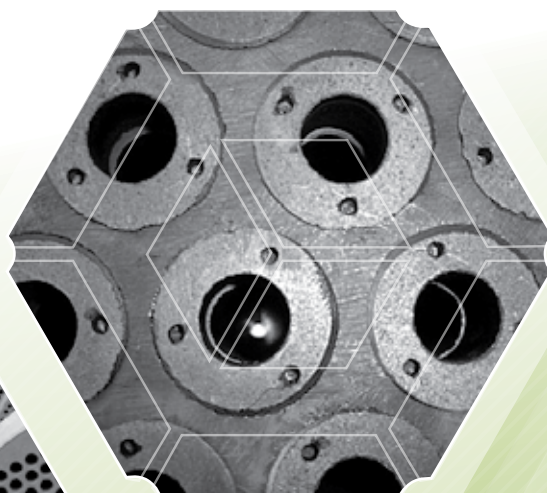


WILK GRAPHITE

EQUIPMENT FOR THE CPI

*Graphite heat exchangers and
components for corrosive applications*



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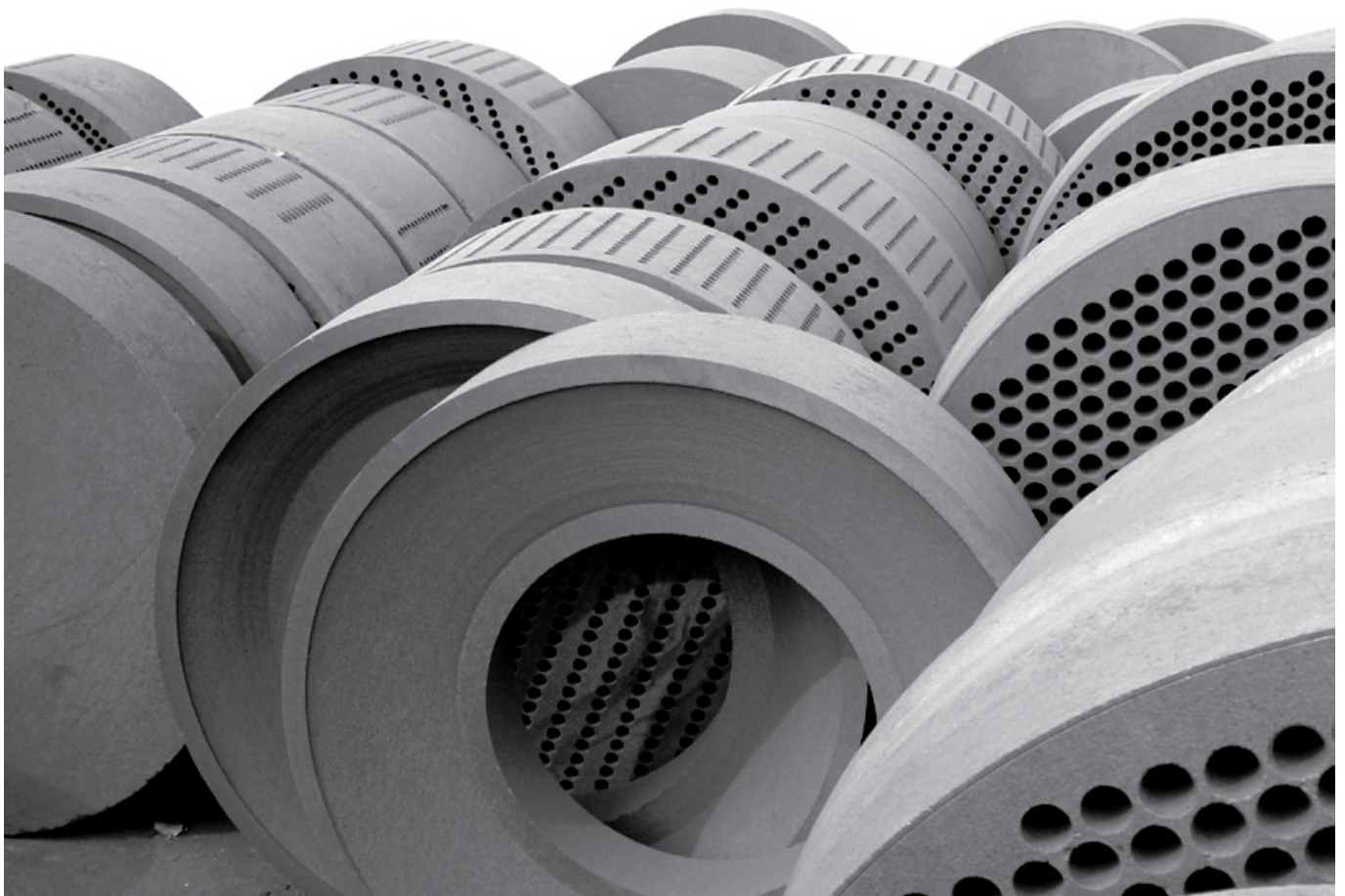
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INTRODUCTION

