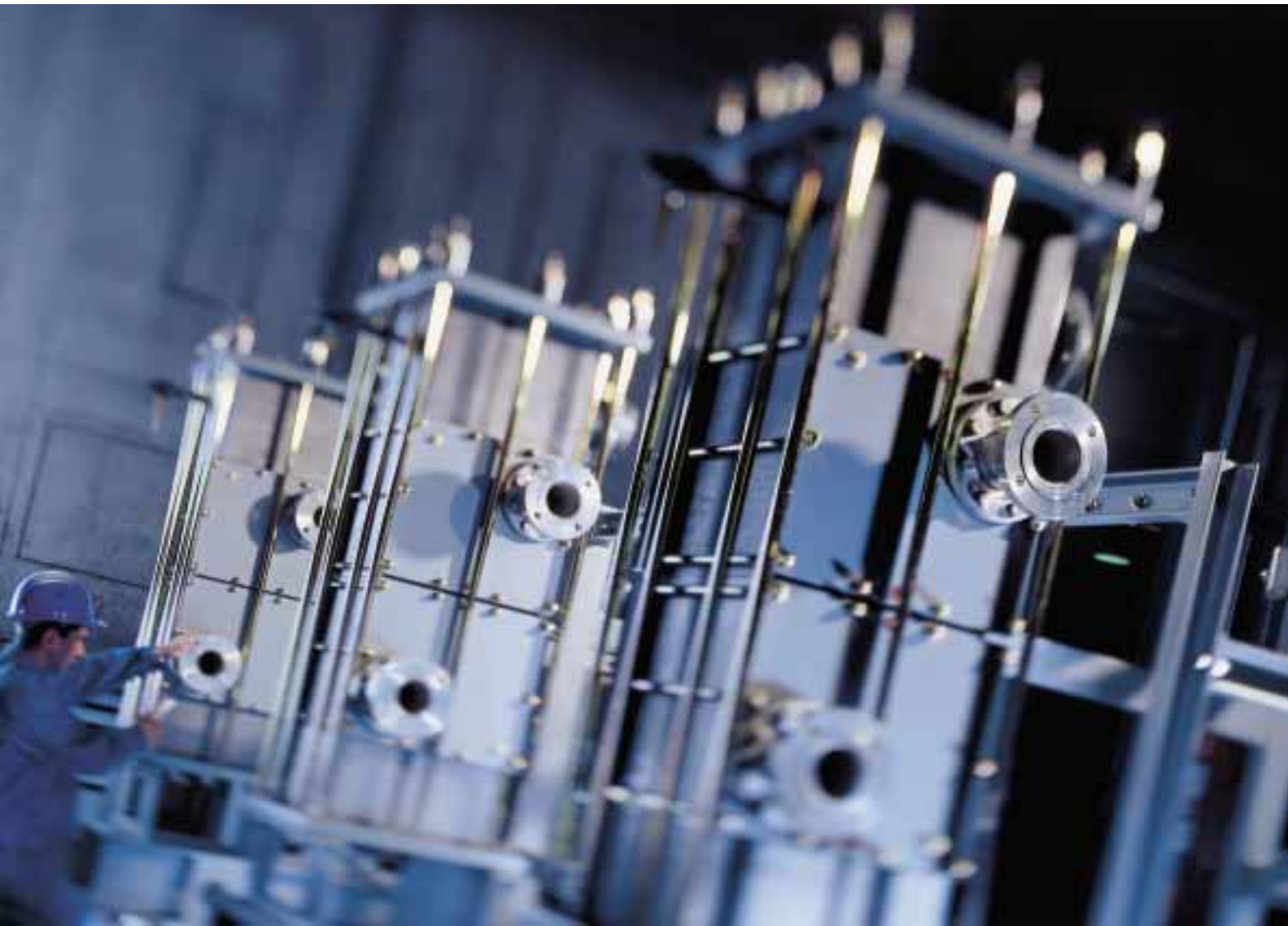


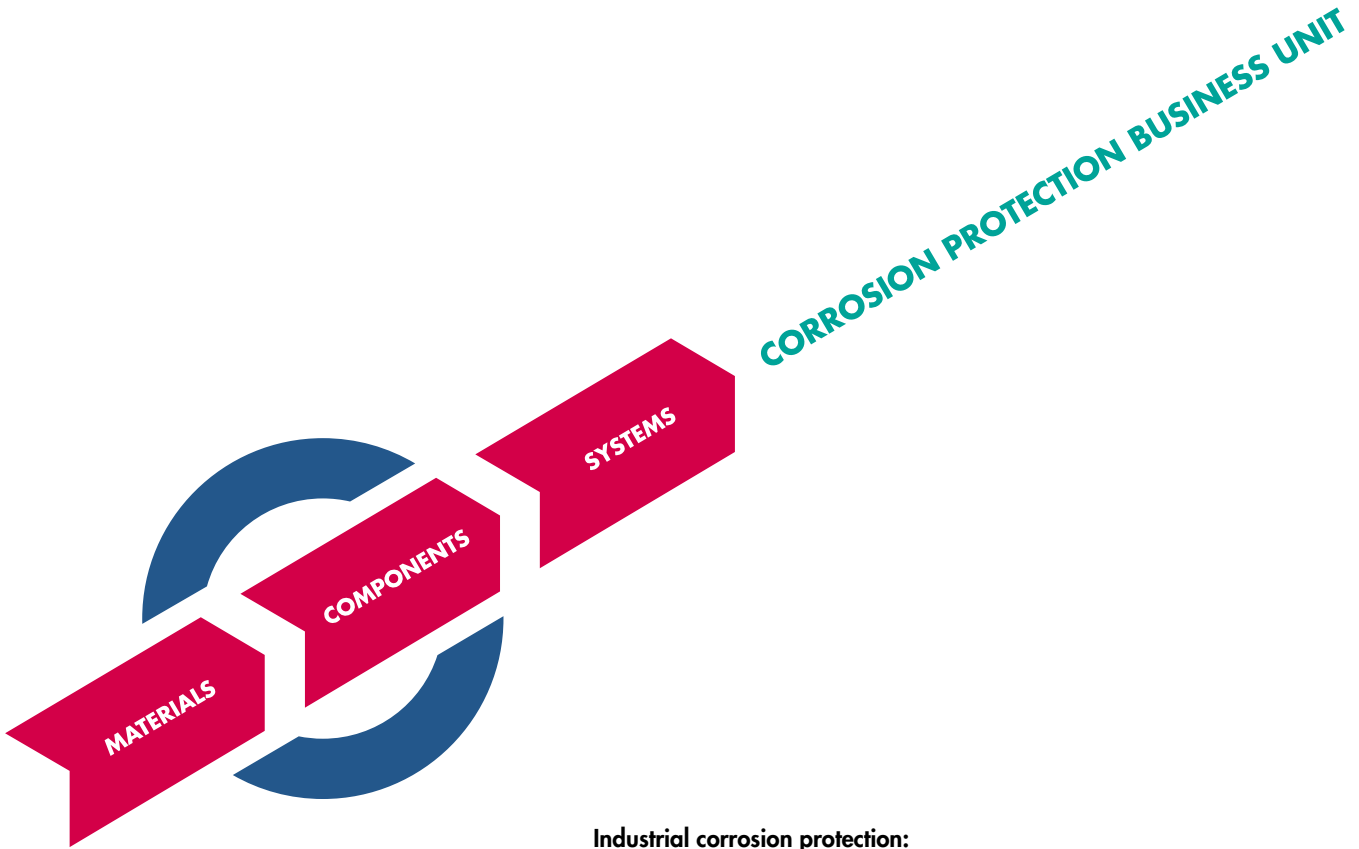
**HEAT EXCHANGERS WHICH OFFER A BLOCK OF ADVANTAGES**  
BLOCK HEAT EXCHANGERS



## CONTENTS

Foreword	3
Areas of application	4 - 5
Product description	6 - 9
Materials	10 -11
Technical specifications	12 -25
Quality assurance	26 -27

