

Controlled Test Chamber (CTC) for HAAKE MARS Rheometers

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The Controlled Test Chamber (CTC) is a temperature control module for Thermo Scientific™ HAAKE™ MARS™ Rheometers for performing measurements on both fluids and solids in the temperature range from -150 °C* up to 600 °C. The CTC consists of two temperature chamber half-shells that can be moved individually on a rail system. For sample loading, cleaning or changing the measuring geometry, the CTC half-shells can be moved into the so called parking position at the rear left side of the rheometer (Figure 2). In the parking position the operator has full access to the sample and the measuring geometry without the danger of touching the hot (or very cold) inner part of the CTC. Since the CTC is fully closed when in parking position, the internal temperature can be controlled and maintained during cleaning, sample loading or geometry change. When in the measurement (front) position, the two half-shells of the CTC enclose the measuring geometry completely, what allows for a homogeneous and gradient free temperature control of the sample (Figure 2). As a hybrid system, the CTC combines the advantages of convection heat transfer (homogeneous temperature distribution with those of radiation heat transfer (rapid temperature changes). Both heat transfer systems are controlled by means of a digital control circuit. During a measurement the sample can be observed through the windows on both CTC half-shells.

The parking position also allows for using the HAAKE MARS Rheometer with other temperature control modules (like Peltier temperature control modules for parallel plates and cone & plate or for coaxial cylinder measuring geometries) or with the RheoScope module without demounting the CTC (Figure 3).

For measurements below ambient temperature, the CTC can be equipped with a low temperature option for cooling with liquid nitrogen. The low temperature option consists of



Figure 1: HAAKE MARS Rheometer with Controlled Test Chamber (CTC).

an evaporation unit to be used with used a standard 50 l Dewar vessel (optionally available). The evaporation unit is connected to the CTC with flexible double-wall vacuum insulated metal hoses to prevent ice formation on the outside of the hoses.

For the HAAKE CTC various standard parallel plates and cone & plate measuring geometries are available (Figure 3). The lower part of the measuring geometry is mounted on a lower holder with an integrated temperature sensor.

The lower plates are designed to collect surplus material during sample loading or when a material is expanding during a measurement. Upper plate and cone rotors made of titanium (rotor shaft made of ceramic material) are available with different diameters (8, 20, 25 and 35 mm) and cone angles. All rotors are equipped with a quick fit coupling as well as auto-recognition functionality.

Disposable geometries made of aluminum with diameters from 8 to 35 mm are also available. For this type of geometry a separate collection device is available which protects the temperature chamber against fouling (Figure 3).

Customized measuring geometries with different dimensions, with special surfaces (e.g. sandblasted) or made from another material (e.g. Hastelloy) are available on request.

Other measuring geometries available for the CTC include:

- Solids clamping tool for dynamic mechanical thermal analysis in torsion
- SER tool for measuring extensional viscosity of films or fibers
- Coaxial cylinder measuring geometry for testing low viscous fluids at very high temperatures

These geometries are described in detail in the corresponding product information.

* with low temperature option

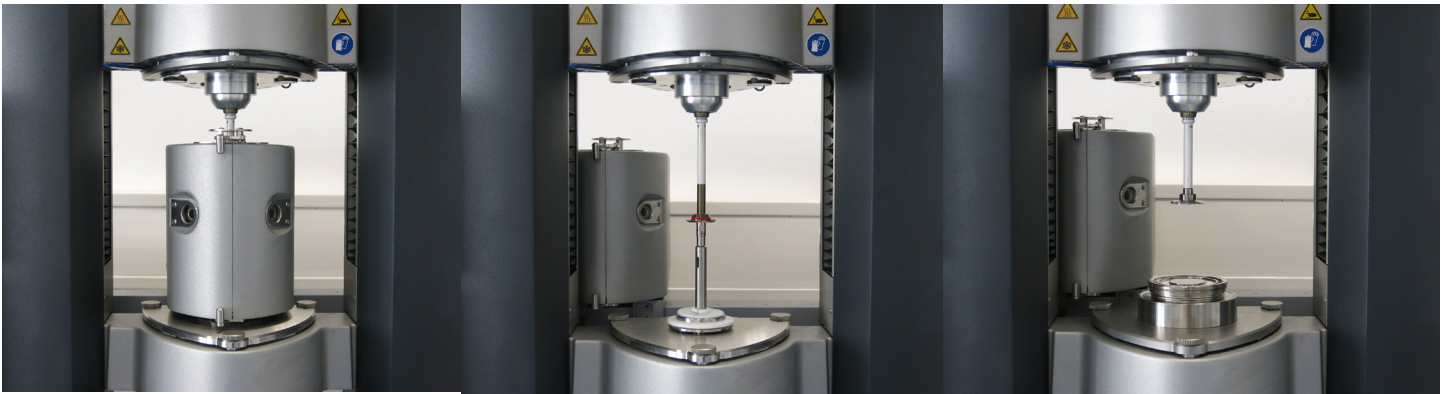


Figure 2: HAAKE MARS Rheometer with Controlled Test Chamber (CTC) in measurement position (left); in parking position (middle); in parking position and Peltier temperature control modules for parallel plates and cone & plate mounted (right).

