

T-Rack[®] vario

The most efficient UF rack design



 **BASF**
The Chemical Company

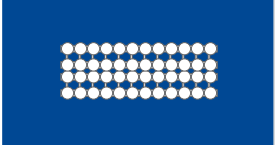
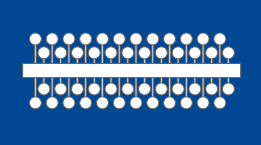
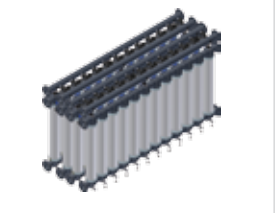

The integrated module & rack design

- Integrated module & rack design
- Hydrodynamically optimized
- Customizable system configuration
- Flexible system operation

The T-Rack® vario boasts a compact footprint, customizable system design, flexible modes of operation and low capital and operating costs. Clever integration of the feed and drain pipes in the end caps of the modules creates ultra-compact racks, while the use of standardized components makes the T-Rack® vario into a fully scalable solution. The design includes separate filtrate headers, which means each row can be operated as a separate filtration line.

The smallest available T-Rack® unit comprises four dizzer® modules in two rows of two modules each, while the largest T-Rack® – the TR-80-4-V model – features 80 modules in a four-row arrangement. Customers can choose specific configurations with either two or four rows of modules. In cases where an uneven number of modules is required, dummy modules are used to fill the empty slots. Dummy modules can subsequently be replaced by fully-functional modules and further modules can be added on, making it quick and easy to expand capacity later on.

Comparison of a sample configuration with 48 dizzer® modules

T-Rack® vario	Conventional rack
1.4 m width	1.9 m width
4.1 m length	5.5 m length
2.4 m height	2.5 m height
5.9 m ² footprint	10.6 m ² footprint
	
Reduced footprint	
	
More compact solution	

The T-Rack® vario is a space-saving solution that is a step above conventional racks, offering a footprint that is up to 60% smaller thanks to its compact design. The header pipes are made of 100% PVC, which eliminates the need for comparatively expensive stainless steel. PVC material has proven to be a highly durable solution that avoids the risk of corrosion, especially when treating sea water and other aggressive types of water.

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T-Rack® vario features



T-Rack® vario offers ...

- significant savings on capital and operating costs thanks to inge's innovative UF technology

- Integration of feed and drain pipes in module end caps
- 60% smaller footprint compared to conventional racks

Your benefit

- Reduction in capital costs and building expenses
- Greater flexibility in situations where floor space is limited

- Modular design enables each T-Rack® to be individually configured and tailored to the available floor space
- Can be arranged in two or four rows

Your benefit

- Highly flexible system design
- No engineering costs

- Serial production, use of standardized components
- Highly stable design with minimal use of steel

Your benefit

- Lower capital costs

- All the headers have the same nominal diameter
- All the flange connections are mounted at the same level

