

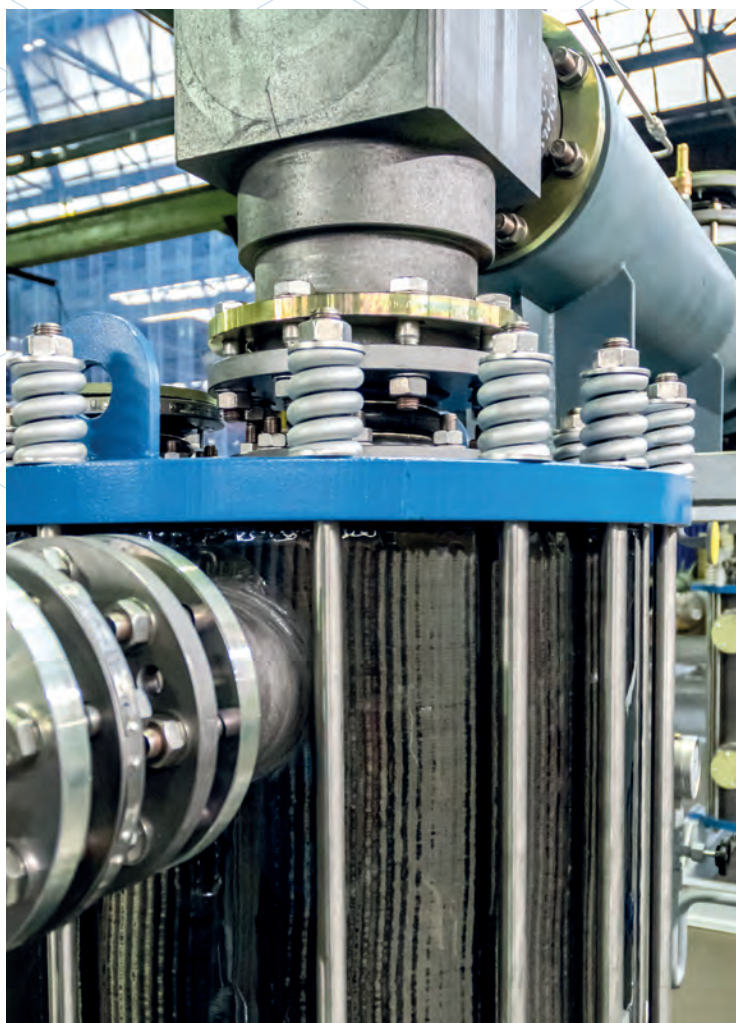
Körting non-metallic vacuum systems



Non-metallic vacuum systems

Körting vacuum systems can be used in a variety of applications as components for many process engineering areas. With over 140 years' experience in designing, manufacturing and operating vacuum technology, Körting Hannover AG also provides vacuum systems in special materials.





Körting graphite vacuum systems are protected by means of bellows against external force or torque. Therefore, when properly used, they excel with long service lives.

The corrosion problem

Metallic materials usually offer the best mechanical characteristics. However, again and again components occur in processes that have a corrosive effect on the majority of metal alloys.

In some cases special alloys or precious metals are available which are corrosion-proof. But this is not always possible, or so costly that it is uneconomical. Therefore, in these cases non-metallic materials, such as graphite or PTFE, can produce good

results. These materials are especially resistant to the majority of acids and many bases.

Due to their simple design, jet ejectors are ideal to be made of special materials like graphite or PTFE. In mechanical pumps this is often not possible at all, or entails substantial additional cost. Jet ejectors also have no rotating parts or moving mechanical components. Therefore they are reliable, durable and require little maintenance.

Special features

The special advantage of non-metallic materials lies in their resistance to a large number of corrosive media. However, due to temperature and pressure they can only be used in a limited number of areas.

Graphite

Alongside ceramics, graphite is the most popular non-metallic material for ejectors. Impregnated graphite is customarily used because impregnation makes it impervious to gas. It stands apart for its resistance to virtually all media. Only highly oxidising acids, elementary bromine and fluorine, as well as some concentrated bases and solvents rule out using this material.

It can be used in temperatures ranging from -60 °C and +180 °C, as well as -1 bar g +6 bar g. In isolated cases the range can even be increased to +200 °C and 10 bar g. Graphite is also electrically and extremely thermally conductive. So the material is predestined for use in heat exchangers. Compared with ceramics, its biggest advantage remains that components can be customised. Therefore, selecting graphite instead of ceramics cuts operating costs.

Nevertheless, graphite is brittle and breaks easily. Consequently, external force or torque must not be applied to the graphite joints. Therefore, bellows have to be provided for assembly and the tightening torque strictly observed. Pressure surges (e.g. when starting up a system) must be avoided and the devices emptied if there is any risk of frost. Suitable measures are taken to ensure that Körting graphite vacuum systems are designed and manufactured for safe transport and long service lives.

