

walter+bai

w+b

High Temperature Furnaces Overview



Welcome to the walter+bai Overview Brochure

Dear Customer

Mechanical testing plays a major role in research and education, product development, design and quality control. In this Overview Prospect we present our range of high-temperature furnaces used for the determination of the high-temperature properties of materials.

By selecting our equipment you benefit from our extensive experience in development and production of materials testing systems to suit numerous applications.

Should you require a very specific and customized testing system, we are able to design, develop and produce such system for you. We deliver customized solutions and complete installations for physical and mechanical testing laboratories world-wide.

In this Overview Brochure you will find:

- General information about company
- List of services provided by walter+bai
- Static and dynamic materials testing machines and systems
- Overview of the most common accessories including grips, fixtures, extensometers, hydraulic power supply, environmental chambers and furnaces.

Our prior goal is to supply advanced and up-to-date testing equipment designed for standard and severe conditions, coupled with long-lasting and reliable operation. To ensure that you obtain the maximum rewards from your investment, our accredited calibration laboratory guarantees an excellent after-sale service and verification facilities are always available for your installation. Our world-wide network of experienced representatives and qualified engineers provide you with optimum after sale support so that you thoroughly benefit from your testing system.

Please do not hesitate to inform us how we can make this catalogue better for you in the future. Your feedback and suggestions will be gladly received on info@walterbai.com.

Sincerely yours,

Ralph Walter
Managing Director, walter+bai ag

walter+bai Testing Machines



walter+bai ag Testing Machines supplies a wide range of material testing machines and systems for the safety and quality of materials, industrial products and buildings. Mechanical testing is carried out in many industrial sectors, such as the automotive and aircraft industry, metal industry, plastic and rubber industry, the chemical industry, construction industry, bio mechanics as well as at institutes and universities. Serving these sectors for more than 45 years, w+b customers benefit from the company's extensive experience in producing material testing systems and equipment to meet this wide range of applications. Due to our comprehensive know-how and considerable engineering capabilities we are able to offer not only standard testing machines but also customized solutions or complete installations for physical testing laboratories world-wide. To ensure you obtain the maximum rewards from your investment, our accredited calibration laboratory guarantees that excellent verification facilities and after-sale service are available for your testing equipment.

Profile

We are renowned for the production of high quality systems. Due to our continuous research and development policy as well as actively collaborating with our customers and suppliers we have always maintained the very high product standard ever since the company was founded in 1970 by

Armin Walter and Alfred Bai in Löhningen - Switzerland. The sales, design and manufacturing divisions associated with testing machines has grown due to the constant interaction with a multitude of clients and the systematic realisation of their requirements. Our product range has been steadily expanded and our service sector activities extended to meet growing demands. The unique position of w+b in the field of material testing machines can be attributed to the fact that their specialised know-how related to materials testing is being constantly updated whilst offering custom designed products and services. A well qualified and highly motivated staff coupled with an efficient organisational structure forms the backbone of w+b upon which you can rely for know-how, competence and reliable performance.

«Specific testing tasks demand appropriate testing equipment!»

This is our motto. Therefore, besides our standard range of testing machines, we have developed an extensive number of customized testing machines for static and dynamic material and component testing.

w+b Testing Machines are the pacemaker for trendsetting technologies. They are a prerequisite for the safety and quality of materials, industrial products and buildings.

Our Products and Services

- Manufacturing of materials testing machines and systems
- Customer specific testing systems
- Servohydraulic and electromechanical, static and dynamic testing machines
- Digital measuring and control systems and testing software
- Hydraulic power packs
- Static and dynamic actuator testing systems
- Accesories and fixtures for component testing
- Testing machines for construction materials
- Modernisation of existing testing machines
- Maintenance and calibration of material testing machines
- Project management and technical consulting

High Temperature 3-Zone Split Furnaces Series HTO 08 & 19 & 37 up to 1100°C

These three-zone split high temperature resistance furnaces are designed for materials testing in air. The double-walled design reduces the outer wall temperature through convective-cooling. This furnace is well suited for high temperature tension, compression, cyclic fatigue testing and fracture mechanics testing. The Version 08 provides 300 mm heated zone length whereas version 37 is with extended heating zone length of 360 mm and version 19 is with heated zone length of 200 mm optimized for Low Cycle Fatigue (LCF) applications in combination with high temperature LCF Grips Series HTG.

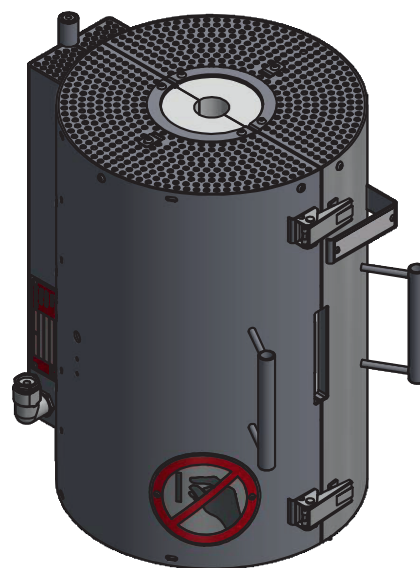
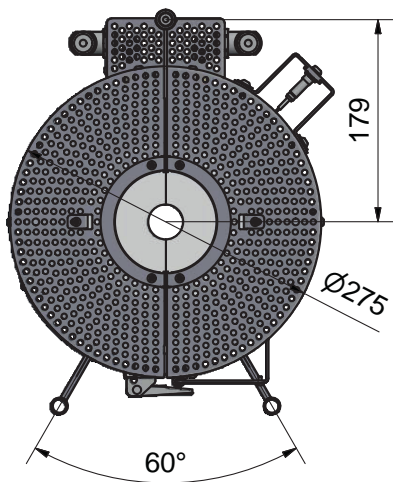
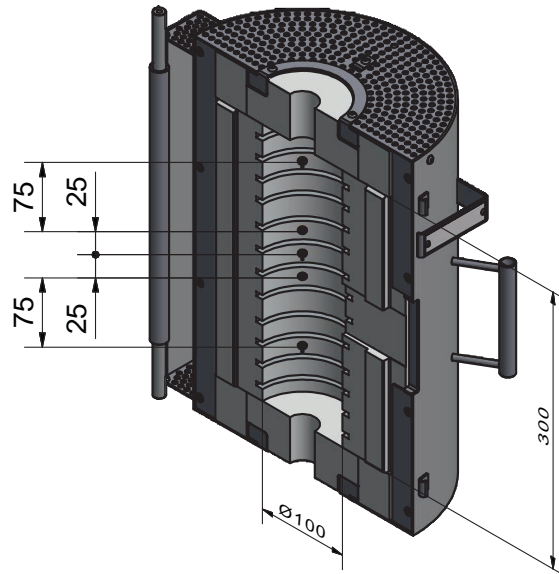
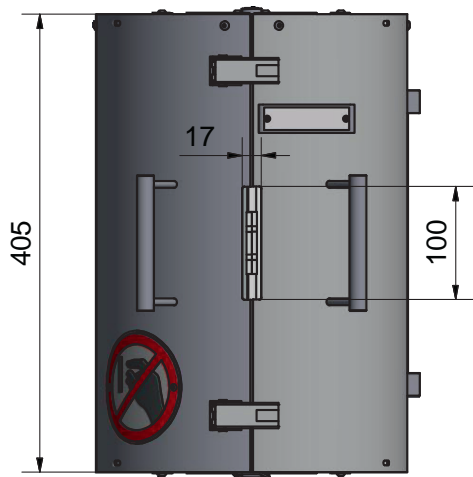
The furnace work with low voltage and high current archived by a transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.



Key Features

- Split construction design providing fast and easy sample loading.
- Durable embedded horizontal heating elements coils
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free material for minimum power consumption
- Furnace case made of stainless steel
- All electric connections including heat current are pluggable at the controller
- Front cut-out provides access of side-entry high-temperature extensometers
- Three independent heating zones provide an uniform temperature gradient
- Accurate closed-loop temperature control in combination with Eurotherm temperature controller
- RS485 Interface
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Programmable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Five Feedthrough for additional thermocouples
- Three feedthrough in the centre of each heating zone
- Slidable Thermocouple arrangement optionally available for teperature
- Adjustable stainless steel latches for easy locking of the furnace acquisition during testing.
- Top and bottom end plates are optimized to the pull rods

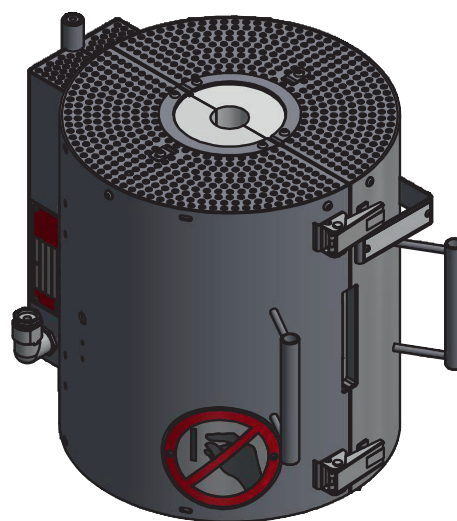
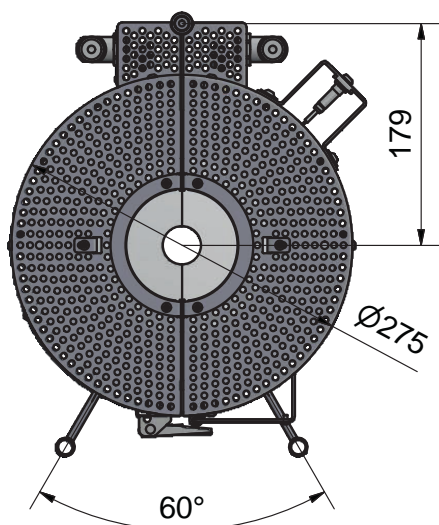
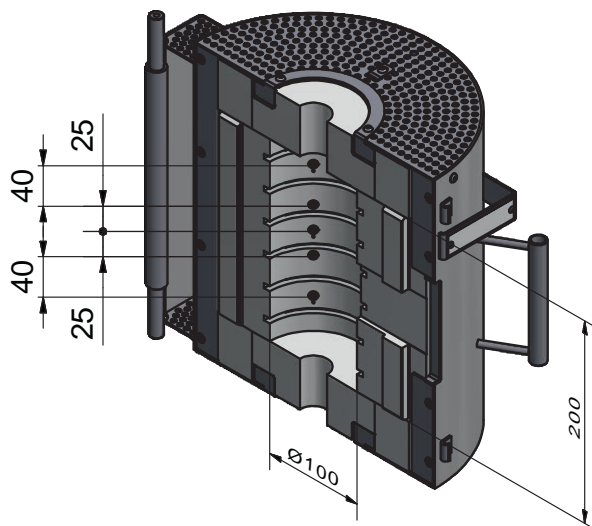
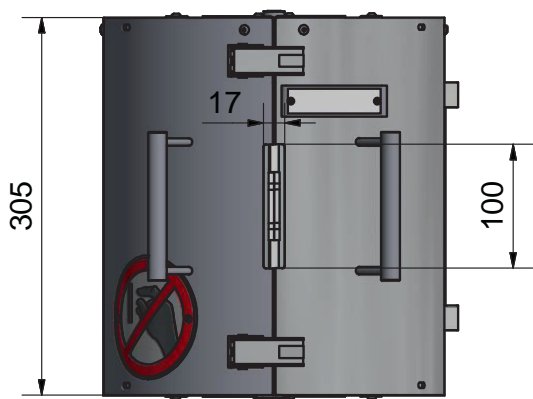
w+b High Temperature Accessories



Furnace Type HTO		08	08/1	08/2
Max. Heating Element Temperature	°C	1150	1150	1150
Max. Sample Temperature*	°C	900	1000	1100
Max. Heating Rate	°C/min.	20	20	20
No. of Heated Zones	No.	3	3	3
Hot Zone Height	mm	300	300	300
Heating Zone Diameter	mm	100	100	100
No. of Thermocouples included**	No.	3	3	3
Thermocouple Type***	Type	NiCr-Ni, Type K	NiCr-Ni, Type K	NiCr-Ni, Type K
Output Voltage for Heating Element	V	3 x 34	3 x 34	3 x 34
Outside Diameter	mm	275	275	275
Overall Furnace Length	mm	405	405	405
Weight	kg	35	35	35
Power Consumption (each Zone)	kW	0.5	0.6	0.6
Thermal Insulation		Amorphous Alumina Silicate wool	Al2O3-Wool Polycrystalline	Al2O3-Wool Polycrystalline
Heat Conductor		Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL203 soft felt holders		

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

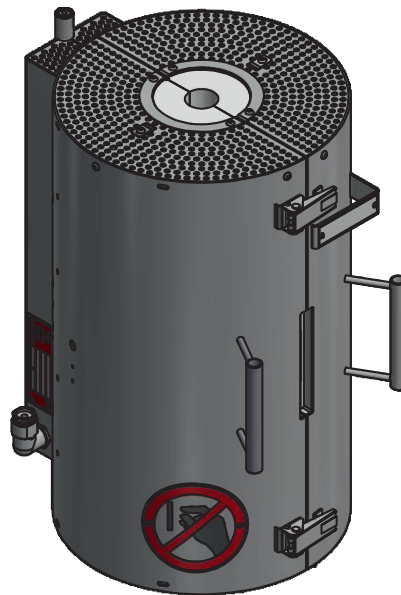
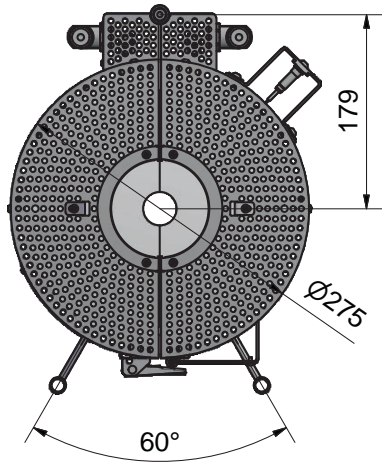
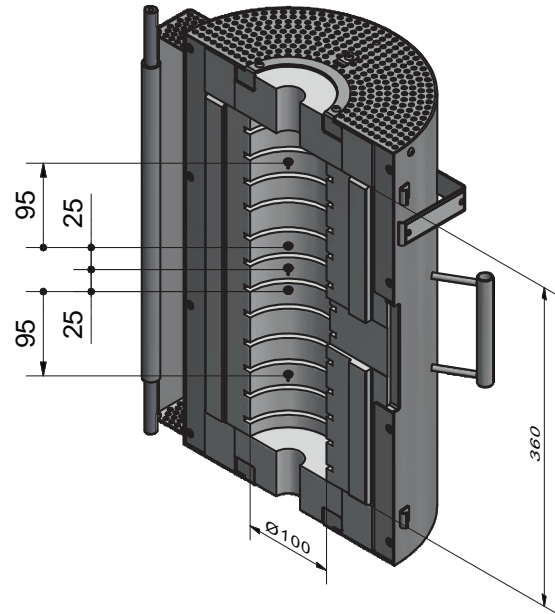
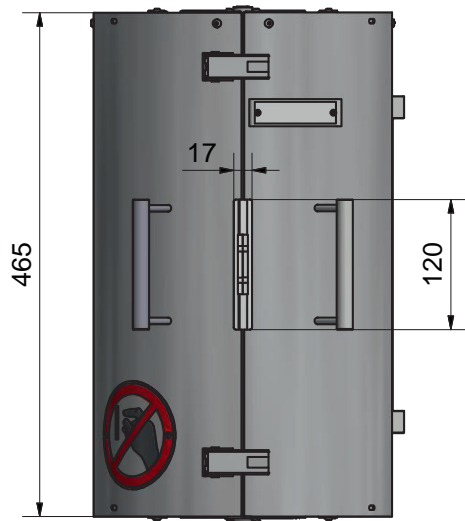
w+b High Temperature Accessories