Your benefit

- Simpler piping layout
- Lower installation costs

- Optimum hydraulic properties of T-Rack® design

Your benefit

- Lower operating costs

- Each row can be operated as a separate filtration line

Your benefit

- Highly flexible system operation

- More modules can be installed at a later date

Your benefit

- Low capacity expansion costs

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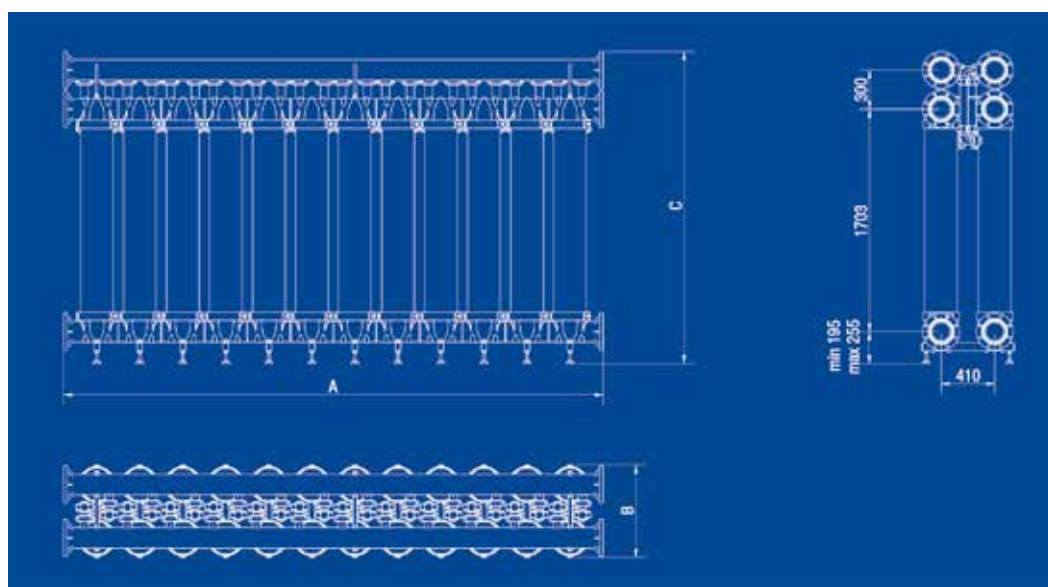
T-Rack® vario - system configuration with 2 rows

2 row configuration

Number of modules	T-Rack® vario unit	Part number*	Length (A)**		Membrane area***		Weight, dry (incl. module)		Weight, filled (incl. module)		Hold-up volume, feed side		Hold-up volume, filtrate side	
			mm	ft.	m²	sq.ft.	kg	lbs.	kg	lbs.	m³	US. gal	m³	US. gal
4	TR-4-2-V	TR-0423	837	2.7	240	2580	310	680	510	1120	0.13	40	0.10	30
6	TR-6-2-V	TR-0623	1167	3.8	360	3880	450	990	750	1650	0.20	50	0.15	40
8	TR-8-2-V	TR-0823	1497	4.9	480	5170	600	1320	990	2180	0.26	70	0.20	50
10	TR-10-2-V	TR-1023	1827	6.0	600	6460	740	1630	1220	2690	0.32	80	0.25	70
12	TR-12-2-V	TR-1223	2157	7.1	720	7750	880	1940	1460	3220	0.38	100	0.30	80
14	TR-14-2-V	TR-1423	2487	8.2	840	9040	1020	2250	1690	3730	0.44	120	0.35	90
16	TR-16-2-V	TR-1623	2817	9.2	960	10330	1160	2560	1930	4250	0.51	130	0.40	110
18	TR-18-2-V	TR-1823	3147	10.3	1080	11630	1310	2890	2170	4780	0.57	150	0.45	120
20	TR-20-2-V	TR-2023	3477	11.4	1200	12920	1450	3200	2400	5290	0.63	170	0.50	130
22	TR-22-2-V	TR-2223	3807	12.5	1320	14210	1590	3510	2640	5820	0.69	180	0.55	150
24	TR-24-2-V	TR-2423	4137	13.6	1440	15500	1740	3840	2880	6350	0.75	200	0.60	160
26	TR-26-2-V	TR-2623	4649	15.3	1560	16790	1910	4210	3160	6970	0.83	220	0.66	170
28	TR-28-2-V	TR-2823	4979	16.3	1680	18080	2050	4520	3390	7470	0.89	230	0.71	190
30	TR-30-2-V	TR-3023	5309	17.4	1800	19380	2190	4830	3630	8000	0.95	250	0.76	200
32	TR-32-2-V	TR-3223	5639	18.5	1920	20670	2330	5140	3870	8530	1.01	270	0.81	210
34	TR-34-2-V	TR-3423	5969	19.6	2040	21960	2480	5470	4100	9040	1.07	280	0.86	230
36	TR-36-2-V	TR-3623	6299	20.7	2160	23250	2620	5780	4340	9570	1.14	300	0.91	240
38	TR-38-2-V	TR-3823	6629	21.7	2280	24540	2760	6080	4580	10100	1.20	320	0.96	250
40	TR-40-2-V	TR-4023	6959	22.8	2400	25830	2910	6420	4810	10600	1.26	330	1.01	270