Wilk-Graphite exemplifies first class graphite chemical process equipment from one of the largest worldwide producers. All the products offered exclusively to the international markets represent the state of the art of graphite manufacturing and look back on long reference lists with thousands of units installed in various chemical surroundings. Every piece of equipment installed has given an excellent, competitive life time in severe applications.

Wilk-Graphite provides technical service, an international network and the ability to serve our clients with high quality products.

Wilk-Graphite was founded in 2005 by Andreas Wilk, who has been in the field of corrosion protection and for many years. It is our goal to support the international competitiveness of our customers with economical interesting pricing for lower investment and maintenance cost. In 2010 Coidan Graphite Products were appointed as the UK representative of Wilk Graphite.

Nantong Sunshine Graphite Equipment Technology Co. Ltd

The equipment is produced by the privately owned, independent company Nantong Sunshine Graphite Equipment Technology Co. Ltd, who is China's market leader. Formed in 1995, the company concentrated on graphite heat exchangers for the local market, then expanded to joint ventures and currently export around the world. In addition to the production of high quality equipment Sunshine developed its own engineering department, mainly focusing on acid recovery processes and HCL synthesis units.

Guarantee

Guarantees on the mechanical performance and the thermodynamic design are included and follow the European standards.

References

The heat exchangers and all other units are installed in many different applications for years with excellent results. More than 5000 references are available. Please ask for a reference for your process.

Nantong Sunshine Graphite Technology

- more than 350 Employees
- production capacity of 50,000 m²
- privately owned since 1995
- more than 5000 units installed
- all design and development in-house

Service

Wilk-Graphite offers full service from general technical support, thermodynamic layout, along with an after sales service. In an emergency case we are set up to provide fast service.

- Service point in Germany
- Fast delivery of spare parts ex stock from Germany or by air from China
- Local support by experienced representatives
- Fast delivery from China within only a few days in case of an emergency

ISO - Certificate

Nantong Sunshine has been certified according to ISO 9001:2000 by European Bureau Veritas and is subject to routine audit.

International Standards

All products are designed and manufactured according to international standards such as the European Pressure Code. The units are tested by independent authorities like the TÜV in China. The nozzle connections may follow ASME or DIN measurements. Please ask for additional norms.



GRAPHITE

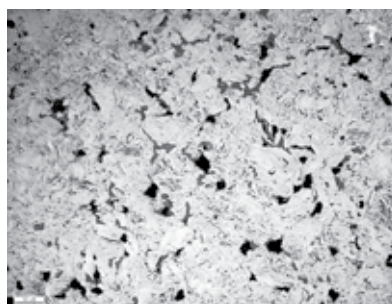
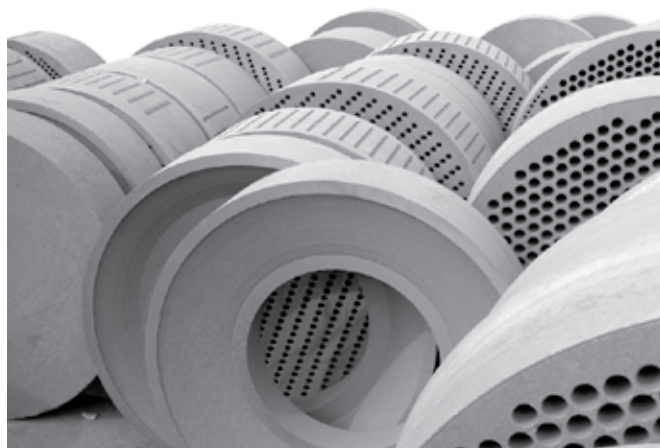
Graphite has been established in the past as a well known, reliable material for the Chemical Process Industry. Using various impregnation materials as phenolic resins or PTFE dispersions graphite offers an excellent chemical resistance.

The Graphite process equipment made by Nantong Sunshine has a particle size of only 0.2 or 0.8 mm and a low surface roughness. The result is an excellent mechanical strength and thermodynamical performance.

