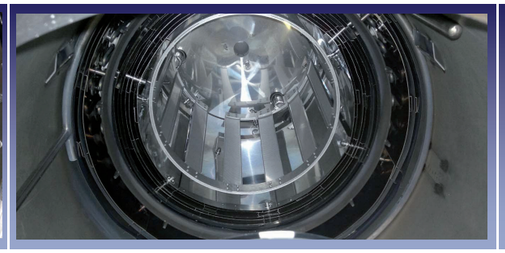
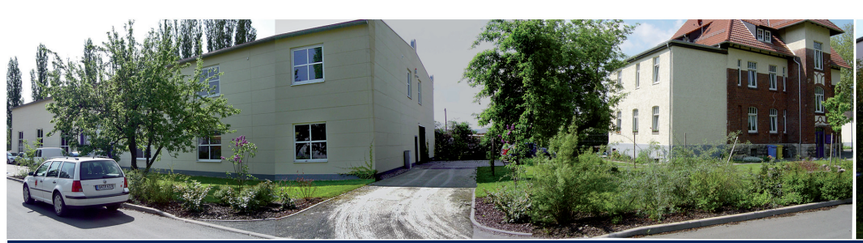
Furnace atmospheres and temperatures	Molybdenum	Tungsten
Air / O_2	300	450
hydrous	300	450
N_2	1550	1700
Ar	1700	2400
H_2	1700	2400
Vacuum	1700	2200
MFC	X	X
Vacuum (Oil-sealed or dry compressing vacuum pumps)	X	X
High vacuum (Oil diffusion pumps or turbomolecular pumps and if necessary high vacuum slide valve)	X	X
Burnable gases (Waste gas purification is needed)	X	X
Gas humidifier (Bubbler or evaporator)	X	X
Fast cooling (Fast cooling with side channel blower)	X	X
Fail safe PLC	X	X
Charging rack (Customized solutions)	X	X
Cooling module	X	X
Process visualization	X	X


MUT ADVANCED HEATING GmbH designs and manufactures customized thermal processing equipment and systems since 1994 for industries, such as: glass and ceramic, metal processing, powder metallurgy, carbon and chemical processing industries.
We design systems for state of the art processes, such as: sintering, debinding, joining techniques, heat treatment of aggressive substances as well as for high-pressure and hot gas treatment.

With in-house competence in mechanical design, process and safety techniques, electrical design and software development we are a skilled and reliable partner to our customers.
MUT is distinguished in its industry by a high level of vertical integration.

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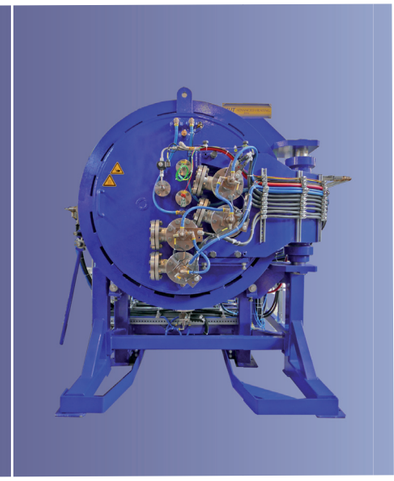
MUT ADVANCED HEATING

Thermal Processing Equipment for the manufacture of high quality components





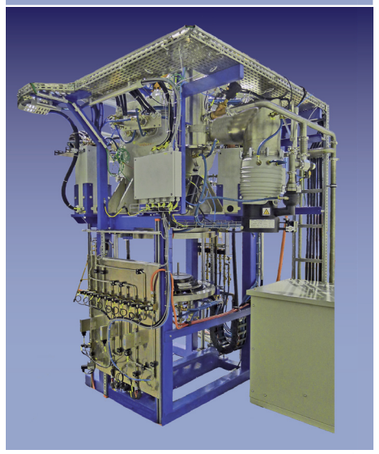
MO/W Vacuum Full-metal Furnaces

Vacuum full-metal furnaces
manufacturing the products made from:

- high purity metals and metal alloys
- powder metallurgy
- PIM, MIM & CIM, 3D-Print
- technical ceramics
- medical technology
- joining of different materials
- fine chemicals

EFRE EUROPA FÜR THÜRINGEN
EUROPÄISCHER FONDS FÜR REGIONALE ENTWICKLUNG
Erstellungsdatum: 06.04.2018
EUROPÄISCHE UNION
MADE IN GERMANY

MUT ADVANCED HEATING



MUT's MO/W furnace series is on the market since 1997. The furnace concept has been reworked continuously and induced design reviews. A lot of experiences from the last years have been incorporated.