* Rack parts without modules ** Tolerance according to ISO 2768-1c *** Membrane area per module 60m² (645 sq.ft)

Sample configuration TR-24-2-V



Header feed / drain
 $d_i = 143 \text{ mm (5.59 inch)}$
 $d_a = 160 \text{ mm (6.30 inch)}$

Header filtrate
 $d_i = 143 \text{ mm (5.59 inch)}$
 $d_a = 160 \text{ mm (6.30 inch)}$

Height (C)**
 min = 2340 mm (7.68 ft.)
 max = 2400 mm (7.87 ft.)

Width (B)**
 B = 710 mm (2.33 ft.)

T-Rack® vario - system configuration with 4 rows

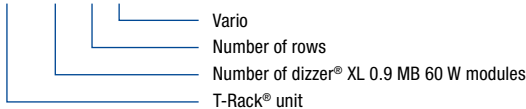
4 row configuration

Number of modules	T-Rack® vario unit	Part number*	Length (A)**		Membrane area***		Weight, dry (incl. module)		Weight, filled (incl. module)		Hold-up volume, feed side		Hold-up volume, filtrate side	
			mm	ft.	m ²	sq.ft.	kg	lbs.	kg	lbs.	m ³	US. gal	m ³	US. gal
16	TR-16-4-V	TR-1643	1497	4.9	960	10330	1200	2650	1980	4370	0.52	140	0.41	110
20	TR-20-4-V	TR-2043	1827	6.0	1200	12920	1480	3260	2440	5380	0.64	170	0.51	130
24	TR-24-4-V	TR-2443	2157	7.1	1440	15500	1760	3880	2920	6440	0.76	200	0.61	160
28	TR-28-4-V	TR-2843	2487	8.2	1680	18080	2040	4500	3390	7470	0.89	230	0.71	190
32	TR-32-4-V	TR-3243	2817	9.2	1920	20670	2330	5140	3860	8510	1.01	270	0.81	210
36	TR-36-4-V	TR-3643	3147	10.3	2160	23250	2620	5780	4340	9570	1.14	300	0.91	240
40	TR-40-4-V	TR-4043	3477	11.4	2400	25830	2900	6390	4810	10600	1.26	330	1.01	270
44	TR-44-4-V	TR-4443	3807	12.5	2640	28420	3180	7010	5280	11640	1.38	370	1.11	290
48	TR-48-4-V	TR-4843	4137	13.6	2880	31000	3470	7650	5750	12680	1.51	400	1.21	320
52	TR-52-4-V	TR-5243	4649	15.3	3120	33580	3810	8400	6310	13910	1.65	440	1.32	350
56	TR-56-4-V	TR-5643	4979	16.3	3360	36170	4090	9020	6790	14970	1.78	470	1.42	370
60	TR-60-4-V	TR-6043	5309	17.4	3600	38750	4380	9660	7260	16010	1.90	500	1.52	400
64	TR-64-4-V	TR-6443	5639	18.5	3840	41330	4670	10300	7730	17040	2.02	530	1.62	430
68	TR-68-4-V	TR-6843	5969	19.6	4080	43920	4950	10910	8210	18100	2.15	570	1.72	450
72	TR-72-4-V	TR-7243	6299	20.7	4320	46500	5240	11550	8680	19140	2.27	600	1.82	480
76	TR-76-4-V	TR-7643	6629	21.7	4560	49080	5530	12190	9150	20170	2.40	630	1.92	510
80	TR-80-4-V	TR-8043	6959	22.8	4800	51670	5810	12810	9630	21230	2.52	670	2.02	530

