**DOWEX™ MONOSPHERE™ MR-3 UPW**  
A Separable Uniform Particle Size Mixed Bed Ion Exchange Resin for Ultrapure Water Production

<table>
<thead>
<tr>
<th>Product</th>
<th>Resin ratio</th>
<th>Matrix</th>
<th>Functional group</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWEX™ MONOSPHERE™ MR-3 UPW</td>
<td>Note*</td>
<td>Styrene-DVB, gel</td>
<td>Sulfonic acid and quaternary ammonium</td>
</tr>
</tbody>
</table>

### Guaranteed Sales Specifications

<table>
<thead>
<tr>
<th></th>
<th>H+ form</th>
<th>OH- form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total exchange capacity, min.</td>
<td>1.9</td>
<td>1.0</td>
</tr>
<tr>
<td>kgr/ft³ as CaCO³</td>
<td>41.5</td>
<td>21.9</td>
</tr>
<tr>
<td>Water content</td>
<td>% 46 - 51</td>
<td>55 - 65</td>
</tr>
<tr>
<td>Bead size distribution†</td>
<td>µm 650 ± 50</td>
<td>590 ± 50</td>
</tr>
<tr>
<td>Uniformity coefficient, max.</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Whole uncracked beads, min.</td>
<td>% 95</td>
<td>95</td>
</tr>
<tr>
<td>Crush strength</td>
<td>g/bead 500</td>
<td>350</td>
</tr>
<tr>
<td>&gt; 200 g/bead, min.</td>
<td>% 95</td>
<td>95</td>
</tr>
</tbody>
</table>

### Typical Physical and Chemical Properties

<table>
<thead>
<tr>
<th></th>
<th>H+ form</th>
<th>OH- form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle density</td>
<td>g/mL 1.22</td>
<td>1.08</td>
</tr>
<tr>
<td>Shipping weight**</td>
<td>g/L 689</td>
<td>lbs/ft³ 43</td>
</tr>
</tbody>
</table>

### Recommended Operating Conditions
- Maximum operating temperature: 60°C (140°F)
- Resin bed depth, min.: 800 mm (2.6 ft)
- Flow rates:  
  - Service: 10 - 60 m/h (4 - 24 gpm/ft²)  
  - Pressure drop: see Figure 1

### UPW Mixed Resin Specific Properties
- Cationic resin conversion to H: 99.9% min.
- Anionic resin conversion to:  
  - OH: 95% min.  
  - CO³: 5% max.  
  - Cl: 0.1% max.
- Rinse characteristics:  
  - UPW grade resins are rinsed with +17.5 Megaohm.cm water to meet stringent ionic and organic residuals  
  - Ionic conductivity rinse down to 0.055 μS/cm (see Figure 2)  
  - TOC rinse down to 2 ppb (+) (see Figure 2)  

**Note**: Resin ratio of anion to cation is volumetrically optimized to achieve maximum removal of boron and silica.

† For additional particle size information, please refer to Particle Size Distribution Cross Reference Chart (Form No. 177-01775).

(+): delta TOC ppb measured in/out

**As per the backwashed and settled density of the resin, determined by ASTM D-2187.**
**Typical Properties and Applications**

DOWEX™ MONOSPHERE™ MR-3 UPW grade resin is recommended as a working or polishing mixed bed to complement two bed ion exchange or reverse osmosis systems. It can be used as a regenerable mixed bed since the color difference and particle size difference will allow a visually good separation to achieve optimal regeneration. Very low ionic load to a regenerable mixed bed can occasionally lead to clumping, especially when the mixed bed is operated to a boron or silica break. An improvement in the manufacturing process of DOWEX MONOSPHERE 550A UPW grade will eliminate cation/anion clumping under normal regeneration conditions.

The UPW grade is characterized by the high conversion to ionic sites (95.0% min.) and a volumetric ratio that allows a higher exchange of boron and silica. As shown in Figure 2, the excellent rinse characteristics also allow a very efficient on-line operation.

**Figure 1. Pressure Drop Data**

Temperature = 20°C (68°F)

![Pressure Drop Data Graph](image1)

For other temperatures use:

\[ P_T = P_{20°C} / \left( 0.025 T_{20} + 0.48 \right), \]  where \( P = \text{bar/m} \)

\[ P_T = P_{20°F} / \left( 0.014 T_{20} + 0.05 \right), \]  where \( P = \text{psig/ft} \)

**Figure 2. Conductivity and TOC Rinsedown Curves**

![Conductivity and TOC Rinsedown Curves](image2)

DOWEX™ Ion Exchange Resins

For more information about DOWEX resins, call the Dow Water Solutions business:

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Japan: +813 5460 2100
China: +86 21 2301 9000
http://www.dowwatersolutions.com

Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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