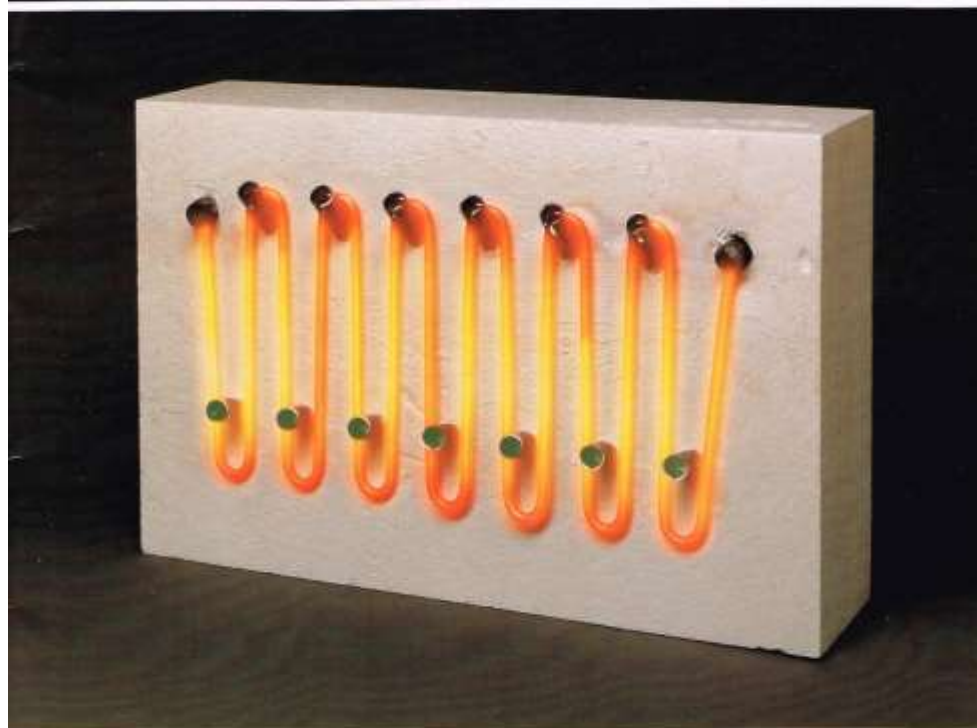




FIBROTHAL



IDEA BOOK



Plan ahead

Kanthal is presenting a new modular building system that now enables a furnace to be renovated in only a couple of days - with very little loss of production.

The method is based on prefabricated components and enables us to convert the old furnace to a fresh furnace during a scheduled outage - during the regular production season.

Kanthal takes care of all or parts of the job. You do what you are best at.

You avoid having to design the furnace, calculate the power requirement, determine the quality and shape of the elements. You avoid having to calculate the required thickness and number of layers of insulation. You avoid having to solve all the problems of electric control and much else.

And above all, you avoid having to do the heavy work, buying all the material and engaging someone to do the installation work during the summer holidays when labour is scarce - and much more expensive.

It's easy to make mistakes along the way ...

Plan ahead - and let Kanthal do the whole job. It'll pay off in the end!



A simple basic idea.

Fibrothal is a complete modular building system for heating and insulation of furnaces that combines the best properties of electric heating and fibre insulation.

This system is flexible and simple to use. Fibrothal with built-in furnace elements is available in the form of panels, half-cylinders and cylinders.

Fibrothal is also available without heating elements, as insulation. These modules can be combined with free-radiating elements for higher heating power in walls or roofs. Fibrothal makes all combinations possible.

The system fits all furnaces. From the smallest laboratory furnace to the largest production furnaces.

Fibrothal provides energy-efficient and reliable furnaces.





Prefabricated package solutions.

Renovating an old furnace with Fibrothal goes very quickly.

No other system on the market is as simple to install.

Production disruptions are minimized – a normal renovation time of a couple of weeks is reduced to only a couple of days with Kanthal's new modular building system.

Kanthal delivers both the hardware – fibre modules, elements, hangers etc – and the software – design, computations etc plus installation.

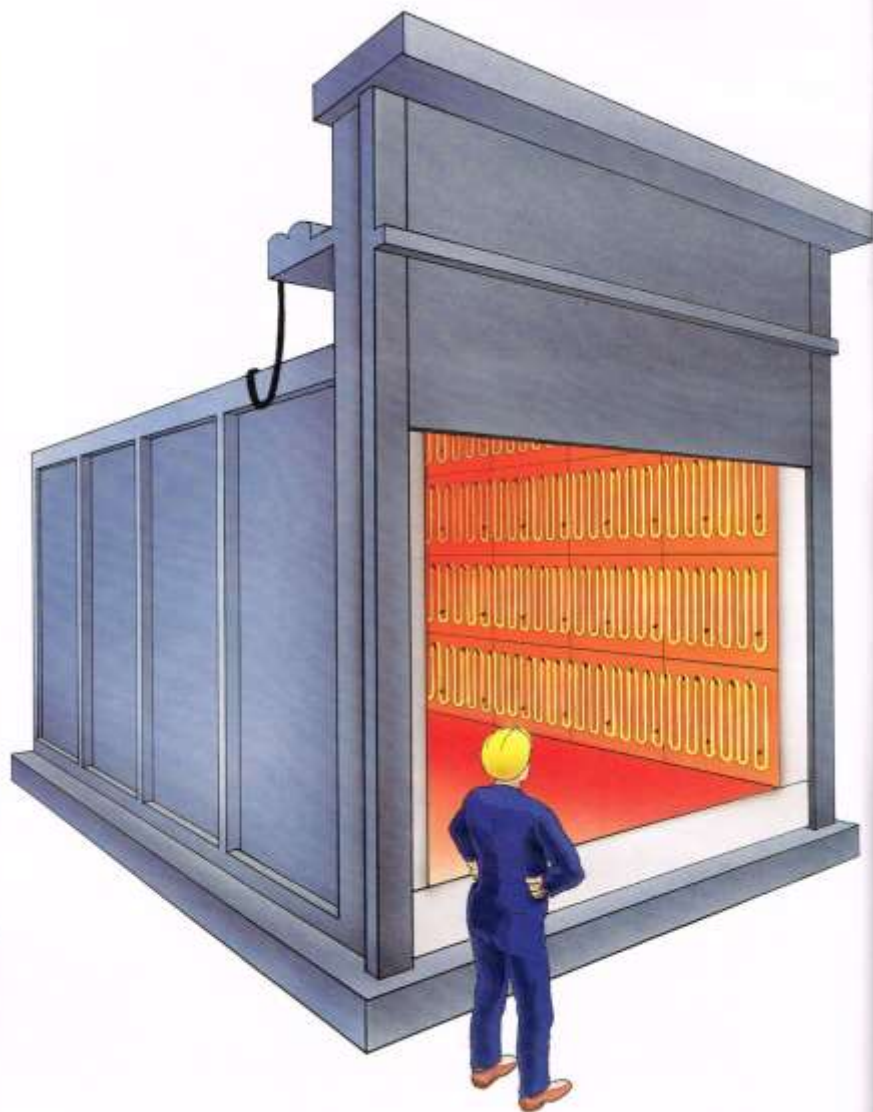
The completely prefabricated package solution means that you get a complete estimate before the work is begun.

You can decide how much you want to do yourself when you get the estimate from Kanthal. Which parts of the package you want to buy or what you want Kanthal to do. It's your decision.

But more and more, Kanthal is being contracted to do the whole job, including on-site installation by their own specialists.