# COMPLETE SYSTEMS CREATE NEW BENEFITS



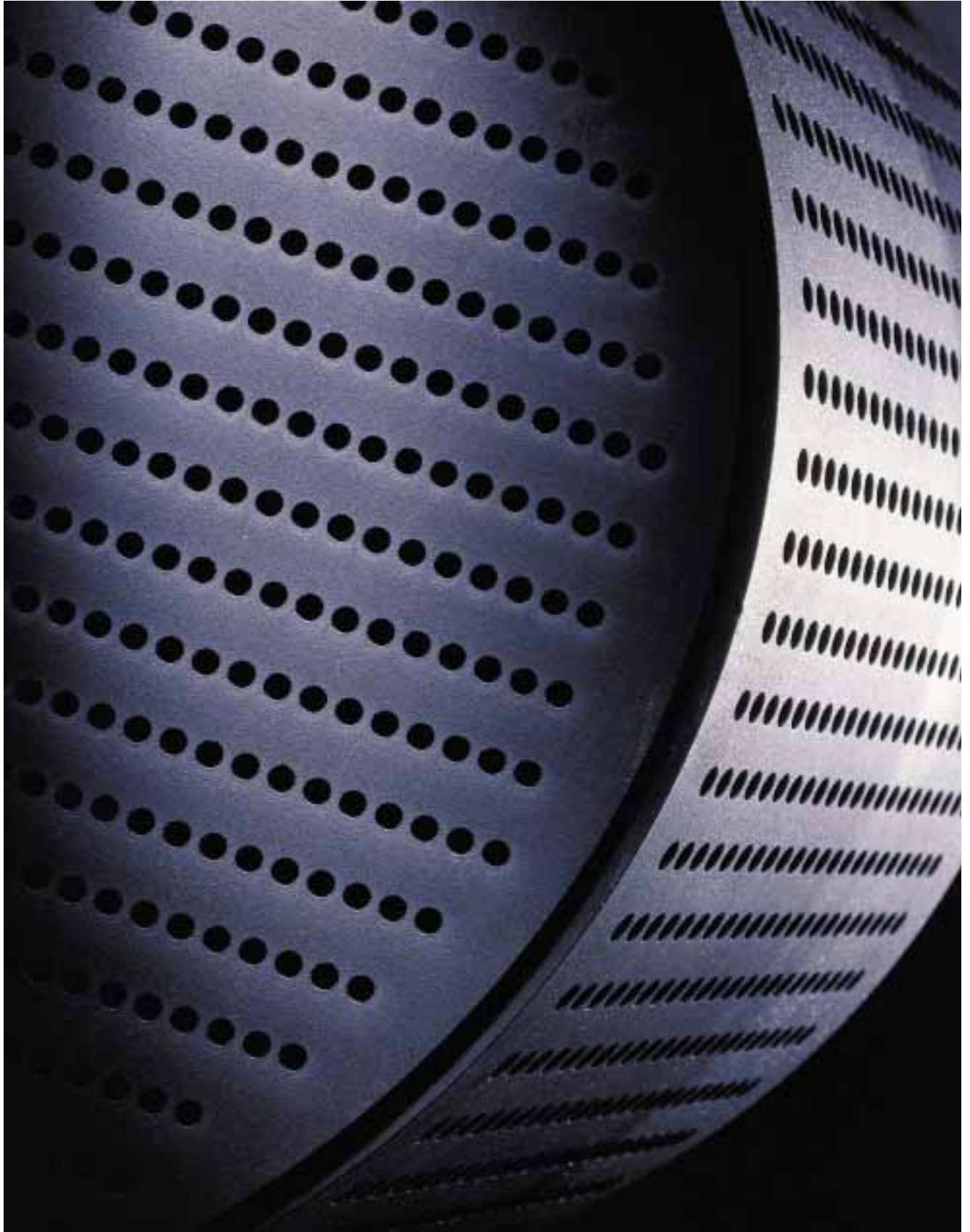
## Industrial corrosion protection:

A host of suppliers and subcontractors, difficult coordination and non-harmonized bids for materials, components, process equipment, packages and systems make efficient planning and execution of new plants a complex, time-consuming task. It doesn't have to be that way. We can now offer you a fully comprehensive range of products and services for industrial corrosion protection – we are the only producer in the world that is able to do so. We offer a complete system from a single source – from optimized material selection through interface management, production, delivery and installation right up to the warranty.

Our system approach is based on the combined expertise in materials and the decades of experience of three leading companies in corrosion protection.

These companies – SGL TECHNIK, HAW LININGS and KCH – have now been merged into the new SGL ACOTEC GmbH, the German-based headquarters of the global Corrosion Protection Business of the SGL CARBON GROUP.

You can save yourself time and trouble in the future – by taking advantage of our comprehensive, system-based range of products and services.



## BLOCK HEAT EXCHANGERS – FLEXIBLE IN USE

The main reason for employing block heat exchangers made of ®DIABON process equipment graphite is their great flexibility. They can be used for all heat exchange and mass transfer processes involving corrosive media. This is why ®DIABON graphite block heat exchangers have been employed for decades in every branch of the organic and inorganic chemical industry. All our know-how in the design and production of heat exchangers has been used for the chemical and other industries. Our experience in the field of graphite production and our expertise in heat exchangers result in synergies which benefit you. SGL ACOTEC offers system-based, customer-focused solutions to problems – and in the field of block heat exchangers, convincing advantages:

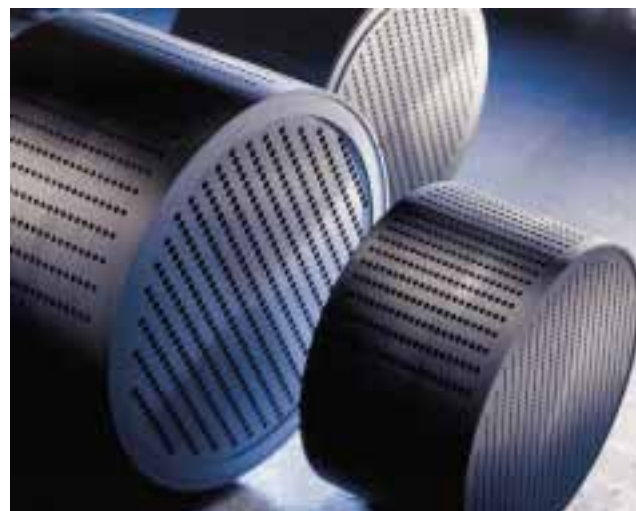
- Rapid replacement of damaged blocks due to compact modular design
- Suitability for corrosive media on both service and product sides, depending on design
- High thermal efficiency even with low mass flows
- Easy maintenance (cleaning and block replacement are very simple) due to gasketed but cement-free block joints allowing simple dismantling and assembly
- Increase of block heat exchanger transfer area by adding further block elements.

Because of these advantages ®DIABON graphite block heat exchangers are used in a variety of functions:

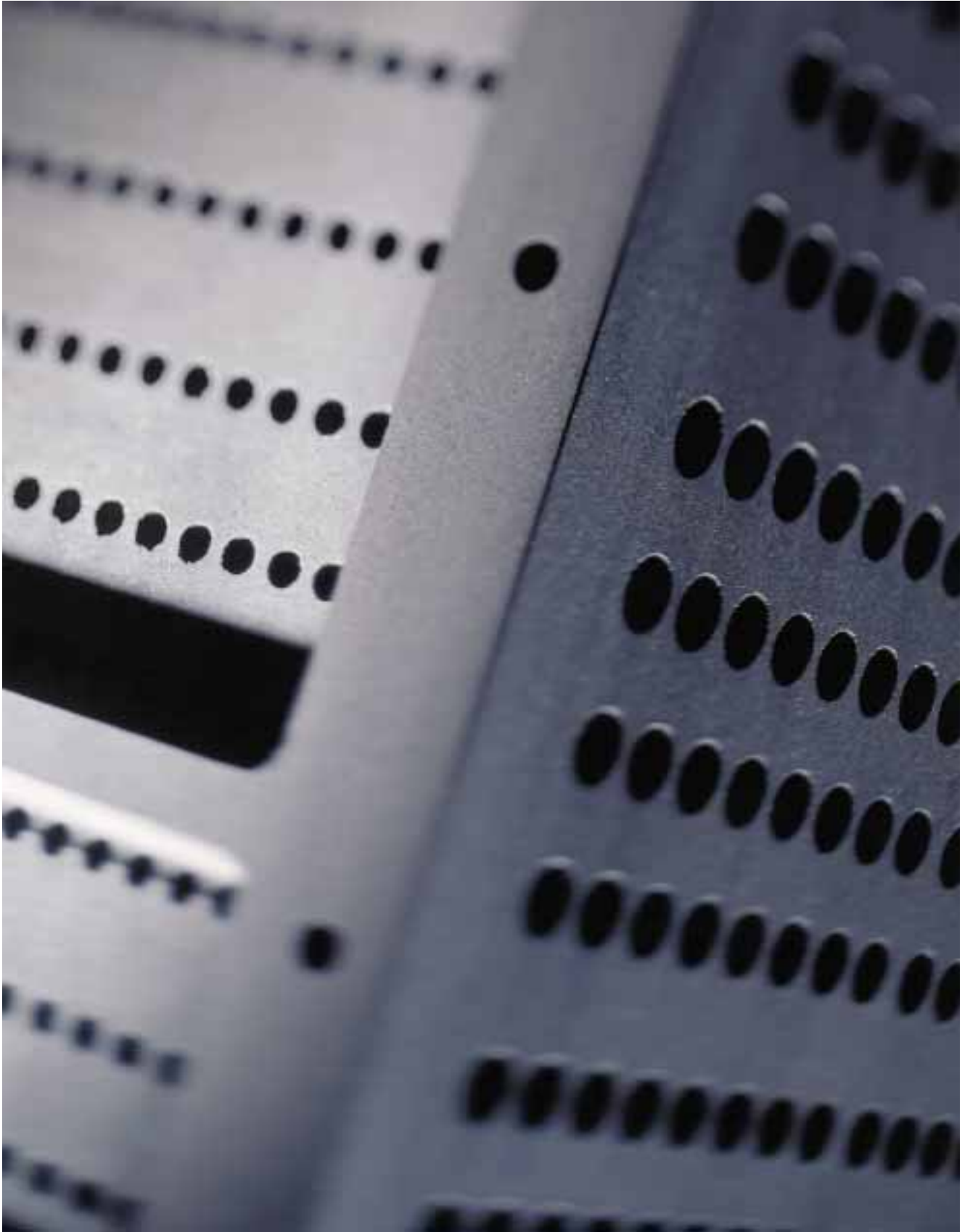
- For cooling and heating of corrosive media
- For heat exchange between two corrosive media as special design
- As forced and natural circulation evaporators
- For full and partial condensation (extended bottom header for phase separation on request)
- For absorption with simultaneous cooling.

Since they are compact and very adaptable, block heat exchangers are mainly used as:

- Overhead condensers and sump coolers, e.g. on absorption and separation columns
- Pickling line heaters
- Reactor coolers
- Ventilation condensers and sump coolers on agitators and reaction vessels
- Circulation coolers for quenchers
- Preheaters for evaporators.



