Zwick / Roell

Messphysik
Materials Testing

Product Information
1.200°C high temperature furnace, with temperature controller

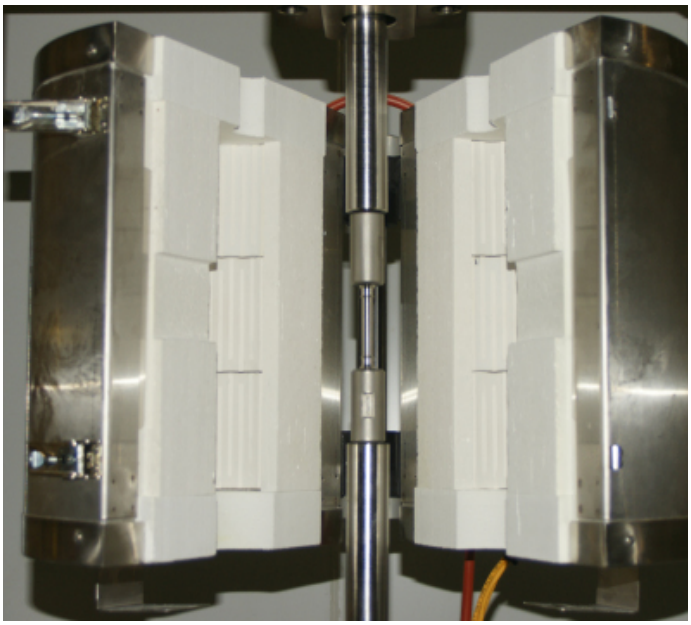

figure 1: 1200 °C round furnace, 3 zones, for material tests

figure 2: Temperature controller, desk type

High temperature standard furnace *
- 3-zone furnace; standard from 100/200°C to 1.200 °C
- Internal diameter: 100 mm,
- Heated length: 300 mm
- Openings for load train, Thermocouples and Extensometers
- 3 Thermocouples for furnace controller, up to 3 additional Thermocouples for temperature control at the specimen

Characteristics
- Precise temperature distribution by 3-zone-temperature-controller
- Light, thermal insulation material (free of asbestos)
- Casing made of stainless steel
- Standard: Thermocouples Type K for furnace and specimen

Optional:
- The furnace is prepared for the side-entry of a high temperature extensometer
- Lateral vision panel e.g. for optical strain measurement
- Thermo element Type R or S for specimen
- Temperature > 1.200 °C
- Vertical positioning of furnace: furnace stays in the centre of the specimen during test

* different technical data available on request

High temperature controller
The high temperature controller is ideally suitable for high temperature furnace control according ISO 204 and ASTM E 139.
3-zone control (EUROTHERM 2604) with 3 control areas (3 thermo elements on the specimen) and 3 zone temperature controller

Characteristics
- Usable as stand alone operation and also PC-operation with testXpert® II software
- Integrated, sophisticated control algorithm for precise temperature along the specimen and for protection from overshoot of temperatures.
  Note: empirically determined control parameters for different temperatures are no longer required
- Automatic controller settings according tolerances of ISO 204 and ASTM E 139 in the temperature range of 100/200 °C to 1.200 °C
- Display of 3 temperatures on the specimen and of the 3 temperatures in the middle of each heating zone.
- Inputs for 6 thermocouples
- RS232 interface to PC with 6 virtual channels
- Applicable for different HT-furnaces

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Technical data standard furnace*

Furnace dimensions and weight

Heated length	per zone	approx. 100 mm (vertical) each zone is controlled independently
Furnace, outer	diameter height	approx. 304 mm approx. 405 mm
Heating area, inner	diameter height	approx. 100 mm approx. 300 mm
Openings for pull rods	above and below	approx. 40 mm
Weight		approx. 30 kg

Thermic data

Temperature range	Ambient temperature from 100/200 °C to 1.200 °C
Heating rate	max. 20 K/minute

Material data

Heat conductor	A1-Resistance spirals, horizontal, embedded in an AL_2O_3 soft felt holder
Thermo-element	NiCr-Si-NiSi, Type N
Thermic insulation	AL_2O_3-Soft felt
Casing	Stainless steel, double coated outer wall, reducing the temperature trough convection air cooling between the insulation and the casing wall, can be opened on a hinge,with lateral aperture (at the split) for sensor arms, snap lock for opening / closing the furnace.