Furnace Type HTO		19	19/1	19/2
Max. Heating Element Temperature	°C	1150	1150	1150
Max. Sample Temperature*	°C	900	1000	1100
Max. Heating Rate	°C/min.	20	20	20
No. of Heated Zones	No.	3	3	3
Hot Zone Height	mm	200	200	200
Heating Zone Diameter	mm	100	100	100
No. of Thermocouples included**	No.	3	3	3
Thermocouple Type***	Type	NiCr-Ni, Type K	NiCr-Ni, Type K	NiCr-Ni, Type K
Output Voltage for Heating Element	V	3 x 30	3 x 30	3 x 30
Outside Diameter	mm	275	275	275
Overall Furnace Length	mm	305	305	305
Weight	kg	25	25	25
Power Consumption (each Zone)	kW	0.5	0.6	0.6
Thermal Insulation		Amorphous Alumina Silicate wool	Al2O3-Wool Polycrystalline	Al2O3-Wool Polycrystalline
Heat Conductor		Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders		

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

w+b High Temperature Accessories



Furnace Type HTO		37	37/1	37/2
Max. Heating Element Temperature	°C	1150	1150	1150
Max. Sample Temperature*	°C	900	1000	1100
Max. Heating Rate	°C/min.	20	20	20
No. of Heated Zones	No.	3	3	3
Hot Zone Height	mm	360	360	360
Heating Zone Diameter	mm	100	100	100
No. of Thermocouples included**	No.	3	3	3
Thermocouple Type***	Type	NiCr-Ni, Type K	NiCr-Ni, Type K	NiCr-Ni, Type K
Output Voltage for Heating Element	V	3 x 34	3 x 34	3 x 34
Outside Diameter	mm	275	275	275
Overall Furnace Length	mm	465	465	465
Weight	kg	37	37	37
Power Consumption (each Zone)	kW	0.6	0.6	0.6
Thermal Insulation		Amorphous Alumina Silicate wool	Al2O3-Wool Polycrystalline	Al2O3-Wool Polycrystalline
Heat Conductor		Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders		

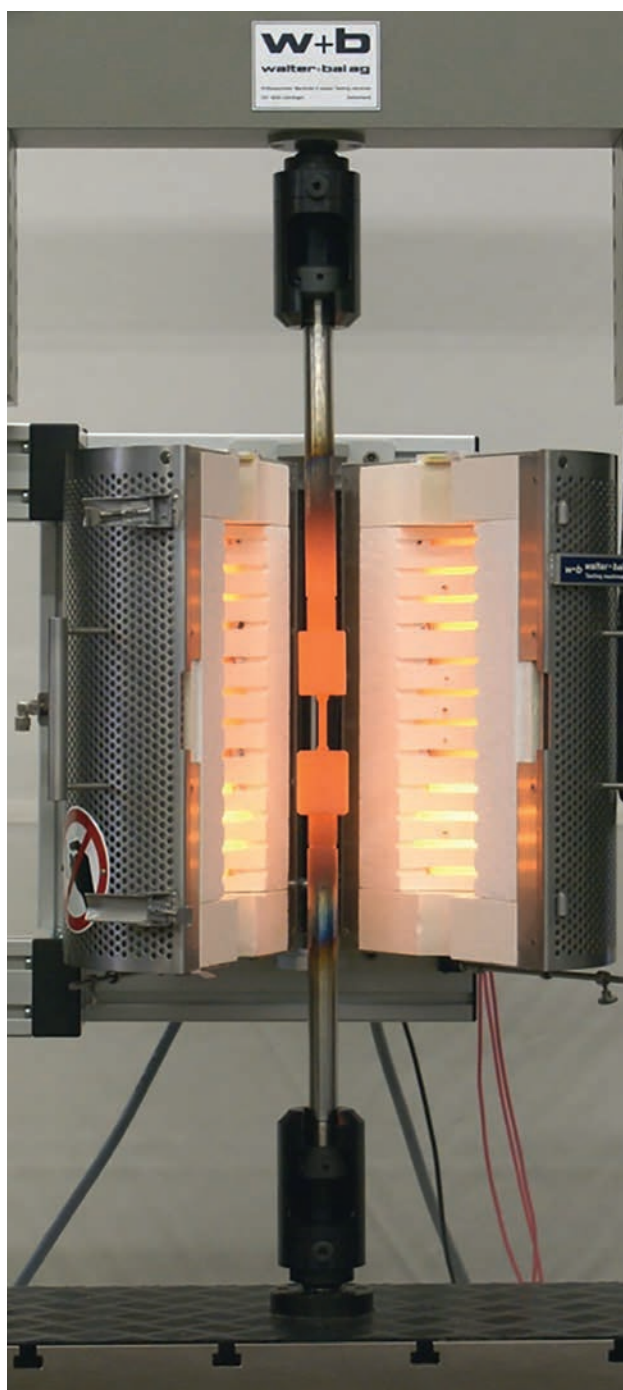
*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

High Temperature 3-Zone Split Furnaces Double-Walled

Series HTO 15 & 27 & 38 up to 1200°C

These three-zone split high temperature resistance furnaces are designed for materials testing in air. The double-walled design reduces the outer wall temperature through convective-cooling. This furnace is well suited for high temperature tension, compression, cyclic fatigue testing and fracture mechanics testing. The Version 15 provides 300 mm heated zone length whereas version 38 is with extended heating zone length of 360 mm and version 27 is with heated zone length of 200 mm optimized for Low Cycle Fatigue (LCF) applications in combination with high temperature LCF Grips Series HTG.

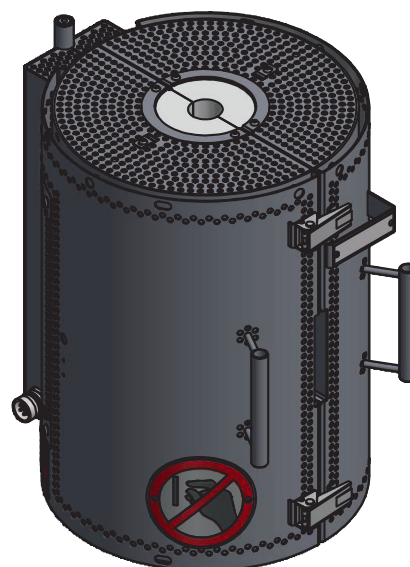
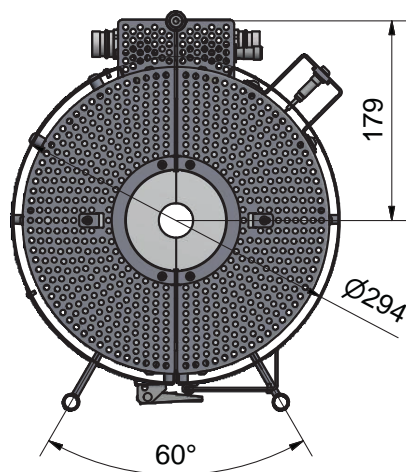
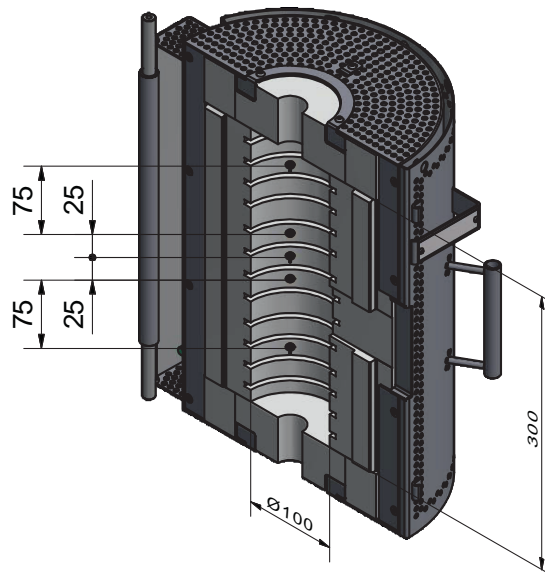
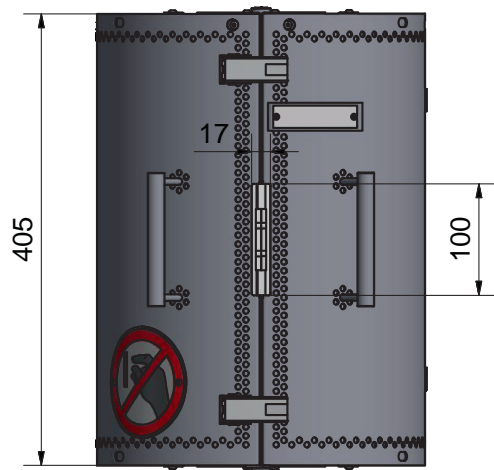
The furnace work with low voltage and high current archived by a transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.



Key Features

- Split construction design providing fast and easy sample loading.
- Double-walled construction to reduce outer wall temperature through convective-cooling
- Safty switch shout down the furnace when when the furnace is opened
- Durable embedded horizontal heating colis
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free material for minimum power consumption
- Furnace case made of stainless steel
- All electric connections including heat current are pluggable at the controller
- Front cut-out provides access of side-entry high-temperature extensometers
- Three independent heating zones provide an uniform temperature gradient
- Accurate closed-loop temperature control in combination with Eurotherm temperature controller
- RS485 Interface
- Furnace protected against over-temperature
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Progammable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Five Feedthrough for additional thermocouples
- Three feedthrough in the centre of each heating zone
- Slidable Thermocouple arrangement optionally available for temeprature
- Adjustable stainless steel latches for easy locking of the furnace during testing.
- Top and bottom end plates are optimized to the pull rods

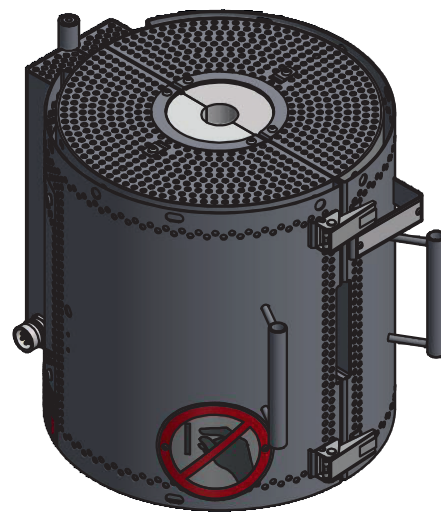
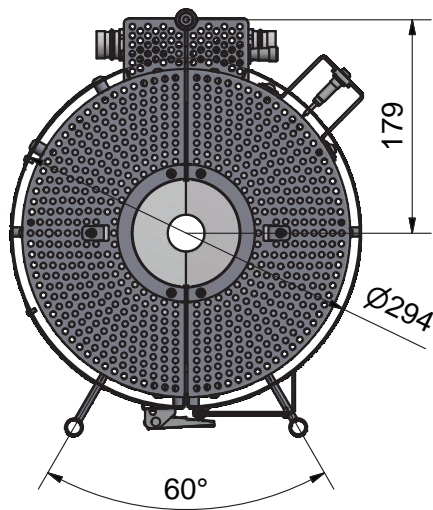
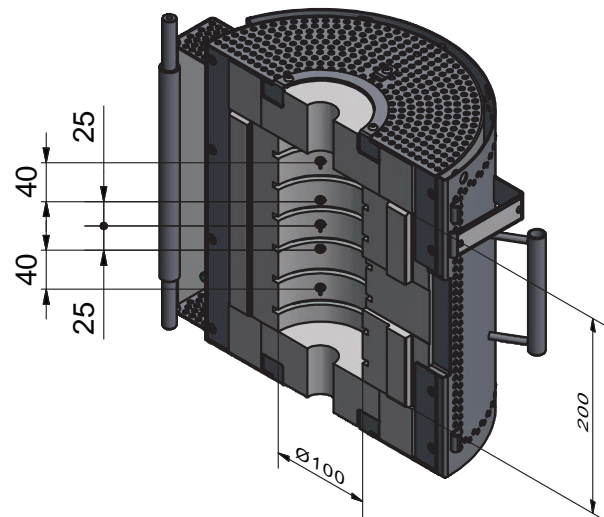
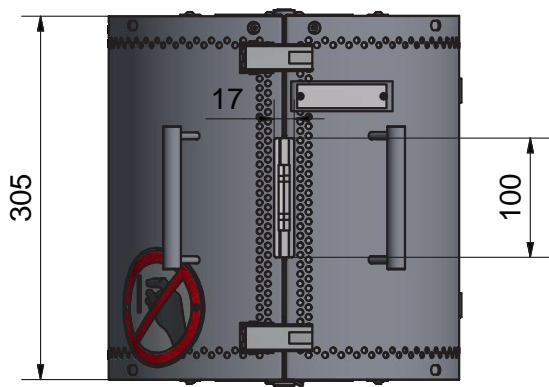
w+b High Temperature Accessories



