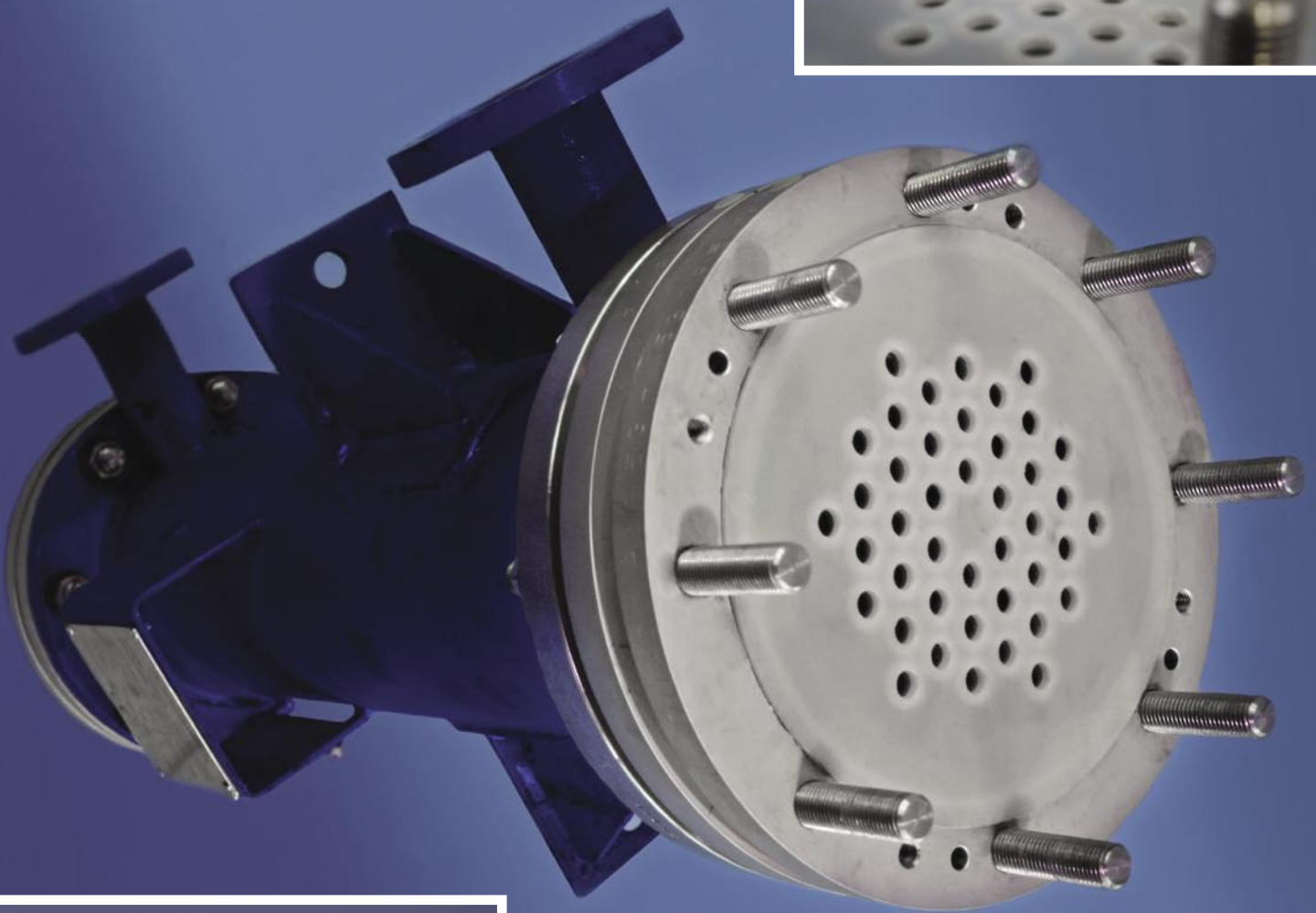
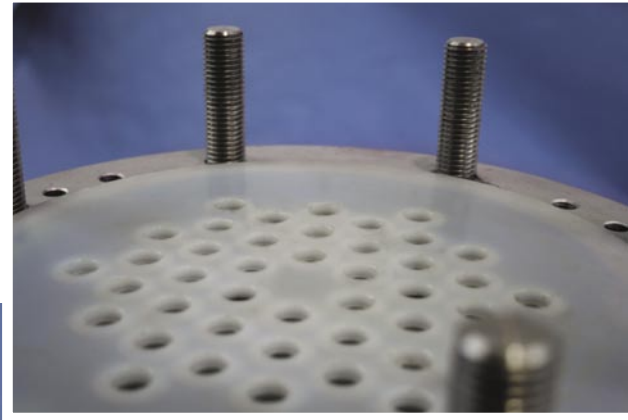