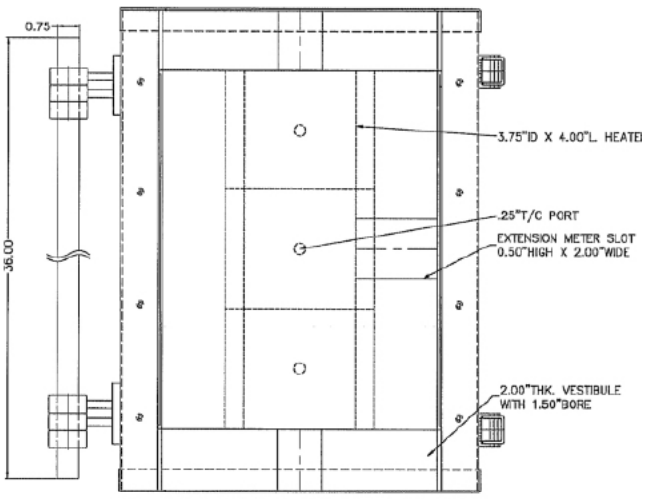


figure 3: Split furnace detail

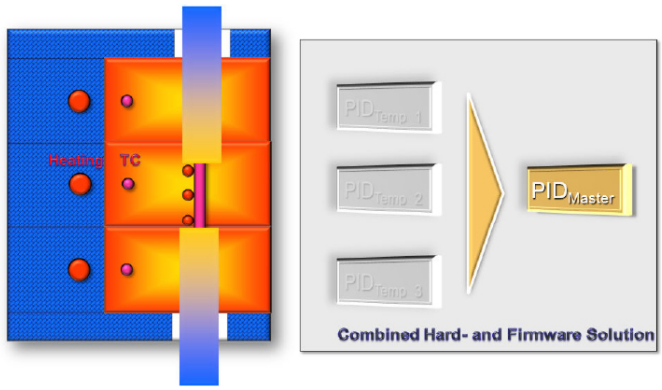
Technical data temperature controller

Electricity

Control/Measuring range	from 100/200 °C up to 1.200 °C
Heating rate	max. 10 K/minute
Temperature control accurance	+/- 1....2°C acc. to ASTM E 139 and ISO 204
Power Supply	1x230V, 50Hz, 16A, 3-pole P+N+PE, CEE 7/7 plug

* Adaptions to special HT-furnaces available

Unique Temperature Control System



The combined Hard- and Firmware Solution

- offers easy and time saving handling by just setting the test temperature
- ensures precise test temperature along the specimen

* other furnaces are available

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Functional principle

Furnace positioning device

- Automatic axial positioning of the furnace center to the center of the specimen
  Travel of furnace = 1/2 Travel´s of crosshead
- Ensures ideal temperature gradient along the specimen even at high specimen elongation over a long time
- Alternatively the furnace can be fixed axially by clamping on the column
- Incl. swivel functionality to position the furnace in or out of the test axis
- Maximum load 40 kg (furnace weight)

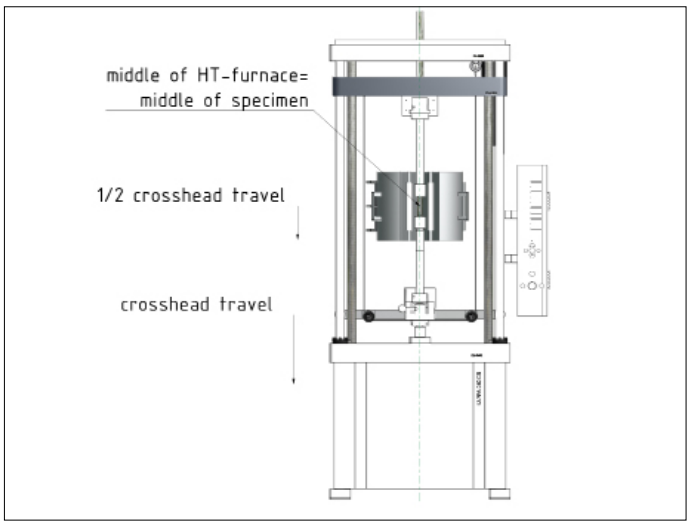

figure 4: Furnace positioning device

Swivel unit

- Tests at high-temperature and at ambient temperature or use of 2 different furnaces