Furnace Type HTO		15
Max. Heating Element Temperature	°C	1250
Max. Sample Temperature*	°C	1200
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	3
Hot Zone Height	mm	300
Heating Zone Diameter	mm	100
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	NiCr-Si-NiSi, Type N
Output Voltage for Heating Element	V	3 x 34
Outside Diameter	mm	295
Overall Furnace Length	mm	405
Weight	kg	35
Power Consumption (each Zone)	kW	0.6 each zone
Thermal Insulation		Al2O3-Wool Polycrystalline
Heat Conductor	Conductor Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders and free radiating mounted	

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

w+b High Temperature Accessories



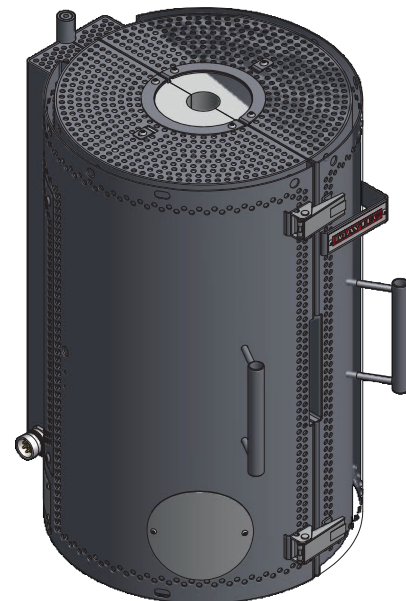
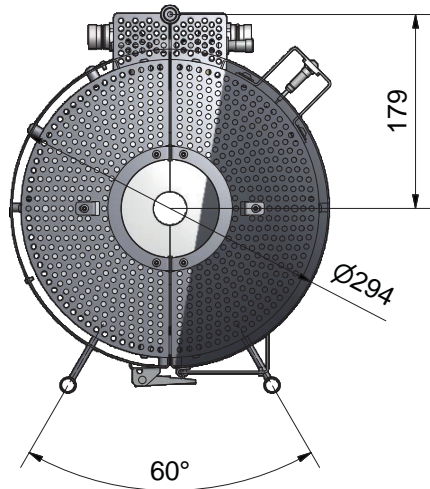
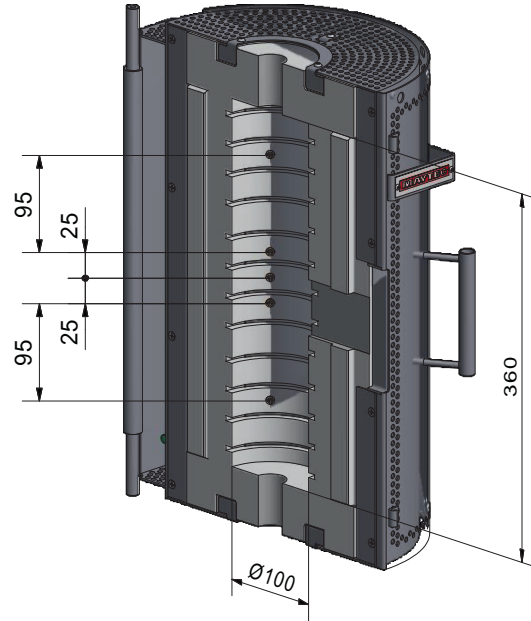
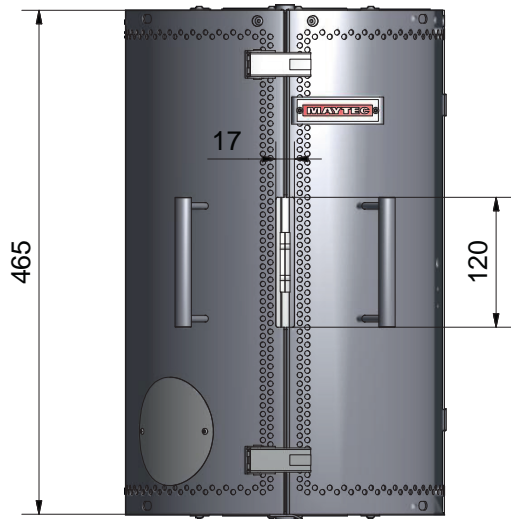
Furnace Type HTO

27

Max. Heating Element Temperature	°C	1250
Max. Sample Temperature*	°C	1200
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	3
Hot Zone Height	mm	200
Heating Zone Diameter	mm	100
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	NiCr-Si-NiSi, Type N
Output Voltage for Heating Element	V	3 x 30
Outside Diameter	mm	295
Overall Furnace Length	mm	305
Weight	kg	30
Power Consumption (each Zone)	kW	0.6 each zone
Thermal Insulation		Al2O3-Wool Polycrystalline
Heat Conductor	Conductor Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders and free radiating mounted	

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

w+b High Temperature Accessories



Furnace Type HTO		38
Max. Heating Element Temperature	°C	1250
Max. Sample Temperature*	°C	1200
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	3
Hot Zone Height	mm	360
Heating Zone Diameter	mm	100
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	NiCr-Si-NiSi, Type N
Output Voltage for Heating Element	V	3 x 34
Outside Diameter	mm	295
Overall Furnace Length	mm	465
Weight	kg	40
Power Consumption (each Zone)	kW	0.6 each zone
Thermal Insulation		Al2O3-Wool Polycrystalline
Heat Conductor	Conductor Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders and fee radiating mounted	

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

High Temperature 3-Zone Split Furnaces Water Cooled Series HTO 20 up to 1600°C

These three-zone split high temperature resistance furnace is designed for materials testing in air. The furnace is optimized for high temperature tension, compression, cyclic fatigue testing including Low Cycle Fatigue (LCF) Tests on metallic materials.

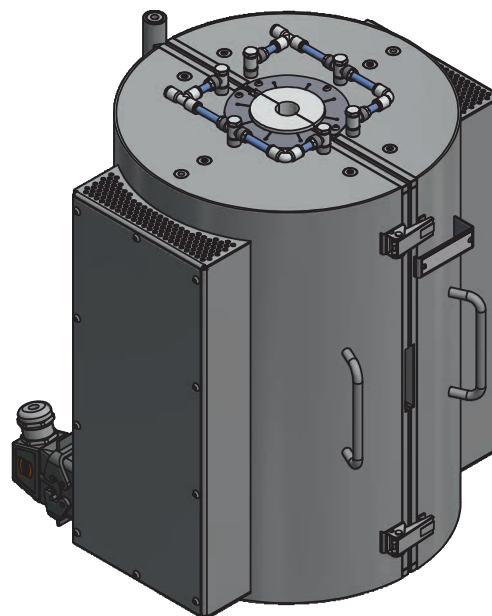
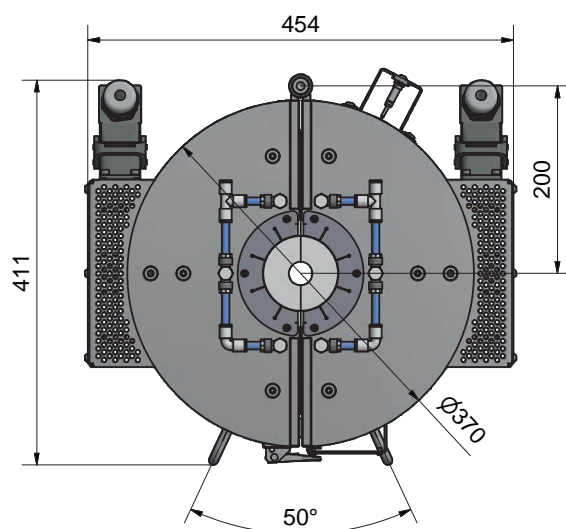
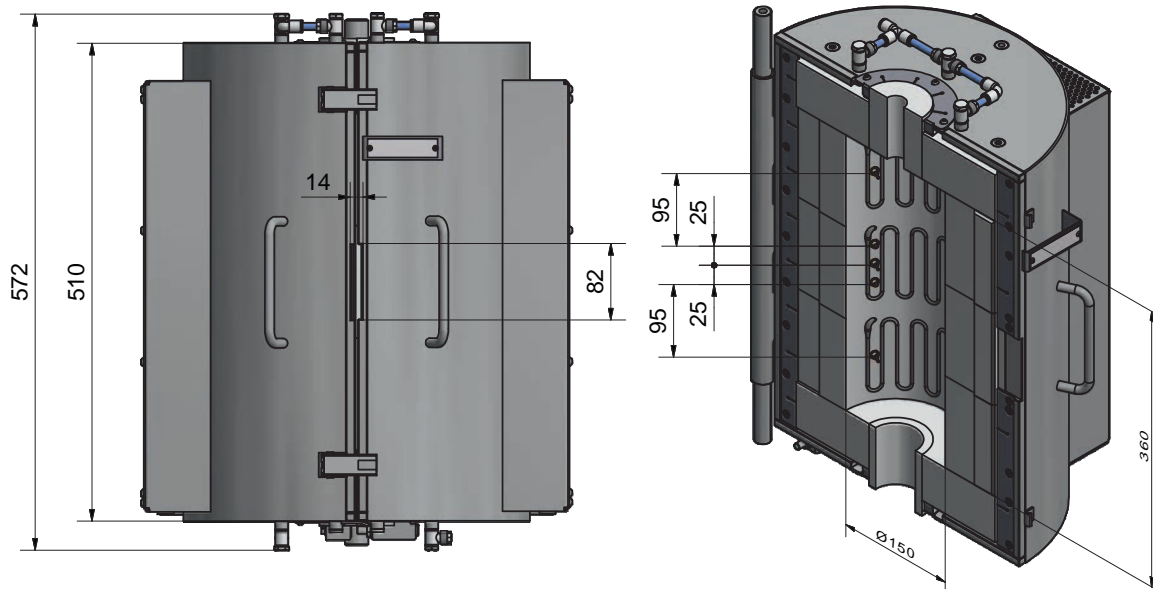
The furnaces works with low voltage and high current archived by an internal transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.



Key Features

- Double walled, water cooled furnace keeps the outer case surface cool
- Heated zone length provides uniform temperature over sample length
- Excellent temperature-uniformity due to 3 heating zones and adequate heated zone length
- Each heating zone independently controllable
- The split construction design providing fast and easy sample loading.
- High quality molybdenum disilicide heating elements
- Phase-segment operating mode with current limiting to protect the heating elements
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free Al2O3 pliable felt material for minimum power consumption
- Furnace case made of stainless steel
- All electric connections including heat current are pluggable at the controller
- Front cut-out provides access of side-entry high-temperature extensometers
- Accurate closed-loop temperature control in combination with Eurotherm temperature controller
- RS485 Interface
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Programmable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Three feedthrough for heating zone thermocouples and additional two feedthrough for additional thermocouples attachable direct on the samples
- Adjustable stainless steel latches for easy locking of the furnace during testing.
- Top and bottom end plates are optimized to the pull rods

w+b High Temperature Accessories



Furnace Type HTO		20
Max. Heating Element Temperature	°C	1600
Max. Sample Temperature*	°C	1550
Operating Temperature	°C/min.	800 – 1600 (heating element temperature)
Max. Heating Rate	°C/min.	20 up to 1200°C / 15 from 1200°C to 1400°C / 10 above 1400°C
No. of Heated Zones	No.	3
Hot Zone Height	mm	360
Heating Zone Diameter	mm	130
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	Pt10%-Ph/Pt, Type S
Output Voltage for Heating Element	V	50 two series connected modules
Width	mm	453
Overall Furnace Length	mm	560
Weight	kg	65
Power Consumption (each Zone)	kW	1.35 each zone
Thermal Insulation		Al2O3 Pliable Felt
Coolant Water Flow	l/min.	4
Cooling Water Inlet Pressure	bar	Max. 0.5
Heat Conductor		Molybdenum Disilicide Elements

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

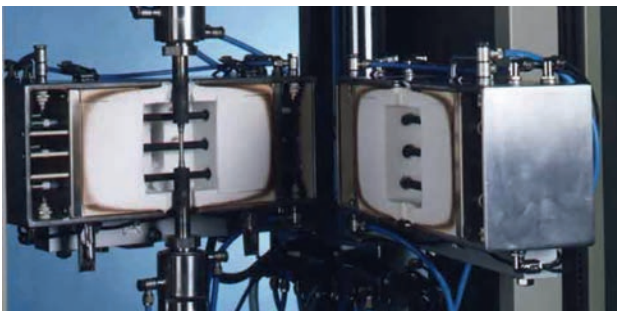
High Temperature 3-Zone Split Furnaces Water Cooled Series HTO 11 up to 1500°C

This three-zone split high temperature resistance furnace is designed for materials testing in air.

The HTO 11 offer an ideal low-profile solution for applications where the testing space is severely restricted due to specimen or grip or fixture size. Further are rapid heat-up and cool-down rates attainable due to a small internal working volume.

The furnace is optimized for high temperature tension, compression, flexural or cyclic fatigue testing on metallic or ceramic materials. The furnace allows the integration of the PMA-06 High Temperature Deflection Measuring Device for Flexural or Compression Tests on Ceramics.