your partner against corrosion

FLUROSIC® - Silicon Carbide Shell and Tube Heat Exchanger

DIN/ANSI



**We keep
everything flowing**

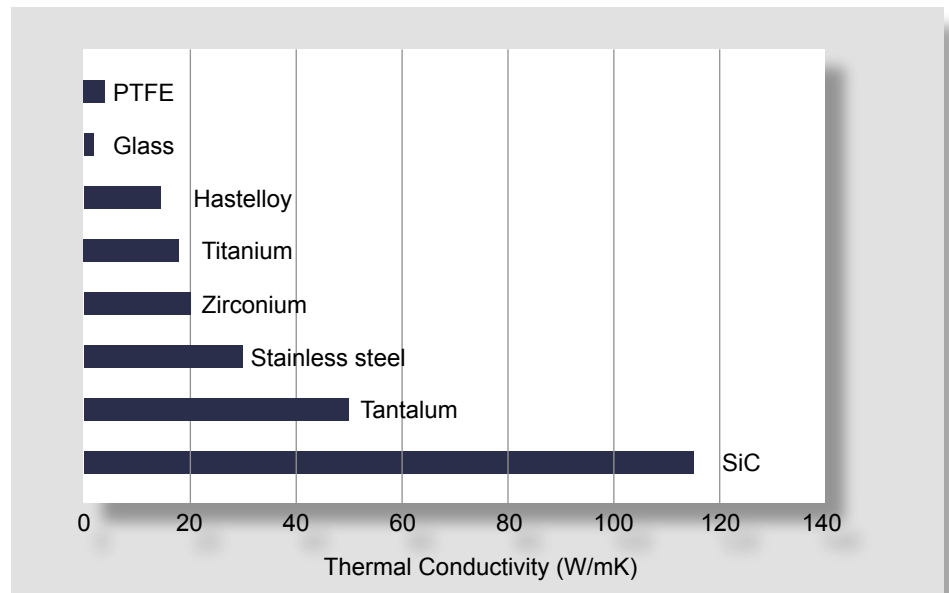
your partner against corrosion

FLUROSIC® Shell and Tube heat exchanger, the solution for difficult applications, but not only for heavy corrosive media

The FLUROSIC® heat exchanger was developed especially for tough applications with very corrosive media. The near universal chemical resistance of PFA and the silicon carbide provides long term operation with highly aggressive media. The silicon carbide material used for our tubes additionally has excellent thermal conductivity properties, which dramatically reduces the size of the heat exchanger. Along with this, the patented rigid double tube sheets make the FLUROSIC® heat exchanger a reliable & robust heat exchanger for difficult applications. FLUROSIC® is suitable for corrosive media flowing on both the shell and / or tube sides.

High thermal conductivity – small sizes – for high heat capacity

The thermal conductivity of silicon carbide (SiC) is with 115 W/mK much higher than tantalum, stainless steel, glass or PTFE. Also the wall-thickness of the SiC is just 1.5 mm (or 2.2 mm). Due to the small wall-thickness and the high thermal conductivity, the FLUROSIC® heat exchanger has a high heat capacity and a small size.