For less arduous applications (non pressure parts), graphite with a particle size of 2 - 3 mm is available, which suits many applications such as distributor trays and column internals.

Graphite has been successfully installed in all those applications where other materials fail because of limited chemical resistance or the price of graphite was very favourable. The materials replaced are exotic alloys like tantalum or hastelloy, glass and other materials such as ceramics or plastics.

In the years 2005 to 2009 numerous long term tests regarding the mechanical performance or chemical resistance have been executed by our customers and independent research laboratories.



CARBEX BF3 - 200 times larger

Properties	Unit	BLOCKS			PIPES			
		Carbex® BF1	Carbex® BF2	Carbex® BF3	Carbex® T	Carbex® TT	Carbex® TB	Carbex® TS
Max. particle size	mm	3	0.8	<0.2	0.4	0.4	0.4	0.4
density	kg/cm ³	1.85-1.90	1.89-1.92	1.97-1.98	>1.9	>1.92	>1.92	>1.90
Compressive strength	Mpa	65-74	82-91	93-94	>80	>85	>80	>80
Tensile strength	Mpa	15-18	16-19	24-26	>30	>30	>30	>16
Bending strength	Mpa	29-32	33-37	40-44	>50	>50	>50	>30
Thermal conductivity	W/mk	>110	>130	>130	>55	>55	>55	>110
Lin. coeff. for thermal exp.	10-6/k bei 130°C		5.4-5.7		8.2			2.4
Allowable temperature	°C	180	200	200	200	200	200	200
Bursting strength (hydr.)	Bar				>85	>90	>80	>70
Ash content	%	<0.05	<0.05	<0.05	>8.5	>9	>8	>7

*All data are related to phenolic resin impregnated material **All pipes can be offered with fibre support (T)

Impregnation

- Phenolic resin
- Furane resin
- PTFE

Application

We look back on more than 5000 references and a corrosion table including many different chemicals, temperatures and mixtures. If we do not have information about the chemical resistance of your media, we will test samples in our laboratory.

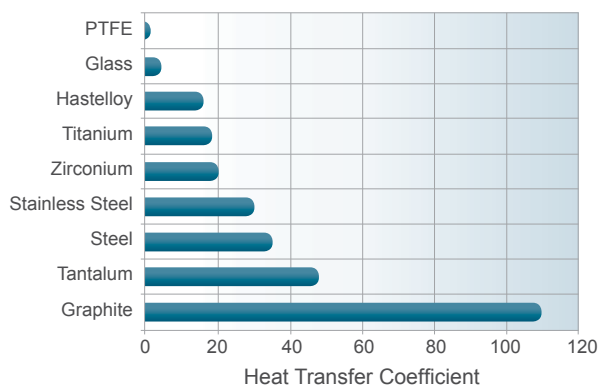
Pipe Materials

Carbex® pipes are available in different grades for to suit the application. The variety of the pipes enables us to choose the best pipe for each of our customers needs.

- Carbex® T extruded from a mixture of Graphite and Phenolic resin
- Carbex® TB extruded, calcinated and impregnated
- Carbex® TS extruded, graphitized and impregnated
- All pipes can have an optional fibre support to increase the operating pressure



CARBEX BF3 - 500 times larger



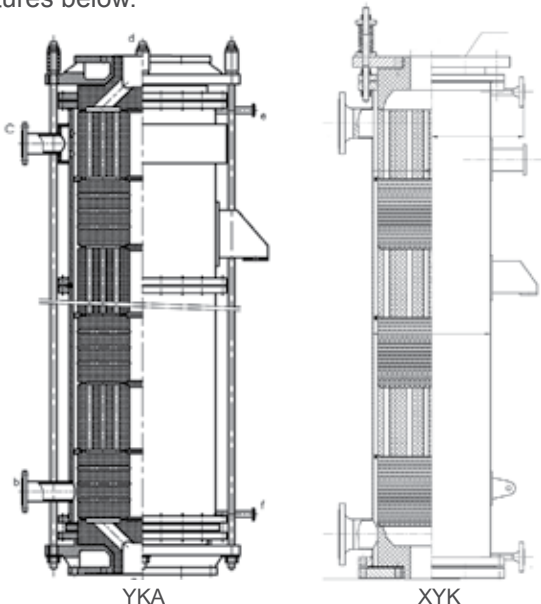
BLOCK HEAT EXCHANGER

Cylindrical Blocks

The cylindrical block heat exchanger is based on round graphite blocks which may reach diameters of up to 1400 mm. It has pass way drillings for the product and the service medium. The size of the drilling varies with the properties of the media from 10 to 24 mm. An optimized drilling is needed to achieve best results for each process. The individual blocks are sealed with PTFE gaskets against each other and the whole package is fastened by springs. The sealing system works in the temperature range of the unit and has been established for many years. By innovative baffles the service media can be adopted to the process individually, which allows an optimized design.