This way, you avoid a large number of specialized tasks that require time, resources and know-how.





Chamber furnaces

When a chamber furnace is lined with Fibrothal, the result is an energy-efficient and flexible furnace. The furnace reaches the working temperature quickly and doesn't have to stay on during nights and weekends.

A uniform distribution of heat throughout the furnace ensures high-quality results.

The furnace is also very easy to control and very fast – i.e., heats up and cools down very quickly.

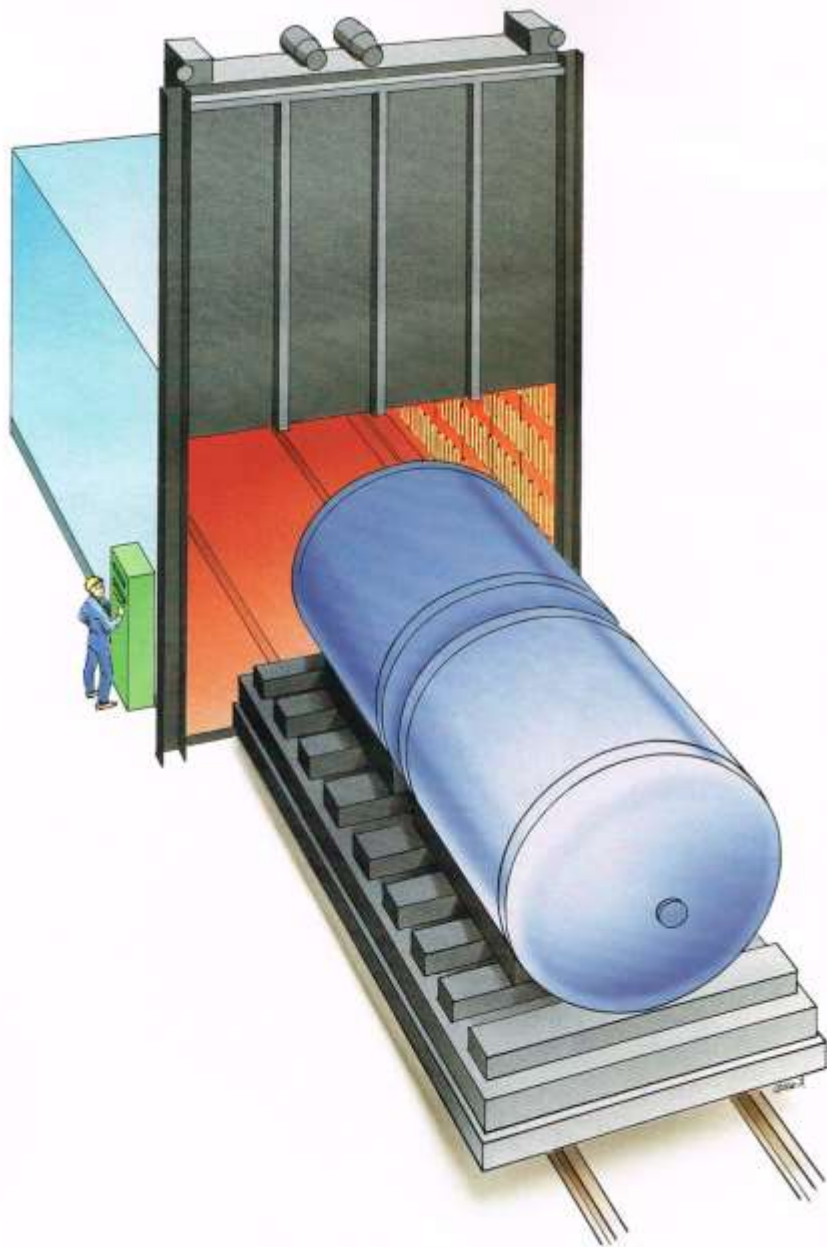
Depending on the power require-

ment, Fibrothal is chosen with built-in or free-standing elements.

Example

A double chamber furnace used for annealing wire was renovated with Fibrothal. The power requirement is now half of what it used to be. Each chamber has a power rating of 50 kW with a temperature of 1 050°C. The furnace is heated and insulated by Fibrothal heating modules, 12 in each chamber.





Car bottom furnaces

This car bottom furnace is designed to very exacting standards.

An advanced electronic control system and Fibrothal modules ensure that the temperature varies no more than 1°C. The energy saving is more than 20% compared with a previous brick-lined furnace.

The furnace is a selling point inasmuch as it enables the company to promise precise heat treatment and product quality.

In addition, the furnace can be used when it is really needed. It can be charged in the evening and the control equipment set so that the material is ready in the morning.

Since the furnace is much faster and more flexible than comparable brick-lined furnaces, the annual number of heat treat-

ment cycles is much greater. In this case, the increase in capacity amounts to between 50 and 100%.

Example

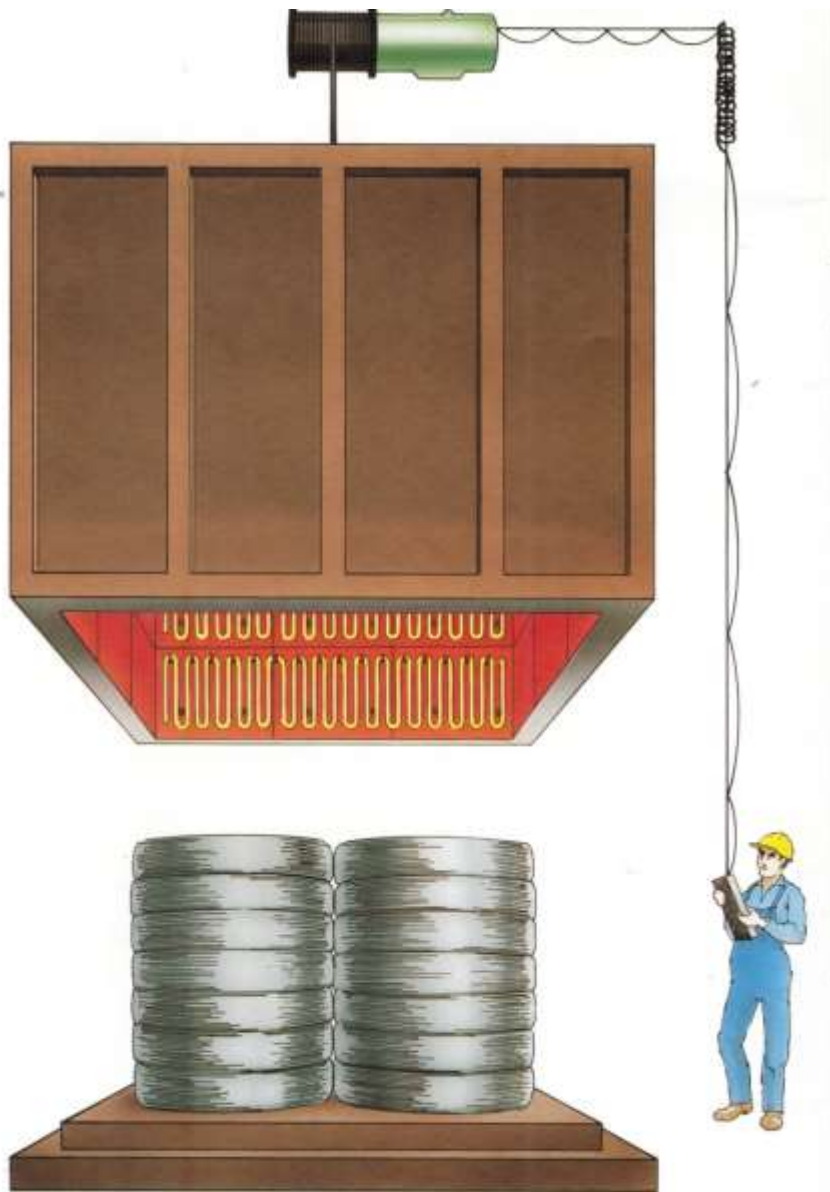
The furnace is rated at 400 kW and has 24 elements of Kanthal AF wire, 6.5 mm.

