

# T-Rack<sup>®</sup> 3.0

Innovative rack solutions for ultrafiltration



## T-Rack® 3.0 – State-of-the-art ultrafiltration solutions

- Suitable for direct feed – high pressure operability
- Optimized for seawater – high corrosion resistance
- Small footprint – high treatment capacity
- Plug-and-play installation – less maintenance required
- Easy to add more modules – great flexibility

We carefully tailor our product development to the **needs of the market** and our customers' requirements. That's why we've decided to address the specific requirements of larger-scale filtration systems (e.g. those used for pretreatment in seawater desalination or wastewater reuse) by launching the **next generation** of our ultra-compact racks – the **T-Rack® 3.0**

**Robust:** Two of the most important requirements for an ultrafiltration rack – particularly for the pretreatment stage of seawater desalination – are **corrosion resistance** and **high pressure operability**, especially at high temperatures. The new T-Rack® 3.0 meets both these requirements thanks to the direct welding of the T-pieces to the module body, connection of the individual modules to the headers using 6" flexible pipe couplings and the elimination of all adhesive connections. As a result, the design pressure\* of our new T-Rack® 3.0 is 5 bar at 40°C with a 10 year service life\*\*.

**Compact:** Integrating the header pipes in the module end caps enables us to position the modules closer together in the rack. This **space-saving design** gives the T-Rack® 3.0 a footprint that is up to 15 percent smaller than that of its predecessors. By using standardized components, we have made our new rack into a fully scalable solution.

**High-capacity:** To increase the output of the UF system, we have equipped each dizzer XL module with a 70 m<sup>2</sup> (754 ft<sup>2</sup>) membrane area. That means our new rack design offers **more capacity than ever**. The maximum rack size of 136 modules provides up to 9520 m<sup>2</sup> (102.480 ft<sup>2</sup>) of membrane area. Assuming a flux rate of 80 LMH (47 gfd), that corresponds to a water treatment capacity of approx. 760 m<sup>3</sup>/h (4.8 MGD).

**Flexible:** The more flexibility you have to configure a system, the more you can tailor it to your exact requirements. Depending on the required system size and treatment capacity, we can supply **configurations with either two or four rows of modules**. For systems containing 72 modules or more, the racks are arranged on both sides of a valve block. However, the design includes separate filtrate headers, so each row can still be operated as a separate filtration line.

**Expandable:** The standardized components and the modular design of the rack make it quick and easy to expand capacity to reflect changing needs. **Additional individual modules** can simply be added to the end of the rack up to max. pump capacity.



\* The design pressure corresponds to the maximum permitted operating pressure in continuous operation at the specified design temperature. Higher operating pressures than 5 bar at 40°C may be possible in certain cases. However, this must first be verified and approved by inge.

\*\* Use DIN ISO 9080 and/or ASTM D 2837 to calculate the design pressure for different temperatures and service lives. For example, the design pressure of 5 bar at 40°C with a service life of 10 years corresponds to a design pressure of 8.2 bar at 20°C. Once again, however, this must first be verified and approved by inge.

® = Registered trademark of BASF

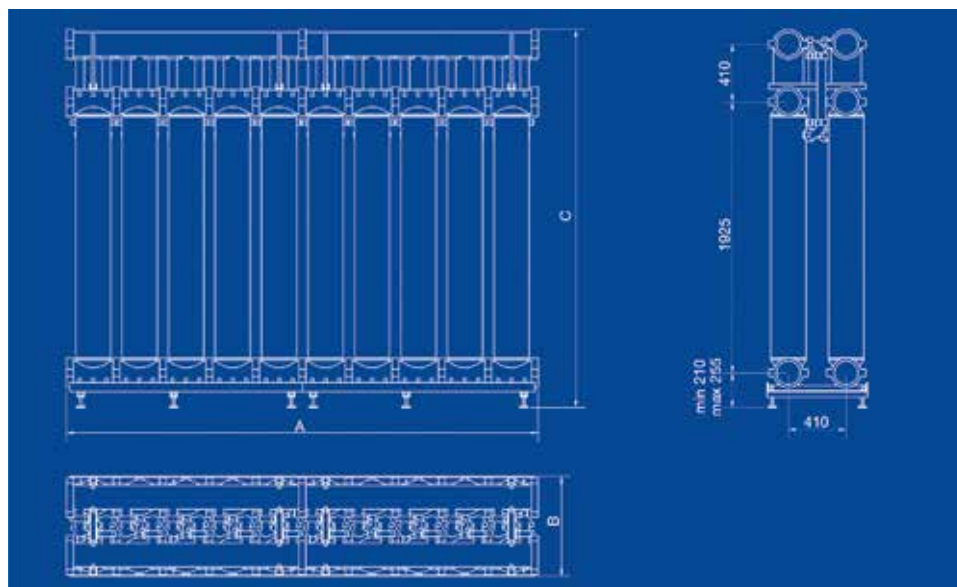
# T-Rack® 3.0 – system configuration with 2 rows