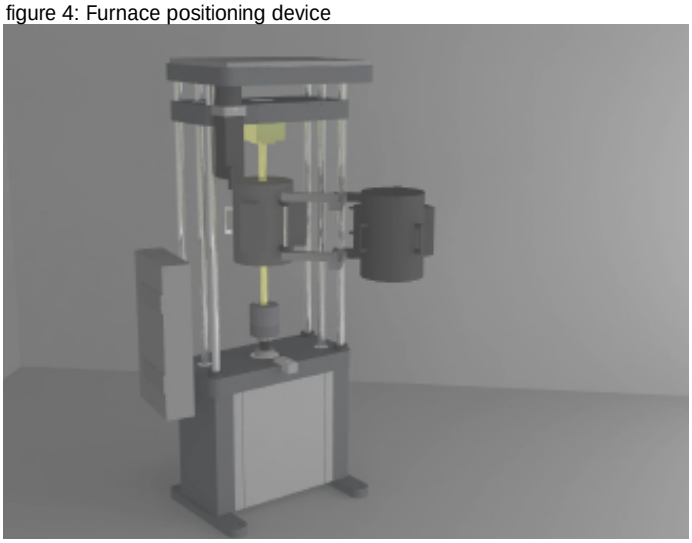
figure 5: swivel unit with HT-furnace in and out of test area

Thermocouples

- As the Thermocouples are attached acc. to ASTM E 633 they are always symmetrical on the specimen - even at high elongation

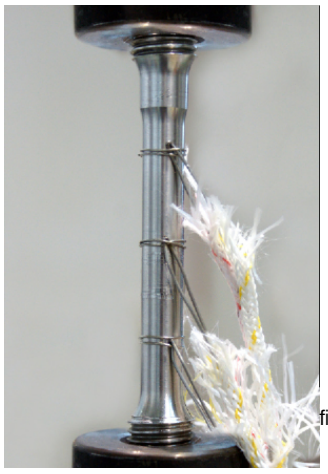
figure 6: 3 TC´s along specimen

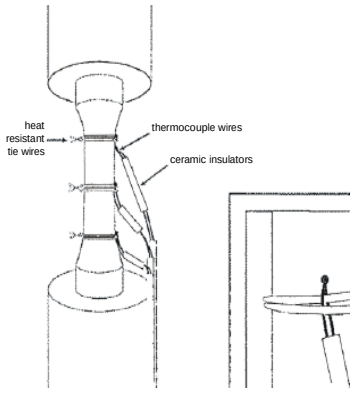

fig. 7: Installation with Welded Junctions

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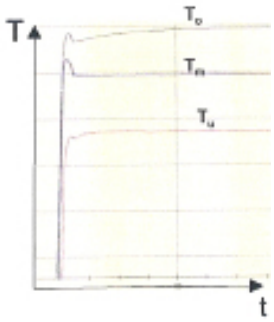
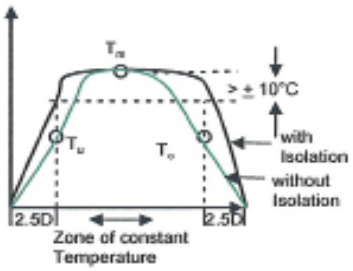
Functional principle

- 1-zone-controller
  result: unsuitable for materials testing
  - high difference in temperature along the specimen
  - short zone of constant temperature
  - dependency of furnace-opening
  - local overshoots

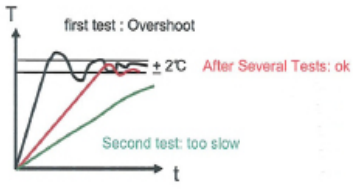


Specimen temperatures

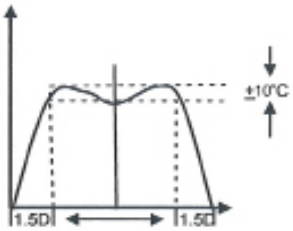


Temperature deviation

- 3-zone-controller with 3 specimen TC´s with conventional cascade controller
  result: - extended zone of constant temperature
  - more operating expense for optimizing the controller
  - dependency of furnace-opening
  - gradient in temperature along the specimen
  - risk of overshoots
  - controller parameter is only for one temperature situation usable

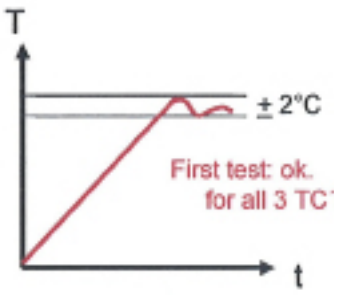


Manual Controller setup

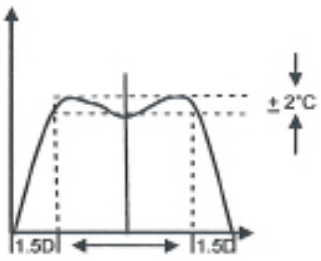


Temperature deviation

- 3-zone-controller, with 3 specimen TC´s with soph. control-algorithm
  result: no operating expense for optimizing the controller
  - no-dependency of furnace-opening
  - no overshoots
  - controller parameter for all temperature situations are automatically set



Automatic Control algorithm



Temperature deviation