Water Softener

Water softening is the removal of calcium, magnesium, and certain other metal cations which exist in hard water. Use of soft water extends the lifetime of pipes and fittings by reducing or eliminating scale build-up. Water softening is usually achieved using lime softening or ion-exchange resins .
When water is referred to as 'hard' this simply means, that it contains more minerals especially calcium and magnesium than ordinary water.
The degree of water hardness increases, when more calcium and magnesium dissolve.
Magnesium and calcium are positively charged ions. Because of their presence, other positively charged ions will dissolve less easily in hard water compared to water that does not contain calcium and magnesium.
PACKMAN'S Water softeners are specific ion exchangers that are designed to remove ions, which are positively charged. Softeners mainly remove calcium ($Ca2+$) and magnesium ($Mg2+$) ions. Calcium and magnesium are often referred to as 'hardness ions'. Softeners are sometimes even applied to remove iron. The softening devices are able to remove up to five milligrams per liter (5 mg/L) of dissolved iron. Softeners can operate automaticly, semi-automaticly, or manually. Each type is rated based on the amount of hardness it can remove before regeneration is necessary. A water softener collects hardness minerals it's conditioning tank and from time to time flushes them away to drain. When an ion exchanger is applied for water softening, it will replace the calcium and magnesium ions in the water with other ions, for instance sodium or potassium. These ions are added to the ion exchanger's reservoir as sodium and potassium salts (NaCl and KCl).
After a period of time, the resin beads become coated with minerals and must be cleaned or "recharged" to become effective again. The water softener's timer and/or controls automatically run the appliance through cycles to backwash, recharge, and rinse the beads. A control that is designed to recharge based on the amount of processed water is better than a timer that cycles the water on a scheduled basis because it operates based on need, not time. The result is savings in energy, salt, and water.
During a backwash cycle, the flow of water is reversed so that water is forced down the riser tube to the bottom of the tank so that it will flow up through the

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resin beads in the tank. The unit flushes and expands the resin, washing off the beads and then carrying the minerals out through a drainpipe. A “brine tank” is paired with the mineral tank to help with the regeneration process. During the “brine draw” cycle, salty water (brine) is pumped from the brine tank into the resin tank. As the water flows down through the resin beads, it exchanges sodium with the hard-water ions, regenerating the electrical attraction of the resin beads. Then, when the brine tank is empty, a slow rinse begins, followed by a more forceful fast rinse. With both of these cycles, fresh water rinses excess brine from the resin and expels it down the drain. Then the brine tank is refilled.

PACKMAN’S Water Softener’s Properties

PACKMAN’S Water Softeners are made of steel plate of ST37 grade (recommended for the manufacturing of pressure vessels with no direct fire contact). In case of customer’s request, the filters can be made of 17MN4 (suitable for boiler construction) without any change in product’s price. The Water Softeners are vertical cylinders in different capacities and two types of single and double systems.
The installed geyser on top of the water softeners, uniforms the water flow and balanus the water pass through out the filter.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in the construction of water softener tanks.

Torispherical / Elliptical Head

PACKMAN’S water softener tank’s head are Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. In addition, the heads are welded internally and externally, which increases their life & strength. In

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the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method with EW7018 electrodes in used in the cover pass.

Nozzles

The nozzles used in PACKMAN'S water softeners are all made of brass, and for each square meter of resins, surface, about 50 nozzles are placed, which makes the optimum washing procedure possible.

Silica and Resin of water softener

PACKMAN'S water softener's resin is the PUROLITE with a high ion exchange rate coefficient and a high quality silica with a purity of 98% which is used at the bottom of the tank.

Product Capacity Calculation & Selection:

water Softener Capacity (Grain):

$$\frac{\text{(Flow Rate (Gpm)} \times 60 \times \text{Washing cycle (hr)} \times \text{Water Hardness (ppm)}}{17.1}$$

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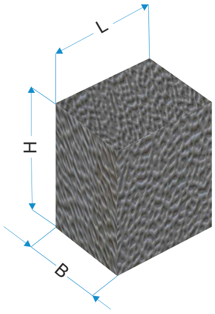