## Configuration with 2 rows

| Number of modules | T-Rack® 3.0 unit | Part number | Length (A)* |      | Membrane area** |        | Shipping weight (incl. modules and frame) |      | Weight, filled (incl. modules and frame) |       | Hold-up volume, feed side |         | Hold-up volume, filtrate side |         |
|-------------------|------------------|-------------|-------------|------|-----------------|--------|---|------|--|-------|---------------------------|---------|-------------------------------|---------|
|                   |                  |             | mm          | ft.  | m <sup>2</sup>  | sq.ft. | kg  | lbs. | kg                                       | lbs.  | m <sup>3</sup>            | US. gal | m <sup>3</sup>                | US. gal |
| 8                 | TR-8-2-1-3.0     | TR-0008     | 1322        | 4.4  | 560             | 6030   | 600                                       | 1310 | 1180                                     | 2600  | 0.25                      | 70      | 0.42                          | 110     |
| 10                | TR-10-2-1-3.0    | TR-0010     | 1653        | 5.5  | 700             | 7535   | 740                                       | 1620 | 1470                                     | 3230  | 0.32                      | 85      | 0.53                          | 140     |
| 12                | TR-12-2-1-3.0    | TR-0012     | 1983        | 6.6  | 840             | 9045   | 880                                       | 1920 | 1750                                     | 3860  | 0.38                      | 100     | 0.63                          | 165     |
| 16                | TR-16-2-1-3.0    | TR-0016     | 2644        | 8.7  | 1120            | 12060  | 1190                                      | 2620 | 2360                                     | 5200  | 0.50                      | 135     | 0.84                          | 225     |
| 18                | TR-18-2-1-3.0    | TR-0018     | 2975        | 9.8  | 1260            | 13565  | 1330                                      | 2920 | 2650                                     | 5830  | 0.57                      | 150     | 0.94                          | 250     |
| 20                | TR-20-2-1-3.0    | TR-0020     | 3305        | 10.9 | 1400            | 15070  | 1470                                      | 3230 | 2930                                     | 6460  | 0.63                      | 170     | 1.05                          | 280     |
| 22                | TR-22-2-1-3.0    | TR-0022     | 3636        | 12.0 | 1540            | 16580  | 1610                                      | 3540 | 3220                                     | 7090  | 0.69                      | 185     | 1.15                          | 305     |
| 24                | TR-24-2-1-3.0    | TR-0024     | 3966        | 13.1 | 1680            | 18085  | 1750                                      | 3850 | 3500                                     | 7720  | 0.75                      | 200     | 1.25                          | 335     |
| 26                | TR-26-2-1-3.0    | TR-0026     | 4297        | 14.1 | 1820            | 19595  | 1920                                      | 4230 | 3830                                     | 8430  | 0.82                      | 215     | 1.36                          | 360     |
| 28                | TR-28-2-1-3.0    | TR-0028     | 4627        | 15.2 | 1960            | 21100  | 2060                                      | 4540 | 4110                                     | 9060  | 0.88                      | 235     | 1.46                          | 390     |
| 30                | TR-30-2-1-3.0    | TR-0030     | 4958        | 16.3 | 2100            | 22605  | 2200                                      | 4840 | 4400                                     | 9690  | 0.94                      | 250     | 1.57                          | 415     |
| 32                | TR-32-2-1-3.0    | TR-0032     | 5288        | 17.4 | 2240            | 24115  | 2340                                      | 5150 | 4680                                     | 10320 | 1.00                      | 265     | 1.67                          | 445     |
| 34                | TR-34-2-1-3.0    | TR-0034     | 5619        | 18.5 | 2380            | 25620  | 2480                                      | 5460 | 4970                                     | 10950 | 1.07                      | 285     | 1.77                          | 470     |

