

Печи ретортные с горячими стенками до 1100 °C

NR

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Hot-Wall Retort Furnaces up to 1100 °C

These gas tight retort furnaces are equipped with direct or indirect heating depending on temperature. They are perfectly suited for various heat treatment processes requiring a defined protective or a reaction gas atmosphere with a slight overpressure. These compact models can also be laid out for heat treatment under vacuum up to 600 °C. The furnace chamber consists of a gas tight retort with water cooling around the door to protect the special sealing. With the corresponding safety technology, retort furnaces are also suitable for applications under reaction gases, such as hydrogen or, in combination with the IDB package, for inert debinding or for pyrolysis processes.

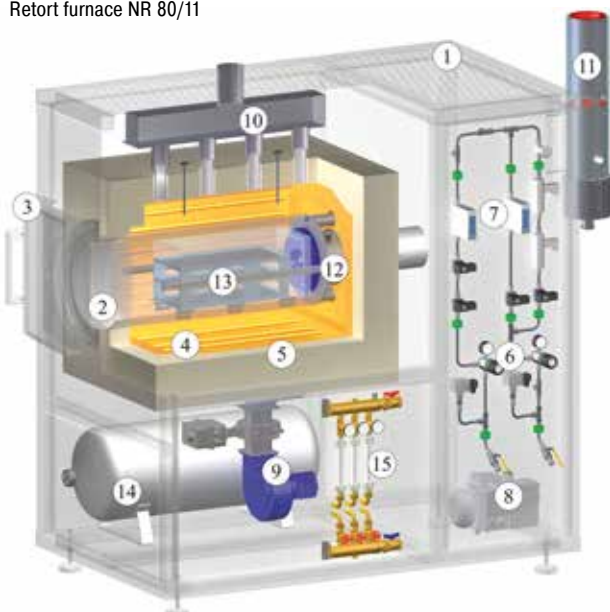
Different model versions are available depending on the temperature range:



Retort furnace NRA 100/06 designed in accordance with AMS2750



Retort furnace NR 80/11



Models NRA ../06 with Tmax 600 °C

- Heating elements located inside the retort
- Retort made of 1.4571 (X6CrNiMoTi 17-12-2)
- Air circulation fan and baffle for directed gas flow
- Insulation made of mineral wool
- Furnace temperature control with measurement inside the retort

Models NRA ../09 with Tmax 900 °C

Design like models NRA ../06 with following differences:

- Outside heating with heating elements around the retort
- Retort made of 1.4828 (X15CrNiSi 20-12)
- Multi-layer refractory insulation and micro-porous panel material
- Furnace temperature control with measurement outside the retort

Models NR ../11 with Tmax 1100 °C

Design like models NRA ../09 with following differences:

- Retort made of 1.4841 (X15CrNiSi 25-21)
- Without gas-circulation and baffles
- Welded support brackets

Schematic presentation of a hot-wall retort furnace NRA 40/09 H₂ with additional equipment

- 1 Housing with integrated switchgear
- 2 Retort
- 3 Door with bayonet catch (additional equipment)
- 4 Heating
- 5 Insulation
- 6 Gas management system
- 7 Mass flow controller MFC (additional equipment)
- 8 Vacuum pump (additional equipment)
- 9 Fan for indirect cooling (additional equipment)
- 10 Outlet indirect cooling (additional equipment)
- 11 Exhaust torch (additional equipment - H₂-safety package)
- 12 Fan for gas circulation (NRA models)
- 13 Charging frame (on request)
- 14 Emergency flushing container (additional equipment - H₂-safety package)
- 15 Open cooling water system



Retort furnace NRA 40/09



Retort furnace NR 20/11 with parallel swing door

Standard Equipment

- Compact design with integrated control and gas supply (up to retort furnace NR(A) 700/..)
- Swivel door hinged on right side
- Open cooling water system
- Control divided into several heating zones
- Temperature uniformity up to ± 8 °C according to DIN 17052-1 in the empty work space see page 94
- Gas supply system for one non-flammable protective or reaction gas with flow meter and magnetic valve
- Controller with touch operation P570

Additional Equipment

- Upgrade for other non-flammable gases
- Mass flow controller MFC
- Process controls H3700, H1700 (PLC) including remote maintenance module
- Temperature control as charge control with temperature measurement inside and outside the retort
- Indirect and/or direct cooling
- Heat exchanger with closed-loop cooling water circuit for door cooling
- Oxygen sensor and dew point sensor
- Parallel swing door or electric bayonet catch
- Retort, made of 2.4633 for Tmax 1150 °C
- External switchgear with or without cabinet cooling
- Charge support or custom-built charging trolley
- Temperature uniformity optimized according to DIN 17052 or AMS2750H to ± 5 °C in empty work space see page 94