The special design features of the MO/W series are:

- Vacuum-tight, double-walled water cooled vessel made from stainless steel special designed to high tightness
- Multi-layered insulation built as radiation sheet package for different application temperatures
- Removable heating interior with multi-zone heater assembly; support frame carries radiation sheet insulation construction
- Different heating systems possible (molybdenum up to 1.700 °C, tungsten up to 2.400 °C)
- Usage of low voltage heating elements (electrical supply by high current transformers)
- Different vacuum pump units available (also dry compressing pump units)
- Gas supply with different inlet gases adapted to the process (optional for burning gases)
- Directed gas guide to prevent impurities by degassing
- Mass Flow Controller for gas flow adjustment via the heat treatment program (optional)
- partial pressure operation; controlled pressure with constant gas flow
- Easy up-scaling to encrease usable furnace space without risk of process
- Multiple system solutions for charging the products
- Safe disposal of exhaust gases by thermal post combustion (optional)
- Short cycle time by fast cooling unit (optional)
- Control system SIEMENS S7 including possibility of remote access

MO/W furnace series have some benefit to the user:

- High temperatures under special clean gas atmosphere (f.e. low remaining oxygen); (under high vacuum too)
- Good temperature distribution due to multi-zone heater assembly
- Robust furnace construction for production and industrial application
- Energy savings by reduced specific energy input
- Partial pressure opreation with hydrogen and other burnable gases
- gas atmosphere change under hot condition
- Quick gas exchange rates or fast cooling unit to reduce cycle time
- Useable space adaptations to individual conditions possible
- Different furnace sizes available with modular add-on devices
- Different modular charging systems which are selected for specific operating conditions, thus minimizing the logistics effort

Following types are available:

model	usable heating chamber dimensions [mm]	usable furnace volume [dm³]	dimensions of furnace [mm] W xD x H	dimensions of switch cabinet [mm] W x Dx H	heating power MO-version [kW]	electrical supply [A] 3~
			vertical version			
MO/(W) 460/600	Ø460 x H600	100	1280/2080/3260	1200 x 400 x 2100	100	200
MO/(W) 580/700	Ø580 x H700	185	1490/2240/3580	1600 x 400 x 2100	165	315
MO/(W) 800/800	Ø800 x H800	402	1650/2360/3780	2000 x 400 x 2100	280	500
MO/(W) 980/1000	Ø980 x H1000	754	2150/2720/4360	2400 x 500 x 2100	420	800
			horizontal version			
MO/(W) 330/330/500	B330 x H330 x T500	54	1250/1200/1800	1600 x 400 x 2100	90	160
MO/(W) 480/480/900	B480 x H480 x T900	207	1900/3800/2300	2000 x 400 x 2100	210	315
MO/(W) 580/580/1250	B580 x H580 x T1250	421	2300/4600/2400	2000 x 500 x 2100	350	630
MO/(W) 700/700/1300	B700 x H700 x T1300	637	2500/5200/2550	2400 x 500 x 2100	450	800

Please configure your furnace according to your application:

The clearly arranged configurator shows all available possibilities. Our application specialists will help you to choose the optimal facilities that are necessary for the manufacturing process of your product.

■	Basic configuration
●	Options
▲	Accessory

Configurator for vacuum-full-metal-furnaces	
Features	**MO/W**
Sturdy steel frame supports furnace equipment	■
Dopple-walled water cooled vessel made from stainless steel with several cooling water circuits	■
Cooling water supply with separate adjustable and monitored circuits	■
Gas inlet for one inert gas (1x purge gas valve und 1x process gas valve); process gas valve with rotameter	■
Heating chamber, consisting of heating elements and insulation	■
Removable heating interior; support frame carries radiation sheet insulation construction	■
Lasttransformator, sensors and actors hard-wired completely	■
Furnace versions: up to 1,550 °C (MO-molybdenum); up to 1,700 °C (MO-molybdenum); up to 2,400 °C (W-tungsten)	●
vertikal versions	-
Inside bottom heating element and top heating element	■
Charging flange equipped with electric driven elevator (bottom loader)	■
Particularly good temperature homogeneity in the plane	■
Inside top heating element	●
upper top flange (service flange)	●
horizontal versions	-
Charging door with hinge-joint for manual opening (front loader)	■
Inside door heating element and rear wall heating element	■
movable charging door	●
Both-sided flange at the vessel (charging door / service flange)	●
Charging by carriage system	●
all versions	-
Separate switch box including switch, control and power electronic components	■
Control system SIEMENS S7 including possibility of remote access	■
Operation via SIEMENS touch panel with graphic visualisation	■
Fine vacuum unit to 5 x 10^{-2} mbar (clean, cold, dry, and empty furnace)	■
Hydraulic locking system	●
Cold trap	●
Partial pressure operation	●
Operation with flammable process gases (Atex version)	●
Operation with powdery materials	●
High vacuum unit to 5 x 10^{-5} mbar (clean, cold, dry, and empty furnace)	●
Mass Flow Controller (MFC) for gas flow adjustment via the heat treatment program	●
Fast cooling with side channel blower	●
Thermocouples for measuring the charge temperature	●
Dew-point measuring, gas humidifier	●
Torch, thermal post-combustion	●
Design for corrosive media	●
Control system SIEMENS S7 in fail-proof version	●
SIEMENS process visualization, data recording & program library	●
Cooling module (closed-loop furnace-cycle with heat exchanger and pump station)	▲
Charging rack (Consulting, design and manufacturing)	▲
Loading cart and charging place	▲