▲ Cylindrical ®DIABON graphite blocks



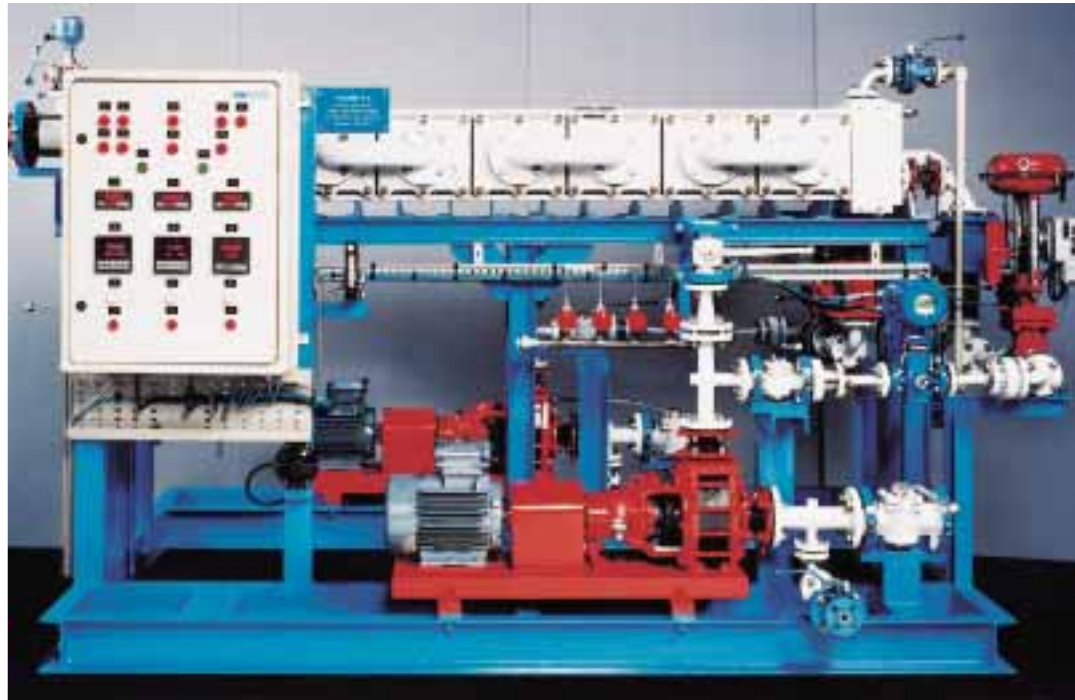
# BLOCK HEAT EXCHANGERS – THE BEST VALUE OVERALL

System-based block heat exchangers – products which have proven themselves in practice over a number of decades. Safe and reliable in design, block heat exchangers supplied by SGL ACOTEC prove their worth through the minimal downtime over their entire service life. Their great advantage is that these heat exchangers combine the universal corrosion resistance of graphite with the high efficiency of block heat exchangers. The basis of this is our synthetic resin-impregnated graphite brands <sup>®</sup>DIABON NS 1 and NS 2.

## **Block heat exchangers – operate perfectly**

Heat transfer takes place in solid <sup>®</sup>DIABON graphite blocks with a crosswise arrangement of drilled flow passages for the product and service side. The size of the blocks and the passage diameters vary according to the application and type of equipment concerned.

Several blocks are assembled to form a column which provides the required heat exchange area in a single unit. The blocks are arranged in such a way that the product passages align with one another. As a result, the product comes into contact only with the corrosion-resistant <sup>®</sup>DIABON graphite material.



◀ Solid <sup>®</sup>DIABON graphite block, cubic design

H<sub>2</sub>SO<sub>4</sub> dilution system ▶

**Corrosion resistance –  
totally convincing**

Synthetic resin- or PTFE impregnated  
®DIABON graphite is a highly  
corrosion-resistant material that SGL  
ACOTEC has developed specially  
for use in very aggressive media.  
®DIABON graphite is resistant to  
most organic and inorganic media.  
It is therefore an ideal material for  
equipment used in handling corrosive  
mixtures.

If requested, heat exchangers for  
extreme corrosion conditions can be  
manufactured in our graphite brand  
®DIABON NS 2, which has  
enhanced resistance to corrosion.

**Cleaning – extremely simple**

®DIABON graphite block heat  
exchangers can be cleaned simply  
by using

- chemicals – in accordance with the  
manufacturer’s instructions
- pressurized water.

®DIABON graphite block heat  
exchangers have proven very reliable  
in many fields of use. Should a defect  
still occur, repairing them is usually  
very simple – the whole exchanger  
is repaired by replacing individual  
elements. This means that repairs  
can be easily carried out on site –  
by your personnel. For this purpose,  
we put your personnel through our  
training courses. If required, the  
repair work can also be carried out  
by ourselves – either at your site or  
in our workshops.  
In addition, our specialists are always  
at your service – whatever your  
problem. We also supply spare parts  
quickly and easily – from stock.

**Design calculations –  
thermal and mechanical**

In order to obtain the optimal values  
in the determination of the size and  
design, SGL ACOTEC uses modern  
calculation programs. For the thermal  
design, HETRAN und HTFS are used.  
For process simulations ASPEN-Plus  
is used as a requirement for the  
design of sub-assemblies. And for  
calculating the mechanical strength  
and load-bearing capacity, ANSYS  
is used.

Block column of a cylindrical  
®DIABON graphite block heat exchanger







# THE GRAPHITE MATERIAL – EXTREMELY PERFORMING

Whichever material is being used, you can rely on the highest quality – and, therefore, on block heat exchangers which are dependable in service through minimum downtimes and, as a result, maximum economy.

## ®DIABON NS 1 graphite – good performance comes as standard

®DIABON NS 1 is our trademark for a synthetic resin-impregnated fine-grain graphite with a homogeneous material structure and a uniform pore size distribution. The pores of the raw graphite are completely filled with synthetic resin.

## ®DIABON NS 2 graphite – an easy-care material

®DIABON NS 2 is our trademark for a synthetic resin-impregnated fine-grain graphite with a homogeneous material structure, small pore size and a uniform pore size distribution. It is characterized by higher strength, better corrosion resistance and lower sensitivity to swelling than ®DIABON NS 1 graphite. Again with NS 2, the pores of the raw graphite are completely filled with synthetic resin.

## ®DIABON HF 1 graphite block – reinforced with carbon fiber

In developing the carbon fiber-reinforced ®DIABON HF 1 graphite components, we have found a way to increase the operational reliability of ®DIABON graphite block heat exchangers and expand their range of application under high-stress conditions.

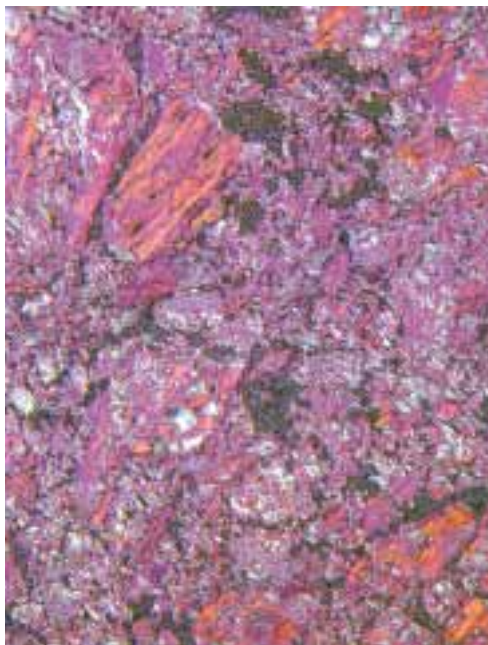
Highly pretensioned carbon fibers are wound around the ®DIABON HF 1 graphite blocks. The relatively high modulus of elasticity of the carbon fiber ensures that the tension on the reinforcement is retained even under sharply fluctuating load or stress surge – no fatigue is experienced.

The reinforcement does not impair stability to corrosion because its chemical resistance is identical to that of synthetic resin-impregnated graphite.

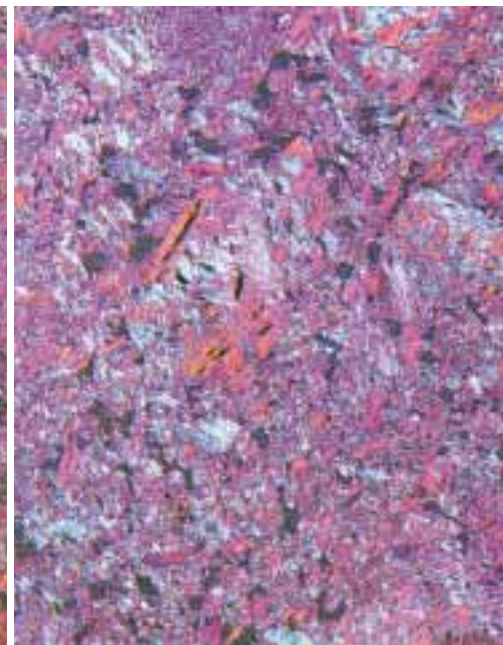
Due to the carbon fiber's negative coefficient of thermal expansion (volume increase in diameter), the tension on the reinforcement is increased when the temperature rises. As a result, the bursting pressure and maximum leakage resistance pressure are greater at higher temperatures than room temperature.

Reinforcement with carbon fibers markedly improves the mechanical properties of graphite components. Today, many ®DIABON graphite heat exchangers subject to special stresses are fitted with carbon fiber-reinforced blocks and headers.