Universal Chemical Resistance

The Hexaloy SA® silicon carbide (SiC) tubes used in FLUROSIC® heat exchangers are directly sintered.

This type of SiC has no free silicon atom, therefore it is universal chemical resistant up to 260°C. (chemical resistant means a corrosion of less than 9,9mg/cm² a). On top of that, the SiC is erosion and abrasion resistant, which allows higher flow velocities and provides additionally better heat capacity.

Robust Design, No Thermoshock

The patented double tube-sheets made of PFA-lined steel give the FLUROSIC® heat exchangers the necessary strength for use in difficult applications. The metal sheet applies the sealing forces and the fluoropolymers are just for protection of the metal! The SiC tubes are pressure tested up to 180bar.

FLUROSIC® heat exchangers are fully thermoshock resistant within an operating temperature range of -30°C to +220°C.

Applications and sizing of the heat exchangers

The FLUROSIC® heat exchangers are used for, liquid/liquid, liquid/gas, gas/gas, - cooling or heating -; condensation, evaporation, fallfilm-evaporation, isothermal pipe-reactors and for multi-purpose processes in chemical and pharmaceutical plants.

Our heat exchanger specialists are able to calculate the sizing by computer, to provide the best FLUROSIC® solution for your application.

Easy Maintenance

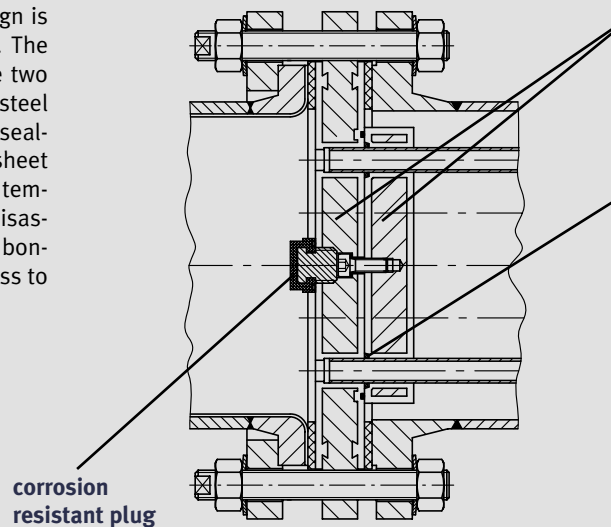
The silicon carbide used in the FLUROSIC® heat exchangers is a ceramic, free of any binding agent and without impregnation, therefore the SiC provides no risk for corrosion or erosion. This provides long operating cycles without maintenance. On site, the FLUROSIC® heat exchangers can be easily disassembled for cleaning or if really necessary to replace a tube. All these advantages reduce the number of shut-downs, saving on costly down times.

The Key for Success:

The patented double tube sheet made of PFA-lined steel provides rigid and robust sealing, where the metal parts apply the sealing force, the lining is just to protect against corrosion.

Detail: Double Tube Sheet

The patented double tube sheet design is based on two PFA-lined steel plates. The seal rings are located in between the two plates and pressed to the tubes. The steel plates in the tube sheets provide the sealing pressure and give the whole tube sheet the necessary stiffness also at high temperatures. The tube sheets can be disassembled easily after dismounting the bonnets. This provides fast and easy access to the tubes.



Tube Sheets:

The steel plates in the PFA-lined tube sheets provide the robust performance of the FLUROSIC® heat exchanger and the universal chemical resistance.

Individual Tube Sealing:

silicon carbide tube is sealed with a special seal ring made of high chemical resistant material.

Sealing Concept:

The seal rings work like a packing in the stuffing box.