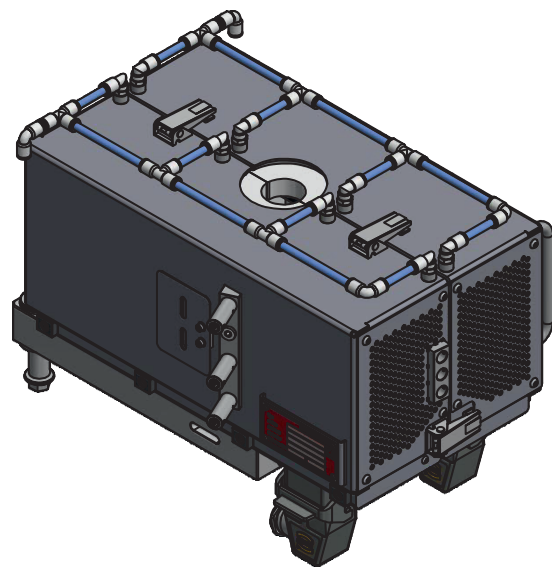
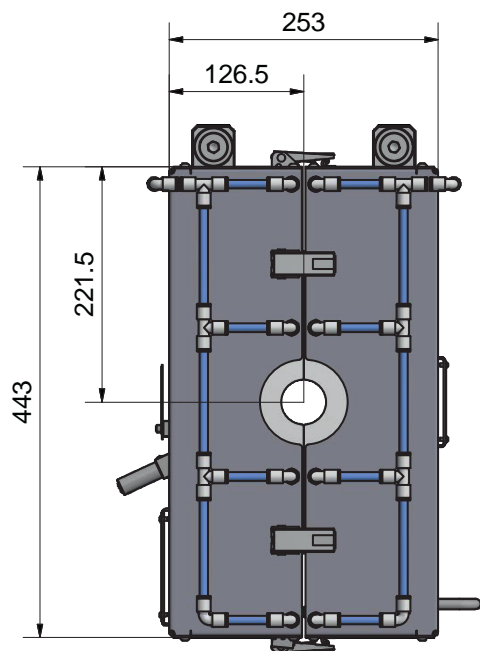
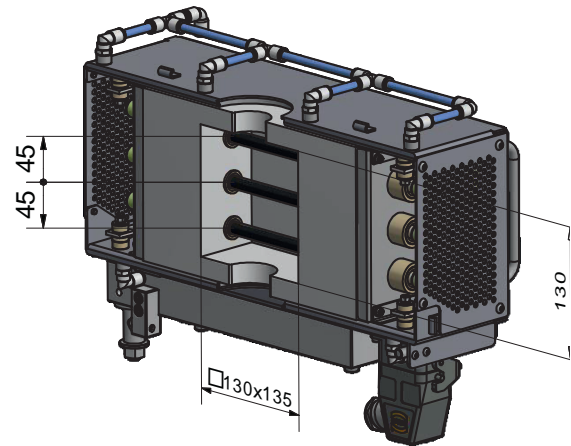
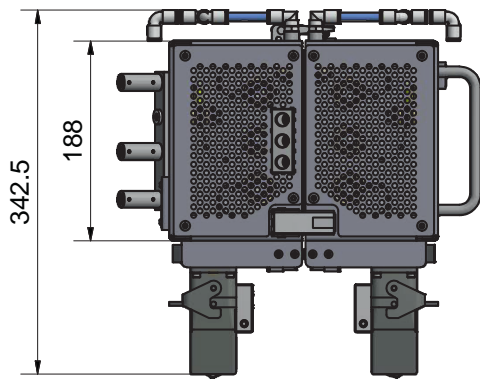
The furnace work with low voltage and high current archived by a transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.



Key Features

- Double walled, water cooled furnace keeps the outer case surface cool
- Short design reduces the load train in combination with high temperature accessories
- Excellent temperature-uniformity due to 3 heating zones, independently controllable from each other with suitable temperature-controller system
- The split construction design providing fast and easy sample loading or extensometer mounting.
- Durable embedded horizontal heating elements
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free material for minimum power consumption
- Furnace case made from stainless steel
- All electric connections including heat current are pluggable at the controller
- Front cut-out provides access of side-entry high-temperature extensometers
- Three independent heating zones provides uniform temperature gradient
- Accurate closed-loop temperature control in combination with Eurotherm temperature controller
- RS485 Interface
- Furnace protected against over-temperature
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Programmable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Three feedthrough for heating zone thermocouples
- Top and bottom end plates are optimized to the load train

w+b High Temperature Accessories



Furnace Type HTO

11

Max. Heating Element Temperature	°C	1600
Max. Sample Temperature*	°C	1500
Operating Temperature	°C/min.	800 – 1600 (heating element temperature)
Max. Heating Rate	°C/min.	40 up to 1200°C / 10 above 1200°C
No. of Heated Zones	No.	3
Hot Zone Height	mm	130
Heating Zone Width	mm	85
Heating Zone Depth	mm	40
No. of Thermocouples included**	No.	1
Thermocouple Type***	Type	Pt10%-Ph/Pt, Type S
Output Voltage for Heating Element	V	34
Inner Heating Zone Area	mm	130 (Width) x 140 (Depth)
Overall Furnace Length	mm	190 (Height) x 480 (Width) x 260 (Depth)
Weight	kg	40
Power Consumption (each Zone)	kW	2 kW each zone
Thermal Insulation		Al2O3 Pliable Felt
Coolant Water Flow	l/min.	6
Cooling Water Inlet Pressure	bar	Max. 0.5
Heat Conductor		Rod elements made from SILIT, horizontal mounted, freely radiating

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

High Temperature Single-Zone Split Furnaces Double-Walled - Water Cooled Series HTO 02 up to 1600°C

This single-zone split high temperature resistance furnace is designed for materials testing under air. The furnace is optimized for high temperature tension, compression, flexural or cyclic fatigue testing on metallic or ceramic materials. The furnace allows the integration of the PMA-06 High Temperature Deflection Measuring Device for Flexural or Compression Tests on Ceramics.

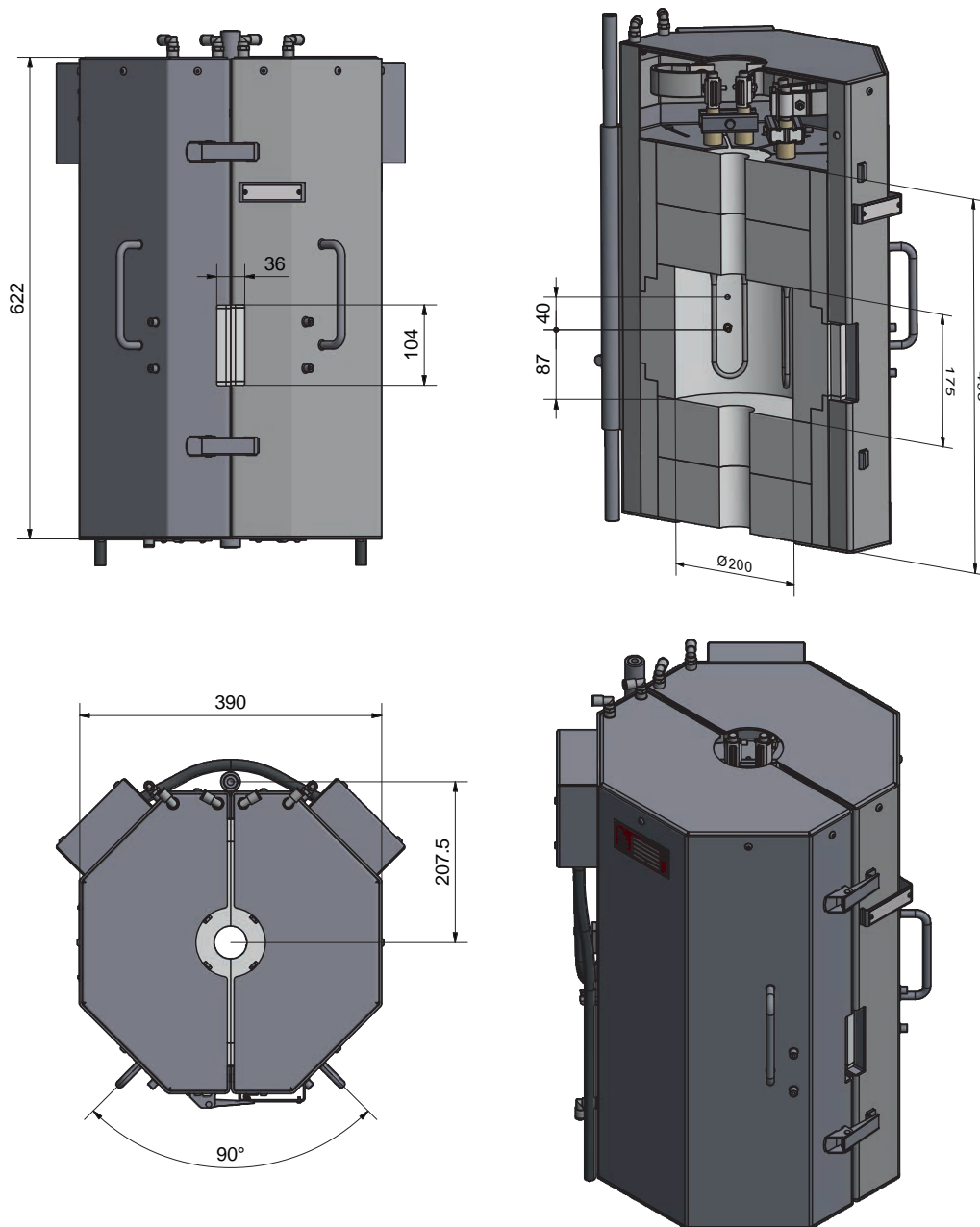
The furnace work with low voltage and high current archived by an transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.



Key Features

- Double walled, water cooled furnace keeps the outer case surface cool
- Single heated zone with length 170 mm provides uniform temperature over sample length
- The split construction design providing fast and easy sample loading and extensometer loading
- High quality molybdenum disilicide heating elements
- Phase-segment operating mode with current limiting to protect the heating elements
- Over-temperature alarm
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free Al₂O₃ pliable felt material for minimum power consumption
- Furnace case made from stainless steel
- All electric connections including heat current are pluggable on the controller
- Front cut-out provides access of side-entry high-temperature extensometers
- Accurate closed-loop temperature control in combination with 8-segment programmable Eurotherm temperature controller
- RS485 Interface
- Furnace protected against over-temperature
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Programmable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Three feedthrough for heating zone thermocouples and additional two feedthrough for thermocouples attachable direct on the samples
- Adjustable stainless steel latches for easy locking of the furnace during testing.
- To and bottom end plates are optimized to the pull or push rods

w+b High Temperature Accessories



Furnace Type HTO		02
Max. Heating Element Temperature	°C	1700
Max. Sample Temperature*	°C	1600
Operating Temperature	°C/min.	800 – 1700 (heating element temperature)
Max. Heating Rate	°C/min.	30 up to 1400°C / 10 above 1400°C
No. of Heated Zones	No.	13
Hot Zone Height	mm	170
Heating Zone Diameter	mm	85
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	Pt10%-Ph/Pt, Type S
Output Voltage for Heating Element	V	35
Width	mm	390
Overall Furnace Length	mm	620
Weight	kg	65
Power Consumption (each Zone)	kW	5
Thermal Insulation		Al2O3 Pliable Felt
Coolant Water Flow	l/min.	4
Cooling Water Inlet Pressure	bar	Max. 0.5
Heat Conductor		U-Mosilit-Disizilid

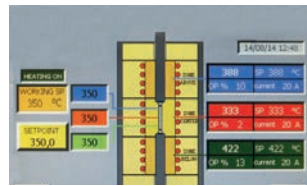
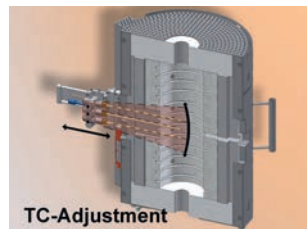
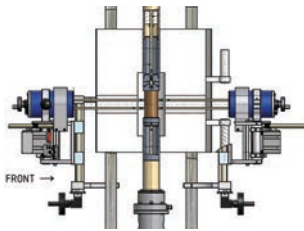
*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

High Temperature 3-Zone Split Furnaces Cascade Controlled Series HTO 34 & 39 up to 1200°C

These high temperature 3-zone split-furnaces are the latest development in the field of high temperature materials testing in air.

The furnaces work with low voltage and high current achieved by transformer. The lower voltage on the heating elements extends the life-time of the furnace system considerable compared with those working with high voltage.

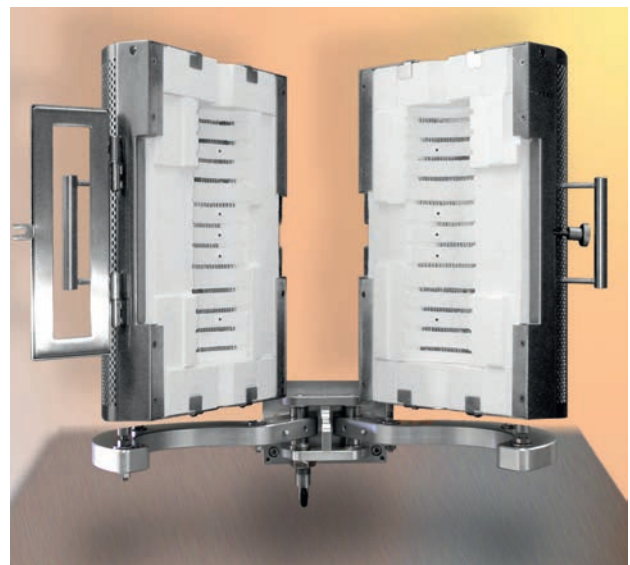
The two-halves split design allows the simultaneous mounting of one high temperature extensometer and the PMA-39 adjustable thermocouple-module or alternative of two high temperature extensometers to measure samples strain on two opposite sides providing single and average strain measurement.



The controlling of the temperature is driven by means of a triple cascaded closed loop control through Eurotherm 6-channel controller with three (3) independently working cascade controller circuits (1 per each heater zone). The cascade closed loop control ensures a short setting time if environmental conditions- or if the sample temperature set points are changed. Temperature overshoots are avoided. This is achieved by controlling of a second, faster process (furnace's heater temperature) which influences the main control loop (sample temperature). The sample temperature is controlled by an overlapping PID circuit (via sample Thermocouple), which signal output determines the heater Thermocouples (via furnace TC's) set point. The heater temperature is controlled by the subordinated PID circuit.