▼ ®DIABON NS 1 graphite, magnification 50x



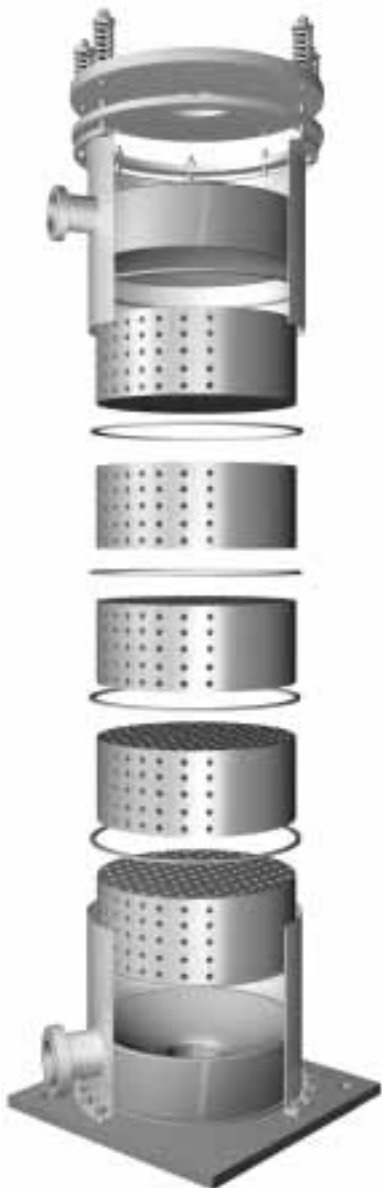
▼ ®DIABON NS 2 graphite, magnification 50x



◀ Our semi-finished products stock ensures short delivery times

## ®DIABON GRAPHITE BLOCK HEAT EXCHANGERS – CYLINDRICAL

®DIABON graphite block heat exchangers of this design consist of ®DIABON graphite blocks that incorporate axial and radial passages. The blocks are assembled on a base plate to form a block column. All joints are appropriately gasketed.



The product flowing through the axial passages is collected in a top and bottom header at the heat exchanger inlet and outlet. A steel shell firmly secured to the base plate surrounds the space around the block column. The joints between base plate and bottom header/steel shell are sealed with gaskets.

The whole block column is secured by bracing the top pressure plate against the steel shell. The joint between the steel shell and the top header is sealed e.g. by an O-ring to allow free movement of the shell. The difference in thermal expansion between graphite and steel is compensated for by helical compression springs.

As a rule, the corrosive medium flows through the axial passages. The service medium in the shell space passes through the horizontal passages. A flexible baffle cage produces forced flow deflection on the service side.

As a design variant for heat exchange between two corrosive media, special designs can be supplied on request with a suitable anti-corrosion coating of the steel shell (e.g. in rubber, PTFE, special metal).

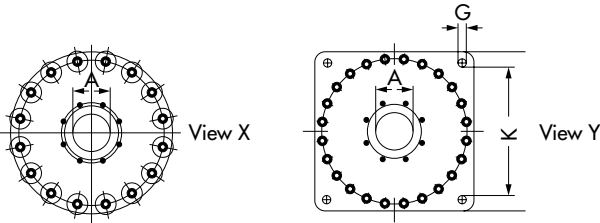
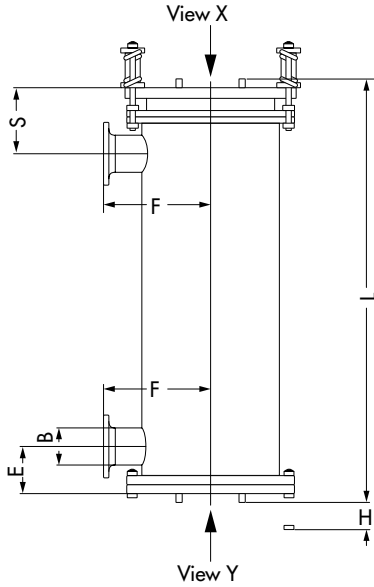
Cylindrical ®DIABON  
graphite block heat  
exchanger, ready-assembled ▶

Assembly and dismantling of a  
®DIABON graphite block heat exchanger ▼





# SERIES CKS / CKL



## Series CKS

- Product passage diameter 8 mm
- Suitable mainly for uncontaminated media
- Evaporation stage
- Suitable for low product flows.

## Series CKL

- Product passage diameter 16 mm
- Owing to the large size of the passages, this block heat exchanger series is easy to clean and therefore suitable for contaminated media which cause fouling
- The relatively large flow cross-section allows this series to be used as:
  - Reflux condenser
  - High-vacuum condenser.

### Maximum permissible service data: CKS CKL

Maximum service pressure (gauge)	Product side 7 bar Service side 7 bar	Product side 7 bar Service side 7 bar
Maximum service temperature, depending on the medium, up to	200 °C	200 °C

### Sizes supplied:

Heat exchange area	0.91 to 178 m <sup>2</sup>	0.72 to 154 m <sup>2</sup>
Block no. per heat exchanger	1 to 15 items	1 to 15 items
Product passage diameter	8 mm	16 mm

### Preferred

fields of use:	Mainly for uncontaminated media	Also suitable for contaminated media. Since it has larger-sized passages than CKS, this series can be cleaned.
	Particularly suitable for lower product flows	Suitable for high volume flows
	Used as evaporator	For high-vacuum condensers
		For reflux condensers

Number of blocks	Passage diameter, product side mm	Exchange area, product side m <sup>2</sup>	Height L mm	Type 2			Exchange area, product side m <sup>2</sup>	Height L mm	Type 3		
				Volume, product side l	Volume, service side l	Empty weight kg			Volume, product side l	Volume, service side l	Empty weight kg
1	8	0.9	739	8.0	11.0	280	1.9	758	18.0	28.0	485
	16	0.7	739	9.0	10.0	280	1.6	758	20.0	27.0	485
2	8	1.8	1087	10.0	17.0	320	3.9	1106	22.0	48.0	565
	16	1.4	1087	12.0	16.0	320	3.1	1106	26.0	46.0	565
3	8	2.7	1434	12.0	24.0	360	5.8	1453	26.0	68.0	645
	16	2.2	1434	15.0	22.0	360	4.7	1453	32.0	65.0	645
4	8	3.6	1782	14.0	31.0	400	7.8	1801	30.0	88.0	725
	16	2.9	1782	18.0	29.0	400	6.3	1801	38.0	84.0	725
5	8	4.6	2129	16.0	38.0	440	9.7	2143	34.0	108.0	805
	16	3.6	2129	21.0	36.0	440	7.9	2143	44.0	103.0	805
6	8	5.5	2477	18.0	45.0	480	11.6	2496	38.0	128.0	885
	16	4.3	2477	24.0	42.0	480	9.4	2496	50.0	122.0	885
7	8	6.4	2824	20.0	52.0	520	13.6	2843	42.0	148.0	965
	16	5.0	2824	27.0	49.0	520	11.0	2843	56.0	141.0	965
8	8	7.3	3172	22.0	59.0	560	15.5	3191	46.0	168.0	1045
	16	5.8	3172	30.0	55.0	560	12.6	3191	62.0	160.0	1045
9	8	8.2	3519	24.0	66.0	600	17.5	3538	50.0	188.0	1125
	16	6.5	3519	33.0	62.0	600	14.1	3538	68.0	179.0	1125
10	8	9.1	3867	26.0	73.0	640	19.4	3886	54.0	208.0	1205
	16	7.2	3867	36.0	68.0	640	15.7	3886	74.0	198.0	1205
11	8	10.0	4214	28.0	80.0	680	21.3	4233	58.0	228.0	1285
	16	7.9	4214	39.0	75.0	680	17.3	4233	80.0	217.0	1285
12	8	10.9	4562	39.0	87.0	720	23.3	4571	62.0	248.0	1365
	16	8.6	4562	42.0	81.0	720	18.8	4571	86.0	236.0	1365
13	8										
	16										
14	8										
	16										
15	8										
	16										