	NRA ../06	NRA ../09	NR ../11
Tmax in °C	600	900	1100 ¹
Atmosphere circulation	✓	✓	–
Operation with non-flammable protective gas	✓	✓	✓
Operation with air/oxygen ²	✓	✓	✓
Operation with flammable gas ³	✓ ⁵	✓	✓
Inert debinding IDB ³	✓	✓	✓
Low vacuum ≤ 10 mbar ⁴	✓	✓	✓
Fine vacuum $> 10^{-3}$ mbar ⁴	✓	✓	✓
High vacuum $< 10^{-4}$ mbar ⁴	✓ ⁵	✓	✓
Retort Heating	outside/inside ⁶	outside	outside

¹Up to 1150 °C with 2.4633 as retort material without a circulation fan

²Increased wear on the retort and the attachments

³Only in connection with the corresponding safety package

⁴Up to 600 °C vacuum operation; 650 °C with 2.4633 as retort material without a circulation fan

⁵Only if heated from the outside

⁶Only available from size NRA 300/06 on

Model	Outer dimensions ¹ in mm			Work space dimensions in mm			Useful volume in l	Connected ¹ load in kW*
	W	D	H	w	d	h		
NR(A) 20/..	1100 ²	1600	1700	225	400	225	20	34
NR(A) 40/..	1200 ²	1600	1900	325	400	325	40	34
NR(A) 80/..	1200 ²	2000	1900	325	750	325	80	44
NR(A) 100/..	1400 ²	1800	2100	450	500	450	100	64
NR(A) 160/..	1400 ²	2100	2100	450	800	450	160	74
NR(A) 300/..	2200	3100	2600	590	900	590	300	157
NR(A) 400/..	2200	3400	2600	590	1200	590	400	187
NR(A) 500/..	2300 ³	3300	2700	720	1000	720	500	217
NR(A) 700/..	2300 ³	3500	2700	720	1350	720	700	287
NR(A) 1000/..	2300 ³	3600	2800	870	1350	870	1000	307

¹Outer dimensions and connected load of models NR ../11

²Outer dimensions plus separate switchgear with gas supply package for flammable gases or PLC control

*Please see page 86 for more information about supply voltage

³Outer dimensions plus separate switchgear



Retort furnace NRA 300/09 H₂ for heat treatment under hydrogen



Retort furnace NRA 80/11 IDB H₂



Retort furnace NRA 400/03 IDB with thermal post combustion system



Retort furnace NR 300/08 for treatment in high vacuum

H₂ Version for Operation with Flammable Process Gases

When using flammable process gases, such as hydrogen from ambient temperature, these furnaces are equipped with a safety package. Only certified components are used as safety-relevant sensors.

Standard Equipment

- Safety concept for using flammable gases
- Supply of flammable process gas at controlled overpressure of 50 mbar relative
- Process control H3700 with PLC for data input
- All safety-relevant values monitored by a failsafe PLC system
- Redundant magnetic valves for hydrogen
- Monitored pre-pressures of all process gases
- Bypass for safe flushing of furnace chamber with inert gas
- Torch for thermal post combustion of exhaust gases
- Emergency flood container for purging the furnace in case of failure

IDB Version for Debinding under Non-Flammable Protective Gases

For debinding under non-flammable protective gases or for pyrolysis processes.

Standard Equipment

- Safety concept for inert debinding and pyrolysis processes
- Process control under monitored overpressure
- Process control H1700 with PLC controls and graphic touch panel for data input
- All safety-relevant values monitored by a failsafe PLC system
- Monitored gas pre-pressure of the process gas
- Bypass for safe flushing of furnace chamber with inert gas
- Thermal post combustion of exhaust gases

Vacuum Version for Operation in High Vacuum

The furnaces can be equipped with the corresponding high vacuum technology for processes that take place in high vacuum to 600 °C.

Standard Equipment

- Process control H1700 with PLC controls
- Turbomolecular pump with booster pump for an ultimate vacuum of < 10⁻⁵ mbar in the cold furnace
- Process gas connection with protective gas or compressed air to fill the furnace at the end of the process



Hot-wall retort furnaces NR 1000/11 in production



Hot-wall retort furnace NRA 3300/06 with automatic door opening for the integration in a fully automatic quench & temper plant

Solutions for Customer-Specific Applications

With their high level of flexibility and innovation, Nabertherm offers the optimal solution for customer-specific applications.

Based on our standard models, we develop individual solutions also for integration in overriding process systems. The solutions shown on this page are just a few examples of what is feasible. From working under vacuum or protective gas via innovative control and automation technology for a wide selection of temperatures, sizes, lengths and other properties of retort furnaces – we will find the appropriate solution for a suitable process optimization.



Semi-automatic annealing plant with retort furnace NR 50/11 and water quenching bath on rails



Hot-wall retort furnace NRA 1700/06 with charging frame. For grey room/clean room installation for heat treatment of glass under protective gases.



Electric bayonet catch



Charging support and TUS measuring frame for retort furnace NR 20/11



Gas supply system with mass flow controller



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