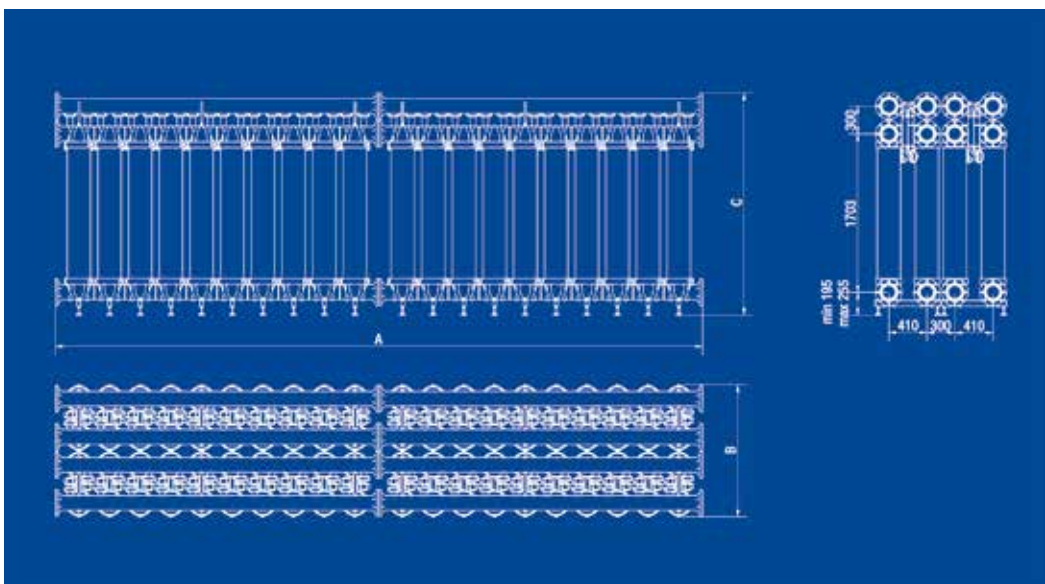
* Rack parts without modules ** Tolerance according to ISO 2768-1c *** Membrane area per module 60m² (645 sq.ft)

T-Rack designation:

TR-24-4-V



Sample configuration TR-80-4-V



Header feed / drain
 $d_1 = 143 \text{ mm (5.59 inch)}$
 $d_a = 160 \text{ mm (6.30 inch)}$

Header filtrate
 $d_1 = 143 \text{ mm (5.59 inch)}$
 $d_a = 160 \text{ mm (6.30 inch)}$

Height (C)**
 min = 2340 mm (7.68 ft.)
 max = 2400 mm (7.87 ft.)

Width (B)**
 $B = 1420 \text{ mm (4.66 ft.)}$

Exploded view and bill of materials



T-Rack® vario bill of materials

Pos.	Article description	Material
1	Bottom cross brace	
1.1	Support 60 x 40 x 3 mm	SS 1.4301 / AISI: 304
1.2	Plug 60 x 40 mm	PE
1.3	Hexagon nut (DIN 934) M16	SS 1.4301 / AISI: 304
1.4	Hexagon screw (DIN 933) M16 x 170 mm	SS 1.4301 / AISI: 304
1.5	Shim (DIN 433) A17	SS 1.4301 / AISI: 304
1.6	Adjustable foot M16	PA6 GF30
1.7	Hexagon screw (DIN 933) M10 x 80 mm	SS 1.4301 / AISI: 304
1.8	Lock washer (DIN 127) B10	SS 1.4301 / AISI: 304
2	Top cross brace	
2.1	Support 30 x 10 x 1,5 mm	SS 1.4301 / AISI: 304
2.2	Plug 30 x 10 mm	PE
2.3	Hexagon screw (DIN 933) M10 x 40 mm	SS 1.4301 / AISI: 304
2.4	Shim (DIN 9021) A10,5	SS 1.4301 / AISI: 304
2.5	Fastening clamp PE d160	PE
3	dizzer® XL-W module body	PVC-U
4	Module connecting parts	
4.1	Coupling inge Ultra S 250	1.4509 / AISI: 441
4.2	Coupling flexible 2" incl. EPDM gasket	PA6 GF30
4.3	Filtrate pipe TR vario 2" / 362 mm, transparent	PVC-U
4.4	Elbow 90° Victaulic PP 2"	PP
5	Feed/drain header	
5.1	Header top and bottom with fixed flange (connecting dimensions according to ISO 7005 PN10, ANSI class 150)	PVC-U
6	Filtrate header 160 mm with fixed flange (connecting dimensions according to ISO 7005 PN10, ANSI class 150)	PVC-U