Both sides of the heat exchanger may be corrosion resistant, using different shell materials such as stainless steel, rubber lining or other materials. Block heat exchangers are used for many applications because of their safe operation. The compact design offers low space requirement and the modular construction allows easy maintenance, cleaning and supports the adaption of the units for changed process conditions. The units have a low pressure drop and can be customized according to individual requirements for pressure, temperature, fouling and process media.

For Block Heat Exchangers there are 2 different designs available. The major difference of the type XYK and the type YKA is the way the service medium is passed through the blocks. Please see the pictures below.



TECHNICAL DATA

operating temperature	-20°C to 170°C with phenolic impregnation -20°C to 240°C with PFA dispersion
operating pressure	6 bar, 10 bar on request
heat transfer areas	5 to 500 m ² /unit
block diameter	300 to 1.400 mm
pass way product side	10, 12, 14, 16, 18, 20, 22 mm
service side	10, 12, 14, 16 mm
shell options	carbon steel, stainless steel, customised

The diameter of the drilling is designed according to the process data. Heat exchangers are made according to the European Pressure Code, connections to DIN and ANSI norm.



Benefits

- high mechanical strength
- modular design · good resistance against impact
- compact design, minimum space required
- high thermal exchange rate even at low mass flow rates
- reliable operation · easy maintenance and cleaning

References

- waste water
- titanium dioxide
- fine chemicals
- fertiliser

- pesticide
- pharmaceuticals
- Hydrochloric acid

Applications

- evaporator
- condenser
- cooler
- heater

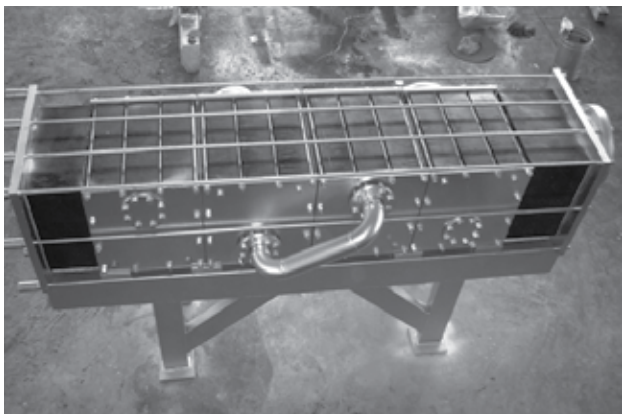
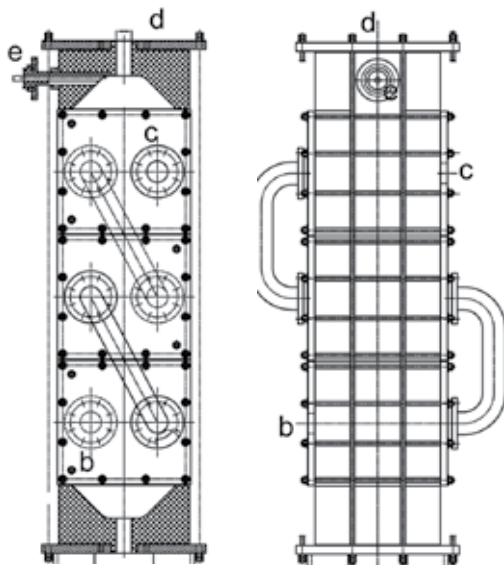
Service

- thermodynamic design
- maintenance training
- standard blocks on stock
- customized design
- service teams

Rectangular/Cubic Blocks

In addition to the cylindrical version, rectangular designs have been developed for various tasks like condensation and successfully introduced to the industry. Compared to the cylindrical design the service medium is not passed through a steel shell, but is transported by elbows and cast iron covers from one block to the next one. This system is very convenient for maintenance as each block can be cleaned individually. The blocks are fixed horizontally by tie rods and the system therefore has to take pressure in one direction only. PTFE gaskets are used for sealing.