\* Tolerance to ISO 2768-1c    \*\* Rack equipped with 70m<sup>2</sup> (754 sq.ft.) dizzer XL 0.9 MB 70 WT modules

## Sample configuration TR-20-2-1-3.0



Header feed / drain  
 $d_f = 142 \text{ mm (5.59 inch)}$   
 $d_a = 168 \text{ mm (6.61 inch)}$

Header filtrate  
 $d_f = 152 \text{ mm (5.98 inch)}$   
 $d_a = 168 \text{ mm (6.61 inch)}$

Height (C)\*  
 min = 2650 mm (8.70 ft.)  
 max = 2695 mm (8.85 ft.)

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

Connection for 6" grooved pipe coupling

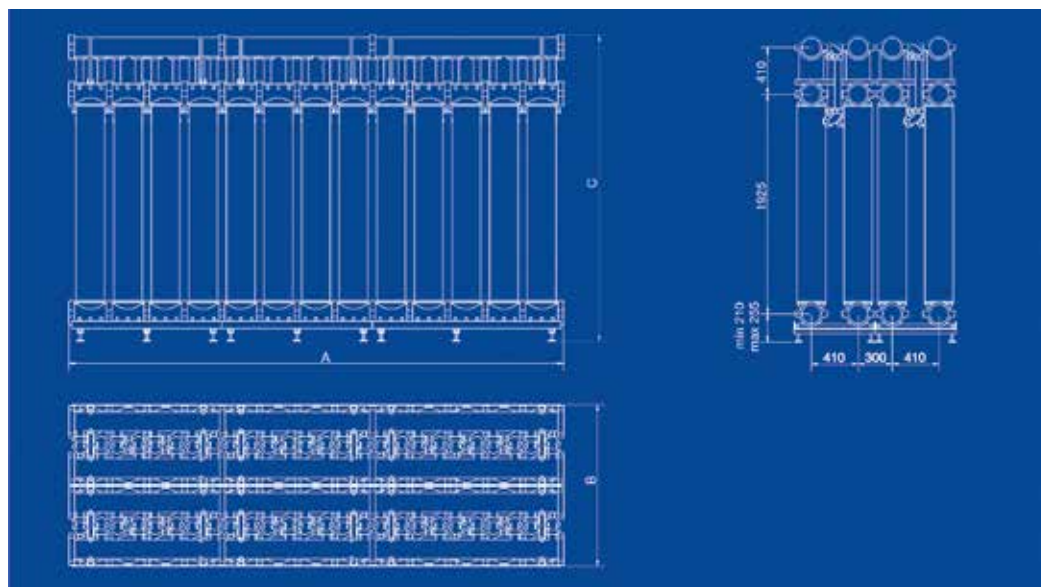
# T-Rack® 3.0 – system configuration with 4 rows

## Configuration with 4 rows on one side

| Number of modules | T-Rack® 3.0 unit | Part number | Length (A)* |      | Membrane area** |        | Shipping weight (incl. modules and frame) |       | Weight, filled (incl. modules and frame) |       | Hold-up volume, feed side |         | Hold-up volume, filtrate side |         |
|-------------------|------------------|-------------|-------------|------|-----------------|--------|---|-------|--|-------|---------------------------|---------|-------------------------------|---------|
|                   |                  |             | mm          | ft.  | m <sup>2</sup>  | sq.ft. | kg  | lbs.  | kg                                       | lbs.  | m <sup>3</sup>            | US. gal | m <sup>3</sup>                | US. gal |
| 36                | TR-36-4-1-3.0    | TR-0036     | 2975        | 9.8  | 2520            | 27130  | 2650                                      | 5840  | 5290                                     | 11660 | 1.00                      | 265     | 1.67                          | 445     |
| 40                | TR-40-4-1-3.0    | TR-0040     | 3305        | 10.9 | 2800            | 30140  | 2930                                      | 6460  | 5860                                     | 12920 | 1.25                      | 330     | 2.09                          | 555     |
| 44                | TR-44-4-1-3.0    | TR-0044     | 3636        | 12.0 | 3080            | 33155  | 3210                                      | 7070  | 6430                                     | 14180 | 1.38                      | 365     | 2.30                          | 610     |
| 48                | TR-48-4-1-3.0    | TR-0048     | 3966        | 13.1 | 3360            | 36170  | 3490                                      | 7690  | 7010                                     | 15440 | 1.50                      | 400     | 2.50                          | 665     |
| 52                | TR-52-4-1-3.0    | TR-0052     | 4297        | 14.1 | 3640            | 39185  | 3840                                      | 8460  | 7650                                     | 16850 | 1.63                      | 430     | 2.71                          | 720     |
| 56                | TR-56-4-1-3.0    | TR-0056     | 4627        | 15.2 | 3920            | 42200  | 4120                                      | 9070  | 8220                                     | 18110 | 1.75                      | 465     | 2.92                          | 775     |
| 60                | TR-60-4-1-3.0    | TR-0060     | 4958        | 16.3 | 4200            | 45210  | 4400                                      | 9680  | 8790                                     | 19370 | 1.88                      | 495     | 3.13                          | 830     |
| 64                | TR-64-4-1-3.0    | TR-0064     | 5288        | 17.4 | 4480            | 48225  | 4670                                      | 10300 | 9360                                     | 20640 | 2.00                      | 530     | 3.34                          | 885     |
| 68                | TR-68-4-1-3.0    | TR-0068     | 5619        | 18.5 | 4760            | 51240  | 4950                                      | 10910 | 9930                                     | 21900 | 2.13                      | 565     | 3.54                          | 940     |