PTFE (polytetrafluorethylene)

PTFE is a material that is very resistant to chemicals and is only attacked by very strong reducing agents (e.g. alkaline-metal ammonia solutions), or very strong oxidisers (e.g. elementary fluorine). It is an especially good choice for applications where hydrofluoric acid occurs.

The potential operating range is similar to graphite. However, it is less vacuum tight, making its design more complex than graphite types. PTFE is not inherently electrically conductive, but additional substances can make it conductive. Its thermal conductivity is very low. Therefore, this material is unsuitable for condensers. However, a combination with graphite condensers would be possible. Due to its characteristics, PTFE is used for both bellows (compensators) in graphite systems as well as jet ejectors.

Customised choice of materials

Other materials or coatings are also conceivable. By liaising closely with customers, Körting engineers can find the right materials for all applications and adapt the vacuum systems to suit the area concerned.

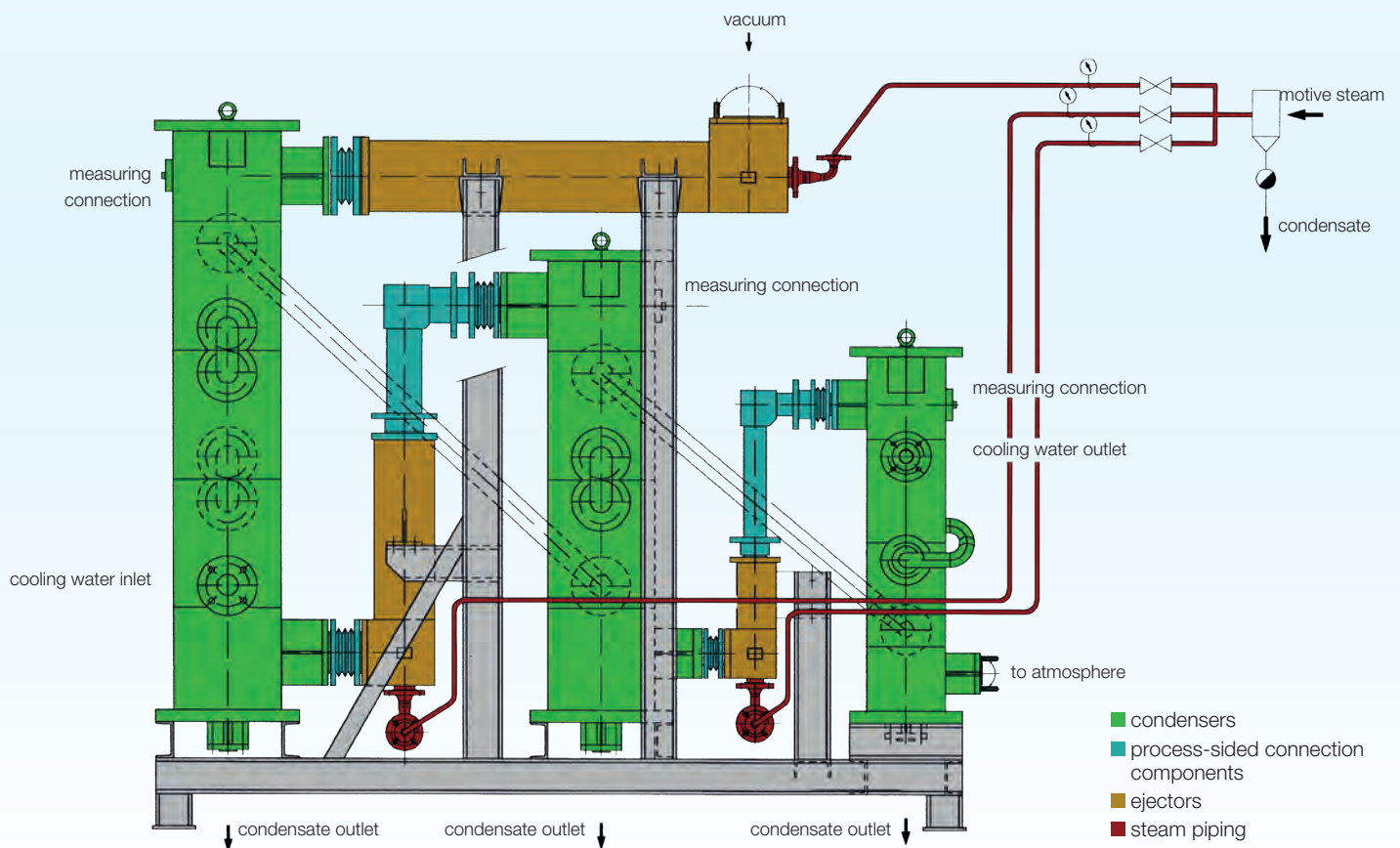
Applications

Körting non-metallic vacuum systems are operated in many process applications. They can be applied anywhere where metallic materials are ruled out due to corrosion. In the chemical industry they are used to suck off and condense aggres-

sive gases. Körting vacuum systems are always designed to comply with the customary standards and the safety requirements of the areas they are operated in.