Advantages:

- Thermoshock resistant
- Universal chemical, abrasion and erosion resistant
- Successfully used in chemical, pharmaceutical applications, as well as for production of high purity acids (Chip-industry), due to the pure and corrosion resistant SiC-material
- High heat transfer rates, up to 3000W/m²K provides small heat exchangers and high heat capacity
- Easy maintenance with simply disassembly
- Professional heat exchanger sizing
- Two heat exchanger lines are available: the economical „Standard“ -FLUROSIC® or the individually designed „Allround“-FLUROSIC® heat exchanger.
- Universal chemical resistant silicon carbide tubes in Ø14x1,5mm or Ø19,05x2,2mm
- FFKM seal rings (similar to Kalrez) or Viton high performance seal rings
- Operating pressure up to 10 bar
- Vacuum resistance available
- Operating temperature 0°C up to 200°C, design for -40°C to 230°C available
- Shell and bonnets can be made of:
 - carbon steel
 - stainless steel (1.4541 (similar to AISI 321) or 1.4571 (similar to AISI 316Ti)
 - carbon steel or stainless steel with POLY-FLURON® - PTFE lining
 - glass-lined steel
- The heat exchanger is made according to European Pressure Equipment Directive and comes with CE-marking
- Alternatively the shell and the bonnets can be supplied according to ASME Sect. VIII, Div.1 or with „China-Stamp“.
- The heat exchangers can be positioned in vertical, horizontal or horizontal position with a slope
- The number and design of baffles will be selected according to the application
- We are specialists in providing individual solutions!
- Global service network through our sales agents around the world

The new Standard-FLUROSIC® heat exchanger, the safe and inexpensive solution:

Hundreds of FLUROSIC® heat exchangers have been sold into applications with the corrosive media only flowing through one side, utilising a modular design which customers have become accustomed to. On this basis we now are able to offer the „Standard“ -FLUROSIC® heat exchanger with the following characteristics:

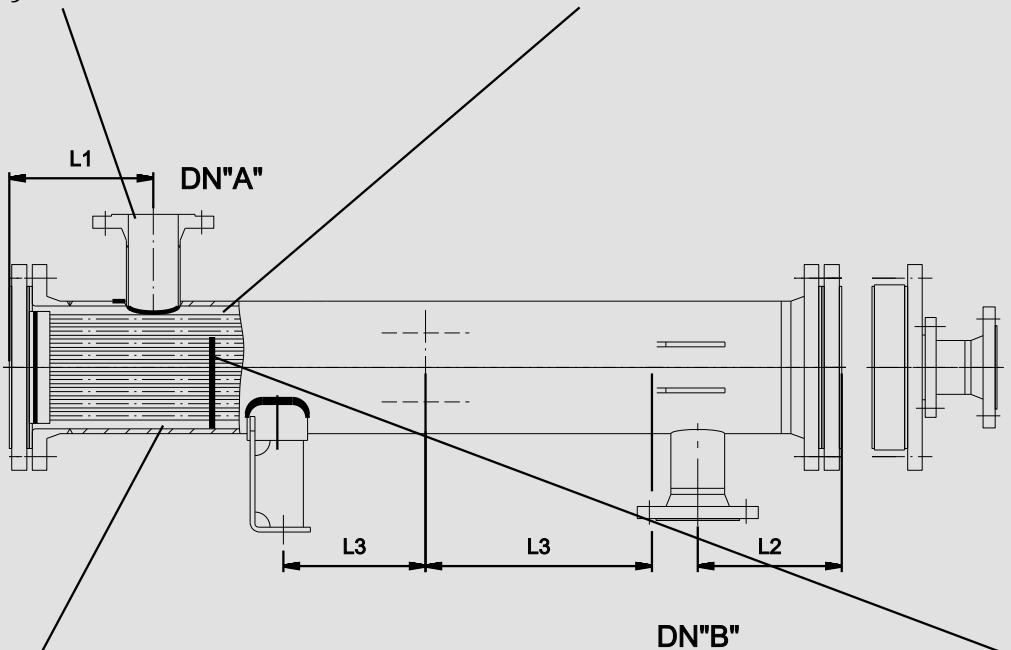
- Shell made of carbon steel in certain lengths, with fixed nozzle sizes in specific positions
- The heat exchanger is made according to European Pressure Equipment Directive
- Standard drawings are promptly available
- Corrosion resistant (tube-side) double tube-sheet (PFA-lined steel)
- Highly corrosion resistant Viton®-seal-rings for the tubes
- Operating temperature: 0°C to 150°C
- Corrosion resistant bonnets are also available as an option
- Very inexpensive solution

Nozzles:

The nozzle sizes are according to the table on page 5.