The insulation consists of Fibrothal blocks in the roof, walls and door, attached by ceramic cups.

Seven different block sizes have been used. The total wall thickness is 225 mm.

The furnace's maximum temperature is 1 050°C, but the working range is relatively wide, about 650 - 1 050°C. The heating time is dependent on the material to be heat-treated, but can be up to about 12 hours. Heating to 1 000°C takes about three hours with an empty furnace.





Bell-type furnaces

The renovation of this bell-type furnace was completed in four days. This eliminated a big problem. The previous furnace, with electrical strip elements, required repairs almost every day.

Kanthal came up with the solution. The furnace had to be both lightweight and robust. Fibrothal met these requirements. Now it is used for treating fabricated material weighing up to two tonnes. The products are often made of stainless and acid-resistant steel.

The total power rating of the furnace is 290 kW. The modules are installed with a specially designed mounting hook directly in the furnace wall, since the fur-

nace is mobile. This permits very simple replacement of element blocks.

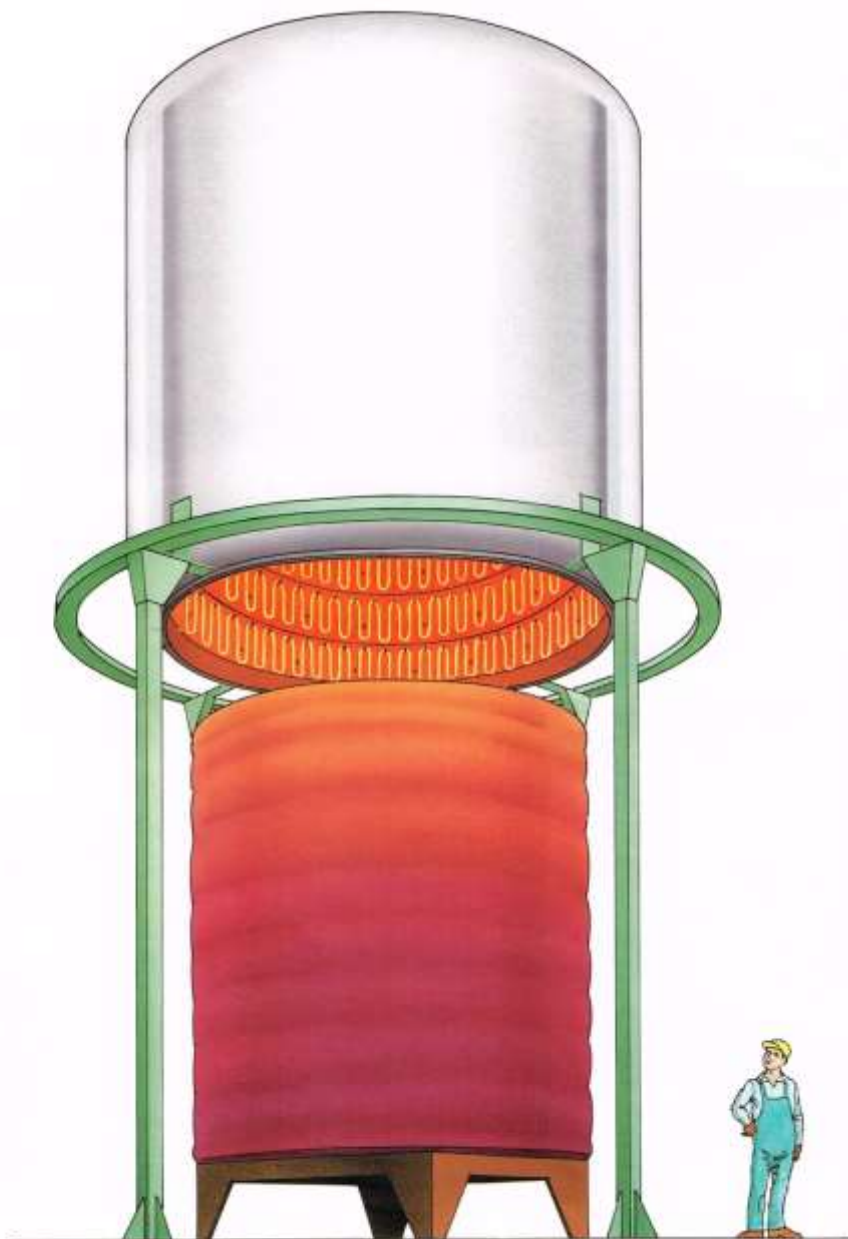
Example

The operating range is 475-1 050°C. The heating time has been reduced to only four hours.

The bell-type furnace measures 2.9 x 3.8 x 2.4 metres. It contains 34 Fibrothal blocks, each 900 x 600 x 125 mm and at rated 8.4 kW.

Special supports of Nikrothal 80 alloy permit simple replacement of the element blocks.





Elevator furnaces

Elevator furnaces are ideal for Fibrothal with its very low weight.

The overall size of the furnace is also reduced due to the efficient fibre insulation.

The furnace is very fast. It can be heated and cooled quickly, which means shorter cycle times than before.

Fibrothal's excellent insulation characteristics also contribute towards substantial energy savings.

Example

The figure shows a large elevator furnace. The furnace is lined with 18 1/6 Fibrothal blocks with AF/ROB elements.

It is used for highly advanced heat treatment of jet engine components.

The temperature is normally between 1 050 and 1 150°C. The material is heat-treated in a retort, which is raised and lowered in the furnace by means of an elevator mechanism.

The furnace starts at 300 kW, 380V, until a temperature of 1 025°C has been reached, at which point the power decreases to 75 kW. The element temperature never exceeds 1 280°C.

The combination of a state-of-the-art control system with Fibrothal permits the temperature to be controlled very precisely to provide exactly the right temperature in the different phases of the cycles.



Pit furnaces

Modern pit furnaces are lined with Fibrothal and Kanthal AF elements. This makes them maintenance-free, flexible and energy-efficient.

The Fibrothal modules with Kanthal AF heating elements can be customized for all types of pit furnaces and installed on-site in a few days.