## Material specification

### Steel components

Metallic materials as specified in national standards such as

- AD specification
- ASME
- Stoomwezen
- CODAP

### Graphite material brands

- @DIABON NS 1
- @DIABON NS 2
- @DIABON HF 1
- @DIABON HF 2

### Seals

As required for a particular application

- PTFE O-ring seal
- @SIGRAFLEX graphite foil
- Rubber
- Viton

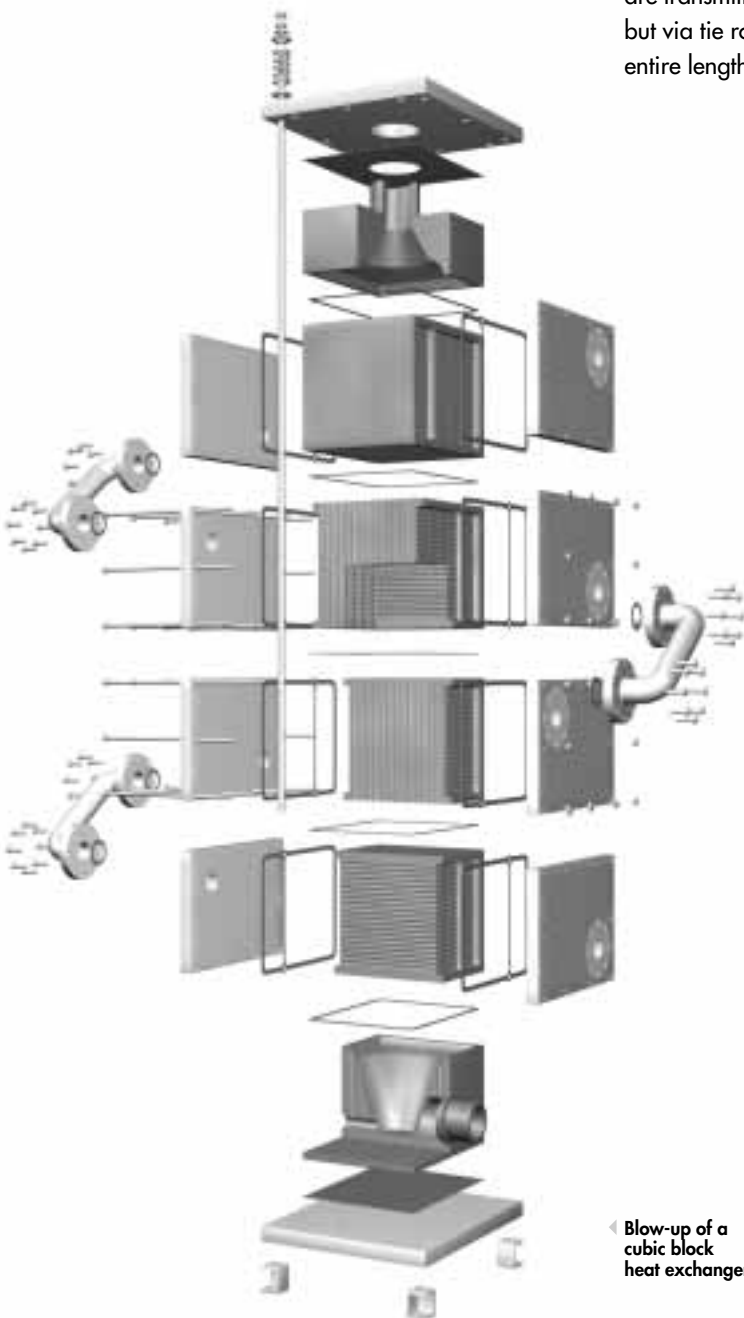
Property	Unit	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
Shell diameter	mm	273	406	508	609	711	864
Block diameter	mm	220	305	405	505	610	765
Block height	mm	347	347	347	347	347	347
<b>Passage diameter</b>							
Service side	mm	8		8		10	
Product side	mm	8	16	8	16	8	16
<b>Flow cross-section</b>							
Service side	cm <sup>2</sup>	91	78	144	105	209	157
Product side	1 pass	52	82	111	179	197	320
	3 passes	17	27	37	60	66	107
	5 passes	10	16	22	36	39	64
Exchange area A <sub>j</sub> per block	m <sup>2</sup>	0.9	0.7	1.9	1.6	3.4	2.8
<b>Nozzle connection A</b>							
Product side	1 pass	100		150		200	
	3 passes	50		80		100	
	5 passes	50		80		100	
Nozzle connection	B	80		100		150	
Nozzle distance	S	374		383		403	
Nozzle distance	E	365		375		395	
Nozzle distance	F	280		345		415	
Securing borehole	G	18		18		22	
Height of support	H	95		95		145	
Base plate width	J	405		530		630	
Bore hole distance	K <sub>1</sub>	365		490		585	
	K <sub>2</sub>	345		470		530	

Type 4					Type 5					Type 6					Type 7				
Exchange area, product side	Height L	Volume, product side	Volume, service side	Empty weight	Exchange area, product side	Height L	Volume, product side	Volume, service side	Empty weight	Exchange area, product side	Height L	Volume, product side	Volume, service side	Empty weight	Exchange area, product side	Height L	Volume, product side	Volume, service side	Empty weight
3.4	798	33.0	43.0	690	4.9	918	52.0	61.0	1120	7.5	1018	85.0	94.0	1500	11.9	1138	170.0	130.0	2300
2.8	798	37.0	42.0	690	4.1	918	58.0	56.0	1120	6.3	1018	95.0	89.0	1500	10.3	1138	187.0	120.0	2300
6.9	1146	40.0	70.0	800	9.8	1266	62.0	101.0	1260	15.0	1366	100.0	152.0	1680	23.8	1486	194.0	196.0	2570
5.6	1146	48.0	68.0	800	8.2	1266	75.0	94.0	1260	12.5	1366	120.0	143.0	1680	20.5	1486	228.0	180.0	2570
10.3	1493	47.0	97.0	910	14.7	1613	72.0	141.0	1400	22.5	1713	115.0	210.0	1870	35.7	1833	218.0	262.0	2840
8.4	1493	59.0	94.0	910	12.4	1613	92.0	132.0	1400	18.8	1713	145.0	197.0	1870	30.8	1833	269.0	240.0	2840
13.8	1841	54.0	124.0	1020	19.6	1961	82.0	181.0	1540	30.0	2061	130.0	268.0	2050	47.6	2180	242.0	328.0	3110
11.2	1841	70.0	120.0	1020	16.5	1961	109.0	170.0	1540	25.0	2061	170.0	251.0	2050	41.0	2180	310.0	300.0	3110
17.2	2188	61.0	151.0	1130	24.6	2308	92.0	221.0	1680	37.6	2408	145.0	326.0	2240	59.5	2528	266.0	394.0	3380
14.0	2188	81.0	146.0	1130	20.6	2308	126.0	208.0	1680	31.3	2408	195.0	305.0	2240	51.3	2528	351.0	360.0	3380
20.6	2536	68.0	178.0	1240	29.5	2656	102.0	261.0	1820	45.1	2756	160.0	384.0	2420	71.4	2876	290.0	460.0	3650
16.8	2536	92.0	172.0	1240	24.7	2656	143.0	246.0	1820	37.5	2756	220.0	359.0	2420	61.6	2876	392.0	420.0	3650
24.1	2883	75.0	205.0	1350	34.4	3003	112.0	301.0	1960	52.6	3103	175.0	442.0	2610	83.3	3223	314.0	526.0	3920
19.6	2883	103.0	198.0	1350	28.8	3003	160.0	284.0	1960	43.8	3103	245.0	413.0	2670	71.8	3223	433.0	480.0	3920
27.5	3231	82.0	232.0	1460	39.3	3351	122.0	341.0	2100	60.1	3451	190.0	500.0	2790	95.2	3571	338.0	592.0	4190
22.4	3231	114.0	224.0	1460	33.0	3351	177.0	322.0	2100	50.0	3451	270.0	467.0	2790	82.1	3571	474.0	540.0	4190
30.0	3578	89.0	259.0	1570	44.2	3698	132.0	381.0	2240	67.6	3798	205.0	558.0	2980	107.1	3918	362.0	658.0	4460
25.2	3578	125.0	250.0	1570	37.1	3698	194.0	360.0	2240	56.3	3798	295.0	521.0	2980	92.3	3918	515.0	600.0	4460
34.4	3926	96.0	286.0	1680	49.1	4046	142.0	421.0	2380	75.1	4146	220.0	616.0	3160	119.0	4266	386.0	724.0	4730
28.0	3926	136.0	276.0	1680	41.2	4046	211.0	398.0	2380	62.5	4146	320.0	575.0	3160	102.6	4266	556.0	660.0	4730
37.8	4273	103.0	313.0	1790	54.0	4393	152.0	461.0	2520	82.6	4493	235.0	675.0	3350	130.9	4613	410.0	790.0	5000
30.8	4273	147.0	302.0	1790	45.3	4393	228.0	436.0	2520	68.8	4493	345.0	629.0	3350	112.9	4613	597.0	720.0	5000
41.3	4621	110.0	340.0	1900	58.9	4741	162.0	501.0	2660	90.1	4841	250.0	732.0	3530	142.8	4961	434.0	856.0	5270
33.6	4621	158.0	328.0	1900	49.4	4741	245.0	474.0	2660	75.0	4841	370.0	683.0	3530	123.1	4961	638.0	780.0	5270
44.7	4968	117.0	376.0	2010	63.8	5088	172.0	541.0	2800	97.6	5188	265.0	790.0	3720	154.7	5308	458.0	922.0	5540
36.4	4968	169.0	354.0	2010	53.6	5088	262.0	512.0	2800	81.3	5188	395.0	737.0	3720	133.4	5308	679.0	840.0	5540
48.2	5313	124.0	394.0	2120	68.7	5436	182.0	581.0	2940	105.1	5536	280.0	848.0	3900	166.6	5656	482.0	988.0	5810
39.2	5313	180.0	380.0	2120	57.7	5436	279.0	550.0	2940	87.5	5536	420.0	791.0	3900	143.0	5656	720.0	900.0	5810
51.6	5663	131.0	421.0	2230	73.7	5783	192.0	621.0	3080	112.7	5883	295.0	906.0	4090	178.5	6003	506.0	1045.0	6080
41.0	5663	191.0	406.0	2230	61.8	5783	296.0	588.0	3080	93.8	5883	445.0	845.0	4090	153.9	6003	761.0	960.0	6080

## ®DIABON GRAPHITE BLOCK HEAT EXCHANGERS – CUBIC

The functional principles of cubic block heat exchangers are similar to those of cylindrical equipment, but their structural design is very different. In securing the graphite block column, the forces exerted by bracing the top against the bottom pressure plate are transmitted not via the steel shell but via tie rods extending over the entire length of the heat exchanger.

On the service side, the graphite blocks are interconnected by U-pipes, which are braced against the blocks via steel pressure plates. Separate gaskets are used to seal the product and service sides against leakage into the atmosphere. This gasket system prevents product and service media from mixing if the gaskets are damaged. Cubic block heat exchangers are designed in two series, series EC and series NEC.