Shell:

The shell of the Standard-FLUROSIC® is made of carbon steel.



Bonnets (also lined) can be supplied as a separate item for our Standard-FLUROSIC® heat exchanger.

Silicon Carbide Tubes:

Diameter 14mm x 1.5mm wall

Baffles:

The number of baffles made of stainless steel, is defined according to the application.

Technical specifications are subject to change without notice.

Main Dimensions:

Heat transfer surface area: 0.22 – 33.64m²
 Length of the SiC tubes: 1.0 – 4.5m
 Shell diameter: ND100 – ND400

Heat transfer data:

Liquid/liquid up to 2000W/m²K

Operating data:

Temperature: 0°C / +150°C
 Operating pressure: -1 / +10barg

Standard-FLUROSIC® Dimensions

ND	bundle length mm	surface area m ²	L mm	DN „A“ 1)	L 1 mm	DN „B“ 1)	L 2 mm	L 3 mm
100	1000	0.32	1016	80	180	80	180	165
	1500	0.49	1516	80	180	80	180	290
	2000	0.67	2016	80	180	80	180	415
	2500	0.84	2516	80	180	80	180	540
	3000	1.02	3016	80	180	80	180	665
	3500	1.2	3516	80	180	80	180	790
	4000	1.37	4016	80	180	80	180	915
125	4500	1.55	4516	80	180	80	180	1040
	1000	0.51	1016	80	180	80	180	165
	1500	0.8	1516	80	180	80	180	290
	2000	1.09	2016	80	180	80	180	415
	2500	1.37	2516	80	180	80	180	540
	3000	1.66	3016	80	180	80	180	665
	3500	1.95	3516	80	180	80	180	790
150	4000	2.23	4016	80	180	80	180	915
	4500	2.52	4516	80	180	80	180	1040
	1000	0.87	1016	100	195	100	195	160
	1500	1.36	1516	100	195	100	195	285
	2000	1.84	2016	100	195	100	195	410
	2500	2.33	2516	100	195	100	195	535
	3000	2.81	3016	100	195	100	195	660
200	3500	3.29	3516	100	195	100	195	785
	4000	3.78	4016	100	195	100	195	910
	4500	4.26	4516	100	195	100	195	1035
	1000	1.63	1016	100	205	100	205	150
	1500	2.56	1516	100	205	100	205	275
	2000	3.48	2016	100	205	100	205	400
	2500	4.4	2516	100	205	100	205	530
250	3000	5.33	3016	100	205	100	205	655
	3500	6.25	3516	100	205	100	205	780
	4000	7.17	4016	100	205	100	205	905
	4500	8.1	4516	100	205	100	205	1030
	1000	3.08	1016	150	245	150	245	130
	1500	4.83	1516	150	245	150	245	260
	2000	6.59	2016	150	245	150	245	385
300	2500	8.35	2516	150	245	150	245	510
	3000	10.11	3016	150	245	150	245	635
	3500	11.87	3516	150	245	150	245	760
	4000	13.63	4016	150	245	150	245	885
	4500	15.39	4516	150	245	150	245	1010
	1000	4.52	1016	150	250	150	250	130
	1500	6.72	1516	150	250	150	250	255
350	2000	8.18	2016	150	250	150	250	380
	2500	11.65	2516	150	250	150	250	505
	3000	14.11	3016	150	250	150	250	630
	3500	16.57	3516	150	250	150	250	755
	4000	19.55	4016	150	250	150	250	880
	4500	21.5	4516	150	250	150	250	1005
	1000	5.12	1018	200	275	200	275	120
400	1500	8.11	1518	200	275	200	275	245
	2000	11.1	2018	200	275	200	275	370
	2500	14.36	2518	200	275	200	275	495
	3000	17.08	3018	200	275	200	275	620
	3500	20.07	3518	200	275	200	275	745
	4000	23.07	4018	200	275	200	275	870
	4500	26.06	4518	200	275	200	275	995
450	1000	6.55	1018	250	310	250	310	130
	1500	10.42	1518	250	310	250	310	225
	2000	14.29	2018	250	310	250	310	350
	2500	18.16	2518	250	310	250	310	475
	3000	22.03	3018	250	310	250	310	600
	3500	25.9	3518	250	310	250	310	725
	4000	29.77	4018	250	310	250	310	850
	4500	33.64	4518	250	310	250	310	975