\* Tolerance to ISO 2768-1c    \*\* Rack equipped with 70m<sup>2</sup> (754 sq.ft.) dizzer XL 0.9 MB 70 WT modules

## Sample configuration TR-52-4-1-3.0



Header feed / drain  
 $d_i = 142 \text{ mm (5.59 inch)}$   
 $d_a = 168 \text{ mm (6.61 inch)}$

Header filtrate  
 $d_i = 152 \text{ mm (5.98 inch)}$   
 $d_a = 168 \text{ mm (6.61 inch)}$

Height (C)\*  
 min = 2650 mm (8.70 ft.)  
 max = 2695 mm (8.85 ft.)

Width (B)\*  
 B = 1420 mm (4.66 ft.)

Connection for 6" grooved pipe coupling

# T-Rack® 3.0 – system configuration with 4 rows arranged on both sides

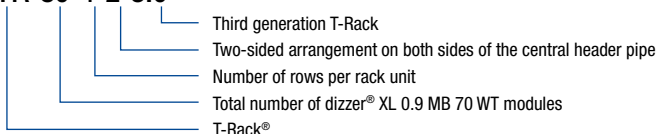
## Configuration with 4 rows on two sides

| Number of modules | T-Rack® 3.0 unit  | Part number | Length (A)* |      | Membrane area** |        | Shipping weight (incl. modules and frame) |       | Weight, filled (incl. modules and frame) |       | 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 |
| 72                | TR-72-4-2-3.0     | TR-0072     | 5949        | 19.6 | 5040            | 54255  | 5300                                      | 11680 | 10580                                    | 23310 | 2.00                      | 530     | 3.34                          | 885     |
| 76                | TR-76-4-2-3.0***  | TR-0076     | 6280        | 20.6 | 5320            | 57270  | 5580                                      | 12300 | 11150                                    | 24570 | 2.25                      | 595     | 3.75                          | 995     |
| 80                | TR-80-4-2-3.0     | TR-0080     | 6610        | 21.7 | 5600            | 60280  | 5860                                      | 12910 | 11720                                    | 25830 | 2.50                      | 660     | 4.17                          | 1105    |
| 84                | TR-84-4-2-3.0***  | TR-0084     | 6941        | 22.8 | 5880            | 63295  | 6140                                      | 13530 | 12290                                    | 27090 | 2.63                      | 695     | 4.38                          | 1160    |
| 88                | TR-88-4-2-3.0     | TR-0088     | 7271        | 23.9 | 6160            | 66310  | 6420                                      | 14140 | 12860                                    | 28350 | 2.75                      | 730     | 4.59                          | 1215    |
| 92                | TR-92-4-2-3.0***  | TR-0092     | 7602        | 25.0 | 6440            | 69325  | 6690                                      | 14750 | 13430                                    | 29610 | 2.88                      | 760     | 4.79                          | 1270    |
| 96                | TR-96-4-2-3.0     | TR-0096     | 7932        | 26.1 | 6720            | 72340  | 6970                                      | 15370 | 14010                                    | 30870 | 3.00                      | 795     | 5.00                          | 1325    |