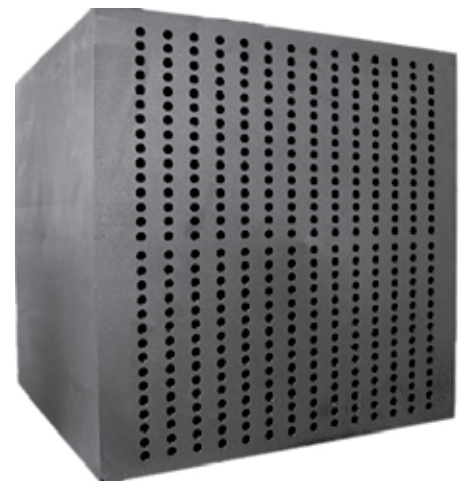
Block heat exchangers are often used as condensers, because the condensate can be collected in the bottom cover and can be separated easily.



TECHNICAL DATA

operating temperature	-20°C to 150°C with phenolic impregnation -20°C to 240°C with PFA dispersion
operating pressure	3 bar, (10 bar on request)
heat transfer areas	5 to 300 m ² /unit
block dimensions	380 x 380 x 380 mm, 380 x 380 x 660 mm 380 x 760 x 660 mm, 380 x 1140 x 660 mm
pass way*	drilling
product side	10, 12, 14, 18, 20 mm
service side	10, 12, 14 mm
shell options	carbon steel, stainless steel, customised

The diameter of the pass way is designed according to the process data. Heat exchangers are made according to the European Pressure Code, connections to DIN and ANSI norm.



Design Options

- 1) horizontal installation
- 2) both sides corrosion resistant
- 3) optimized condensate removal

Service

- thermodynamic design
- maintenance training
- standard blocks on stock
- customized design
- service teams

SHELL AND TUBE HEAT EXCHANGER

Shell and tube or tubular heat exchangers are made of graphite tubes, which are connected to graphite tube sheets. On the shell side baffles support the tubes mechanically and guide the service side fluids.

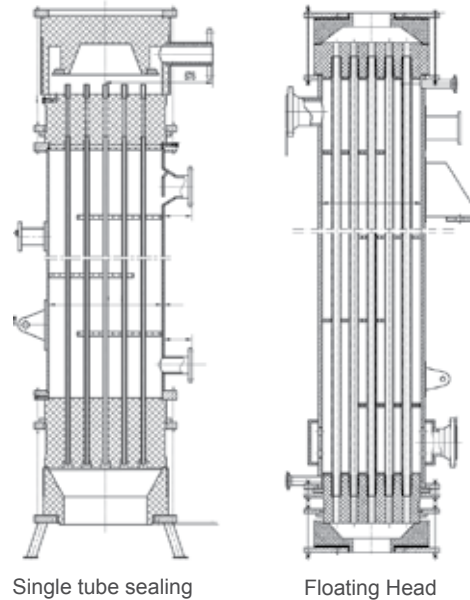
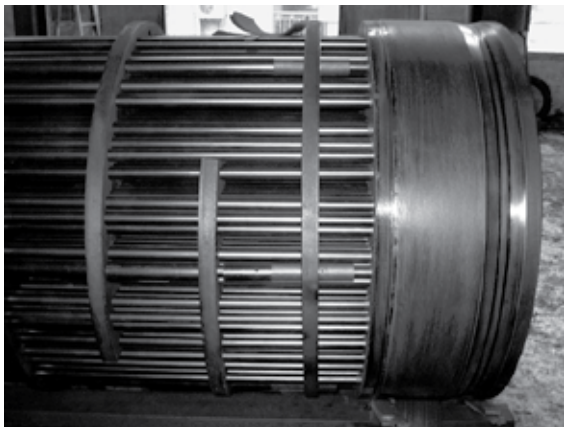
The heat exchangers offer a low pressure drop and are ideal for application where large mass flows require heat transfer areas of up to 1,000 m² per unit.

The diameter of the tubes is selected according to the application and duty. Two standard tube sizes are available, which cover most applications. In order to achieve higher mechanical strength the tubes can be straightened with carbon fibres. The units are successfully used as coolers and condensers.

The units are easy to maintain.