HTO-39

Double Slot Furnace for High-Temperature Axial Extensometer (contact or optical) or / and PMA-39 or two Axial Extensometers



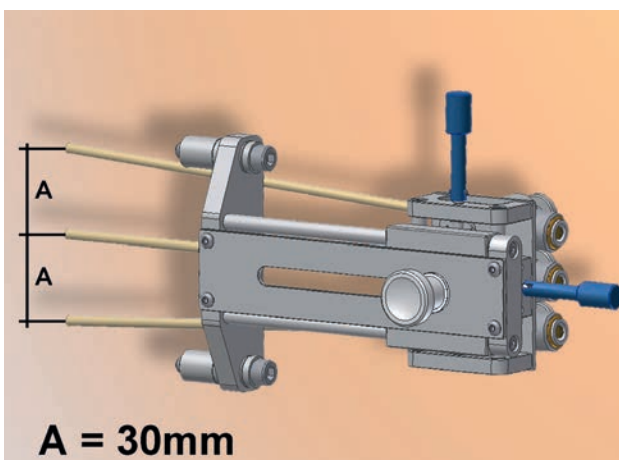
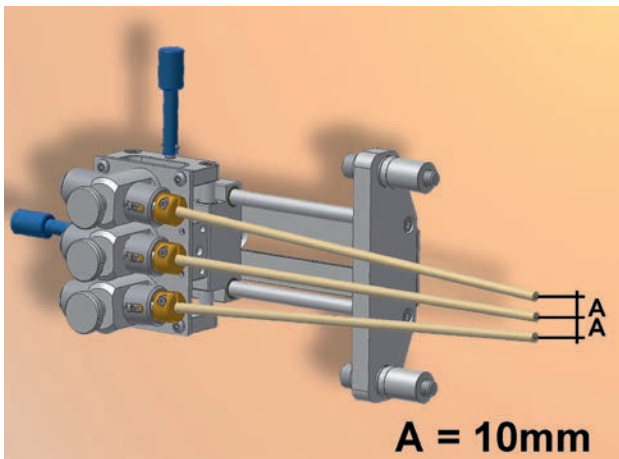
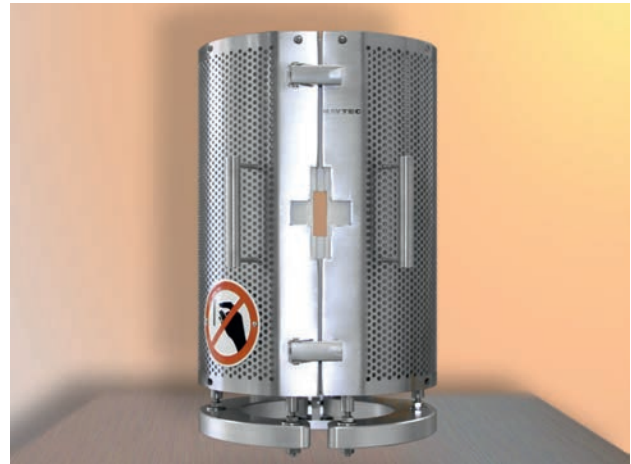
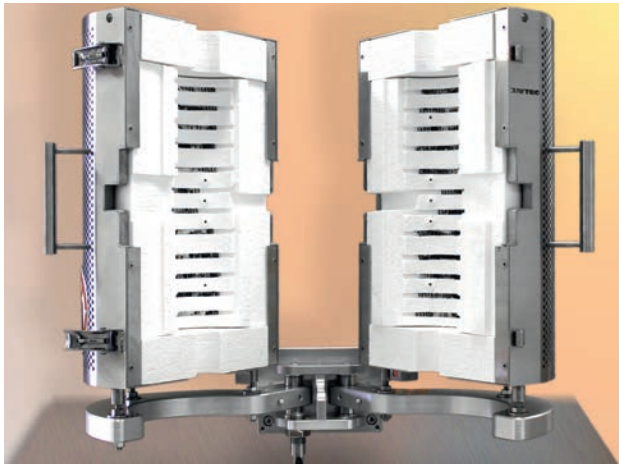
Observation Window optionally available

Material of the windowpane: Silical Gla
Max. permissible window glass temperature: 800°C
Suitable for outlet of the wave length 650 nm

w+b High Temperature Accessories

HTO-34

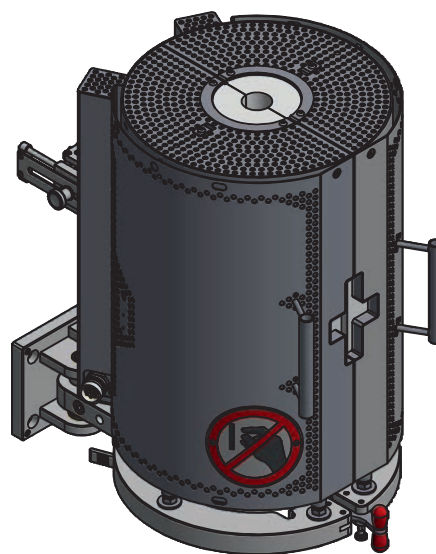
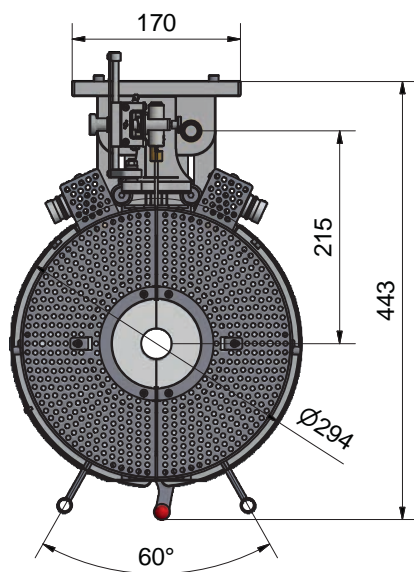
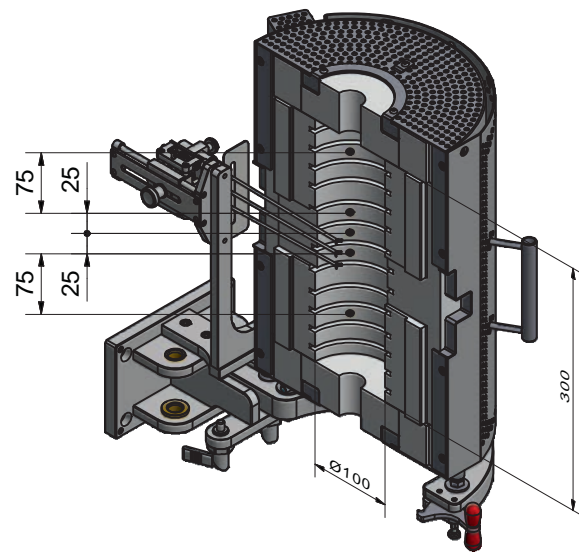
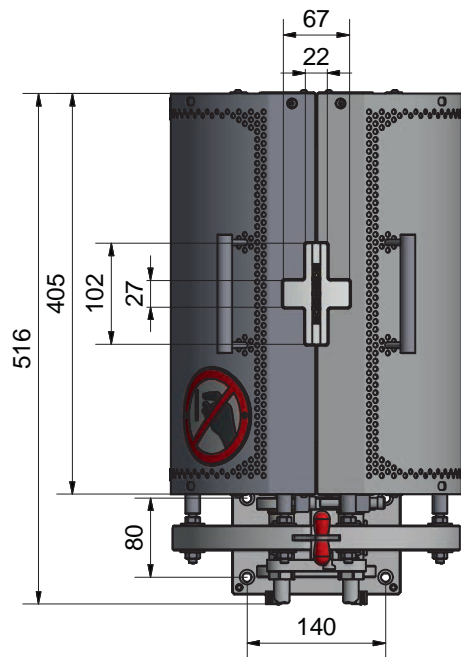
Double Cross Recess Furnace for Axial or / and Transfers or diametral High-Temperature Extensometer and PMA-39



Key Features

- Split construction design providing fast and easy sample loading, extensometer and thermocouple mounting
- Good temperature-uniformity due to three (3) heating zones, independently controllable from each other with advanced temperature-controller system
- Double-coated construction to reduce outer wall temperature through convective-cooling
- Casing made of stainless steel
- Both halves of the furnace are hinged via two semi-circle profiles (sickle shaped) at a basic plate, which allows the mounting of a TC-module at the rear split line of both halves
- Safty switch shout down the furnace when the furnace is opened
- Durable embedded horizontal heating coils
- The furnace bore has been optimized to suit a wide range of adapters and test fixtures without encouraging excessive thermal losses
- The furnace is well isolated by a light-weight asbestos-free material for minimum power consumption
- Furnace case made from stainless steel
- All electric connections including heat current are pluggable at the controller
- Accurate closed-loop temperature control in combination with 6-Channel Eurotherm temperature controller with 3 independently working cascade controller circuits (1 per each heater zone)
- RS485 Interface
- Selectable PID settings for lower and higher temperature range providing the best control behave
- Programmable heating rates with possibility to slow down the temperature ramp close to the end-temperature to avoid any temperature overshooting.
- Ten (10) feedthrough for additional thermocouples
- Adjustable stainless steel latches for easy locking of the furnace during testing.
- To and bottom end plates are optimized to the load train

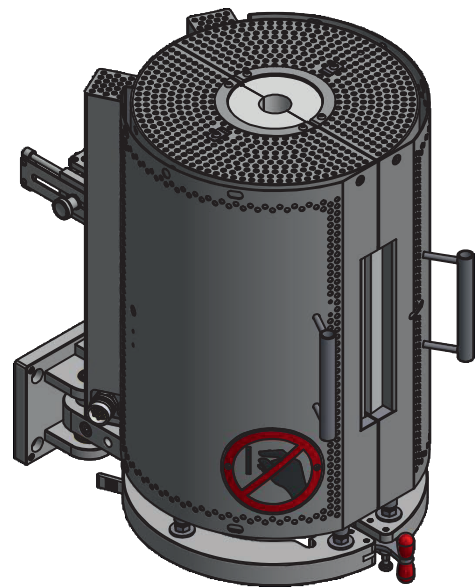
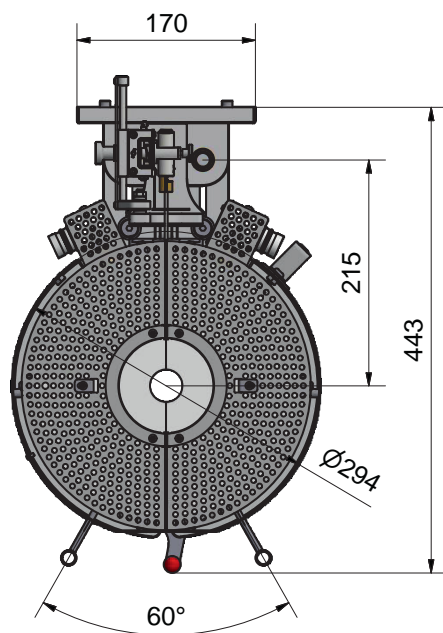
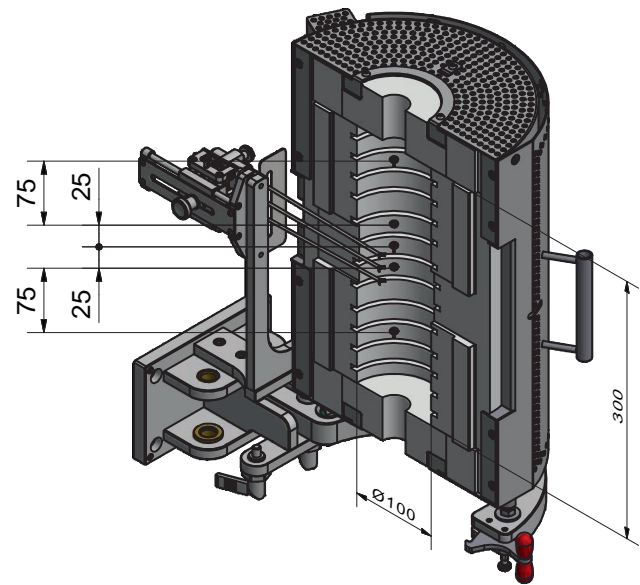
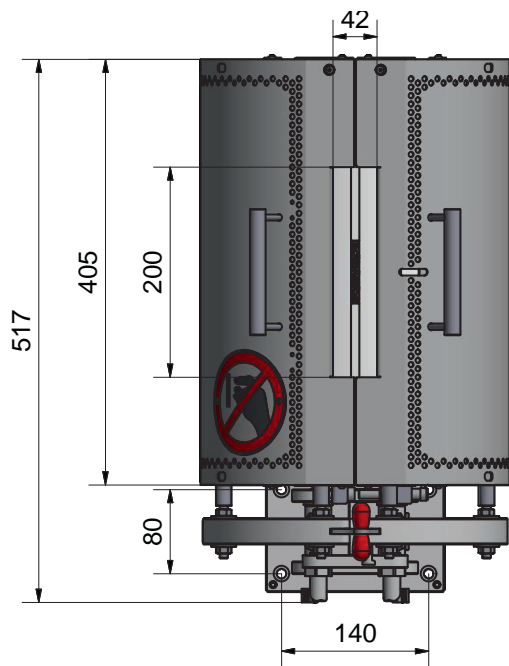
w+b High Temperature Accessories



Furnace Type HTO		34
Max. Heating Element Temperature	°C	1250
Max. Sample Temperature*	°C	1200
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	3
Hot Zone Height	mm	300
Heating Zone Diameter	mm	100
No. of Thermocouples included**	No.	6
Thermocouple Type***	Type	NiCr-Si-NiSi, Type N
Output Voltage for Heating Element	V	3 x 34
Outside Diameter	mm	295
Overall Furnace Length	mm	460
Weight	kg	45
Power Consumption (each Zone)	kW	0.6
Thermal Insulation	Al2O3-Wool Polycrystalline	
Heat Conductor	Conductor Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders and free radiating mounted	

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

w+b High Temperature Accessories



Furnace Type HTO		39
Max. Heating Element Temperature	°C	1250
Max. Sample Temperature*	°C	1200
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	3
Hot Zone Height	mm	300
Heating Zone Diameter	mm	100
No. of Thermocouples included**	No.	3
Thermocouple Type***	Type	NiCr-Si-NiSi, Type N
Output Voltage for Heating Element	V	3 x 340
Outside Diameter	mm	295
Overall Furnace Length	mm	460
Weight	kg	45
Power Consumption (each Zone)	kW	0.6
Thermal Insulation	Al2O3-Wool Polycrystalline	
Heat Conductor	Conductor Fibrothal-Module with A1-resistance spirals, horizontal imbedded in AL2O3 soft felt holders and free radiating mounted	

*Assuming pull/push rod with diameter 24 mm **Further Thermocouples available ***Other Thermocouples types available

Temperature Control Unit Series MSRA-7

Designed for furnaces HTO-08, HTO-08-1, HTO-08-2, HTO-15, HTO-19, HTO-19-1, HTO-19-2, HTO-27, HTO-34, HTO-37, HTO-37-1, HTO-37-2, HTO-38 and HTO-39

This high temperature control unit provides accurate temperature control and measurement of three-zone furnaces.

The unit is designed for accurate, flexible, reproducible and user-friendly operation.

The intelligent control algorithms ensure accurate control and avoid temperature overshooting combined with excellent temperature gradients.

The control unit can be used as stand-alone system or with interface to the digital controller PCS series with DION programmable with selectable fixed heating rate or with previously entered temperature profile (programmer functions ramp, dwell, step), including interface to digital controllers of testing system and DION application software.

The control unit is equipped with Eurotherm 2704 Advanced Multi-Loop Temperature Controller.

Indicator lights for all three heating zones (each left & right) shows the working status.

The hour meter shows the working hours.

Integral part is also the transformer which provides low voltage and high current to the furnace heating elements extending the life-time of the furnace system considerable compared with those working with high voltage.