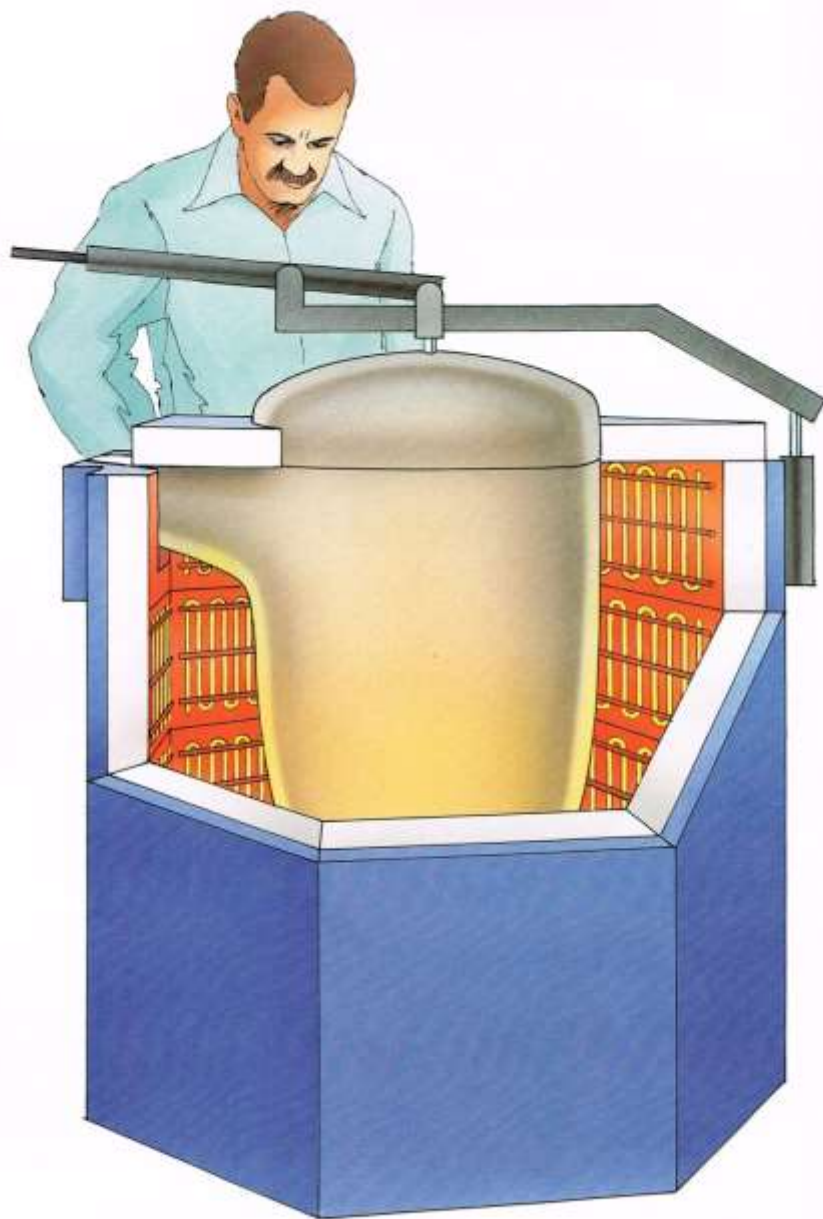
Example

An example is provided by a Norwegian engineering company that uses 25 pit furnaces for different processes, including carburizing.

The first pit furnace was renovated with Fibrothal in just two days, with the following results:

- Energy consumption at the holding temperature (960°C in the retort) is half of what it was before (29 kW/h compared to 60).
 - The furnace is easy to adjust and can be quickly heated up and cooled down. It can be turned off during weekends.
 - The temperature of the shell is much lower than before.
 - The short installation time – 48 hours – means almost no loss of production. It used to take up to eight weeks to re-brick the furnace.
 - It is easy to carry out repairs in the furnace, since it cools down so quickly.
- Based on these good experiences, two more pit furnaces have now been renovated with Fibrothal.





Crucible furnaces

The advantages of this furnace design are as follows:

Very low energy consumption despite high melting capacity due to the fact that the heat is not stored in the walls.

A comparison between brick and Fibrothal in a 93 kW furnace with a capacity of 600 kg reveals the following: Energy consumption from room temperature to melting temperature the brick-lined furnace is 170 kWh - Fibrothal 75 kWh, 55% less. Energy consumption during soaking in a brick-lined furnace is 17 kWh - Fibrothal 12 kWh, 29% less.

Quality is improved due to better temperature accuracy.

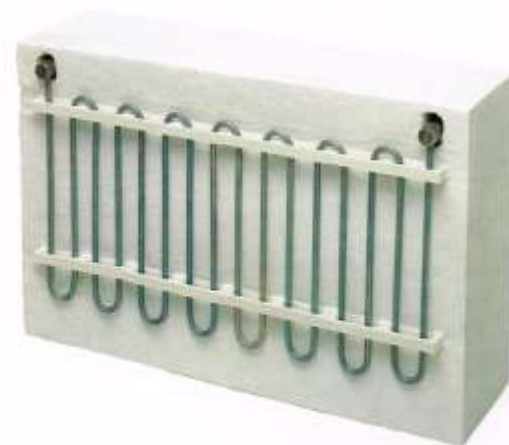
Time is saved during installation. Installing the insulation in a brick-lined furnace takes 36 man-hours - Fibrothal furnace, 24. Replacing the insulation in the event of an accident: Brick-lined furnace about 36 man-hours - Fibrothal 2-3.

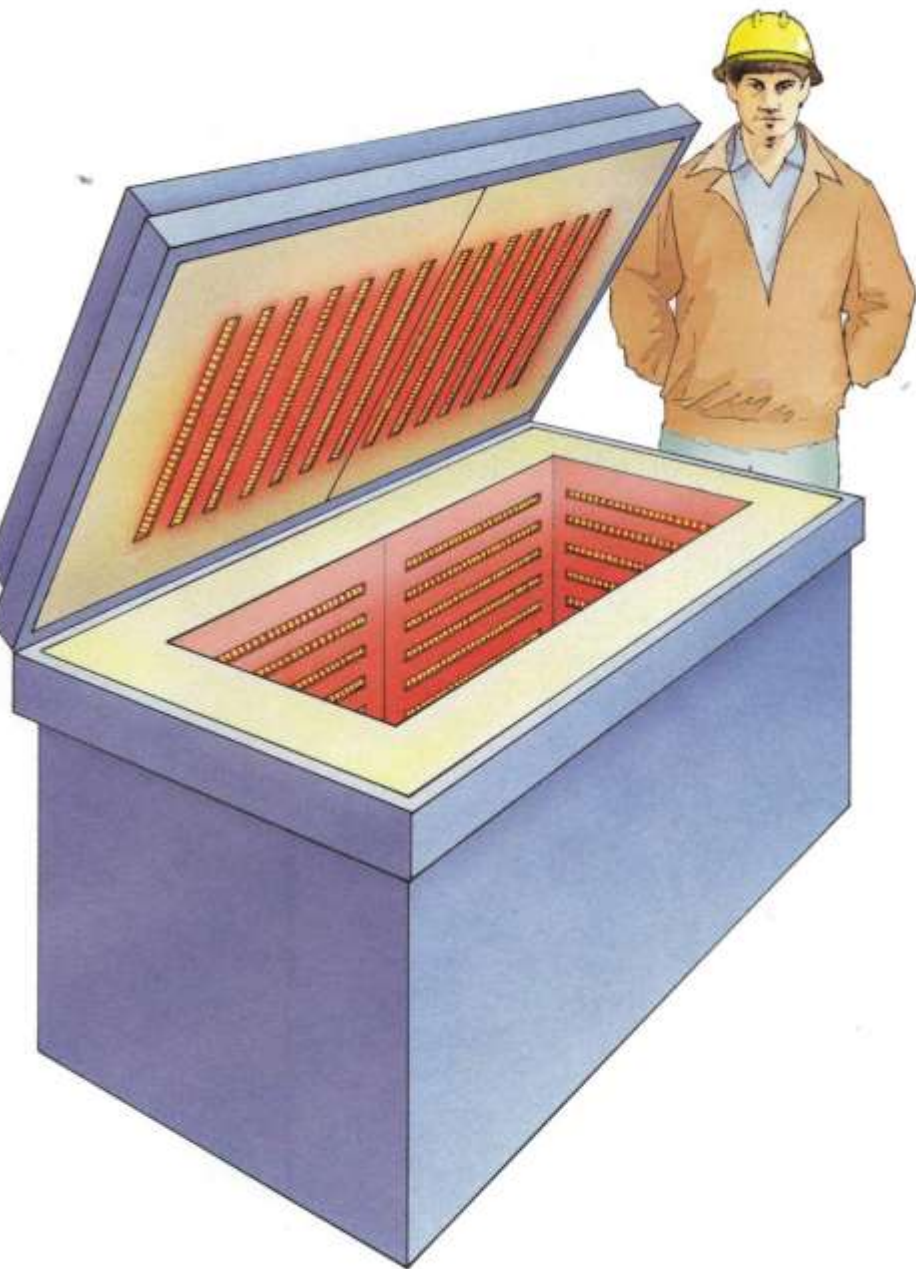
With a Fibrothal furnace, no cooling-down is required, and the crucible does not have to be taken out since the Fibrothal elements are replaced from the outside.