1) nozzle flanges are available according to DIN PN10, ANSI 150lb. or JIS.
Technical specifications are subject to change without notice.

The Allround-FLUROSIC® heat exchanger (one for all applications)

The „Allround“-FLUROSIC® heat exchanger allows corrosive media on the shell and/ or the tube side. The heat exchanger can be individually designed, according to the customer specification. The following options are available:

- Shell and/or the bonnets can be made of carbon steel, stainless steel, also lined with POLYFLURON®-PTFE, or glass

- Individual selection of nozzle sizes and nozzle orientation
- The heat exchanger is made according to European Pressure Equipment Directive
- Corrosion resistant (both sides) double tube-sheet (PFA-lined steel)
- Highly corrosion resistant seal-rings made of FFKM (similar to Kalrez®), FPM-rings (similar to Viton®) are also available

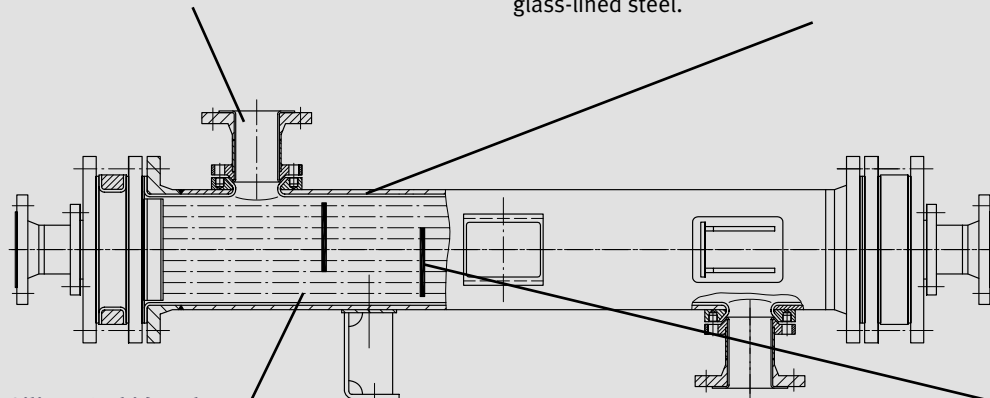
- Operating temperature: 0°C to 200°C, in certain applications also -40°C to 230°C
- Working pressure up to 10 bar, in special cases also vacuum resistant
- Selection of SiC tube diameters, either Ø14x1.5mm or Ø19.05x2.2mm
- For application as a cooler, heater, condenser, evaporator, fallfilm-evaporator etc.

Nozzles:

The nozzle sizes can be specified by customer.

Shell design:

The shell of the Standard- FLUROSIC® is made of carbon steel. Other materials like POLYFLURON®-PTFE lined steel are also available. In case of vacuum applications we recommend also glass-lined steel.



Silicon Carbide Tubes:

Series 1: Diameter 14mm x 1.5mm wall
Series 2: Diameter 19.05mm x 2.2mm wall

The example shows POLYFLURON®-PTFE lined steel shell and bonnets

Baffles:

The number and the shape of baffles is defined according to the application. The baffles can be made of stainless steel or PTFE, depending on the service.

technical specifications are subject to change without notice.