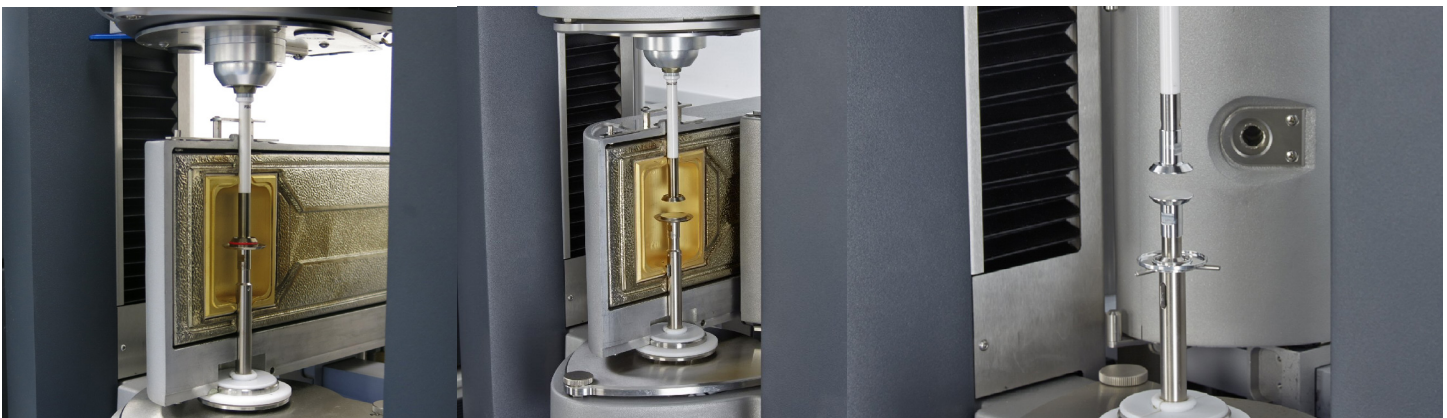


Figure 3: HAAKE MARS with Controlled Tests Chamber (CTC) half-open (left); Standard measuring geometry for CTC consisting of lower shaft with exchangeable plate and upper rotor with ceramic shaft (middle); Disposable measuring geometry for CTC with collection device to prevent chamber fouling (right).

Table 1. Ordering information

Product	Order no.
Controlled Test Chamber for temperature range 30 °C up to 600 °C, if input voltage is not 230 V transformer is needed (222-1768)	379-0600
Mounting rods (needs to be ordered for HAAKE MARS 40 Rheometer, in HAAKE MARS 60 Rheometer included)	222-1914
Option "low temperature" with low energy consumption for temperatures down to -150 °C	222-1730
Dewar vessel (50 l)	222-1733

Table 2. Standard measuring geometries- lower plates

Product	Order no.
Lower holder for exchangeable measuring geometries incl. temperature sensor 222-1769	222-2251
Rotor insert P35-CTC/St	222-2141
Rotor insert P25-CTC/St	222-2142
Rotor insert P20-CTC/St	222-2143
Rotor insert P8-CTC/S	222-2144

Table 3. Upper rotors with "Connect Assist" and ceramic shaft

Product	Order no.
Plate P35-CTC/Ti (CS)	222-2221
Cone C35 4°-CTC/Ti (CS)	222-2225
Cone C35 1°-CTC/Ti (CS)	222-2226
Plate P25-CTC/Ti (CS)	222-2222
Plate P20-CTC/Ti (CS)	222-2223
Cone C20 1°-CTC/Ti (CS)	222-2227
Plate P8-CTC/Ti (CS)	222-2224

Table 4. Disposable measuring geometries

Product	Order no.
Lower holder for exchangeable measuring geometries incl. temperature sensor 222-1769	222-2251
Adapter P2 (CS) Adapter for disposable plates D PXX /Al (upper adapter for CTC) with "Connect Assist" and ceramic shaft	222-2151
D P8 /Al Plates D P8 /Al (40 pcs., as lower or upper plate)	222-2152
D P10 /Al Plates D P10 /Al (40 pcs., as lower or upper plate)	222-2153
D P20 /Al Plates D P20 /Al (40 pcs., as lower or upper plate)	222-2154
D P25 /Al Plates D P25 /Al (40 pcs., as lower or upper plate)	222-2155
D P35 /Al Plates D P35 /Al (40 pcs., as lower or upper plate)	222-2156

Table 5. Recommended accessory - Collection device for disposable plates

Product	Order no.
For P20 mm Al Ex	222-1778
For 25 mm Al Ex	222-1779
For 35 mm Al Ex	222-1787

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