

TMA 402 **F1/F3** Hyperion®

Interchangeable, vertical furnaces (located on motorized hoist)	<ul style="list-style-type: none"> ▪ Steel furnace: -150°C to 1000°C ▪ SiC furnace: RT to 1550°C ▪ IC-furnace: -70°C to 450°C ▪ Copper furnace: -150°C to 500°C (possible coupling to humidity generator) ▪ Water-vapor furnace: RT to 1250°C (for measurements under steam by coupling to water-vapor generator or to humidity generator)
Heating/cooling rates	0.001 K/min to 50 K/min
Cooling systems	<ul style="list-style-type: none"> ▪ For steel and copper furnace: <ul style="list-style-type: none"> ▪ Liquid nitrogen cooling (optional with 60-liter Dewar; convenient refill system) ▪ Vortex tube (based on compressed air; < 0°C) ▪ Intracooler for IC-furnace ▪ Forced air for SiC furnace
Measurement modes	Expansion, penetration, 3-point bending, tension (up to 1550°C)
Measuring ranges/ Δl resolution	<ul style="list-style-type: none"> ▪ 500 μm / 0.125 nm ▪ 5000 μm (± 2500 μm) / 1.25 nm
Force and displacement	Simultaneous measurement of force and displacement signal
Force range (load at sample)	0.001 N to 3N (F3) / 4 N (F1) in steps of 0.02 mN without using additional weights
Force resolution	< 0.01 mN
Modulated force (only for 402 F1 Hyperion®)	<ul style="list-style-type: none"> ▪ 0.0003 Hz to 1 Hz; customizable frequencies ▪ Wave forms: square, sinusoidal, triangular, steps, ramps, single pulses
Interchangeable sample holder systems	<ul style="list-style-type: none"> ▪ Fused silica: up to 1100°C ▪ Alumina: up to 1550°C
Special sample containers	For tests on pastes, powders, liquids, waxes, molten metals, immersion
Sample dimensions	<ul style="list-style-type: none"> ▪ Length: 30 mm max.; alumina sample holder Ø 10 mm max., fused silica sample holder Ø 12 mm / 8 mm; ▪ Automatic sample length determination (precision: 0.01 mm)
Atmospheres	Software-controlled, inert, oxidizing, reducing, vacuum