◀ Blow-up of a cubic block heat exchanger

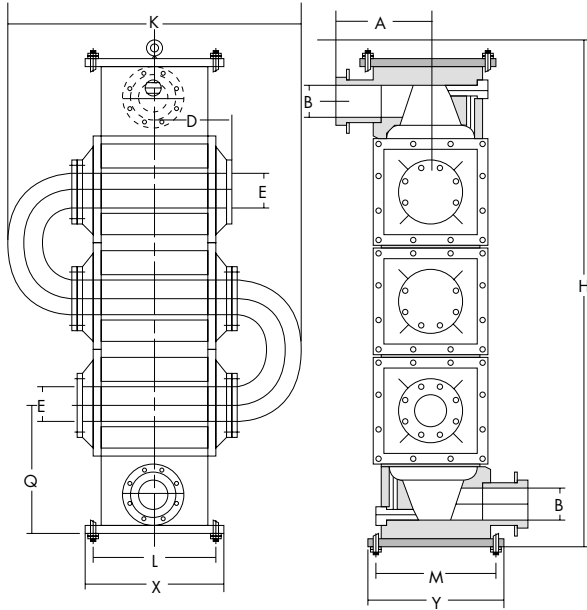
▶ ®DIABON graphite block heat exchanger, series NEC ◀







# SERIES EC



## Series EC

Cubic block heat exchanger with a maximum of 19 passes. For vertical or (on request) horizontal installation. The service medium in this heat exchanger series is distributed by suitably cast iron plates.

### Maximum permissible service data:

Maximum service pressure (gauge)	Product side 5 bar Service side 5 bar
Maximum service temperature, depending on the medium, up to	200 °C

### Sizes supplied:

Heat exchange area	0.5 to 65 m <sup>2</sup>
Block no. per heat exchanger	1 to 12 blocks
Product passage diameter	10, 12, 18 and 20 mm, depending on type

### Preferred fields of use:

Coolers, condensers, interchangers, evaporators with heat transfer medium, no steam heating

Property	Unit	Type 1R	Type 3	Type 4	Type 5
<b>Block cross-section</b>	mm	220 x 220	300 x 300	300 x 300	510 x 510
<b>Block height</b>	mm	290	360	360	490
<b>Passage diameter</b>					
Service side	mm	10	10	10	10
Product side	mm	12	10	18	10 20
<b>Flow cross-section</b>					
Service side	cm <sup>2</sup>	66	126	97	256 204
Product side 1 pass	cm <sup>2</sup>	51	100	153	275 502
3 passes	cm <sup>2</sup>	17	33	51	92 167
5 passes	cm <sup>2</sup>	10	20	31	55 100
<b>Exchange area A<sub>j</sub> per block</b>	m <sup>2</sup>	0.5	1.4	1.2	5.4 4.9
<b>Nozzle connection B</b>					
Product side 1 pass	mm	80	100	100	250
3 passes	mm	50	100	100	80
5 passes	mm	50	80	80	125
Lateral nozzle connection E <sup>1)</sup>	mm	65	80	80	125
Nozzle distance A <sup>2)</sup>	mm	252	337	337	462
Nozzle distance R <sup>2)</sup>	mm	115	150	150	235
Nozzle distance D	mm	165	212	212	348
Nozzle distance S <sup>2)</sup>	mm	356	456	456	711
Nozzle distance Q <sup>2)</sup>	mm	356	456	456	711
U-pipe distance K <sup>2)</sup>	mm	622	774	774	1330
Height P	mm	115	150	150	235
L x M	mm	280 x 265	405 x 345	405 x 345	590 x 450
X x Y	mm	330 x 315	455 x 395	455 x 395	640 x 600
G	mm	18	18	18	22

1) opposite position with odd block number

2) with single pass

Property	Unit	Number of blocks											
		1	2	3	4	5	6	7	8	9	10	11	12
<b>Type 1R, passage diameter, product side 12 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.6	6.0
Height H	mm	712	1002	1293	1583	1874	2164	2455	2745	3036	3326	3617	3907
Volume													
Product side	l	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0
Service side	l	4.0	9.0	14.0	19.0	24.0	29.0	34.0	39.0	44.0	49.0	54.0	59.0
Empty weight	kg	150	205	260	315	370	425	480	535	590	645	700	755

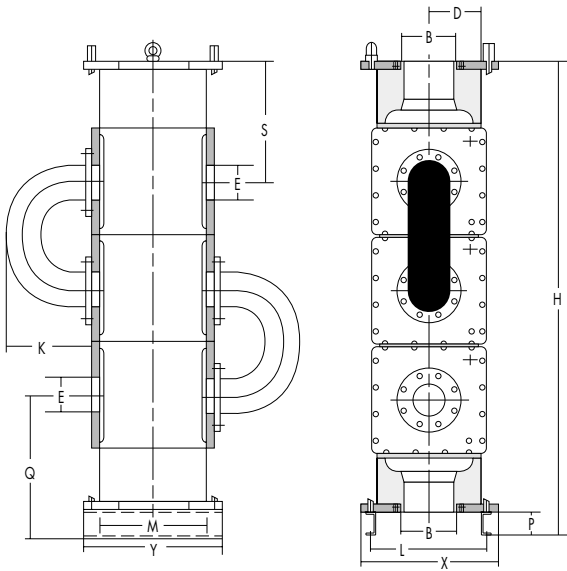
<b>Type 3, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	1.4	2.9	4.3	5.8	7.2	8.7	10.1	11.6	13.0	14.5	16.0	17.4
Height H	mm	911	1271	1632	1992	2353	2713	3074	3434	3795	4155	4516	4876
Volume													
Product side	l	16.0	20.0	24.0	28.0	32.0	36.0	40.0	44.0	48.0	52.0	56.0	60.0
Service side	l	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0
Empty weight	kg	250	365	480	595	710	825	940	1055	1170	1285	1400	1515

<b>Type 4, passage diameter, product side 18 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.8	11.0	12.2	13.4	14.6
Height H	mm	911	1271	1632	1992	2353	2713	3074	3434	3795	4155	4516	4876
Volume													
Product side	l	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	72.0	78.0	84.0
Service side	l	9.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	81.0	90.0	99.0	108.0
Empty weight	kg	250	365	480	595	710	825	940	1055	1170	1285	1400	1515

<b>Type 5/10, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	5.4	10.8	16.2	21.6	27.0	32.4	37.8	43.2	48.6	54.0	59.4	64.8
Height H	mm	1423	1913	2404	2894	3385	3875	4366	4856	5347	5837	6328	6818
Volume													
Product side	l	94.0	108.0	122.0	136.0	150.0	164.0	178.0	192.0	206.0	220.0	234.0	248.0
Service side	l	19.0	49.0	79.0	109.0	139.0	169.0	199.0	229.0	259.0	289.0	319.0	349.0
Empty weight	kg	1050	1360	1670	1980	2290	2600	2910	3220	3530	3840	4150	4460

<b>Type 5/20, passage diameter, product side 20 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	4.9	9.8	14.7	19.6	24.5	29.4	34.3	39.2	44.1	49.0	53.9	58.8
Height H	mm	1423	1913	2404	2894	3385	3875	4366	4856	5347	5837	6328	6818
Volume													
Product side	l	105.0	130.0	155.0	180.0	205.0	230.0	255.0	280.0	305.0	330.0	355.0	380.0
Service side	l	22.0	55.0	88.0	121.0	154.0	187.0	220.0	253.0	286.0	319.0	352.0	385.0
Empty weight	kg	1050	1360	1670	1980	2290	2600	2910	3220	3530	3840	4150	4460

# SERIES NEC



## Series NEC

Cubic block heat exchanger with a maximum of 15 passes. For vertical or (on request) horizontal installation. The service medium in this series is distributed by suitably machined ©DIABON graphite blocks. The clamping plates are manufactured from materials permitted for the construction of pressure vessels according to AD specification.

### Maximum permissible service data:

Maximum service pressure (gauge)	Product side 7 bar Service side 7 bar
Maximum service temperature, depending on the medium, up to	200 °C

### Sizes supplied:

Heat exchange area	0.8 to 145 m <sup>2</sup>
Block no. per heat exchanger	1 to 12 blocks
Product passage diameter	10 mm depending on type

### Preferred fields of use:

Coolers, condensers, interchangers, evaporators with heat transfer medium, no steam heating

Property	Unit	Type 2	Type 4	Type 5	Type 6
<b>Block cross-section</b>	mm	250 x 250	400 x 400	500 x 500	610 x 610
<b>Block height</b>	mm	250	400	500	610
<b>Passage diameter</b>					
Service side	mm	10	10	10	10
Product side	mm	10	10	10	10
<b>Flow cross-section</b>					
Service side	cm <sup>2</sup>	94	207	390	495
Product side	cm <sup>2</sup>	82	207	353	495
3 passes	cm <sup>2</sup>	27	69	118	165
5 passes	cm <sup>2</sup>	16	41	71	99
<b>Exchange area A<sub>j</sub> per block</b>	m <sup>2</sup>	0.8	3.3	7.1	12.1
<b>Nozzle connection B</b>					
Product side	mm	100	150	200	250
3 passes	mm	50	80	100	100
5 passes	mm	40	50	80	80
Lateral nozzle connection E <sup>1)</sup>	mm	80	150	150	200
Nozzle distance D	mm	160	240	295	350
Nozzle distance S <sup>2)</sup>	mm	330	445	540	621
Nozzle distance Q <sup>2)</sup>	mm	330	445	540	621
U-pipe distance K <sup>2)</sup>	mm	670	1145	1260	1580
Height P	mm	95	145	145	145
L x M	mm	330 x 290	486 x 390	605 x 480	715 x 590
X x Y	mm	400 x 350	550 x 590	680 x 720	795 x 830
G	mm	18	22	26	26