Example

A German company was quick to realize the advantages of fibre-insulated melting furnaces and has a series of hydraulic tilting furnaces today, all of which are equipped with Meanderthal elements and insulation.

The furnace temperature is about 1 000°C, and a power density of about 40 kW/m² is required, which entails a high surface load on the elements. It is therefore an advantage to have free-radiating elements, and since the furnaces are tiltable, the company chose Meanderthal, where the elements are held in place by means of ceramic supports.





Box furnaces

A box furnace is often used for small-lot production where the requirements on exact process control are high.

With Fibrothal modules, is it simple to design and build all kinds of box furnaces, including ones with elements in the bottom and roof.

Example

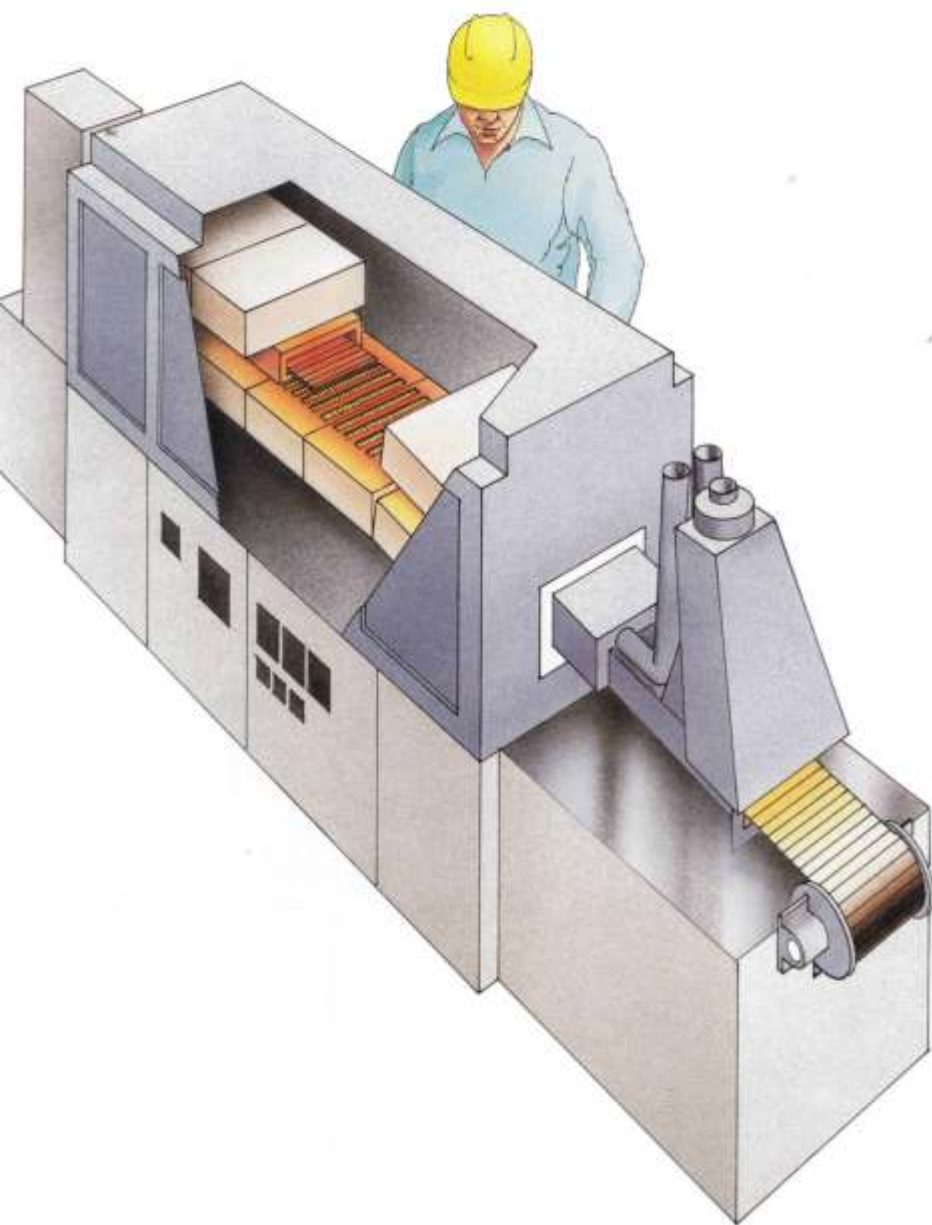
This case involves an English manufacturer of activated charcoal filters. A new manufacturing method has been developed on laboratory scale, and is now going to be scaled up to production size. A heat treatment with very accurate control of the temperature and the furnace atmosphere is required in the manufacturing process.

After having investigated different alternatives, the company chose Fibrothal for the following reasons:

- Easy to customize the furnace exactly as desired
- Easy to calculate and design
- Quick and easy to build
- Very uniform heat throughout the furnace – no hot spots; temperature accuracy $\pm 1^\circ\text{C}$
- Possible to control and monitor the entire heat-treatment process and to obtain written documentation
- Very fast furnace, simple to adjust between different temperatures

The furnace has now been in operation for one year and all specifications and wishes have been met.





Sintering furnaces

Three different kinds of furnaces were tested before a customer in Japan settled on Fibrothal.

The basic requirement was a reliable furnace with a simple design and low energy consumption.

The furnace is approximately four metres long and is used to sinter copper-alloyed bearing parts in a hydrogen atmosphere at approximately 740°C.

Brick-lined furnaces with spiral elements in grooves have not been particularly reliable due to short element life, uneven temperature distribution and relatively high energy consumption.

Before Fibrothal was chosen, a brick-lined furnace and a fiber-blanket-insulated furnace were also tested.

The brick-lined furnace was rejected due to its high weight and long construction time. The radiating furnace, with free electric elements, did not live up to the customer's demands on reliability.

But Fibrothal from Kanthal did.

Example

The main requirement was a very simple design with ready-to-install modules above and below a muffle.

