

# TRISEP® & NADIR®

## Membrane Products

MANN+HUMMEL Water & Fluid Solutions offers a full line of reverse osmosis (RO), nanofiltration (NF), ultrafiltration (UF) and microfiltration (MF) membranes for rolling spiral wound membrane elements and for use in plate & frame devices. TRISEP® and NADIR® membranes are used in a wide variety of process separations in addition to water purification. A general description of these membranes is presented below.

### REVERSE OSMOSIS (RO)

**TRISEP® X-20™ Low Fouling RO:** X-20 membrane's proprietary polyamide-urea formulation results in low fouling characteristics. The unique barrier layer chemistry does not degrade over time like competitive "fouling resistant" membranes that are often standard membranes treated with a surface coating. Excellent for wastewater and other high fouling applications, the X-20 membrane is extremely durable and offers consistent high salt rejection while lowering cleaning frequency and extending membrane life.

**TRISEP® ACM2 High Rejection Brackish Water RO:** ACM2 is a standard brackish water RO membrane, offering high rejection and durability. ACM2 membrane is suitable for water purification and process applications where high solute rejection is required.

**TRISEP® ACM3 Low Energy Brackish Water RO:** ACM3 is a brackish water RO membrane that offers high solute rejection at moderately lower pressure.

**TRISEP® ACM4 Low Energy Brackish Water RO:** ACM4 is a low energy brackish water RO membrane which offers high rejection at lower operating pressures to reduce operating expenses.

**TRISEP® SB20 Cellulose Acetate RO:** SB20 is a cellulose acetate / triacetate blend membrane and has a nominal salt rejection of 98% and can tolerate continuous free chlorine at up to 1.0 ppm. SB20 is not available in flat sheet but is available in a number of strong and durable spiral-wound element designs.

**TRISEP® SB50 Cellulose Acetate RO:** SB50 is a cellulose acetate / triacetate blend with a nominal solute rejection of 95% NaCl and greater than 99% for MgSO<sub>4</sub> and sucrose. SB50 membrane can tolerate continuous free chlorine at up to 1.0 ppm and offers 20% higher flux than SB20 membrane.

### NANOFILTRATION (NF)

**TRISEP® TS80:** TS80 is a semi-aromatic polyamide NF membrane with a nominal monovalent ion rejection of 80 – 90% and >99% divalent ion rejection. It is a versatile membrane that offers high solute rejection of both salts and uncharged organic solutes while operating at lower pressure than reverse osmosis membranes. In many water purification applications, TS80 is considered a "softening" membrane and operates at a feed pressure of about 7 bar (100 psi).

**TRISEP® TS40:** TS40 is a piperazine NF membrane with a molecular weight cut-off (MWCO) in the 200 – 300 Dalton range. Its nominal solute rejection is 40 – 60% NaCl, depending on feed concentration, and greater than 99% for MgSO<sub>4</sub> and sucrose. TS40 is primarily used in food & dairy and other process applications.

**TRISEP® TS50:** TS50 is a piperazine NF membrane that is designed to reject organics with a MWCO above 300 Daltons while passing monovalent ions. It is often used in food & dairy processes, desalting, purification, and other separations.

**TRISEP® XN45:** XN45 is a piperazine NF membrane that has a high rejection of divalent ions while allowing the great majority of monovalent ions to pass through the membrane. Its nominal solute rejection is 10 – 30% NaCl and 94 – 98% for MgSO<sub>4</sub>. With a

MWCO in the range of 300 – 500 Daltons, XN45 is ideal for demineralization of organic solutes and has the versatility to be used in process streams as well as lower pressure water purification.

**TRISEP® UA60:** UA60 is a piperazine, thin-film composite membrane with a similar chemistry to XN45. It has been considered both a “tight” UF membrane as well as an “open” or “loose” NF membrane. UA60 has a MWCO in the 1,000 Dalton range and has limited monovalent salt rejection. Its MgSO<sub>4</sub> rejection is nominally 80%. This product is frequently used in process applications requiring a tight UF membrane or open NF membrane.

**TRISEP® SB90:** SB90 is a cellulose acetate / triacetate blend NF membrane that delivers an excellent combination of solute rejection, fouling resistance and chlorine tolerance. SB90 has a nominal solute rejection of 85% NaCl and >97% MgSO<sub>4</sub> and can tolerate continuous free chlorine at up to 1.0 ppm and operates at about half the pressure (200 psi) of cellulose acetate RO membranes. This high flow cellulose acetate NF membrane is used primarily in beverage applications where free chlorine is used to maintain a sanitary environment.