TECHNICAL DATA

operating temperature	-20°C to 200°C
operating pressure	6 bar on shell side, 8 bar on request 6 bar on tube side
heat transfer areas	5 to 1.000 m ²
tube dimensions	32/22 mm or 50/36 mm
tube length	as required
shell options	Carbon steel or customised



Applications

- evaporator
- condenser
- cooler
- heater
- falling film
- Phosphoric acid
- Chlorinated organic
- Waste acids

Service

- thermodynamic design
- maintenance training
- customized design
- Service teams

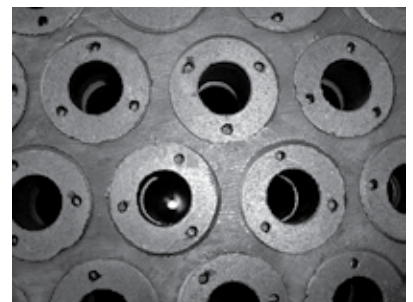
References

- Hydrochloric acid
- Sulphuric acid
- Hydrofluoric acid

Floating Head or single tube sealing

Due to the difference in thermal elongation of the graphite bundle and the steel shell the bundle can be subject to tensile or compressive strength. In order to compensate this stress the bundle can move independently from the shell by a floating head.

For severe conditions we have developed a single tube sealing, which reduces the stress on the tubes even more.



FALLING - FILM ABSORBER

The turbulent graphite falling film absorber offers the benefit of a high absorption rate for a high concentrated medium together with a low outlet temperature and the result of a low concentrated HCL in the tail gas (usually 0.8 - 1.2 t/d per single tube). There is no contamination of the media to be found.

An example for the usage of this unit is the absorption of HCL for the production of hydrochloric acid. It is also successfully used for the falling - film absorption of gases like SO₂, NH₃, P₂O₅ or H₂S.

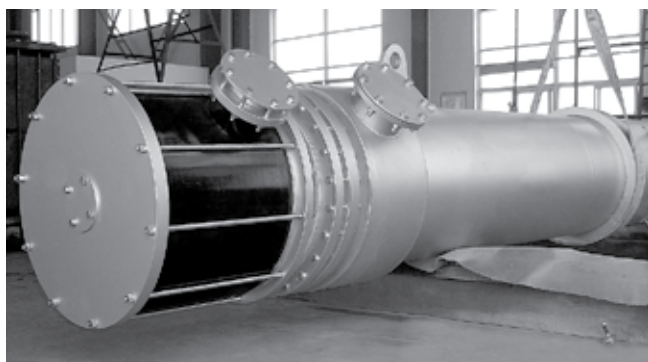
TECHNICAL DATA

operating temperature	< 170°C
operating pressure	1 bar tube side, max 6 bar 4 bar shell side, max 6 bar
heat transfer areas	5 up to 800 m ²

Options

Model I: bottom sealer made of graphite

Model II: bottom sealer made of steel lined rubber



CUSTOMIZED HEAT EXCHANGER

Cooler for high viscosity media

This modified rectangular block heat exchanger has been developed to cool high viscosity acids. The benefits achieved are:

- counter current cooling
- both sides corrosion resistant
- media pass ways of 16 to 24 mm with several drains due to high viscosity of the media
- short media holes for easy cleaning of plugged holes
- self flow needs no feed pump

TECHNICAL DATA

operating temperature	up to 240°C
operating pressure	2 bar, product side, 3 bar water
heat transfer areas	5 up to 300 m ²

COLUMNS AND COLUMN INTERNALS

Column internals like support grids, liquid distributors or inlet pipes are used to support the process in a column. Graphite has been chosen many times because of its many design options, which allow individual constructions for many different processes.

Columns and internals are available up to 3000 mm diameter.

Columns and column internals are designed individually according to the process data. This service is also available including the related guarantees. Many different forms and designs result from the many different tasks. Therefore we can only show some options here and ask for your individual data.

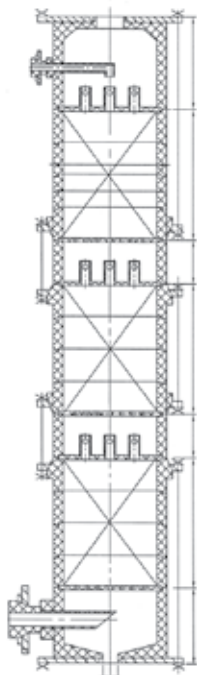


Support grids

Support grids are used in columns to support packing made of various materials suitable for the given process. The construction follows the maximum allowable flow rate, the required load and the size of the packing. It may either be flanged in between two column section, or seated on a support ring.

Liquid distributor

Distributors for liquids are usually individually designed according to the data of the process. They serve to distribute the liquid of a process on the packing and at the same time allow the gases to pass. Accordingly they can have all kinds of different shapes and designs.