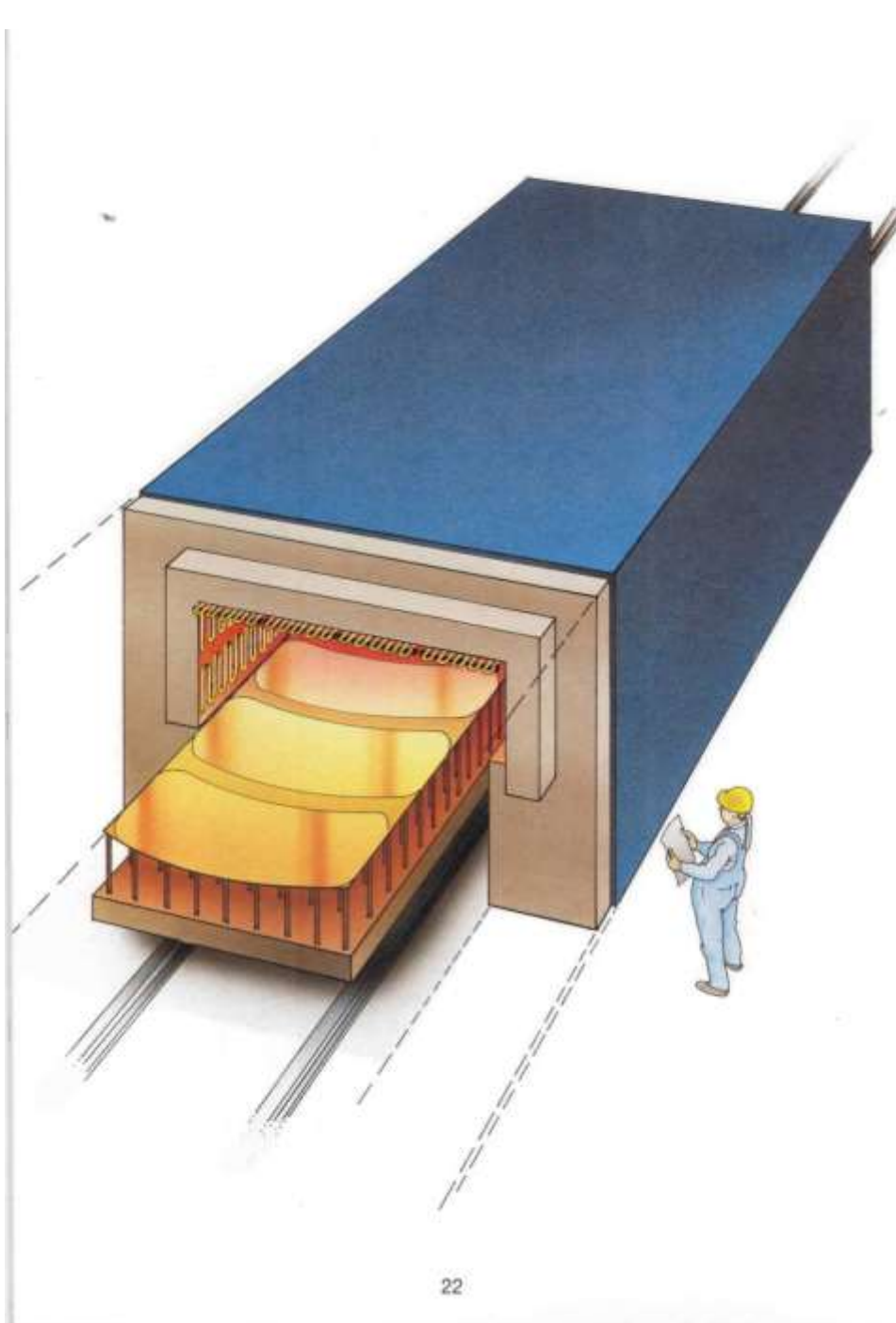
The heating elements were already in place, embedded in fibre, so that the furnace build-up time was very short. The thickness of the fibre was considered adequate to ensure a good energy saving.

Each furnace is equipped with 14 Fibrothal standard modules, 7 above and 7 below the muffle.

The furnace is rated at 15 kW, but only 6 kW is normally used due to the good thermal insulation.

Both temperature and atmosphere (nitrogen, hydrogen) are monitored via a computer, which has increased the exactness in the heat-treating procedure while reducing the need for supervision.





Glass bending and toughening furnaces

When it comes to bending and toughening windscreens for cars, temperature control is all-important. Precise temperature control is a prerequisite for a good result and for high efficiency.

The flexible Fibrothal system is ideal for such demanding applications. There are numerous possibilities for combining different heating systems in the roof, walls and floor to obtain a uniform and exact temperature.

Control of the temperature is also facilitated by the fact that each individual Fibrothal module can be controlled separately.

Example

In this case, a glass company had three old tunnel furnaces. After having converted one to Fibrothal a few years ago, they found that the furnace was so much more efficient that one more Fibrothal furnace would be enough. In other words, two

Fibrothal furnaces took the place of three old ones!

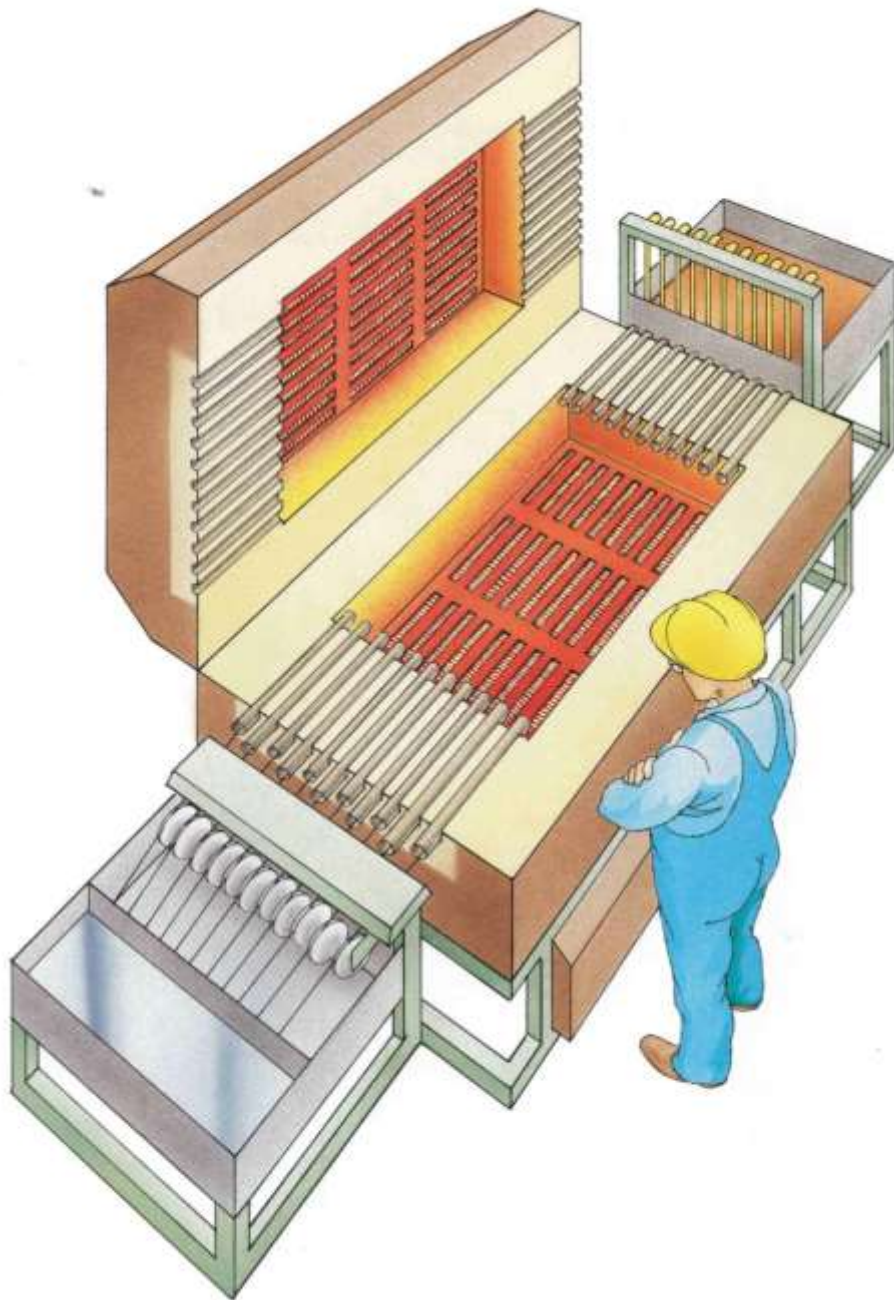
The furnace has very high temperature flexibility, i.e. the temperature can be raised or lowered very quickly. No expensive production time is lost when changing over from one glass model to another that requires a different temperature. Planning is facilitated and production is increased.

