

## Product Line Competence for Laboratory Furnaces

Not only for research applications the thermal treatment of various materials plays a decisive role. Consequently, the choice of the right furnace is the key challenge.

Hence, when choosing and purchasing a laboratory furnace, various are crucial in order to achieve the required results. The first important question is the choice of the application temperature. The maximum temperature of a furnace determines the type and layout of the insulation materials and heating, and in consequence, also the price of the furnace.

Another significant aspect for selection of the right furnace model is the intended use. If the furnace needs to be opened when hot, for instance, insulation materials must be used which can withstand the temperature differences or shocks. In this case, the open door should pivot away from the user, in order to reduce the heat radiation.

If the user is looking for a tube furnace to operate under vacuum, the required vacuum determines the kind of pump to be used and the corresponding tube material. The use of flammable or nonflammable process gases requires a certain set of safety systems.

With more than 60 years of experience Nabertherm has developed into the position of the largest supplier of laboratory furnaces. The wide range of standard furnaces already provides for numerous applications. Thousands of satisfied customers order regularly a Nabertherm furnace for their specific application, whatever it is, e.g. muffle furnaces, high-temperature furnaces, or chamber furnaces. If the required process cannot be covered by a standard furnace Nabertherm is able to manufacture a customized model which will be developed by team of 40 engineers. The furnace designs introduced below outline the broad range of applications and how in most cases, standard furnaces can live up to the needs in the laboratory.

### Muffle Furnaces/Ashing Furnaces

For maximum working temperatures of up to 1300 °C, different furnace families are available, tailored to the requirements of the specific process. The LE 2/11 - LE 14/11 universal furnaces can be defined as best-sellers in the muffle furnace range due to their optimum price/performance ratio. They can be universally used for maximum temperatures of up to 1100 °C, have attractive product features like double-walled housings of stainless steel and continuously adjustable ventilation openings. Their innovative heating with heating elements in quartz glass tubes guarantees very short heating times. Developing these models, the focus was on customers needing a compact furnace with an attractive price tag but still powerful.

For heavy duty use, the well-known models L 3/11 - LT 40/12 have proved their reliability decades. These solid "all-rounders" are available with furnace chambers between 3 and 40 liters for maximum temperatures of 1100 °C or 1200 °C. The user can select whether to buy a furnace with a folding door (L models) which can serve as a shelf when loading, or with a lift door (LT models) which pivots the hot side backwards, away from the operator.

If a professional furnace is needed for ashing, the LV 3/11 - LV 15/11 ashing furnaces especially developed for this process are recommended. These furnaces are designed with an air exchange of more than 6 times per minute of the furnace volume. Nevertheless, these furnaces provide for an acceptable temperature distribution despite the continuous air exchange with fresh air. This crucial property is achieved by first guiding the cold fresh air along the heating plate of the furnace to make sure only preheated air is channeled into the furnace chamber.

The furnace selection described above already take care of a wide range of the applications which are usually performed by muffle furnaces. But there are also other special applications requiring more sophisticated furnace designs. For instance, the standard Nabertherm product line also includes furnace systems with integrated scales for the determination of combustion losses, furnaces with embedded heating elements in a ceramic muffle for aggressive processes, furnaces with brick insulation as well as many other variants of muffle furnaces. On top special furnace designs are also custom-developed and fabricated for customers upon request, to live up to everybody's needs.

## Tube Furnaces

Nabertherm offers a comprehensive line of tube furnaces for nearly any operation or application. Up to 1,300 °C, these furnaces are equipped with wire heating elements, and up to 1,800 °C with SiC rod or molybdenum silicide heating elements.

Tube furnaces are primarily used in university and industrial laboratories. Typical applications are, for instance, materials analysis, sintering and firing of ceramics, gas analysis, crystal growth, thermal decomposition, etc..Nabertherm tube furnaces provide for extremely precise control of temperature and have a competitive edge with respect to their excellent temperature distribution.

Furnaces are available with different equipment, tailored to the respective application. To select the right configuration, the process requirements must be reconciled beforehand. Application conditions such as the temperature range, working positions like horizontal or vertical operation, working tube diameter, heated length, and the atmosphere, are all important decision criteria. Whatever is needed, Nabertherm tube furnaces can be equipped with a wide range of accessories to meet the customer's requirements.

The R model range is designed for simple processes up to 1,300 °C. These compact tabletop furnaces with integrated switch gear and control systems can be used universally for many processes. The hinged RS model range was developed for more complex applications up to 1,300 °C. It can be used either for horizontal or for vertical operation. By making use of the wide variety of accessories, these professional tube furnaces can be tailored to the individual process.

The RHTH and RHTV high-temperature furnaces have been developed for processes requiring temperatures of up to 1,800 °C; the RHTH models are for horizontal operation and the RHTV for vertical operation. Also for this line, a variety of equipment alternatives are available, including a number of predefined gassing packages (vacuum-sealed, water-cooled stainless steel flanges, etc.) There are also standard designs for operation with flammable gasses such as hydrogen.

## High-Temperature Chamber Furnaces

For the high-temperature range of up to 2,500 °C, Nabertherm has build up tremendous experience over the last decades. Furnaces for the sintering of technical ceramics and for numerous other applications in research and the laboratory with temperatures above 1,400 °C can be chosen out of the standard product line.

High-temperature furnaces operating under air are equipped with high-quality heating elements of molybdenum disilicide. Attainable temperatures are 1,600, 1,750, and 1,800 C For temperatures of up to 1,600 °C, SiC heating rods can also be used.

The LHT models are an outstanding table top alternative due to its compact construction. Available sizes are 2, 4, and 8 liters. The state-of-the arts selection of high-quality materials, excellent workmanship, combined with easy handling features recommend this furnace for universal use.

For temperatures above 1,800 °C, high-temperature vacuum furnaces are used, which are operated under protective gas atmospheres. The use of flammable gases is also possible. By using alternative pumping sets, a vacuum of up to 10<sup>-3</sup> mbar can be achieved. By upgrading these furnaces with special retorts and exhaust systems, they can also be used for powder metallurgy.Processes like MIM and CIM can professionally be realized.

## Special Designs for individual Applications

The exceptional furnace range as described above udnerlines Nabertherm's globally leading market position in the laboratory field. Since Nabertherm has one of the largest design and development departments in the furnace industry, customized furnaces of any process can also be designed and manufactured. In many cases, Nabertherm can provide for a special request a solution out of the wide range of standard furnaces for industrial customers. All in all, Nabertherm has the widest product range in the world in the furnace industry.

Hence, for most thermal requirements there already exists a suitable and professional solution in the Nabertherm standard product range. Nabertherm stand always implies an optimum of price/performance ratio and qaultiy. This is why Nabertherm is your first address for any furnace need in the areas of glass, ceramics, heat treatment of metals, casting, plastics, and many other applications.