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dizzer® XL ultrafiltration module and Multibore® membrane

Multibore® 0.9 and 1.5 membrane

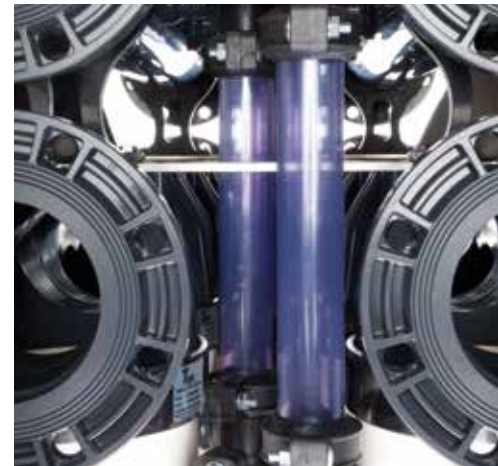
Membrane data		Multibore® 0.9	Multibore® 1.5
Capillaries per fibre		7	7
Inner diameter	mm	0.9	1.5
Outer diameter	mm	4.0	6.0
Pore size	µm	approx. 0.02	approx. 0.02
Material		PESM	PESM

dizzer® XL in T-Rack®

Module data			dizzer® XL 0.9 MB 60 WT		dizzer® XL 1.5 MB 40 WT	
Part number			VK-1068		VK-1069	
Membrane area	m²	sq.ft.	60	645	40	430
Length without end cap	mm	inch	1486 ± 1.5	58 1/2	1486 ± 1.5	58 1/2
Outer diameter of module	mm	inch	250	9 7/8	250	9 7/8
Weight (wet)	kg	lbs.	48	105	42	95
Material, Housing			PVC-U, white		PVC-U, white	
Operation parameters						
Temperature range	°C	°F	1 - 40	34 - 104	1 - 40	34 - 104
Max. operating pressure T-Rack®						
≤ 20°C (≤ 68°F)	bar	psi	5	70	5	70
> 20°C (> 68°F)	bar	psi	3	42	3	42
Flux rate						
Filtration*	lmh	gfd	60 - 180	35 - 105	60 - 180	35 - 105
Backwash standard	lmh	gfd	230	135	230	135
Backwash range	lmh	gfd	230 - 300	135 - 175	230 - 300	135 - 175
Transmembrane pressure (TMP)						
Filtration*	bar	psi	0.1 - 1.5	1.5 - 20	0.1 - 1.5	1.5 - 20
Backwash standard*	bar	psi	0.3 - 3.0	5 - 40	0.3 - 3.0	5 - 40
Burst pressure membrane	bar	psi	> 10	> 150	> 10	> 150
Cleaning/disinfection chemicals						
Free chlorine	ppm	ppm x h	max. 200 max. 200,000 (at pH ≥ 9.5)		max. 200 max. 200,000 (at pH ≥ 9.5)	
H ₂ O ₂ (Hydrogenperoxide)	ppm		max. 500		max. 500	
Caustic Soda pH			max. 13		max. 13	
Acid pH			min. 1		min. 1	

* Specifications apply to common operating conditions.

Subject to technical modifications and errors. Modules are to be operated in accordance with the relevant "Installation, Operation and Maintenance Guidelines". Customized configurations are available on request. Please contact the inge GmbH team if you require any further information.



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