The furnace is divided into different zones, and the Meanderthal panels in the roof can be individually controlled.

Since the Fibrothal furnace is also very well insulated and no energy is consumed when the furnace is not in production, a considerable energy saving has been achieved. In this case 25-30%.

The furnace has been completely maintenance-free since its start two years ago. This means that the furnace has also been 100% available, i.e. there have been no production stoppages.





Annealing furnaces

Using Fibrothal panels above and below the protection tubes in annealing furnaces for the continuous heat treatment of wire and strip really saves a lot of energy.

A very even temperature profile is also obtained over the entire length of the tubes. This results in better quality in the heat treatment and a much higher yield.

Higher capacity, higher quality of the products, lower costs and a better working environment are some important ways in which the furnace is better than its predecessors.

Example

A British furnace builder has designed a

series of furnaces for continuous heat treatment of wire and strip.

The heat-treatment furnaces work within the range 450°C to 1 150°C.

The energy saving is maximal and the heat losses are minimal.

The new electric furnaces are virtually maintenance-free. No maintenance has been necessary during the first 2 000 hours of the guarantee period.

The electric furnace has also greatly improved the working environment and takes up less space.

The furnace has even won first prize in a British competition for efficiency and productivity!



Technical Data

Fibrothal combines all the advantages of fibre insulation and electric heating. The system can handle heat-treatment processes with temperatures up to 1 600°C and can be used in everything from small laboratory furnaces to large industrial furnaces.

Fibrothal provides higher productivity, lower energy costs, lower maintenance and manufacturing costs, a better working environment and higher quality.

The Fibrothal modules can be manufactured in many sizes and shapes. This makes them ideal for modernizing old furnaces or converting oil, and gas fired furnaces to Fibrothal.

Fibrothal Modules

The modules are available in the form of panels, half cylinders and cylinders. The heating element consists of Kanthal A-1 wire.

The modules provide a power density of 16 kW/m² at a maximum element temperature of 1 150°C. At lower furnace temperatures, the wall load can be increased.

In the cylinders, the load varies from 31 kW/m² for the smallest to 17 kW/m² for the largest cylinder. The maximum element temperature is 1 300°C.

All modules are also available as insulation blocks, without heating elements.



ROB

ROB is a system with free-radiating wire elements that are hung on Fibrothal insulation blocks. ROB is used for wall mounting in square or round furnaces.

The maximum element temperature is 1 300°C, which means the temperature in the furnace can be about 1 250°C.

Compared to Fibrothal, the wall load can be considerably higher.

The elements can be made relatively long. This is an advantage in, for example, gastight furnaces since it reduces the number of terminals.

As a rule, Kanthal AF wire is used for the elements, providing very long life and high shape stability.

Meanderthal

Meanderthal is a heating module where the free-radiating wire element is held in place by ceramic supports embedded in the fibre material.

Meanderthal is intended for roof mounting, often in combination with Fibrothal or ROB on the walls.

Meanderthal is also suitable for use on the walls of tiltable furnaces.

The heating wire is Kanthal A-1 or AF. The maximum furnace temperature is 1 200-1 250°C.

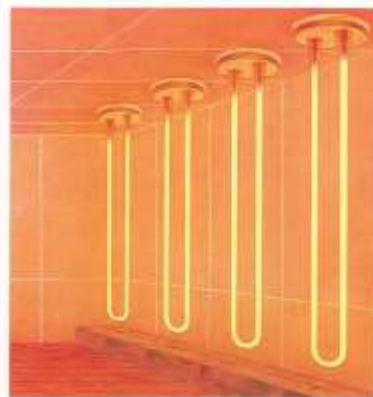


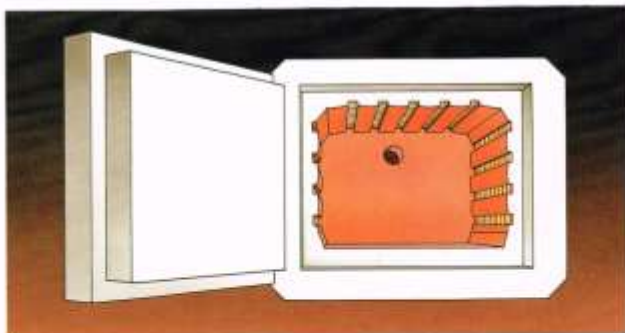
Meanderthal modules are only available in the form of panels of the same sizes as the Fibrothal panels.

Other systems

For furnaces up to about 1 600°C, Kanthal Super or Kanthal Silicon Carbide elements are used in a sandwich construction with layers of Fibrothal providing the insulation.

Silicon Carbide elements can be installed either horizontally or vertically, while Kanthal Super elements are installed in the hanging position.





Muffles

The Fibrothal range includes a series of vacuum-cast fibre muffles with built-in wire elements.

The muffles are ideal for use in laboratory and dental furnaces. They offer a robust and simple design ensuring trouble-free use for many years.

Diffusion cassettes

Fibrothal cylinders are available in a wide standard range with lengths of up to 1 800 mm.

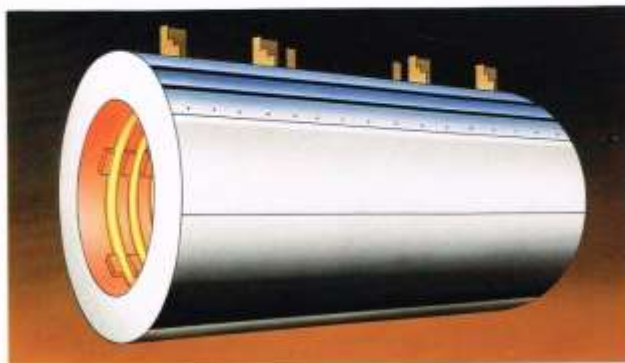
Several tubes can be placed in line with a different temperature in each tube. This enables a temperature profile to be maintained very exactly, within 1-2°C.

Kanthal also has diffusion cassettes with an inside diameter of up to 250 mm. They are ready-to-install on delivery.

Fibre grades

Fibre grade	Contents	Temp.
F-3	Aluminium-silicate fibre 51 %	1150°C
F-17	Aluminium-silicate fibre about 62 %	1300°C
F-14	Pure alumina 99 %	1600°C

Other grades can be manufactured to order. Grade F-3 is normally used for embedded elements such as Fibrothal.



Hanging of panels

The Fibrothal panels are installed using a system consisting of a threaded pin that is welded to the furnace shell.

A ceramic cup is then screwed on with a nut. Depending on the size of the panel, 2 or 4 attachment points are required.

A special welding outfit permits very fast installation.

Shrinkage

All ceramic fibres shrink at temperatures above 800°C. The space between the panels is therefore filled with double-folded Fibrothal felt.