| 100               | TR-100-4-2-3.0*** | TR-0100     | 8263        | 27.2 | 7000            | 75350  | 7320                                      | 16140 | 14650                                    | 32290 | 3.13                      | 825     | 5.21                          | 1380    |
| 104               | TR-104-4-2-3.0    | TR-0104     | 8593        | 28.2 | 7280            | 78365  | 7670                                      | 16910 | 15290                                    | 33700 | 3.25                      | 860     | 5.42                          | 1435    |
| 108               | TR-108-4-2-3.0*** | TR-0108     | 8924        | 29.3 | 7560            | 81380  | 7950                                      | 17520 | 15860                                    | 34960 | 3.38                      | 895     | 5.63                          | 1490    |
| 112               | TR-112-4-2-3.0    | TR-0112     | 9254        | 30.4 | 7840            | 84395  | 8230                                      | 18130 | 16430                                    | 36220 | 3.50                      | 925     | 5.84                          | 1545    |
| 116               | TR-116-4-2-3.0*** | TR-0116     | 9585        | 31.5 | 8120            | 87410  | 8510                                      | 18750 | 17000                                    | 37480 | 3.63                      | 960     | 6.04                          | 1600    |
| 120               | TR-120-4-2-3.0    | TR-0120     | 9915        | 32.6 | 8400            | 90420  | 8790                                      | 19360 | 17580                                    | 38740 | 3.75                      | 990     | 6.25                          | 1655    |
| 124               | TR-124-4-2-3.0*** | TR-0124     | 10246       | 33.7 | 8680            | 93435  | 9060                                      | 19980 | 18150                                    | 40010 | 3.88                      | 1025    | 6.46                          | 1710    |
| 128               | TR-128-4-2-3.0    | TR-0128     | 10576       | 34.7 | 8960            | 96450  | 9340                                      | 20590 | 18720                                    | 41270 | 4.00                      | 1060    | 6.67                          | 1765    |
| 132               | TR-132-4-2-3.0*** | TR-0132     | 10907       | 35.8 | 9240            | 99465  | 9620                                      | 21210 | 19290                                    | 42530 | 4.13                      | 1090    | 6.88                          | 1820    |
| 136               | TR-136-4-2-3.0    | TR-0136     | 11237       | 36.9 | 9520            | 102480 | 9900                                      | 21820 | 19860                                    | 43790 | 4.25                      | 1125    | 7.09                          | 1875    |

\* Length = length rack1 + rack 2, excl. central header pipe, Tolerance to ISO 2768-1c    \*\* Rack equipped with 70m² (754 sq.ft.) dizzer XL 0.9 MB 70 WT modules    \*\*\* Asymmetric module arrangement

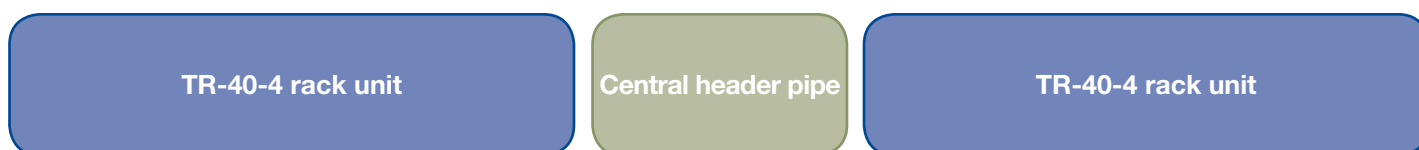
### T-Rack designation:

**TR-80-4-2-3.0**



### Sample configuration TR-80-4-2-3.0

comprising: 2 x TR-40-4-3.0 on both sides of the central header pipe\*\*\*\*



\*\*\*\* optional extra

## Exploded view and parts list



### T-Rack® 3.0 parts list

| Pos. | Article description                            | Material             |
|------|--|----------------------|
| 1    | Bottom frame                                   |                      |
| 1.1  | Angle profile L 65 x 50 x 5 x div.             | 1.0037 C4 coated     |
| 1.2  | Channel section U 50 x 710 mm                  | 1.0037 4C coated     |
| 1.3  | Hexagon nut (DIN 934) M16                      | 1.4401               |
| 1.4  | Hexagon bolt (DIN 933) M16 x 150               | 1.4401               |
| 1.5  | Washer (DIN 125) A17                           | 1.4401               |
| 1.6  | Adjustable feet M16                            | PA6 GF 30            |
| 2    | Bottom connecting brace                        |                      |
| 2.1  | Channel section U 50 x 688 mm                  | 1.0037 4C coated     |
| 2.2  | Threaded pins (DIN 913) M10 x 50               | 1.4401               |
| 2.3  | Washer (DIN 125) A10.5                         | 1.4401               |
| 2.4  | Hexagon nut (DIN 934) M10                      | 1.4401               |
| 3    | Top cross brace                                |                      |
| 3.1  | Channel section U 50 x 688 mm                  | 1.0037 4C coated     |
| 3.2  | Threaded pins (DIN 913) M10 x 50               | 1.4401               |
| 3.3  | Washer (DIN 125) A10.5                         | 1.4401               |
| 3.4  | Hexagon nut (DIN 934) M10                      | 1.4401               |
| 3.5  | Mounting clamp PE d 168                        | PE                   |
| 4    | dizzer® XL-WT module body                      | PVC-U                |
| 5    | Module connecting parts                        |                      |
| 5.1  | Flexible coupling 6" / d168<br>incl. EPDM seal | cast iron, C4 coated |
| 5.2  | 90° elbow piece PP 2"                          | PP                   |
| 5.3  | Transparent filtrate pipe 2" / 464 mm          | PVC-U                |
| 5.4  | Flexible coupling 2" incl. EPDM seal           | PA6 GF30             |
| 6    | Filtrate header 168.3mm/ 6"                    | PVC-U                |



# dizzer® XL ultrafiltration module and Multibore® membrane

## Multibore® membrane

| Membrane specifications |    | dizzer® XL 0.9 MB 70 WT |
|-------------------------|----|-------------------------|
| Capillaries per fiber   |    | 7                       |
| Inside diameter         | mm | 0.9                     |
| Outside diameter        | mm | 4.0                     |
| Pore size               | µm | approx. 0.02            |
| Material                |    | PESM                    |

## dizzer® XL in T-Rack® 3.0

| Module specifications                             |     |        |              | dizzer® XL 0.9 MB 70 WT |  |
|---|-----|--------|--------------|-------------------------|--|
| Part number                                       |     |        |              | VK-1087                 |  |
| Active membrane area                              | m²  | sq.ft. | 70           | 753                     |  |
| Length (incl. T-piece)                            | mm  | inch   | 2100 ± 1.5   | 82 2/3                  |  |
| Module diameter                                   | mm  | inch   | 250          | 9 7/8                   |  |
| Shipping weight                                   | kg  | lbs.   | 58           | 128                     |  |
| Casing material                                   |     |        | PVC-U, white |                         |  |
| Operating parameters                              |     |        |              |                         |  |
| Permissible temperature range                     | °C  | °F     | 0 - 40       | 32 - 104                |  |
| Max. operating pressure T-Rack®                   |     |        |              |                         |  |
| 20°C  | bar | psi    | 8.2          | 119                     |  |
| 40°C  | bar | psi    | 5            | 72                      |  |
| Flux rate   |     |        |              |                         |  |
| Filtration*                                       | lmh | gfd    | 60 – 180     | 35 – 105                |  |
| Standard backwash                                 | lmh | gfd    | 230          | 135                     |  |
| Backwash range                                    | lmh | gfd    | 230 – 300    | 135 – 175               |  |
| Transmembrane pressure (TMP)                      |     |        |              |                         |  |
| Filtration*                                       | bar | psi    | 0.1 – 1.5    | 1.5 – 20                |  |
| Standard backwash*                                | bar | psi    | 0.3 – 3.0    | 5 – 40                  |  |
| Burst pressure (membrane)                         | bar | psi    | > 10         | > 150                   |  |
| Cleaning/disinfection chemicals                   |     |        |              |                         |  |
| Free chlorine                                     | ppm |        | max. 200     |                         |  |
| H <sub>2</sub> O <sub>2</sub> (hydrogen peroxide) | ppm |        | max. 500     |                         |  |
| Caustic pH  |     |        | max. 13      |                         |  |
| Acid pH   |     |        | min. 1       |                         |  |

\* Specifications apply to normal operating conditions.

Subject to technical modifications and errors. Please follow the instructions provided in the inge® "Operator's Manual". Customized configurations are available on request. Please contact the inge GmbH team if you require any further information.



**Note**

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