Raschig Super Rings®

High-performance, free-flowing random metal and plastic packing for scrubber and stripper applications.

Product Technical Bulletin 625
Raschig Super-Rings®

Mass transfer

Effective mass transfer between phases demands not only a large interfacial area but also the most turbulent possible flow conditions and frequent renewal of the phase interfaces. A packed bed of Raschig Super-Rings® produces numerous thin films of liquid in turbulent flow. These are formed on the sinusoidal webs and are constantly intermixed as the result of the recurrent contact points within each packing piece.

Performance data of the Raschig Super-Rings®

Empirical studies have confirmed the above comments. The following Figures show the pressure drop of the Raschig Super-Rings® as a function of the gas capacity factor at various liquid loads. As a result of a very open structure of Raschig Super-Rings® the pressure drop of dry packing is significantly lower than that of dry 50 mm (~2") metal Pall Rings. This difference increases as a function of liquid load. Also Raschig Super-Rings® has substantially lower pressure drop than other 50 mm metal packings.

The loading capacity of the Raschig Super-Rings® is presented in the following Figures. Raschig Super-Rings® has a higher loading capacity versus 50 mm metal Pall Rings. Additionally Raschig Super-Rings® has significantly higher loading capacity versus other packings.

Also presented are data of absorption of ammonia from air into water. The separation efficiency of Raschig Super-Rings® is up to 14% better than that of 50 mm metal Pall Rings or other similar metal packing choices.

Furthermore the low mass per unit volume of Raschig Super-Rings® allows for lower cost supporting elements in a column. And Raschig Super-Rings® achieves less mass per cubic foot without sacrificing stability. Empirical studies have shown that packed depth of 15 m (~50 ft) is practical. This is the result of the alternating wave design of the metal webs of Raschig Super-Rings®.

Additionally this alternating wave structure prevents entanglement / bridging of the individual packing pieces within a packed bed thus guaranteeing problem-free assembly and dismantling of a tower. Raschig Super-Rings® is also suitable for liquids contaminated with solids as the result of its open structure. Table 1 presents the technical data of Raschig Super-Rings®.
Raschig Super-Ring®

The alternating wave structure prevents entanglement / bridging of individual packing pieces. This assures problem free assembly and dismantling of a tower. Owing to its open structure Raschig Super-Rings® is also suitable for liquids bearing heavy solids loading. Tables 1 and 2 present the technical data of metal and plastic Raschig Super-Rings®.

Table 1: Technical data of metal Raschig Super-Rings®

<table>
<thead>
<tr>
<th>Size</th>
<th>0.1</th>
<th>0.3</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pieces /ft³</td>
<td>14,300</td>
<td>5,100</td>
<td>4,110</td>
<td>2,100</td>
<td>1,290</td>
<td>910</td>
<td>340</td>
<td>270</td>
<td>122</td>
<td>110</td>
</tr>
<tr>
<td>Weight  lbm/ft³</td>
<td>20</td>
<td>14</td>
<td>17</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Surface Area ft²/ft³</td>
<td>138</td>
<td>96</td>
<td>76</td>
<td>66</td>
<td>55</td>
<td>46</td>
<td>37</td>
<td>31</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>Void %</td>
<td>95</td>
<td>96</td>
<td>97</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>98</td>
</tr>
</tbody>
</table>

Table 2: Technical data of plastic Raschig Super-Rings®

<table>
<thead>
<tr>
<th>Size</th>
<th>0.6</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Pieces / ft³</td>
<td>1,530</td>
<td>255</td>
<td>113</td>
</tr>
<tr>
<td>Geometric Surface Area ft²/ft³</td>
<td>63</td>
<td>31</td>
<td>23</td>
</tr>
<tr>
<td>Void %</td>
<td>93</td>
<td>96</td>
<td>97</td>
</tr>
</tbody>
</table>
Pressure drop of metal RASCHIG SUPER-RINGS® system: air/water

RASCHIG SUPER-RINGS® No. 0.3
Column diameter: 0.288 m
Packing height: 1.0 m

RASCHIG SUPER-RINGS® No. 0.5
Column diameter: 0.288 m
Packing height: 1.0 m

Liquid load $u_L$ in ($m^3/m^2\cdot h$)

