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

Product	Resin ratio	Matrix	Functional group
DOWEX™ MONOSPHERE™ MR-3 UPW	Note*	Styrene-DVB, gel	Sulfonic acid and quaternary ammonium

Guaranteed Sales Specifications		H <sup>+</sup> form	OH form
Total exchange capacity, min.	eq/L kgr/ft <sup>3</sup> as CaCO <sub>3</sub>	1.9 41.5	1.0 21.9
Water content	%	46 - 51	55 - 65
Bead size distribution <sup>†</sup>			
Mean particle size	µm	650 ± 50	590 ± 50
Uniformity coefficient, max.		1.1	1.1
Whole uncracked beads, min.	%	95	95
Crush strength			
Average, min.	g/bead	500	350
> 200 g/bead, min.	%	95	95

Typical Physical and Chemical Properties		H <sup>+</sup> form	OH form
Particle density	g/mL	1.22	1.08
Shipping weight**	g/L lbs/ft <sup>3</sup>		689 43

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/ft <sup>2</sup> )
	• 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.
	CO <sub>3</sub>	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)	1 bed volume	
– TOC rinse down to 2 ppb (+) (see Figure 2)	50 bed volumes	

Note\* Resin ratio of anion to cation is volumetrically optimized to achieve maximum removal of boron and silica.  
<sup>†</sup> 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

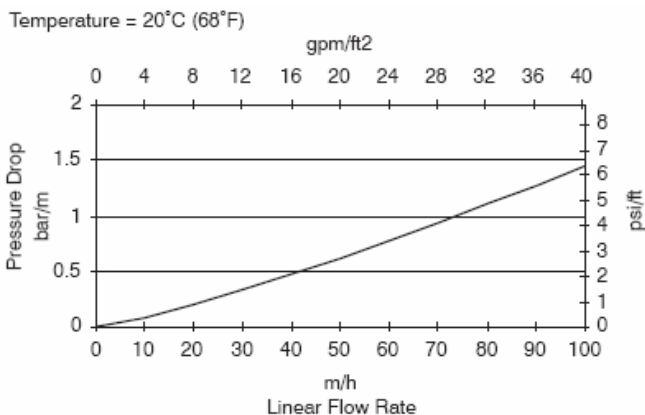
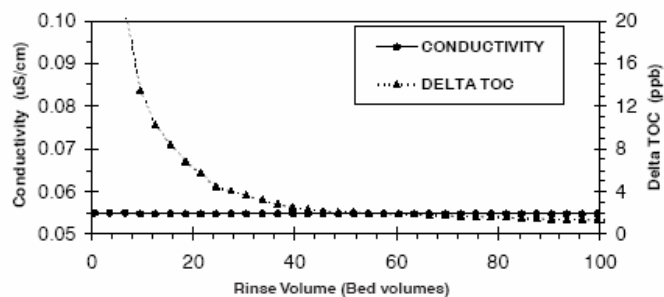


Figure 2. Conductivity and TOC Rinsedown Curves



### For other temperatures use:

$$P_T = P_{20^\circ\text{C}} / (0.026 T_{\text{°C}} + 0.48), \text{ where } P \equiv \text{bar/m}$$

$$P_T = P_{68^\circ\text{F}} / (0.014 T_{\text{°F}} + 0.05), \text{ where } P \equiv \text{psi/ft}$$

### DOWEX™ Ion Exchange Resins

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

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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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