# DOWEX™ MONOSPHERE™ MR-450 UPW

A Non-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-450 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>eq/L</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>kg/ft³</td>
<td>41.5</td>
</tr>
<tr>
<td>Water content</td>
<td>%</td>
<td>46 - 53</td>
</tr>
<tr>
<td>Bead size distribution†</td>
<td>μm</td>
<td>360 ± 50</td>
</tr>
<tr>
<td>Uniformity coefficient, max.</td>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td>Whole uncracked beads, min.</td>
<td>%</td>
<td>95</td>
</tr>
<tr>
<td>Crush strength</td>
<td>g/bead</td>
<td>350</td>
</tr>
<tr>
<td>&gt; 200 g/bead, min.</td>
<td>%</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</td>
<td>1.22</td>
</tr>
<tr>
<td>Shipping weight**</td>
<td>g/L</td>
<td>704</td>
</tr>
<tr>
<td></td>
<td>lbs/ft³</td>
<td>44</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: 99.7% min.
- Anionic resin conversion to:
  - OH: 95% min.
  - CO₃: 5% max.
  - Cl: 0.1% max.
- Rinse characteristics:
  - UPW grade resins are rinsed to meet stringent ionic and organic residuals
  - Ionic conductivity rinse down to 0.055 μS/cm (see Figure 2): 2 bed volumes
  - TOC rinse down to 4 ppb (+): 45 bed volumes

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

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

(+): delta TOC ppb measured inlet.

**: As per the backwashed and settled density of the resin, determined by ASTM D-2187.
DOWEX™ MONOSPHERE™ MR-450 UPW grade resin is a non-separable homogeneous mixed bed resin. It is recommended as a point of use or non-regenerable mixed bed in the polishing loop to achieve sub ppb levels of soluble silica, boron, sodium, potassium, sulfate, chloride, zinc, iron and aluminum. This non-regenerable mixed bed resin is used for two to three years before replacement. The UPW grade product is characterized by the very high conversion to ionic sites (95.0% min.), excellent rinse profiles for conductivity and (delta) TOC and superior crush strength. This homogeneous mixed bed contains 360 micron cation and a 590 micron anion (mean particle size) thus providing efficient kinetics to achieve a higher operating capacity.

**Figure 1. Pressure Drop Data**

![Pressure Drop Data Graph]

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

![Conductivity and TOC Rinsedown Curves Graph]

For other temperatures use:

\[ P_T = \frac{P_{20^\circ C}}{(0.026 T_{\circ C} + 0.48)} \] where \( P \) = bar/m

\[ P_T = \frac{P_{68^\circ F}}{(0.014 T_{\circ F} + 0.05)} \] where \( P \) = psi/ft

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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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