Characteristics of non-metallic Körting vacuum systems

- resistance to corrosive media
- customised optimisation
- vacuum levels down to 0.1 mbar
- temperatures to 180 °C (in certain cases to 200 °C)
- pressures to -1/+6 bar (in certain cases up to 10 bar)

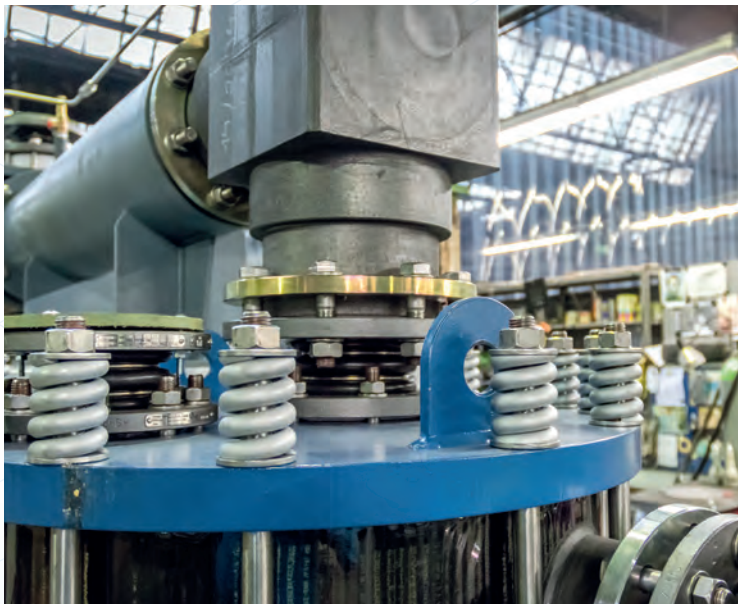


Types and designs

For years Körting Hannover AG has been successfully supplying non-metallic vacuum systems.

Amongst others, these include combinations with metallic devices (e.g. Hastelloy jet ejectors with graphite condensers). Multi-stage graphite steam jet vacuum pumps are the most common types used.

Jet ejectors with flange sizes of DN 200 and vacuum ejectors for absolute pressures of down to 1.0 mbar have already been supplied. But vacuum levels down to 0.1 mbar are also technically possible.

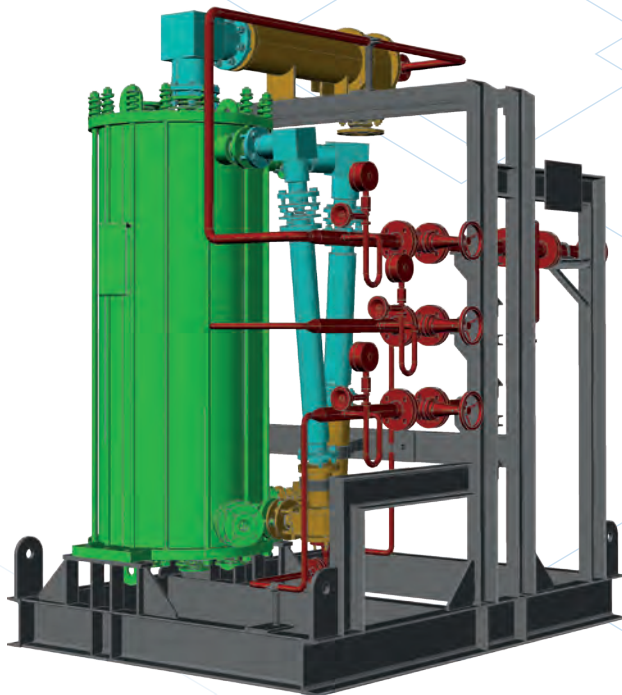


Depending on the application, Körting non-metallic vacuum systems are available as:

- stand-alone devices
- fully assembled groups

Due to the way the jet ejectors and condensers are designed, the combinations are very diverse and include:

- multi-stage steam jet ejectors with surface or mixing condensers
- combinations with water jet ejectors for venting
- different combinations of materials geared to the process



- condenser
- process-sided connection components
- ejectors
- steam piping

Complex, application-driven solutions

Graphite is a material that is highly prone to breaking. Special care must be taken when transporting it or during assembly. Consequently, Körting graphite vacuum systems are supplied pre-mounted on a frame. PTFE bellows are fitted on all graphite joints at the battery limits. Therefore, customers will not need to handle the sensitive graphite parts.

It is easy to position the systems by using the transport devices on the frame. Finally, the pipes are connected to the bellows. The vacuum system is then ready for operation.

At the design phase Körting ensures that the vacuum system is compact in order to minimise transport and installation requirements.

Testing before delivery

Before final delivery, the vacuum systems are subjected to air tests in Körting's own workshop to see if they are leak-proof. Performance tests on the jet ejectors are also carried out on the Körting test rigs. These tests mean that Körting Hannover AG can guarantee that the devices supplied are fully functional and are therefore superb quality.

In-house production and testing before delivery guarantee Körting's outstanding quality and high level of customer satisfaction.





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