Main Dimensions:

Heat transfer surface area: 0.22 – 33.64m²
Length of the SiC tubes: 1.0 – 4.5m
Shell diameter: ND100 – ND400

Heat transfer data:

Liquid/liquid up to 2000W/m²K
Condensation up to 3000W/m²K

Operating data:

Temperature: 0°C / +230°C or -40°C up to 230°C for special design
Operating pressure: -1 / +10 barg

Allround-FLUROSIC® Dimensions

Series 1: SiC-tubes, diameter 14mm x 1.5mm wall

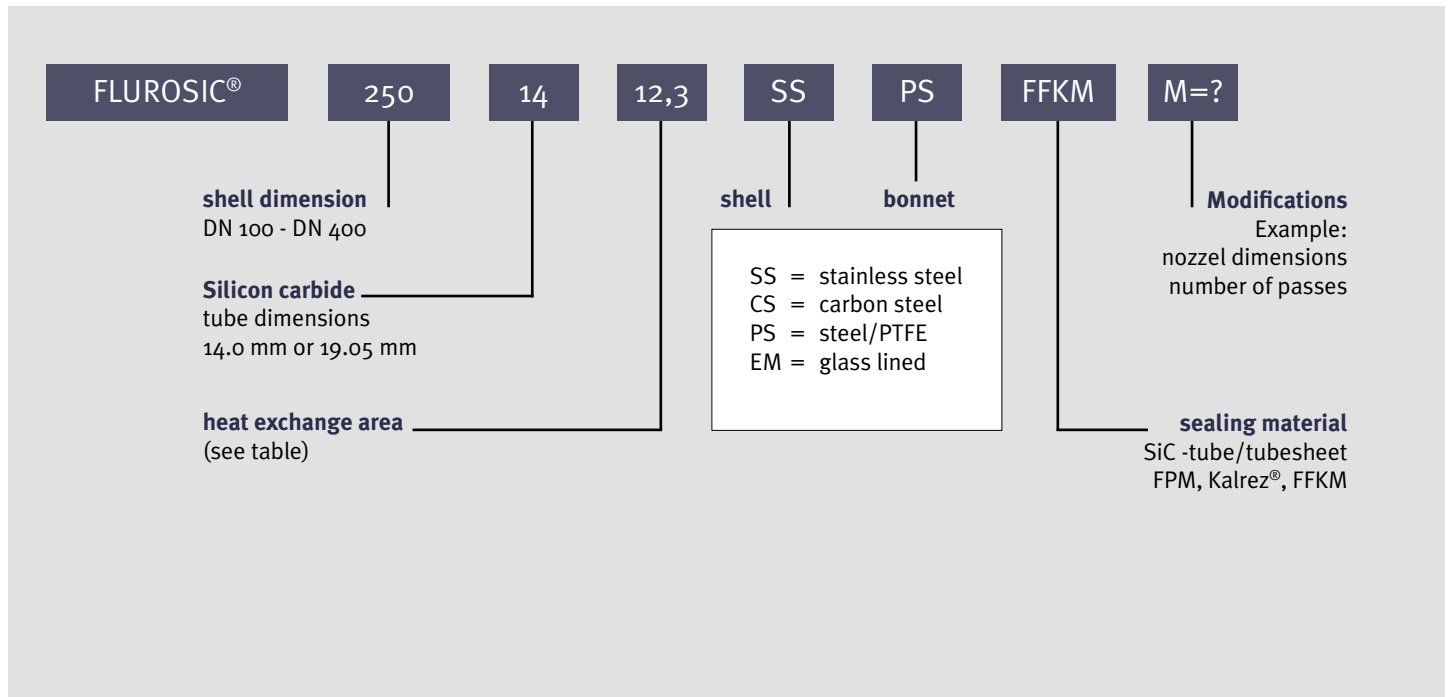
shell ND	nozzle ND	tube length m	area m ²	shell ND	nozzle ND	tube length m	area m ²	shell ND	nozzle ND	tube length m	area m ²
100	32	1.0	0.32	200	80	1.0	1.63	350	125	1.0	5.12
Number of SiC tubes 8 pieces		1.5	0.49	Number of SiC tubes 42 pieces		1.5	2.56	Number of SiC tubes 136 pieces		1.5	8.11
		2.0	0.67			2.0	3.48			2.0	11.10
		2.5	0.85			2.5	4.40			2.5	14.36
		3.0	1.02			3.0	5.33			3.0	17.08
		3.5	1.20			3.5	6.25			3.5	20.07
		4.0	1.37			4.0	7.17			4.0	23.07
		4.5	1.55			4.5	8.10			4.5	26.06
125	40	1.0	0.52	250	100	1.0	3.08	400	125	1.0	6.55
Number of SiC tubes 13 pieces		1.5	0.80	Number of SiC tubes 80 pieces		1.5	4.83	Number of SiC tubes 176 pieces		1.5	10.42
		2.0	1.09			2.0	6.59			2.0	14.29
		2.5	1.37			2.5	8.35			2.5	18.16
		3.0	1.66			3.0	10.11			3.0	22.03
		3.5	1.95			3.5	11.87			3.5	25.90
		4.0	2.23			4.0	13.63			4.0	29.77
		4.5	2.52			4.5	15.39			4.5	33.64
150	50	1.0	0.87	300	100	1.0	4.52	Nozzles at the shell side and bonnets have the same dimensions, variations available weights on request. Nozzle flanges are available according to DIN PN10, ANSI 150 lb. or JIS.			
Number of SiC tubes 22 pieces		1.5	1.36	Number of SiC tubes 114 pieces		1.5	6.72				
		2.0	1.84			2.0	8.18				
		2.5	2.33			2.5	11.65				
		3.0	2.81			3.0	14.11				
		3.5	3.29			3.5	16.57				
		4.0	3.78			4.0	19.55				
		4.5	4.26			4.5	21.50				