Inlet pipes

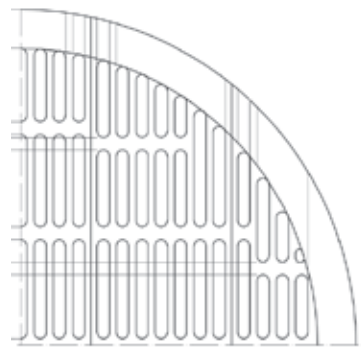
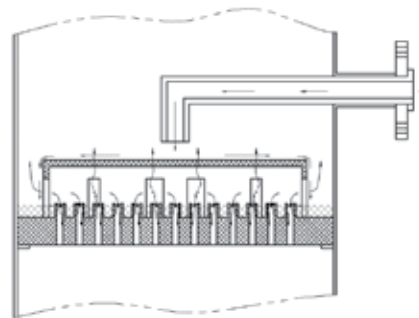
At certain points of a column the media involved in the process needs to be fed to the inner parts of the column, which can be sophisticated sprays or a simple inlet

Customized design

Many different kinds of column designs are available on request. Please send us your process data for an optimized lay out.

Graphite columns

Columns made of graphite up to a diameter of 3000 mm are offered and designed according to customized processes. Please ask for details.



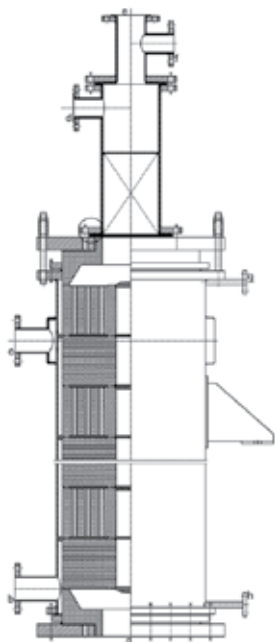
SULPHURIC ACID DILUTION COOLER

For the dilution of sulphuric acid the unit is divided into two parts. In the upper part the acid gets mixed, diluted and distributed. This part consists of PTFE impregnated graphite and a two layer special mixing area for optimized mixing results. The lower part is a standard circular block heat exchanger unit used as a cooler.

This unit is used to reduce the concentration of sulphuric acid from 98% down to 65% or less and cools the acid down to 40°C in one step.

TECHNICAL DATA

operating temperature	-20 °C to 180°C
operating pressure	1 to 4 bar
heat transfer areas	5 to 500 m ²



HCL SYNTHESIS

HCL Synthesis units

During the process of hydrochloric acid synthesis the chlorine gas reacts with water by adding energy to HCL. This process is often used because of its reliable performance and the relatively small units.

The chemical reaction takes place in a furnace which is cooled by separated cooling water. Further steps may include absorption and the cooling of the HCL in one unit.

More than 100 turnkey units designed by Sunshine are installed with more than 15 years of life time.

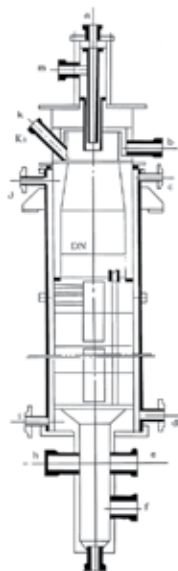
Water jacketed HCL Synthesis furnace

This very simple unit allows the synthesis in a very neat, mechanically strong unit, which usually serves for more than ten years. It consists of the inlets for the gas and the water supply as well as the burner. In order to take away the heat, cooling water is lead to the outside of the burning chamber.

Three in one HCL furnace

This unit design allows three steps in one unit. The synthesis, absorption and cooling of the hot HCL down to 40 – 50°C outlet temperature takes place in only one unit. With more than 100 units installed the technology presents not only the state of the art but includes some important patented features, which allow much higher efficiency than competitive units. The increase in efficiency is achieved by better wall protection in the reaction zone and more efficient heat transfer of the cooling water.