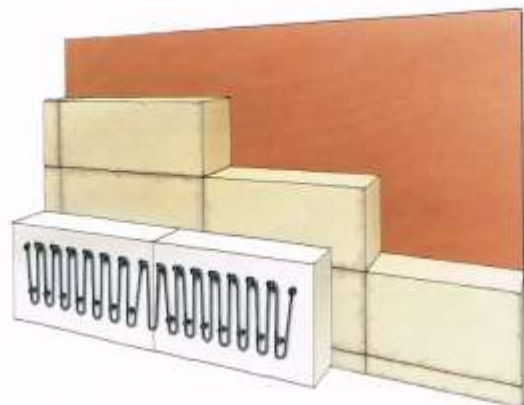
Hanging of ROB elements

Free-radiating ROB elements are hung on the Fibrothal panels with metallic tubes that are cemented or "tent pegs" that are pressed into the fibre.

At higher temperatures, a ceramic tube can be used for extra strength.

The tubes must be installed in advance, while the "tentpegs" can easily be installed as needed.





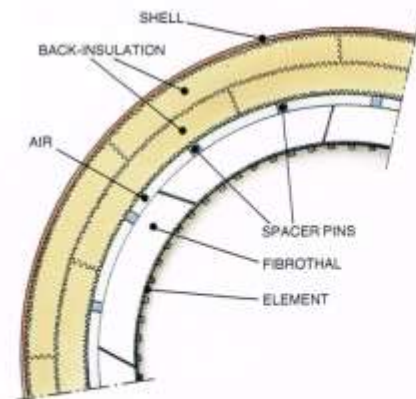
Construction of the furnace wall

It is a good idea to make sure that all joints overlap when Fibrothal is combined with some type of backup insulation.

A cheaper fibre material can also be chosen where the temperature isn't so high.

Round furnaces

Fibrothal is just the thing for round furnaces, such as pit furnaces and elevator furnaces. This is where the flexibility



of the system really offers an advantage.

The inside diameter of the furnace can be up to 3 metres. It is divided into 3-16 rounded panels, depending on size.

For smaller furnaces, the panels can be manufactured so that they lock each other. This renders a special hanging device unnecessary.

Spacer pins are sometimes used to provide the correct distance to the backup insulation.

Metallic elements are hung in using an ROB system.



Accessories

CONNECTIONS

A range of standard and special components are available for connecting modules to each other.

PROTECTION TUBES

Ceramic protection tubes for thermocouples. 7.0/5.0x125 mm. Both ends open. Also metallic tubes in several sizes.

WELDING GUN

For simple welding of the support pins to the furnace shell.

FIBROTHAL FELT

Used for sealing between the modules, 1/4" x 300 mm wide

FIBROTHAL HARDENER

For hardening the surfaces after, for example, cutting of modules.

FIBROTHAL CEMENT

For attaching parts to the blocks, cementing fibres together or repairing damaged surfaces.

MODULE HANGING

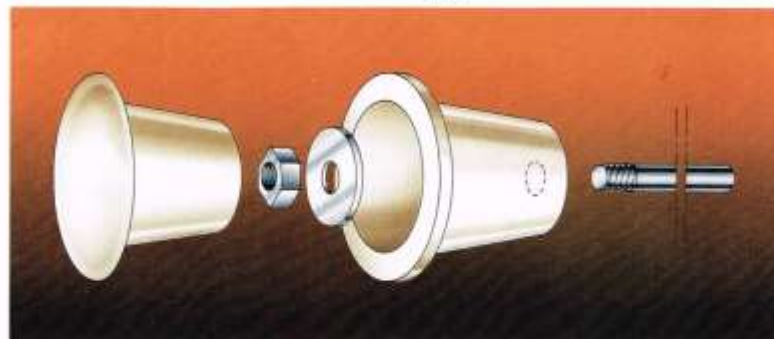
Ceramic cups with support pin, nut, washer and Fibrothal plug.

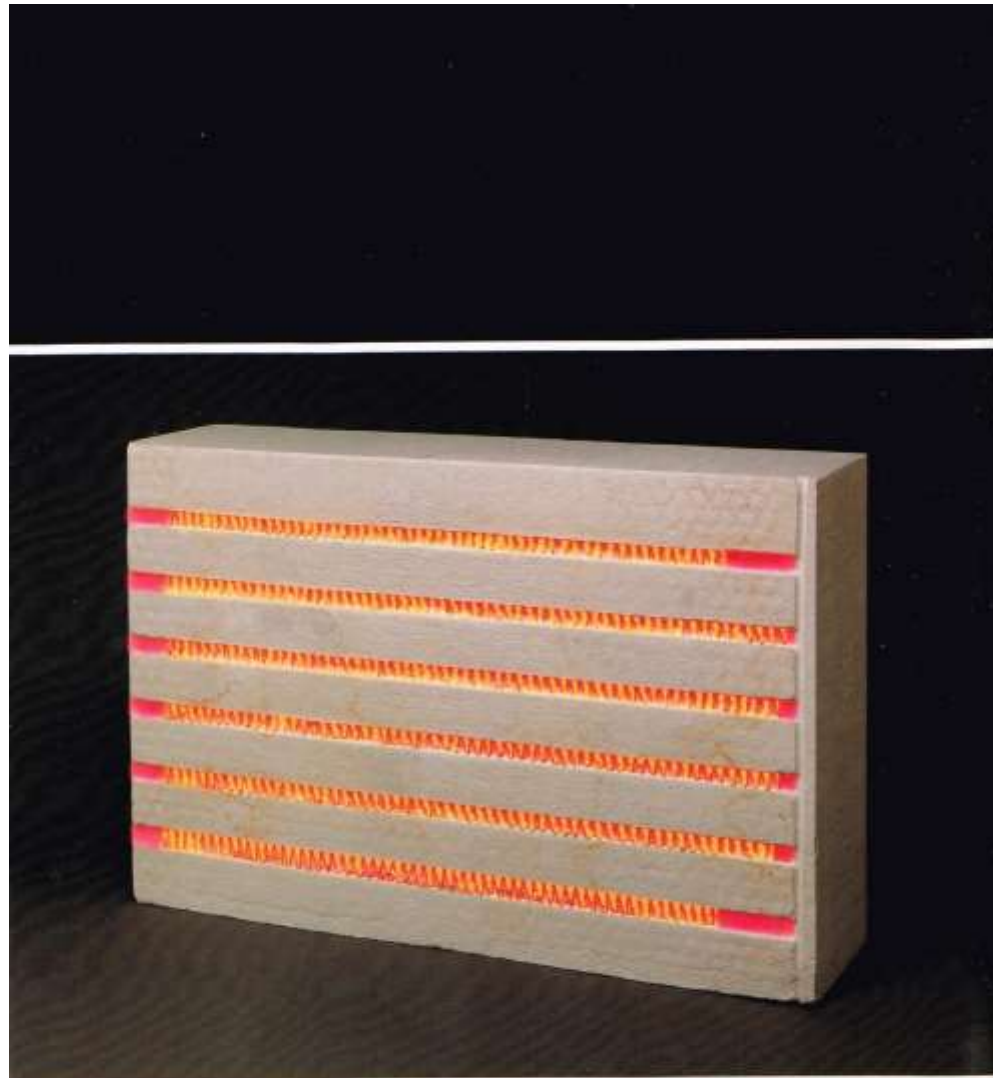
ELEMENT HANGING

Metallic pins and metallic tubes. For higher temperatures, the metallic tubes can be strengthened with ceramic tubes.

INSTALLATION KIT

Complete kit with special tools for simple installation of Fibrothal. The welding gun is not included, but can be rented.





KANTHAL

FURNACE PRODUCTS

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