Series 2: SiC-tubes, diameter 19.05mm x 2.2mm wall

shell ND	nozzle ND	tube length m	area m ²	shell ND	nozzle ND	tube length m	area m ²	shell ND	nozzle ND	tube length m	area m ²
100	32	1.0	0.22	200	80	1.0	1.36	350	125	1.0	4.25
Number of SiC tubes 4 pieces		1.5	0.34	Number of SiC tubes 26 pieces		1.5	2.14	Number of SiC tubes 84 pieces		1.5	6.77
		2.0	0.46			2.0	2.92			2.0	9.28
		2.5	0.58			2.5	3.69			2.5	11.79
		3.0	0.70			3.0	4.47			3.0	14.31
		3.5	0.81			3.5	5.25			3.5	16.82
		4.0	0.93			4.0	6.03			4.0	19.33
		4.5	1.05			4.5	6.81			4.5	21.85
125	40	1.0	0.43	250	100	1.0	2.59	400	125	1.0	5.35
Number of SiC tubes 8 pieces		1.5	0.67	Number of SiC tubes 50 pieces		1.5	4.08	Number of SiC tubes 110 pieces		1.5	8.56
		2.0	0.91			2.0	5.58			2.0	11.76
		2.5	1.15			2.5	7.07			2.5	14.96
		3.0	1.39			3.0	8.57			3.0	18.16
		3.5	1.63			3.5	10.07			3.5	21.36
		4.0	1.87			4.0	11.56			4.0	24.56
		4.5	2.11			4.5	13.66			4.5	27.77
150	50	1.0	0.75	300	100	1.0	3.68	Nozzles at the shell side and bonnets have the same dimensions, variations available weights on request. Nozzle flanges are available according to DIN PN10, ANSI 150 lb. or JIS.			
Number of SiC tubes 14 pieces		1.5	1.17	Number of SiC tubes 72 pieces		1.5	5.83				
		2.0	1.59			2.0	7.99				
		2.5	2.01			2.5	10.14				
		3.0	2.42			3.0	12.3				
		3.5	2.84			3.5	14.45				
		4.0	3.26			4.0	16.61				
		4.5	3.68			4.5	18.76				

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