Features:

- Space-saving desktop housing with integrated power unit and inrush current limitation
- Controller version with automatic PID optimization (in secured operating level)
- Serial interface for the optional reading of the process data and for the external set point specification of the furnace temperature (optionally RS232, RS485, Ethernet)
- Potential free input for "External Furnace On"
- Potential free output (2-pin) and input for "External Emergency Off"
- Current interruption display for each heating zones' half
- Heating start interlock when furnace not closed (if the furnace is provided with a corresponding signal switch)
- All electric connections including heat current are pluggable
- Interface to temperature data acquisition in DION software.

w+b High Temperature Accessories

Eurotherm 2704 Advanced Multi-Loop Temperature Controller

- High performance measurement – the best in class control
- Flexible I/O – meets many diverse requirements
- Feature rich – more than just a temperature controller
- Application specific functions – simplifying complex applications
- Graphical soft wiring – easy to be creative and find solutions to complex problems

High Precision Process Input

If you cannot measure accurately, you cannot control accurately. The 2704 offers typical resolution of 0.25uV making it ideal for applications such as semiconductor, vacuum heat treatment and research applications. All thermocouple input types are catered for, as are Pt100 resistance thermometers and linear input types such as 0-10Vdc and 4-20mA. Four wire Pt100, and Pt25 measurement is also possible using a module specially designed for high accuracy metrology applications.

The 2000IO expander can increase the digital I/O providing the option for greater remote operation of the programmer and expanding the 2704 logic capability:

- 20 logic inputs
- 20 relay outputs

Setpoint Programmer

- Ideal for atmosphere or vacuum furnaces and environmental chambers
- 60 programs
- 3 profiled setpoints/program
- 600 segments
- 16 event outputs
- program mimic display

60 setpoint programs, each with 16 digital events can be stored. A total of up to 600 segments can be programmed, and holdback, wait functions and digital inputs offer an extremely flexible solution for applications such as carburizing and vacuum furnaces, environmental chambers and autoclaves

Controller MRSA		71-RS485-HHH	73-RS485-GPG	73RS485-PPP
Number of Temperature Channels		3	6	6
Number of Temperature Control Channels		3	3	3
Number of additional Temperature Monitoring Channels			3	3
Location of Thermocouples		Middle of each zone (Rod-Specimen-Rod)	Middle of each zone (Rod-Specimen-Rod) & additional 3 measurement	3 on specimen & additional 3 measurement
Number of additional Temperature Monitoring Channels			3	3
Typical Temperature Control Accuracy	°C	±1-2°C		
Serial Interface		1 x RS485, 3 x RS232		
Power Supply	V Hz kW	230 50 2.5		
Dimension	mm	536 x 490 x 200		
Weight	kg	40		

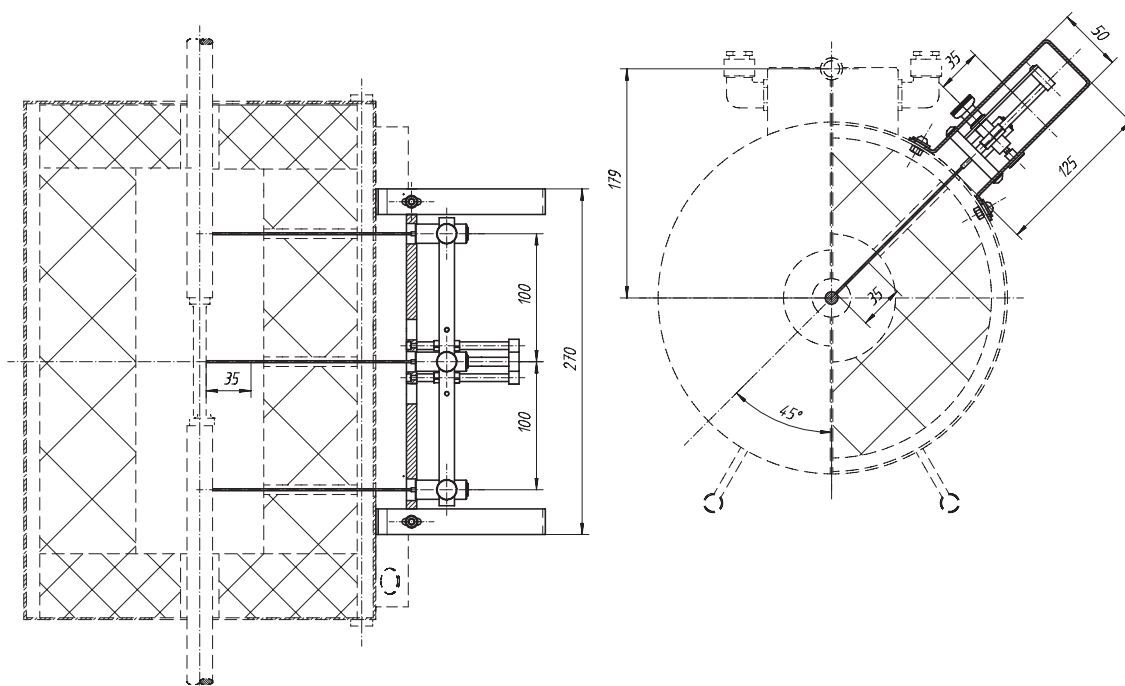
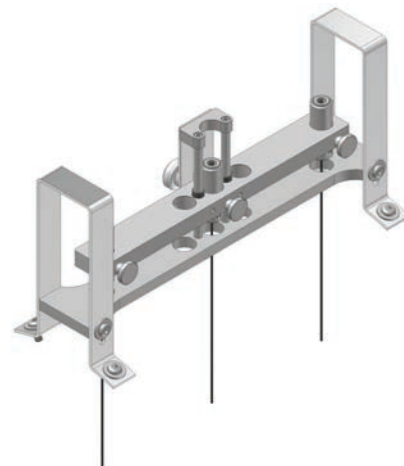
Accessories for HTO Furnaces

Type	Material	Cladding	Temperature	Length	Diameter	Article-No.	Furnace
K	NiCr-Ni	Inconel	Up to 1100°C	192	2 mm	43-5603-000	
K	NiCr-Ni	Inconel	Up to 1100°C	146 mm	2 mm	43-8402-000	
N	NiCr-Ni	Inconel	Up to 1200°C	192	2 mm	43-5728-000	
N	NiCr-Ni	Inconel	Up to 1200°C	146	2 mm	43-6269-000	
S	Pt10Rh-Pt	Inconel	100°-1100°C	192	2 mm	43-4295-000	HTO-08/-15/-19/-27/-34/-37/-38/-39
S	Pt10Rh-Pt	Inconel	100°-1100°C	146	2 mm	43-7111-000	HTO-08/-15/-19/-27/-34/-37/-38/-39
S		Platium (Pt10Rh)	100°-1420°C	192	5 mm	30-4298-000	HTO-08/-15/-19/-27/-34/-37/-38/-39
S	Pt10Rh-Pt	Platium (Pt10Rh)	100°-1420°C	146	5 mm	30-4297-000	HTO-08/-15/-19/-27/-34/-37/-38/-39
S	Pt10Rh-Pt	Ceramics (Al2O3)	100°-1600°C	230 mm	3 mm	30-4300-000	HTO-02
S	Pt10Rh-Pt	Ceramics (Al2O3)	100°-1600°C	145 mm	3 mm	30-4299-000	HTO-02
S	Pt10Rh-Pt	Ceramics (Al2O3)	100°-1600°C	195 mm	2 mm	30-4302-000	HTO-20
S	Pt10Rh-Pt	Ceramics (Al2O3)	100°-1600°C	127 mm	2 mm	30-4301-000	HTO-20
B	Pt30Rh-Pt10Rh	PtRh	600°-1700°C	160 mm	1 mm	43-6887-000	
B	Pt30Rh-Pt10Rh	PtRh	600°-1700°C	130 mm	1.5 mm	43-5997-000	
B	Pt30Rh-Pt10Rh	PtRh	600°-1700°C	180 mm	1 mm	43-6920-000	

Slideable Thermocouple Device for High Temperature Furnaces Series HT0

Slideable Thermocouple arrangement with spring loaded thermocouples allows to go with the upper and lower thermocouple to the adapters and with the middle one onto the sample. Each Thermocouple can be moved independently in horizontal position for adjustment purpose. Additionally, all three (3) thermocouples can be moved together if further same samples are tested. The distance from the middle thermocouple the upper and lower is 100 mm to each side. With this the thermocouples can be used to control the furnace temperature.

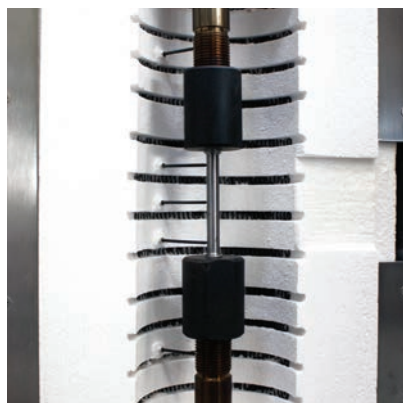
Additional clamping holes for another two thermocouples with a distance of 25 mm to each side from the middle one are available for additional two thermocouples for temperature measurement direct at the sample are available.



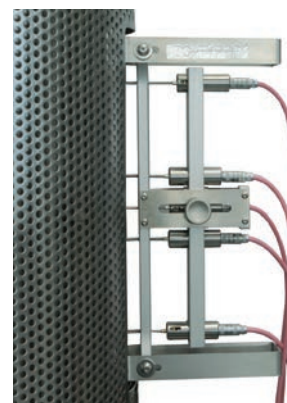
Version with 3 Thermocouples



Version with 5 Thermocouples



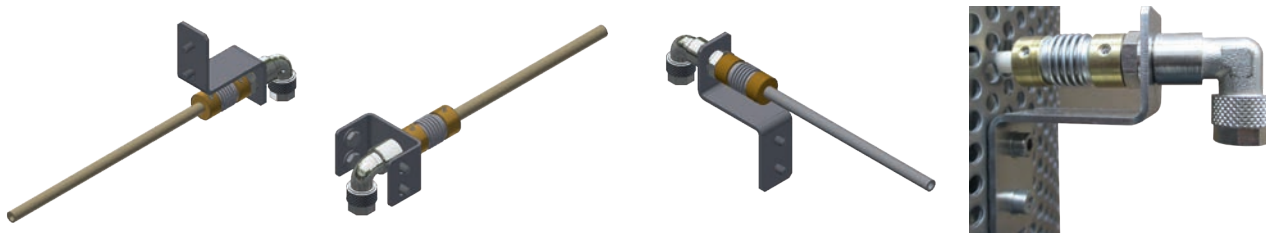
Slideable Device



Inert Gas for High Temperature Furnaces Series HT0

High temperature resistant tube with holder outside of the furnace for external connection of gas supply (e.g. Argon) and for inlet of the gas into the heating area of the furnace.

Remark: The Furnace Gas-Inlet is NOT retrofittable and has to be already ordered along with the furnace.

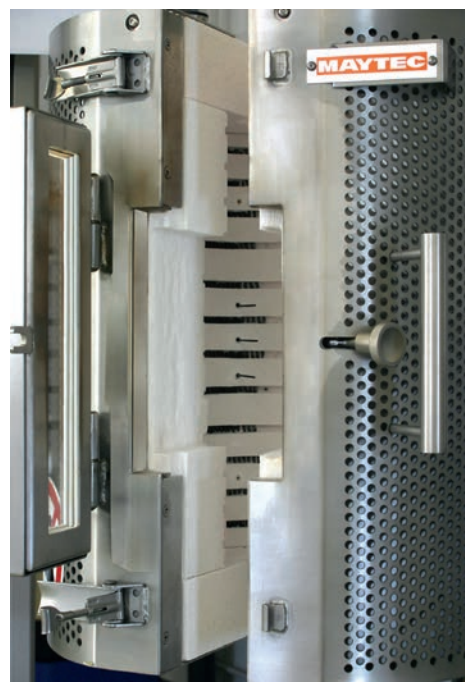


Viewport for Furnace

tiltable on one side at the HT-furnace's left housing half, with integrated double glazing and supporting isolation.

Glass is firmly installed.

Glass material: Quartz glass, max. permissible temperature: 800°C, permeable for wavelength of the light: 650nm



External Temperature Display

Available for 1 to 3 Temperature Display integration into a housing as a separate unit with real-time temperature indication, which can be connected to PCS digital controller.

Spot-Welding Unit for Welding Thermocouple to Specimen

This Spot Welding Unit is designed to weld thermocouples onto test specimens or for sensor manufacturers for the production of commercial grade thermocouple junctions, and for users of large numbers of exposed junction thermocouples such as test and development laboratories where multipoint temperature sensing of test pieces is required. No special skills are needed and most people will be capable of producing quality work with minimal practice. The instrument can be operated via the front panel or by using the footswitch provided. In addition to thermocouple work, the welder is used in many other applications involving the joining of wires to each other and to metal surfaces. This model is suitable for welding wires up to 1.1 mm (0.043") diameter and has an argon gas shield facility. A satisfactory thermocouple junction is produced without using argon, but where argon is available a momentary purge is automatically triggered immediately prior to the weld to give optimum weld integrity.