These units may be adopted to given processes or may be included in a complete system that can be offered as a turn key project Three in one furnace



Three in one furnace

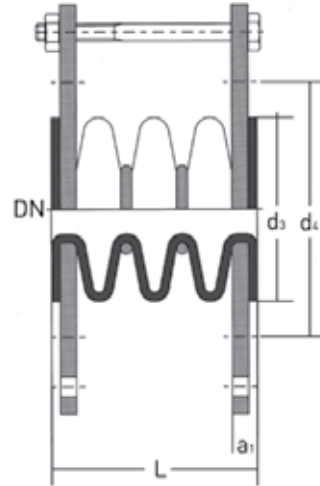
Benefits:

- synthesis, absorption and cooling in one step
- high efficiency
- long lifetime
- turn key system available
- fits into given systems
- more than 100 units installed



PTFE BELLOWS

Bellows or expansion joints made of PTFE are connected to the graphite nozzles of heat exchanger. They compensate the vibrations and stress on the nozzle coming from the pipes work. Using PTFE as a material for our bellows means a very wide range of chemical resistance. The bellows come with CE marking and are also available with DIN ANSI or JIS connections. The PTFE is also available in an antistatic grade.



DN	L mm	Extension compr. ± mm	Misalignment max. mm	Angular Deflection max°	VACUUM RESISTANCE				a ₁	Flared Surface d ₃	Bolt circle d ₄	no. of bolts x thread	Weight kg / piece
					10 ⁵ Pa	max °C	10 ⁵ Pa	max °C					
15	37	6	4	14	0.1	200			11.00	45	65	4 x M 12	1.7
20	37	6	4	14	0.1	200			11.00	58	75	4 x M 12	1.7
25	46	13	6	14	0.1	200			11.00	68	85	4 x M 12	1.6
32	46	13	6	14	0.1	200			13.00	78	100	4 x M 16	2.1
40	46	13	6	14	0.1	200			13.00	88	110	4 x M 16	2.6
50	56	15	9	14	0.1	200			15.00	102	125	4 x M 16	3.8
65	77	19	9	14	0.1	200			15.00	122	145	4 x M 16	4.6
80	77	25	13	14	0.1	200			15.50	138	160	8 x M 16	5.3
100	91	25	13	14	0.1	200			19.00	158	180	8 x M 16	7.0
125	111	25	14	14	0.1	150			19.25	188	210	8 x M 16	11.4
150	101	28	14	14	0.1	150			23.00	212	240	8 x M 20	12.7
200	137	28	14	14	0.1	50	2.0	150	25.00	268	295	8 x M 20	21.0
250	200	30	14	14	0.7	45	3.4	100	28.00	320	350	12 x M 20	27.0
300	196	30	15	14	1.5	45	6.7	100	31.00	378	400	12 x M 20	35.0
350	215	32	18	14	1.5	45	6.7	100	32.00	438	460	16 x M 20	60.0
400	233	35	20	14	1.5	45	6.7	100	34.50	490	515	16 x M 24	75.0
450	280	30	20	14	3.4	45	7.0	100	38.50	540	565	20 x M 24	91.0
500	327	30	25	14	---	---	8.0	100	40.50	610	620	20 x M 24	110.0



SAFETY SHIELDS

Safety shields are used to protect the surrounding of flanges against uncontrolled spray outs and have to be used according to European regulation with aggressive, hazardous, hot or dangerous media.

Scanvex Safety shields come in 50 m rolls and 5 different widths. From the table below the measurement of the tape can be taken and cut off from the roll with the suitable width. Then the tape is simply fixed by fastening with a screw.

Flange size DN	Cut length mm	SHIELD WIDTH		
		Fixed/ fixed mm	Fixed/ loose mm	Loose/ loose mm
25	420	50	50	70
32	500	50	50	70
40	530	50	50	70
50	580	50	70	70
65	640	50	70	70
80	690	50	70	100
100	750	50	70	100
125	850	70	70	100
150	960	70	70	100
200	1130	70	100	100
250	1300	70	100	100
300	1460	70	100	140
350	1650	70	100	140
400	1840	100	100	140
500	2170	100	140	140
600	2510	140	140	180

Material

The shield is made from transparent polypropylene with an UV stabilizer. Can be used from -40°C to 100°C

Benefits

- Universal usage with 5 different widths of the tape
- Transparent material allows visual examination
- Minimised stock
- 50, 70, 100, 140 and 180 mm tape width
- 50 metre rolls

Assembly

Please find the required length of the shield from the table and cut the length from the roll. Wrapped around the flange the overlapping ends are fixed by a VA screw.

Safety shields

This safety device can not only be used with flanges but also with many other items included within a piping system. It offers protection for bellows, armatures and also customised design.

Customized design for

- Flange connections
- Bellows, expansions joints
- Pipe vents
- Ball valves
- T-type fittings
- Other specialty shields

Materials:

- Teflon coated glass cloth
- Teflon and transparent ECTFE
- PCV, transparent option
- Polypropylene
- Polyethylene

