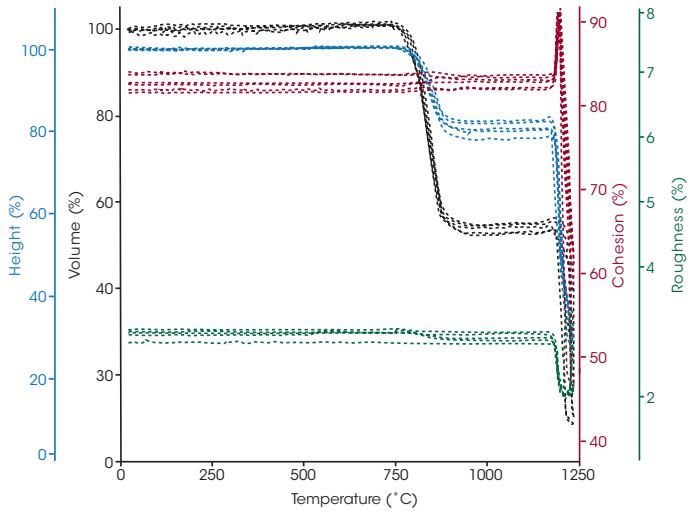
HM 867 Heating Microscope



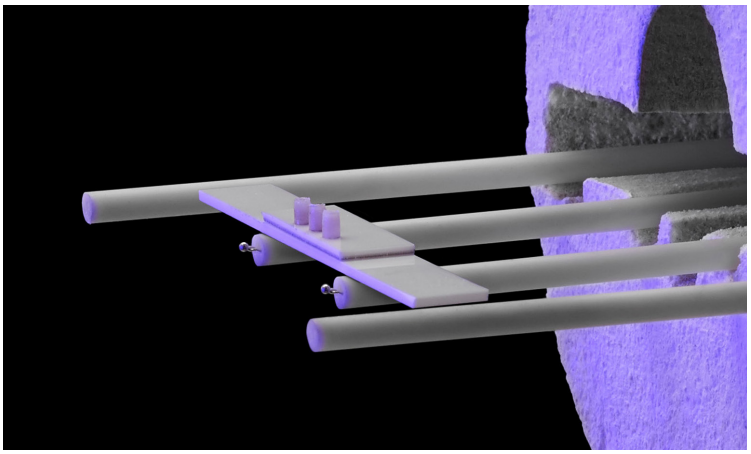
Misura 4 allows the image analysis of up to 8 samples at the same time. The acquisition ambient is split accordingly in order to accommodate the simultaneous frame processing of each pre-set region of interest that can dynamically adapt to sample sizes.

Traditional shape analysis techniques have always been focused on height change. For all the 8 samples analysed, the height signal, especially during the plateau between 900°C and 1190°C, shows variation due to poor sample preparation: the different shrinkage is due to differences in compaction pressure of powders.

The new morphometric analysis results independent from any pre-test operation. Cohesion measures the standard deviation of the contour points from the center of mass of the sample while roughness is expression of profile small imperfections that is determined through spline fitting. Cohesion and roughness are excellent parameters to identify softening and sphere points, when surface tension of liquid phases smooth the profile. At the sphere point in fact, for all samples, cohesion reaches a positive peak, while roughness decreases up to a negative peak. MorphometriX volume is calculated by building the solid of revolution around the central axis of symmetry of the initial cylinder: it doesn't suffer of anisotropies since it considers the real disposition of material. Volume signal of all the 8 sample is, in fact, highly concentrated.



Plot reporting a set of innovative parameters to precisely identify characteristic shapes for 8 samples studied at the same time. Besides the traditional height change signal, sample volume, roughness and cohesion are recorded, in order to fully describe shape evolution with increasing temperature.



HM 867 uses a HD camera to frame the entire specimen and to study its behavior precisely reproducing industrial firing conditions. Capable to analyze samples in a wide range of shapes and sizes, HM 867 can simultaneously test up to 8 samples. The recognition of shapes and the related temperatures can be done accordingly to international standard methods or by user-defined parameters and concepts.

Specification	HM 867
Optical measuring system	Optical bench with an optical measuring system equipped with a HD camera and fully automated focus
Operating modes	Heating microscope
International Standards	ASTM D1857, CEN/TR 15404, BS 1016:Part 15, CEN/TS 15370-1, DIN 51730, IS 12891, ISO 540, NF M03-048
Sample displacement	Bidimensional
Sample number	From 1 up to 8, depending upon samples sizes
Temperature range on specimen	RT – 1600 °C
Temperature resolution	0,2 °C
Heating rate	0,1 – 80 °C/min 200 °C/sec in Flash mode
Resolution	5ppm with standard sample
Sample dimensions:	Up to 19mm (depending upon operating mode)
Morphometrics; automatic quantitation of standard and user-selectable shapes	Sintering beginning, Softening, Deformation point, Sphere, Halfsphere, Melting, Flow point, Bloating, Contact angle, Height, Width, Height/Width Ratio, Perimeter, Area, Roundness, Eccentricity, Center of mass, Surface tension, Cohesion, Relative potential, Volume, Surface, Roughness, Circle fitting, Symmetry, Asymmetrical Sample Shape Filter
Atmosphere	air, oxidative, reductive, quasi-inert
Light source	478nm LED source
Software	Misura 4 Thermal Analysis software