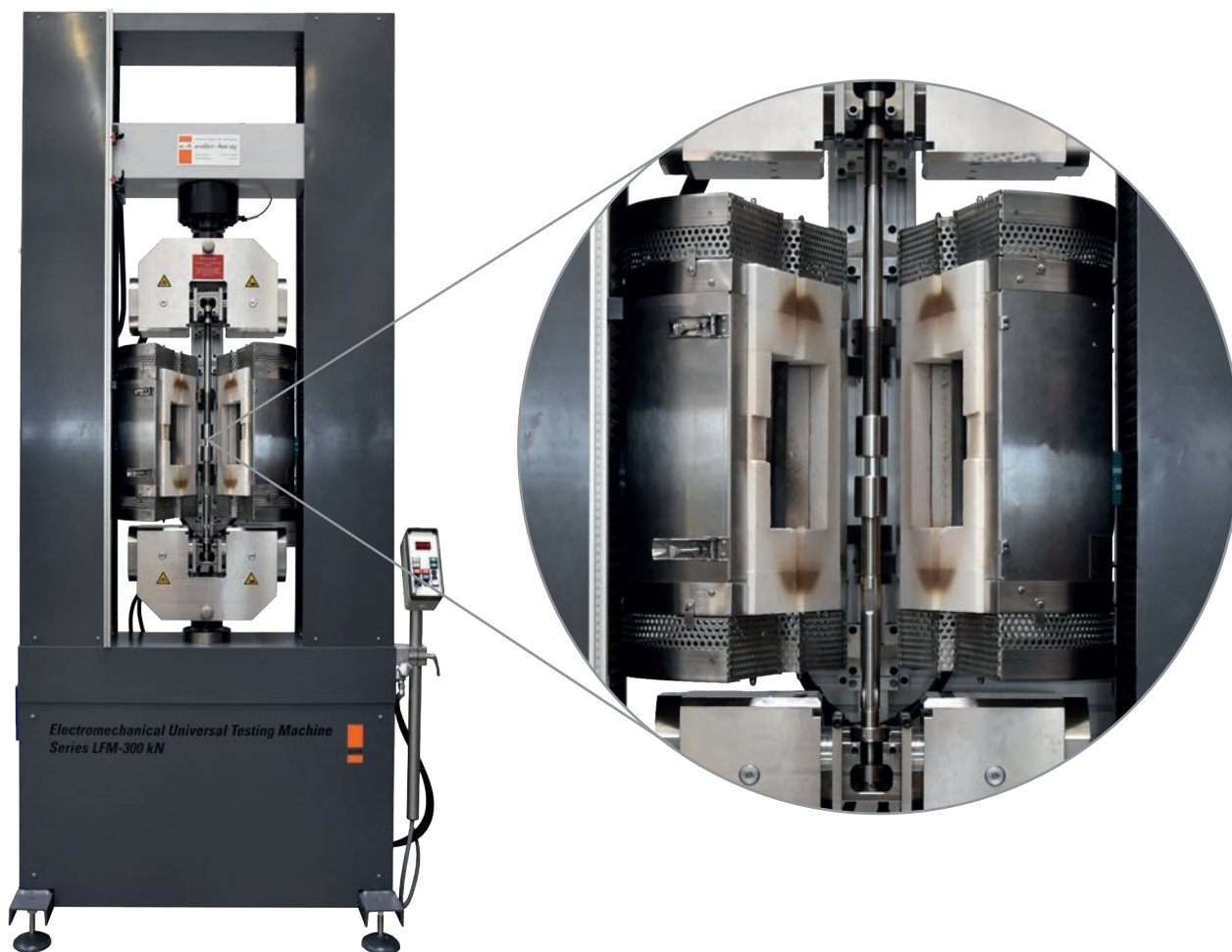
1540°C High Temperature Single-Zone Split Furnaces

Universal Series STE Version 3420

These single-zone silicon carbide split high temperature resistance furnaces are designed for materials testing in air. The design of this furnaces incorporate silicon carbide (SiC) rammed rod type heating elements which are superior, long-lasting elements owing to their slow aging characteristics, high density, increased strength, and ease of replacement. Further construction features include low K-factor vacuum-cast ceramic fibre insulation for rigid structure and superior energy retention and a durable stainless steel shell and end flanges.

This series of high temperature furnaces is available in a numbers of sizes and can be made to custom sizes. The furnace can also be supplied with additional heating zones and optional accessories as viewports, gas-tight retorts a.s.o is available.

This furnaces work at low voltage and high current, requiring a transformer and current-limiting device in the control system.



Furnace Type STE		Version 3420
Max. Furnace Temperature	°C	1540
Max. Heating Rate	°C/min.	20
No. of Heated Zones	No.	1
Heating Zone Diameter	mm	100
Hot Zone Height***	mm	125 to 900
No. of Thermocouples included*	No.	2 (1 Control and 1 for max. Temperature)
Thermocouple Type**	Type	R Type
Power Consumption***	V	1.2 to 12 kW
Thermal Insulation		vacuum-cast ceramic fibre

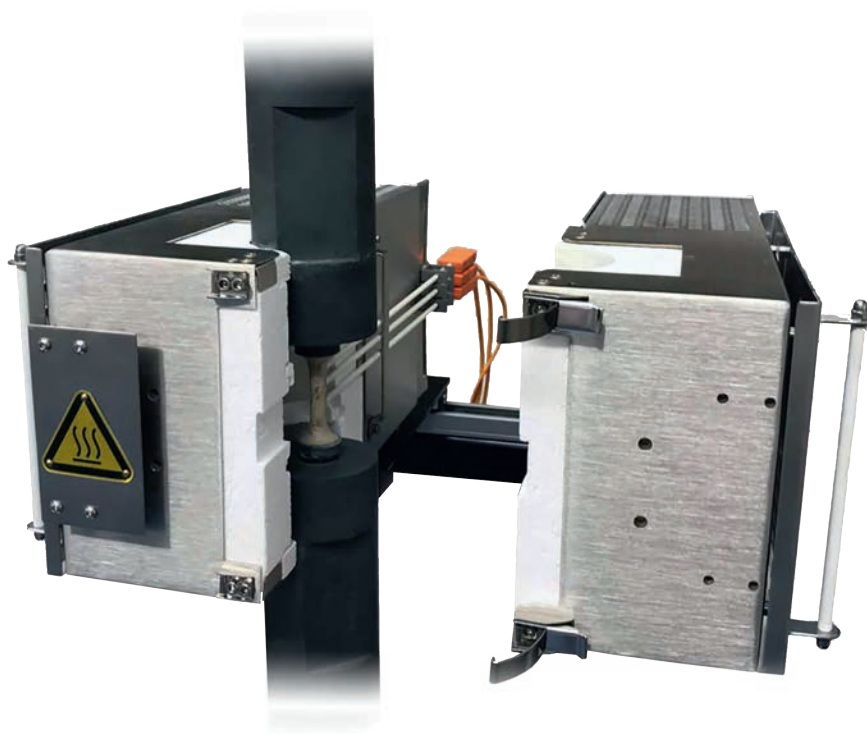
*Further Thermocouples Available **Other Thermocouples types available ***varies with model

1400°C Short Height High Temperature Split Furnaces

Series STE Version 21xx

These single-to-three-zone high temperature resistance furnaces are designed for a wide variety of high-temperature tests including Low Cycle Fatigue, Tension, Compression and Fatigue Testing of metals, composites, ceramics and others. The furnaces allow the use of very short specimen grips / pull rods that reduce the load string costs and improves the alignment.

The clamshell design allows the operator to work from the front providing convenient working.



The high quality robust construction, featuring a stainless steel case with optional provision for side entry extensometry or window for optical measurement devices.

The short design of the furnace might allow to hold the specimens outside of the furnace that might simplify testing as only the specimen is heated. This furnace is also suitable to accommodate tension-compression grips for LCF Testing. The short design improves the specimen alignment.

The furnace is heated by Silicon Carbide Element(s), these being backed by high efficiency insulation. Various removable insulation packs are available to suit specific specimen geometry (interchangeable).

The temperature control system features one, two or three independent Eurotherm controller(s). An independent over temperature alarm is also included.

Furnace Type STE		Version 2149	Version 2150	Version 2151
Max. Heating Element Temperature	°C	1400	1400	1400
Max. Heating Rate	°C/min.	20-50	20-50	20-50
No. of Heated Zones	No.	1	2	3
Hot Zone Height	mm	30	55	110
No. of Thermocouples included*	No.	2 (1 Control & 1 for max.)	3 (2 Control & 1 for max.)	4 (3 Control & 1 for max.)
Thermocouple Type**	Type	R Type	R Type	R Type
Overall Furnace Height	mm	55	85	135
Hot Zone Furnace Depth	mm	50	50	50
Hot Zone Furnace Width	mm	50	50	50
Power Consumption	kW	230 V, 1 kW, 16 Amps	230 V, 2 kW, 16 Amps	230 V, 3 kW, 16 Amps

*Further Thermocouples Available **Other Thermocouples types available

1600°C Short Height High Temperature Split Furnaces Series STE Version 3330

These single zone high temperature resistance furnaces are designed for applications where the available testing space is severely restricted due to specimen size or other factors. These furnace feature highly compact construction while maintaining efficient temperature capabilities up to 1600°C.

Due to a small internal working volume, rapid heat-up and cool-down rates are attainable for testing of ceramics, metal alloys, composites and other materials, using either float or round specimens.



Standard construction features include four (4) large-diameter Kanthal Super molybdenum disilicide (MoSi2) heating elements that are easily replaceable in the laboratory, low K-factor vacuum-cast ceramic fiber insulation, and stainless steel shells, end flanges, and element covers for durability, safety, and appearance.

In addition to standard furnace sizes, custom sizes and zone arrangements are built-to-order, and a wide variety of mounting arrangement, optional construction features, and accessory equipment is available, including high-temperature extensometers, extensometer slots, thermocouples, viewports, water-cooled specimen grips, testing fixtures and more.

The 3330 Furnaces are controlled by Eurotherm 2404 PID Controller.

Remarks

Molybdenum Disilicide heating elements normally operate between 1300°C and 1800°C (2372°F - 3272°F). Molybdenum Disilicide elements may be used below 1300°C (2372°F) particularly for furnace atmospheres harmful to silicon carbide heating elements (e.g., sulfur dioxide, water-steam, etc.).

Molybdenum Disilicide should not be used between the temperature range of 400°C and 700°C (752°F - 1292°F), where a destructive low temperature oxidation may occur called pest.

Furnace atmospheres affect the life expectancy of Molybdenum Disilicide elements. Most favorable are oxidizing atmospheres such as air, CO₂, and water vapor, but they may also be successfully operated in neutral and carburizing atmospheres.



Furnace Type STE		Version 3330-2
Max. Furnace Temperature	°C	1600
No. of Heated Zones	No.	1
Hot Zone Width	mm	50
Hot Zone Depth	mm	75
Hot Zone Height	mm	63
Controller	Type	Eurotherm 2404
No. of Thermocouples included*	No.	2 (1 Control and 1 for max. Temperature)
Thermocouple Type**	Type	B Type with ceramic insulator
No. of Thermocouple Ports	No.	2 located mid-length in each side one located on opposite side of furnace directly in the centre
Extensometer Cut-out	mm	6 mm Width x 40 mm Height
Power	V	240V / 50 Hz / 2240 W (14 V @ 160 amps/zone)
External Dimensions WxDxH	mm	480 x 245 x 230
Thermal Insulation	V	vacuum-cast ceramic fibre

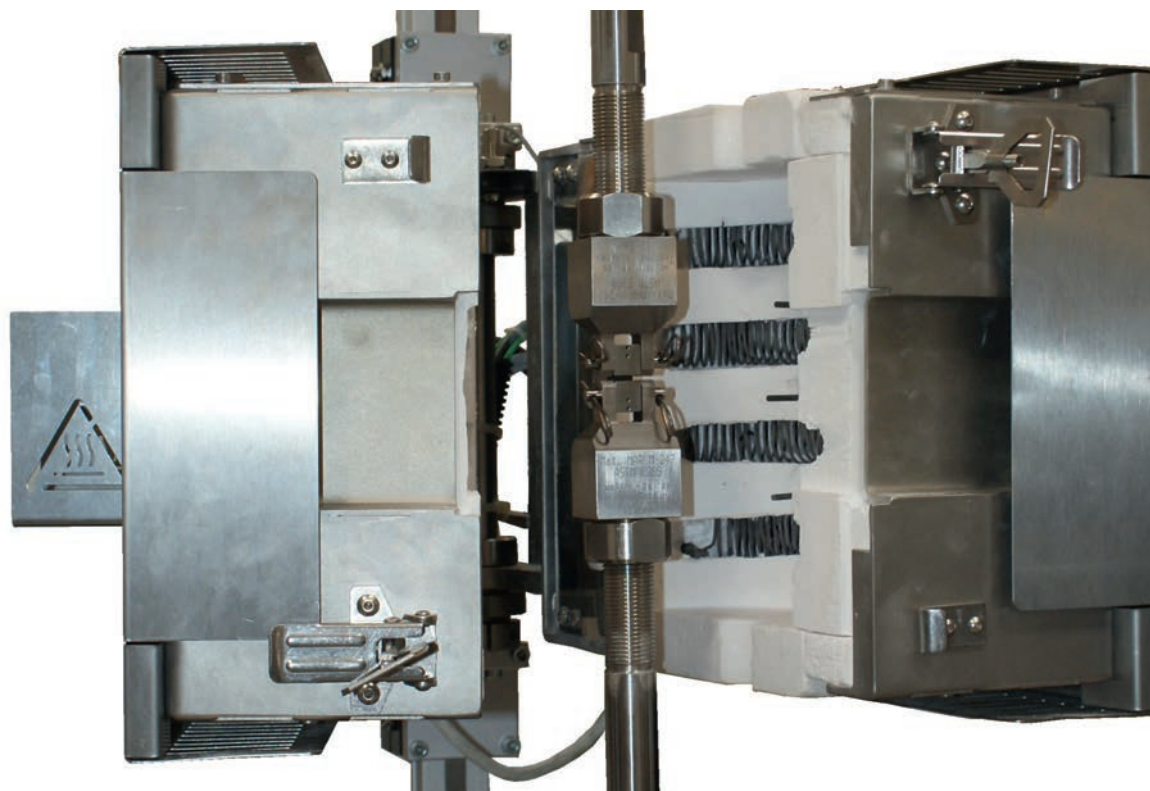
*Further Thermocouples Available **Other Thermocouples types available

1100°C Square Two-Zone Height High Temperature Split Furnac Model STE-FM

These two-zone high temperature resistance furnace is specific designed for high temperature fracture mechanics testing on compact tension (CT) samples with width (B) up to 2". The square design of the furnace provides uniform temperatures along the compact tension specimen.

The split-design allows the operator to work from the front providing for easy specimen loading and extensometer mounting.

The high quality robust construction, featuring a stainless steel case with additional stainless steel protection cover keeping the outside furnace surface temperature low with entry for COD extensometer. An optional view window to observe the specimen or for optical measurement devices is also available.