**TRISEP® SBNF:** SBNF is a cellulose acetate membrane with a nominal MWCO of 2,000 Daltons and can tolerate continuous free chlorine up to 1.0 ppm. SBNF was developed specifically for customers treating surface waters in Northern Europe and is well-suited for removal of organics and color.

**NADIR® NP030:** NP030 is a polyethersulfone (PES) membrane that exhibits NF characteristics when exposed to high pressure. Its stabilized MWCO and nominal solute rejection is in the range of 500-600 Daltons (Da) and 80-95% Na<sub>2</sub>SO<sub>4</sub> after operation at 40 bar (580 psi). NP030 membrane is durable enough to be used in concentrated acid environments and caustic recovery systems with a pH range of 0-14.

**NADIR® NP010:** NP010 is a PES membrane that exhibits NF characteristics when exposed to high pressure. With a stabilized MWCO in the range of 1,000-1,200 Daltons after operation at 40 bar (580 psi) and solute rejection of 35 – 75% Na<sub>2</sub>SO<sub>4</sub>, NP010 is a membrane that is stable in acid and caustic solutions.

## ULTRAFILTRATION (UF)

**TRISEP® UF5:** With a nominal MWCO of 5,000 Daltons, UF5 is a polyethersulfone (PES) membrane that is suited for process separations, particularly applications involving protein concentration to high solids levels. In these applications, a tighter UF membrane is often used to maximize product yield.

**TRISEP® UF10:** UF10 is a 10K MWCO PES UF membrane developed for use in food, dairy and process applications. Combined with MANN+HUMMEL Water & Fluid Solutions’ sanitary TurboClean® outer shell, these membranes are ideal for milk and whey protein concentration. UF10 is also used in pharmaceutical process streams and purification of water for dialysis.

**TRISEP® UE50:** UE50 membrane is a PES UF membrane with a MWCO of 100,000 Daltons used for both water and process applications.

**TRISEP® UB50:** UB50 is a PES UF membrane with a nominal pore size of 0.03 microns. This membrane is used in SpiraSep™ and iSep™ modules and is used in applications including industrial wastewater and tertiary wastewater.

**TRISEP® UB70:** UB70 is a polyvinylidene fluoride (PVDF) membrane with a nominal pore size of 0.03 microns. This membrane is used in SpiraSep™ and iSep™ modules and is used in applications including produced water, MBR peak flow management, industrial wastewater, tertiary wastewater, phosphorous removal, and food & dairy wastewater.

**NADIR® UH004:** UH004 is a polyethersulfone (PES) membrane with a nominal MWCO of 4,000 Daltons. It is suited for process separations, particularly applications involving protein concentration, as well as water purification.

**NADIR® UP005:** UP005 is a PES membrane with a nominal 5,000 Daltons MWCO, offering the highest protein rejection in the industry. When combined with UP005 membrane, TurboClean® UF elements feature the highest protein rejecting membrane with the best sanitary element configuration on the market.

**NADIR® UP010:** UP010 is a PES membrane with a nominal MWCO of 10K Daltons. This UF membrane is used in many different applications ranging from food and dairy process applications to industrial water purification.

**NADIR® UP020:** UP020 is a 20K Daltons MWCO PES UF membrane used in many different applications ranging from food and dairy processes to industrial water purification.

**NADIR® UH030:** UH030 is a PES UF membrane with a nominal MWCO of 30K Daltons. UH030 is used in a wide variety of element designs for process separations and water purification.

**NADIR® UH050:** UH050 is a PES UF membrane with a nominal MWCO of 50K Daltons and is suited for food, dairy and process separations as well as water purification applications.

**NADIR® UP150:** UP150 is a PES UF membrane with a MWCO of 150K Daltons. UP150 membrane is commonly used in the removal of macromolecules or concentration of large organic solutes in both water and process applications and can be used for membrane bioreactor (MBR) applications.

**NADIR® UV150:** UV150 is a PVDF membrane with a nominal MWCO of 150K Daltons. It is used in e-coat applications to reduce wastewater, allow for paint recovery, and reduce chemical and discharge costs.

**NADIR® UC500:** UC500 is a regenerated cellulose (RC) UF membrane with a nominal MWCO of 500K Daltons. This membrane is commonly used in environmental, metal, paint, paper, and pharmaceutical applications.

### MICROFILTRATION (MF)

**NADIR® MP005:** MP005 is a PES MF membrane with a pore size of 0.05 micron. This high-flux membrane is often used to remove macromolecules and concentrate large organic solutes.

**NADIR® MV020:** MV020 is a PVDF MF membrane with a pore size of 0.20 micron. This membrane is used to remove macromolecules and concentrate large organic solutes.

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