Specific pressure drop $\Delta p/H$ [Pa/m]

Gas capacity factor $F_V$ [Pa$^{1/2}$]
Pressure drop of metal
RASCHIG SUPER-RINGS®
system: air/water

RASCHIG SUPER-RINGS® No. 0.7
Column diameter: 0.288 m
Packing height: 2.0 m

RASCHIG SUPER-RINGs® No. 1
Column diameter: 0.288 m
Packing height: 2.0 m

Gas capacity factor \( F_V \) [Pa\(^{1/2}\)]

Liquid load \( u_L \) in (m\(^3\)/m\(^2\)/h)

Specific pressure drop \( \Delta p/H \) [Pa/m]
Pressure drop of metal
RASCHIG SUPER-RINGS®
system: air/water

RASCHIG SUPER-RINGS® No. 1.5

Column diameter: 0.288 m
Packing height: 2.0 m

RASCHIG SUPER-RINGS® No. 2

Column diameter: 0.75 m
Packing height: 3.0 m
Pressure drop of metal RASCHIG SUPER-RINGS system: air/water

RASCHIG SUPER-RINGS® No. 3
Column diameter: 0.440 m
Packing height: 2.0 m

RASCHIG SUPER-RINGS® No. 2
Column diameter: 0.288 m
Packing height: 2.0 m

Liquid load $u_L$ in $(\text{m}^3/\text{m}^2\cdot\text{h})$

Specific pressure drop $\Delta p/H$ [Pa/m]

Gas capacity factor $F_V$ [Pa$^{1/2}$]
Transfer efficiency of metal RASCHIG SUPER-RINGS® in the desorption of CO₂ from water into an atmospheric air-stream

RASCHIG SUPER-RINGS® No. 0.3
Column diameter: 0.288 m
Packing height: 1.0 m

Gas capacity factor Fv = 1.8 Pa⁰.⁵

RASCHIG SUPER-RINGS® No. 0.5
Column diameter: 0.288 m
Packing height: 1.0 m

Gas capacity factor Fv = 1.8 Pa⁰.⁵
Transfer efficiency of metal RASCHIG SUPER-RINGS®
in the desorption of CO₂ from water into an atmospheric air-stream

RASCHIG SUPER-RINGS® No. 0.7
Column diameter: 0.288 m
Packing height: 2.0 m

RASCHIG SUPER-RINGS® No. 1
Column diameter: 0.288 m
Packing height: 2.0 m
Transfer efficiency of metal RASCHIG SUPER-RINGS® in the desorption of CO$_2$ from water into an atmospheric air-stream

RASCHIG SUPER-RINGS® No. 1.5
Column diameter: 0.288 m
Packing height: 2.0 m

Gas capacity factor $F_v = 1.8 \text{ Pa}^{0.5}$

RASCHIG SUPER-RINGS® No. 2
Column diameter: 0.288 m
Packing height: 2.0 m

Gas capacity factor $F_v = 1.8 \text{ Pa}^{0.5}$
Transfer efficiency of metal RASCHIG SUPER-RINGS® in the desorption of CO₂ from water into an atmospheric air-stream

**RASCHIG SUPER-RINGS® No. 3**

Column diameter: 0.288 m
Packing height: 1.0 m

**RASCHIG SUPER-RINGS® No. 2**

Column diameter: 0.288 m
Packing height: 2.0 m
Height of a transfer unit $HTU_{ov}$ for metal

**RASCHIG SUPER-RINGS®**

for the absorption of $NH_3$ from air in water in the
gaseous phase

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**RASCHIG SUPER-RINGS® No. 0.3**

Column diameter: 0.288 m
Packing height: 1.0 m

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**RASCHIG SUPER-RINGS® No. 0.5**

Column diameter: 0.288 m
Packing height: 1.0 m

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Height of a transfer unit $HTU_{ov}$ for metal RASCHIG SUPER-RINGS® for the absorption of $NH_3$ from air in water in the gaseous phase