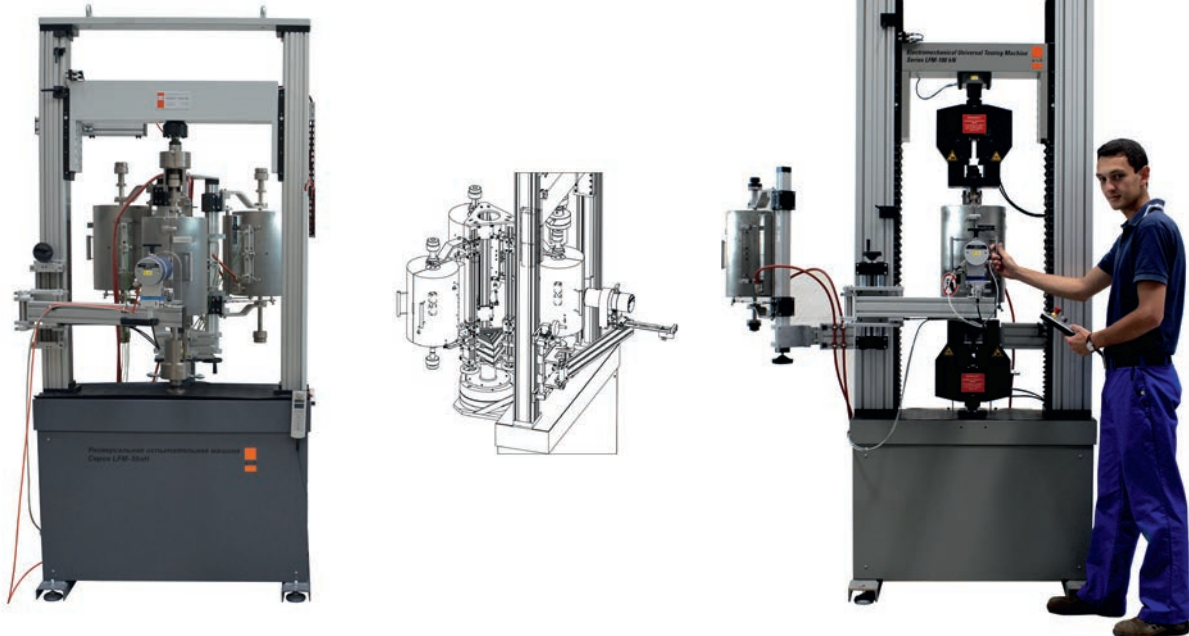
Furnace Type STE		FM
Max. Furnace Temperature	°C	1100
Max. Heating Rate	°C/min.	10
No. of Heated Zones	No.	2
Hot Zone Height***	mm	210
Hot Zone Depth	mm	125
Hot Zone Width	mm	125
No. of Thermocouples included*	No.	3 (2 C control and additional specimen temperature and furnace overtemperature)
Thermocouple Type**	Type	R Type
Outside Width	mm	260
Outside Depth	mm	328
Outside Height	mm	290
Optional view window (HxW)	No.	7x70
Power Consumption	V	400 V, 2 kW, 16 Amps

*Further Thermocouples Available **Other Thermocouples types available

Efficient High Temperature Testing of Metals & Alloys

Walter + Bai offers test systems for tensile testing of metallic materials at elevated temperatures with a multiple furnace system for increased productivity. Working with more than one furnace allows to pre-heat samples outside the testing machine and swivel them into place once the test temperature is reached or the dwell time is passed.

Depending on the number of employed furnaces, they are attached to the testing machine, integrated in a rotary rack or mounted on roller guided carriers.



Automated High-Temperature Test System for Ceramic Materials

The test system is designed to perform flexural and compression tests on ceramic based materials for the determination of strength, ductility and Young's modulus. For increased productivity the system is equipped with an automated sample feeding system avoiding the need to cool-down and re-heat the furnace system after each test. For the high accurate deflection and compressive strain measurement under high temperature the system is equipped with a motorized deformation measurement system. The furnace can be deployed up to 1800°C whereas the deflection measurement system and fixtures are designed for test temperatures up to 1550°C.



After Sales Service

The world-wide network of w+b highly qualified factory trained support staff provides customers with comprehensive after sales solutions for w+b testing systems.

We are focused on the individual customer support and the offered services include on-site installations, repairs and maintenance throughout the entire life cycle of your testing equipment. Customers of w+b know they can benefit a maximum from the acquired testing equipment, and with provided after sales service they are in good hands – now and in the future.



Over 45 Years of Experience

- Customers prefer w+b because of our individual customer approach coupled with flexibility and versatility in developing the most customized and specific testing systems.
- However there is more. By choosing a testing system from w+b you start a long-term partnership with us.
- With our world-wide network of w+b highly qualified support and maintenance engineers provides you with an optimum after sales support, to make sure you get the most from your investment.
- w+b constantly invests in hiring and training service engineers and local representatives.
- w+b provides customers with comprehensive free of charge telephone support of all specialists for the lifetime of the product.
- Our large stock of spare parts from the most w+b equipment helps you to minimize the idle time in case of problems with equipment.
- w+b test systems are designed for stable and long term operation. With the provided constant comprehensive service and support you will profit the maximum from your systems throughout their entire life cycle.

Instruction Manual

At w+b a comprehensive customer support starts with a detailed instruction manual. To each system we deliver a complete technical manual including information about safety, system installation, machine setup, technical drawings of testing system, hydraulic and electric schemes with items list, software and hardware manuals, maintenance information, a.s.o. By providing from very beginning this technical information to our clients, which is later on demand complemented by telephone support, enables us to have practically more than 90% of all shut-downs solved instantly.

Installation and Warranty

Our qualified field service engineers are available in short terms to install and to commission your testing system on site after its delivery. All our field service engineers are factory trained and complete the installation in a timely manner. Our service guarantees the reliable commission and operation of your testing system according to the technical specification. All w+b products are covered by a factory warranty.

Customer Training

It is essential that our clients use w+b testing systems to its full extent, i.e. by employing all possible features and capabilities of the acquired equipment. Additionally, as a well-known fact the comprehensive knowledge of machine operation practically reduces the instrumental setup times, also prevents possible mistakes and in turn increases your testing efficiency. Therefore, the technical instruction and extensive operation training are provided by w+b engineer at the time of system's commissioning. Further repetitive training, organized either on site or at w+b premises, ensures that new system's operators from customer side are properly instructed on the operation capabilities of the installed system, likewise the skills of already

trained operators are refreshed and retained. We provide an extensive range of comprehensive training courses focused on complete machine operation, software usage, sample alignment, all types of materials tests, and many others. These courses can be scheduled with a short notice and given either at w+b or at your premises.

Hardware & Software Support

To ensure that the acquired system can be steadily employed even though your testing requirements are changing with the time, our software and hardware engineers, including w+b local representatives, will assist you with these tasks, as well as you will receive the detailed information on w+b continuous development of software and hardware. This will guarantee that your system is maintained at peak performance. Through planned and systematic service visits of our engineers for preventive maintenance and calibration of your testing system, any potential problems can be identified beforehand and resolved immediately avoiding unnecessary machine's idle time.

Calibration

w+b calibration laboratory is accredited according to the latest ISO EN IEC 17025 (formerly EN 45001) standard. The calibration and verification of your materials testing machine is a part of our provided service. Our field service engineers are not only trained to perform maintenance and calibration service on w+b machines, also the testing machines of other producers are successfully verified and calibrated in a daily manner. The calibration certificate will prove the verification of your system conforming to ISO 9001 and other standards.

Application Service

We consult customers concerning testing techniques and provide with necessary tools, as well as we create report templates or graphic presentations precisely suited to your specification, developed based on w+b standard software packages. Our application experts have many years of experience in development of materials testing applications and will create a product to fully meet your requirements.

Maintenance and Calibration of Materials Testing Systems

by *w+b* Accredited Calibration Laboratory

The maintenance and service works on your materials testing equipment is executed by our specialists with highest attention and precision, and with experience of over 45 years. Highly precise computer-aided calibration equipment guarantees a calibration according to the latest international standards.

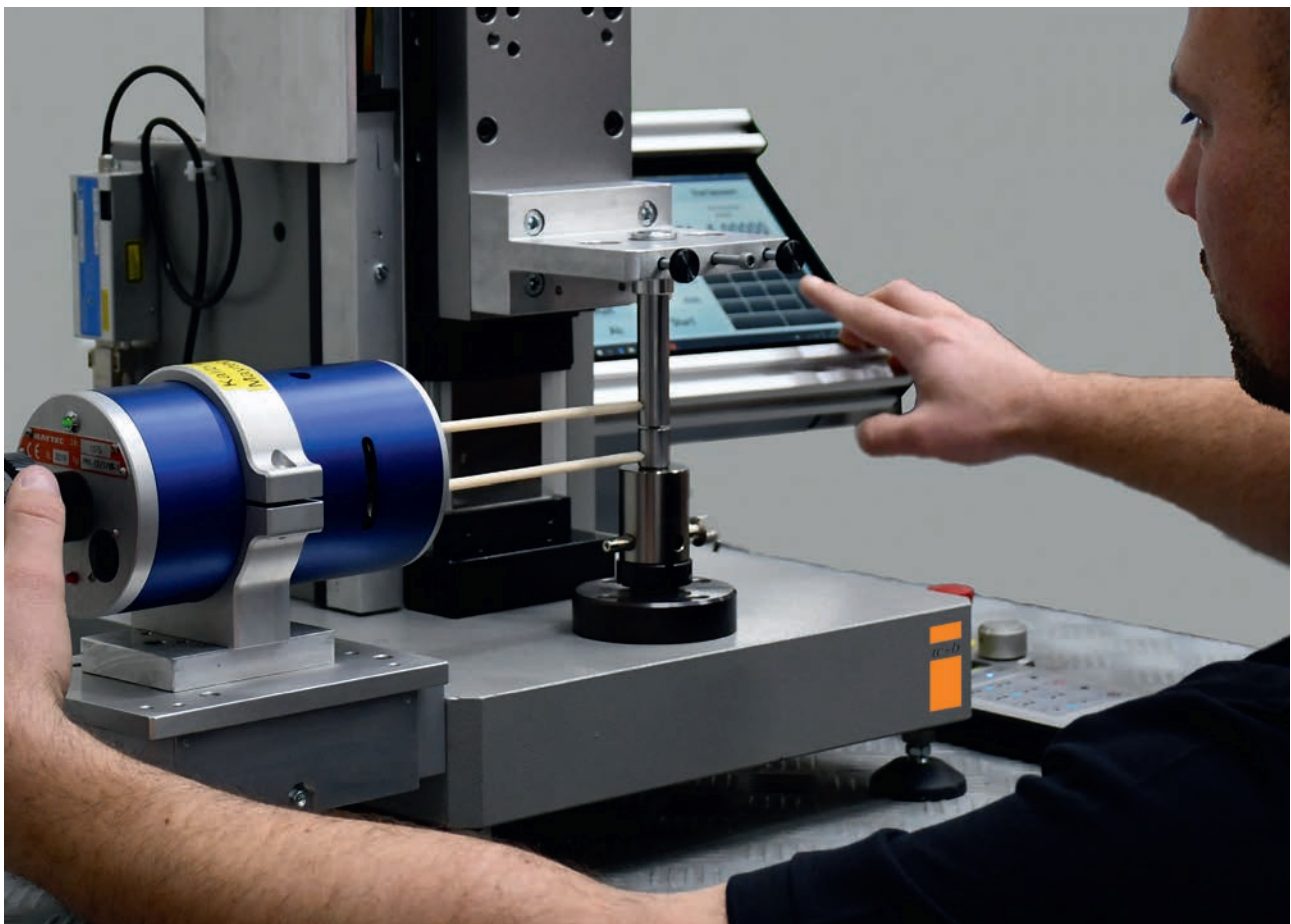


Our calibration laboratory is accredited according to ISO/IEC 17025 which is recognized through the Multilateral Agreement (MLA) for EA - European Cooperation for Accreditation. The maintenance and calibration performed by our specialists with 45 years of experience assure a reliable execution of the service. Your savings: there are no extra costs for an additional calibration by a further official calibration institute, since we are an accredited calibration laboratory.

We will calibrate your test equipment independently of the type and manufacturer. We offer excellent conditions together with flexible dates. The accreditation according to ISO/IEC 17025 is recognized through all signatories of the EA (European Cooperation for Accreditation) multilateral agreement of calibration.

w+b Calibration Laboratory is accredited for:

- Force - Tension, Compression
- Pressure
- Length - Displacement, Deformation
- Hardness
- Energy - Impact Tester



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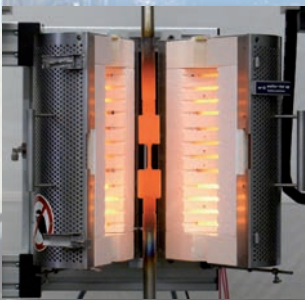


walter + bai ag Testing Machines

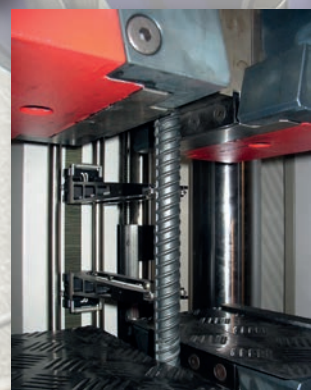
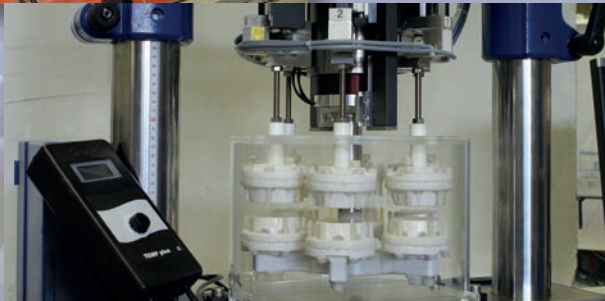
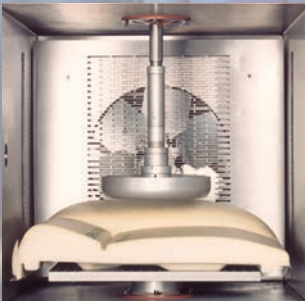
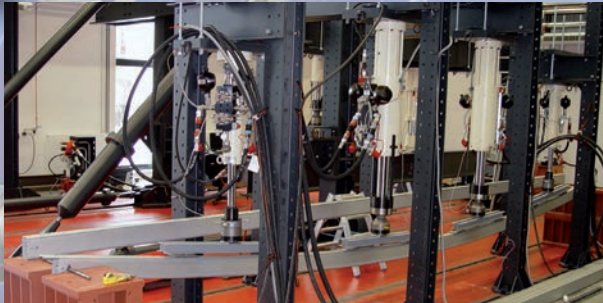
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- Static Universal Testing Machines, Electromechanically or Servohydraulically driven
- Dynamic Multipurpose Testing Systems for Advanced Material and Component Testing
- Torsion, Rotary Bending, Impact Pendulum Testing Machines
- Hydrostatic Pressure Testing Systems
- Customer Specific Testing Machines, Modernisation of Existing Testing Machines



- Accessories for Material Testing, incl. Digital Controllers, Application Software, Hydraulic Power Supply, Grips and Fixtures, Extensometers, Furnaces and Climatic Chambers, a.s.o.
- After-Sale Service at Customers Laboratory
- Calibration of Material Testing Machines