1) opposite position with odd block number

2) with single pass

Property	Unit	Number of blocks											
		1	2	3	4	5	6	7	8	9	10	11	12
<b>Type 2, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.4	8.2	9.0	9.9
Height H	mm	661	911	1162	1412	1663	1913	2164	2414	2665	2915	3166	3416
Volume													
Product side	l	11.0	14.0	17.0	20.0	23.0	26.0	29.0	32.0	35.0	38.0	41.0	44.0
Service side	l	4.0	10.0	16.0	22.0	28.0	34.0	40.0	46.0	52.0	58.0	64.0	70.0
Empty weight	kg	200	260	320	380	440	500	560	620	680	740	800	860
<b>Type 4, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	3.3	6.6	10.0	13.3	16.6	19.9	23.2	26.5	29.9	33.2	36.5	39.8
Height H	mm	891	1291	1692	2092	2493	2893	3294	3694	4095	4495	4896	5296
Volume													
Product side	l	28.0	37.0	46.0	55.0	64.0	73.0	82.0	91.0	100.0	109.0	118.0	127.0
Service side	l	13.0	34.0	55.0	76.0	97.0	118.0	139.0	160.0	181.0	202.0	223.0	244.0
Empty weight	kg	650											
<b>Type 5, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	7.1	14.2	21.3	28.4	35.4	42.5	49.6	56.7	63.7	70.8	77.9	85.0
Height H	mm	1083	1584	2084	2585	3085	3586	4086	4587	5087	5588	6088	6589
Volume													
Product side	l	58.0	76.0	94.0	112.0	130.0	148.0	166.0	184.0	202.0	220.0	238.0	256.0
Service side	l	30.0	65.0	100	135.0	170.0	205.0	240.0	275.0	310.0	345.0	380.0	415.0
Empty weight	kg	900	1320	1740	2160	2580	3000	3420	3840	4260	4680	5100	5520
<b>Type 6, passage diameter, product side 10 mm</b>													
Exchange area $A_i$	m <sup>2</sup>	12.1	24.2	36.3	48.2	60.3	72.4	84.5	96.4	108.5	120.6	132.7	144.8
Height H	mm	1241	1852	2462	3073	3683	4294	4904	5515	6125	6736	7346	7957
Volume													
Product side	l	95	126	157	188	219	250	281	312	343	374	405	436
Service side	l	45	115	185	255	325	395	465	535	605	675	745	815
Empty weight	kg	1400	2040	2680	3320	3960	4600	5240	5880	6520	7160	7800	8440



# ®DIABON GRAPHITE BLOCK HEAT EXCHANGERS – THE SPECIAL MONOBLOCK DESIGN

At the special request of customers, ®DIABON graphite block heat exchangers can be adapted in a variety of ways because of their modular design. The KU series described below is one heat exchanger option that has been used successfully between two highly-corrosive, pressurized media. This gasket-free heat exchanger features a single solid ®DIABON graphite block that includes integral baffles on the product and service sides produced by milling. The graphite block is sealed on four faces with PTFE-lined steel plates, which are braced together. Cubic monoblock-type heat exchangers are used mainly for two applications:

- Corrosive media, e.g. HCl/H<sub>2</sub>SO<sub>4</sub> on both (product and service) sides
- Small temperature differences

### Advantages of KU series

- Single graphite block design without gaskets
- Flexible arrangement of passes
- Easy cleaning of the graphite block by removing the side plates when installed.

### Maximum permissible service data:

Maximum service pressure	Product side full vacuum up to 7 bar (10 bar on request)
	Service side 7 bar (10 bar on request)

Maximum service temperature, depending on the medium:	up to 200 °C
---	--------------

### Sizes supplied:

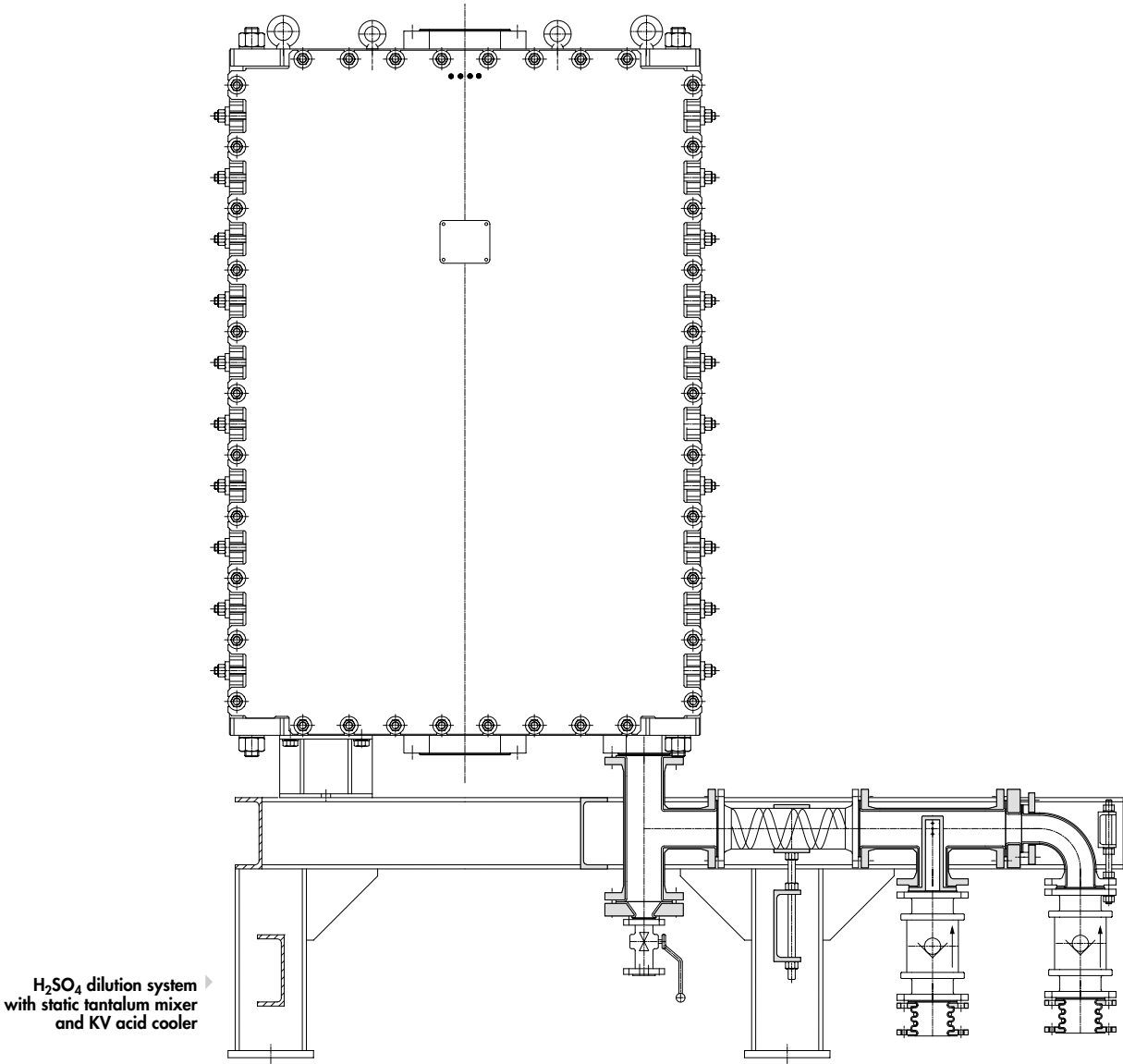
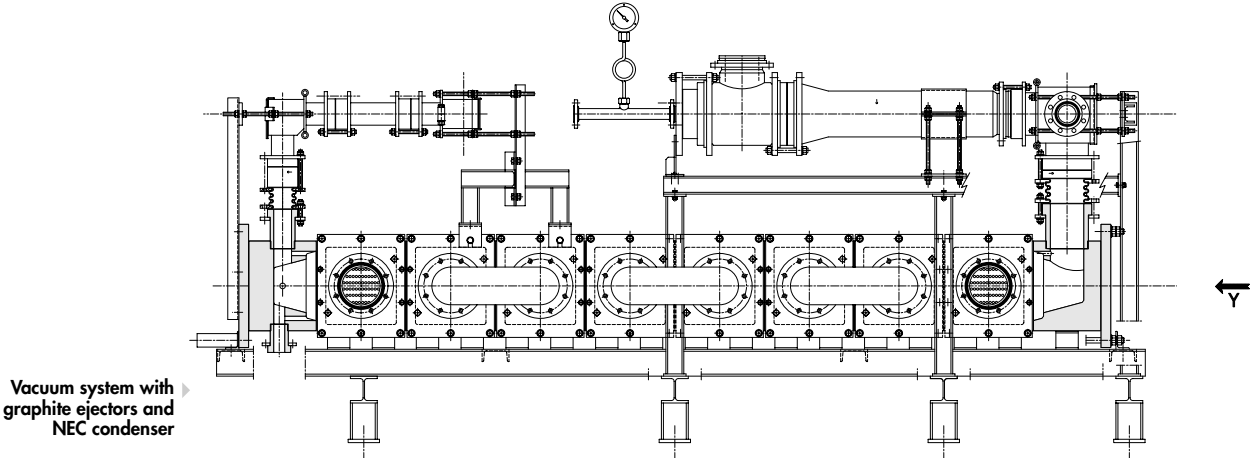
Heat exchange area	0.8 to 100 m <sup>2</sup>
Product passage diameter	8 to 16 mm
Height	600 to 2500 mm
Cross-sections	300 x 300 mm to 800 x 1500 mm

Preferred fields of use:	Interchangers, coolers, heaters
--------------------------	---------------------------------

### Earlier series

The series described in this brochure represent our latest production standard. Spare parts from earlier series are available on request.