### RASCHIG SUPER-RINGS® No. 0.7

- Column diameter: 0.288 m
- Packing height: 2.0 m

Liquid load $u_L = 10 \text{ m}^3/\text{m}^2/\text{h}$

### RASCHIG SUPER-RINGS® No. 1

- Column diameter: 0.288 m
- Packing height: 2.0 m

Liquid load $u_L = 10 \text{ m}^3/\text{m}^2/\text{h}$

Gas capacity factor $F_v [\text{Pa}^{1/2}]$ vs. $HTU_{ov} [\text{m}]$ and Liquid load $u_L = 10 \text{ m}^3/\text{m}^2/\text{h}$
Height of a transfer unit HTU_{ov} for metal RASCHIG SUPER-RINGS® for the absorption of NH₃ from air in water in the gaseous phase

**RASCHIG SUPER-RINGS® No. 1.5**
- Column diameter: 0.288 m
- Packing height: 2.0 m

**RASCHIG SUPER-RINGS® No. 2**
- Column diameter: 0.288 m
- Packing height: 2.0 m
Height of a transfer unit $\text{HTU}_{ov}$ for metal RASCHIG SUPER-RINGS® for the absorption of $\text{NH}_3$ from air in water in the gaseous phase

RASCHIG SUPER-RINGS® No. 3
Column diameter: 0.288 m
Packing height: 2.0 m

RASCHIG SUPER-RINGS® No. 2
Column diameter: 0.288 m
Packing height: 2.0 m
Liquid hold-up in columns with metal RASCHIG SUPER-RINGS® system: air/water

**RASCHIG SUPER-RINGS® No. 0.3**

Column diameter: 0.288 m
Packing height: 1.0 m

**RASCHIG SUPER-RINGS® No. 0.5**

Column diameter: 0.288 m
Packing height: 1.0 m
Liquid hold-up in columns with metal RASCHIG SUPER-RINGS® system: air/water

RASCHIG SUPER-RINGS® No. 0.7
Column diameter: 0.288 m
Packing height: 2.0 m

RASCHIG SUPER-RINGS® No. 1
Column diameter: 0.288 m
Packing height: 2.0 m
Liquid hold-up in columns with metal
RASCHIG SUPER-RINGS®
system: air/water

**RASCHIG SUPER-RINGS® No. 1.5**
Column diameter: 0.288 m
Packing height: 2.0 m

**RASCHIG SUPER-RINGS® No. 2**
Column diameter: 0.288 m
Packing height: 2.0 m

*Graphs showing liquid hold-up in m³/m³ versus gas capacity factor F_v in Pa^{1/2} for different liquid load values.*
Liquid hold-up in columns with metal RASCHIG SUPER-RINGS® system: air/water

RASCHIG SUPER-RINGS® No. 3
Column diameter: 0.288 m
Packing height: 2.0 m

Raschig Super-Ring Nr. 3 made of metal

RASCHIG SUPER-RINGS® No. 2
Column diameter: 0.288 m
Packing height: 2.0 m

Raschig Super-Ring No. 2 made of plastic

Liquid hold-up $h_L$ in m$^3$/m$^3$

Liquid load $u_L$ in (m$^3$/m$^2$h)

Gas capacity factor $F_v$ in Pa$^{1/2}$

Gas capacity factor $F_v$ in Pa$^{1/2}$
Other product bulletins from Raschig USA, Inc.:

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| 200 Metal Random – RSR | 625 Plastic Random – RSR |
| 300 Mist Eliminators – Wire Mesh | 650 Plastic Random – LPR |
| 400 Fractionation Trays and Hardware | 675 Plastic Random – Nor Pak |
| 450 High Capacity – Nye Trays | 700 Plastic Random – Rings and Saddles |
| 475 High Capacity – CoFlo Trays | 800 Ceramic Random Packing |
| 500 Metal Structured Packing – RSR | 900 Winsorp Software |
| 525 Metal Structured Packing – MaxPak | 1000 Process Information |
| 550 Plastic Structured Packing – RSP | 1100 Column Internals |
|  | 1200 Reactor Internals |

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