# TYPICAL SYSTEMS WITH BLOCK HEAT EXCHANGERS





# TECHNICAL SPECIFICATIONS – IN DETAIL

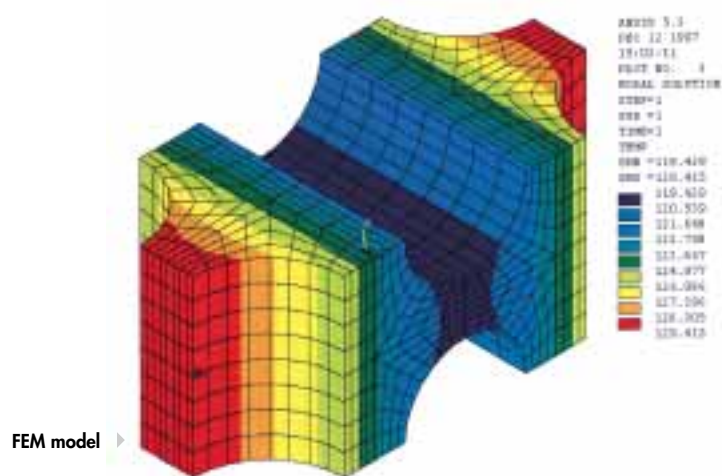
The design calculations for <sup>®</sup>DIABON graphite block heat exchangers are carried out by trained experts. The thermal design calculations are performed with a tried-and-tested program developed by ourselves or with the help of internationally proven and recognized software such as

- HETRAN
- HTFS
- HTRI.

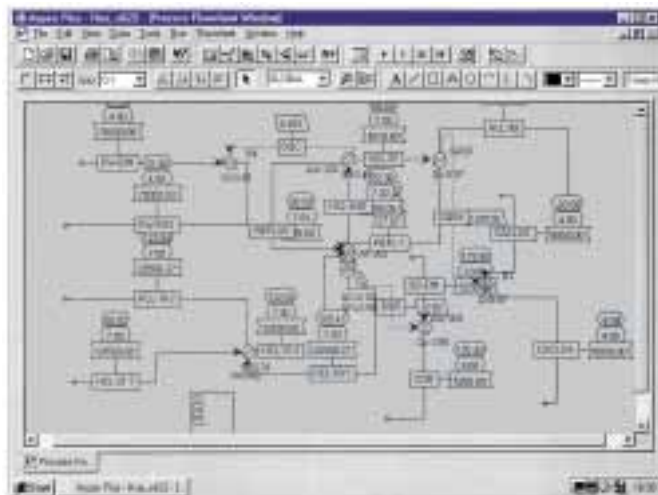
Controlling the complex software and the continuous monitoring of the design using the operating values of the already-installed equipment ensures the highest possible product performance.

For the calculation of equipment in the linking of individual process levels the profiles of the heat transfer are modeled using ASPEN-Plus and the equipment is then designed separately.

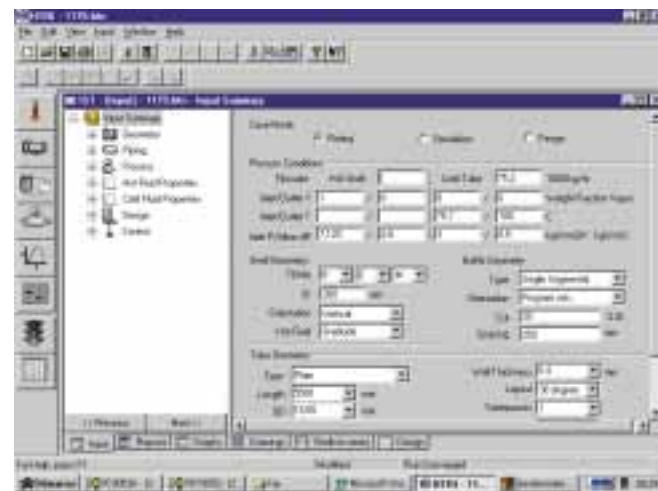
ANSYS software is used to optimize the geometry of the <sup>®</sup>DIABON graphite block heat exchangers and to calculate the necessary mechanical strength.



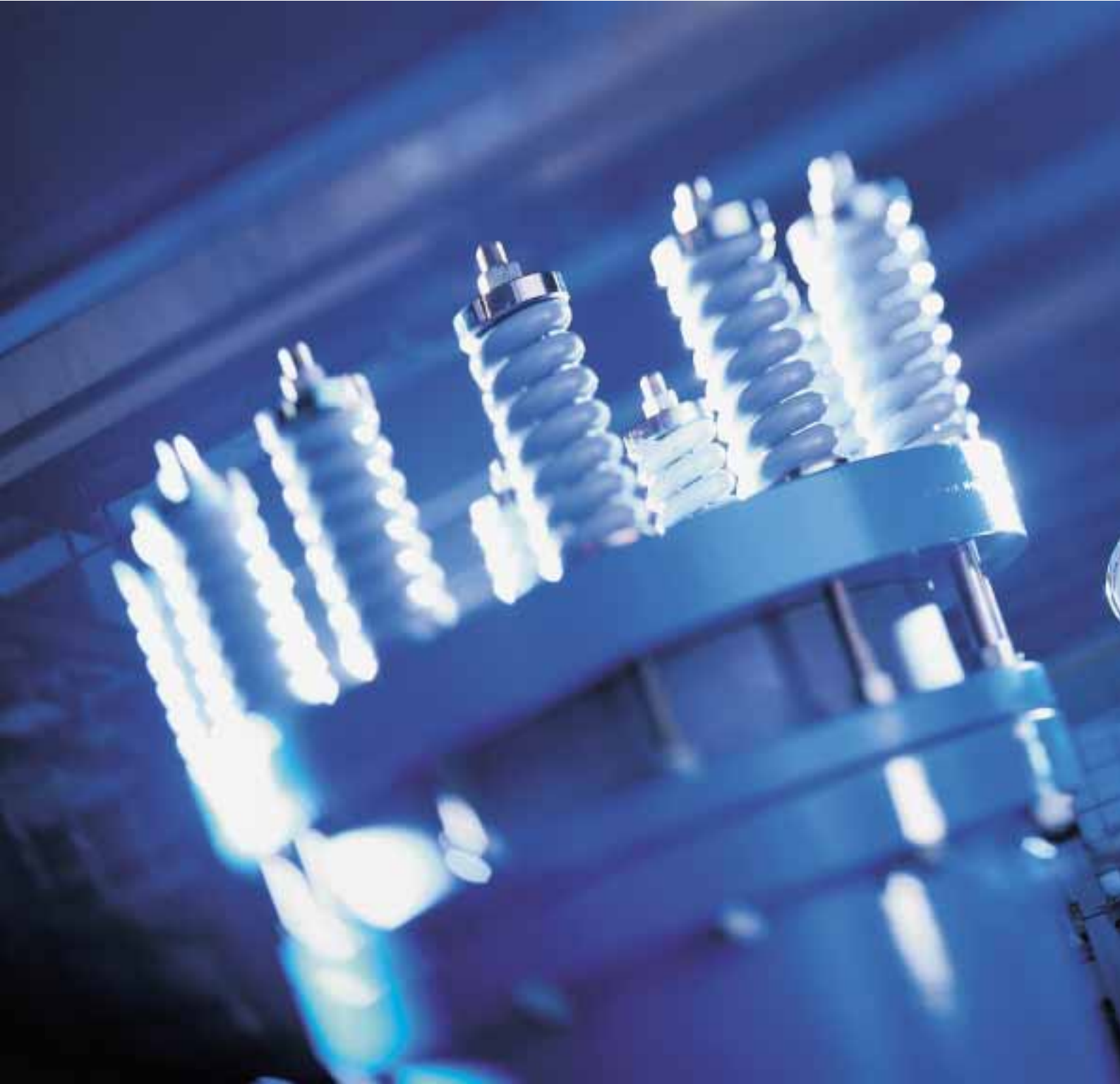
FEM model ▶



Screen shot of an ASPEN-PLUS modeling ▶



Screen shot of an HTRI design calculation ▶



## OUR PRINCIPLE – QUALITY FIRST AND LAST

No question: If you want to guarantee consistently high quality, you must ensure continuous quality testing. SGL ACOTEC therefore operates according to a targeted quality management system. As the leading manufacturer of carbon and graphite products, process equipment and systems for the chemical industry and environmental protection technology, we find targeted quality management vital in ensuring that customer's specified quality standards are attained.

Our quality management system is certified in accordance with DIN EN ISO 9001. For production of ®DIABON graphite block heat exchangers, this means that both the raw materials – graphite semi-finished products, PTFE films, plastics and other bought-in parts – and the finished products made from them are subjected to stringent testing. To give you security in black and white, we keep complete records of these tests.



◀ Pressure test on a CKS/CKL series block heat exchanger



© SGL ACOTEC GmbH, Siershahn (Germany), 2001  
® registered trademarks of SGL CARBON GROUP  
companies

The information contained in this brochure is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should therefore not be construed as guaranteeing specific properties of the products described or their suitability for a particular application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our "General Conditions of Sale".

PE-203/04-2002e Printed in Germany



**SGL CARBON GROUP**

**Corrosion Protection  
Business Unit**

**SGL ACOTEC GmbH**

Werner-von-Siemens-Straße 18  
D-86405 Meitingen / Germany  
Phone +49 (82 71) 83-15 64  
Fax +49 (82 71) 83-21 01  
bspe@sglcarbon.de  
www.sglcarbon.com/cp