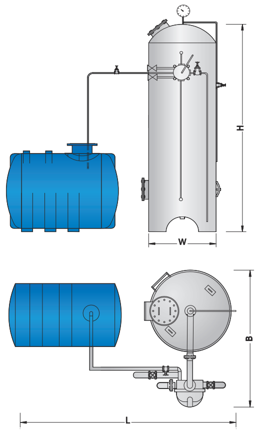

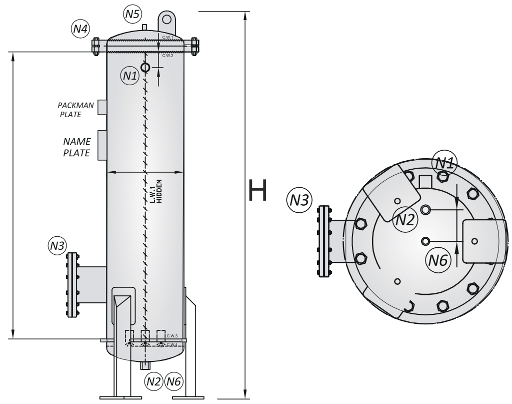

MODEL			PWS -3	PWS-6	PWS-9	PWS-12	PWS-15	PWS-18	PWS-21	PWS-24	PWS-30	PWS-36	PWS-45
SPECIFICATIONS													
CAPACITY (Grain)			30,000	60,000	90,000	120,000	150,000	180,000	210,000	240,000	300,000	360,000	450,000
Vessel Diameter (D) (mm)			270	270	300	400	450	500	500	550	600	600	650
(N1,N2) Inlet/Outlet Size (in.)			3/4”	3/4”	3/4”	1”	1”	1,1/2”	1,1/2”	1,1/2”	1,1/2”	1,1/2”	2”
Flow Date	Service Flow Rates	average (gpm)	2.7	5.3	8.1	10.6	13.3	15.9	18.6	21.2	26.5	31.8	39.8
		Maximum (gpm)	4.4	8.8	13.3	17.7	22.1	26.5	30.9	35.3	44.2	53.1	66.3
	Regeneration (NaCl Injection)	Brine Flow Rate (gpm)	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.5	4.4	5.3	6.6
		Min.Req. Duration (min.)	22	22	22	22	22	22	22	22	22	22	22
	Resin	Flow Rate (gpm)	1.6	3.2	4.8	6.4	8.1	9.5	11.1	12.7	15.9	19.1	23.9
		Min.Req. Duration (min.)	17	17	17	17	17	17	17	17	17	17	17
Resin		Bed Height (mm)	440	870	1060	800	790	760	890	840	890	1060	1130
		Volume(lit)	25	50	75	100	125	150	175	200	250	300	375
Silica Sand		Bed Height (mm)	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x100	3x100
		Weight (Kg)	21	21	24	45	54	69	69	81	99	138	165
Brine (10% NaCl Solu-tion)		Nacl (Kg)	4	8	11	15	19	23	26	30	38	45	56
		Water (lit)	34	68	101	135	169	203	236	270	338	405	506
		Tank Volume(lit)	70	100	220	220	220	300	300	350	500	600	600
General Dimention	(H) Total Height (mm)		1,350	1,900	2,150	1,850	1,850	1,850	2,000	1,950	2,050	2,250	2,450
	Occupied Space (mm x mm)		560 x 450	560 x 450	580 x 500	790 x 650	830 x 700	880 x 740	880 x 740	960 x 790	950 x 780	950 x 780	1300 x 890
Total Pressure Drop (kPa)			8.2	31.2	44.3	26.7	25.5	23.8	32.8	29.8	32.3	47.8	53.8

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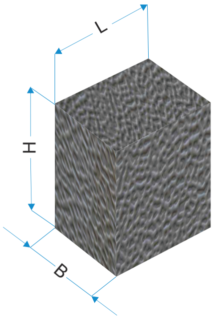

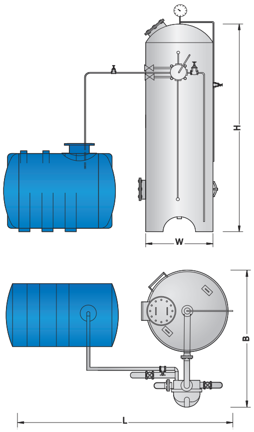

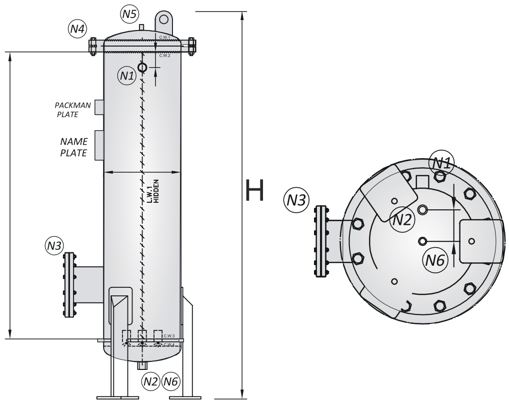

MODEL			PWS -54	PWS-75	PWS-96	PWS-120	PWS-150	PWS-180	PWS-200	PWS-220	PWS-250	PWS-300	PWS-360
SPECIFICATIONS													
Capacity (Grain)			540,000	750,000	960	1,200,000	1,500,000	1,800,000	2,000,000	2,200,000	2,500,000	3,000,000	3,600,000
Vessel Diameter (D) (mm)			750	800	900	1000	1150	1250	1300	1350	1400	1500	1600
(N1,N2) Inlet/Outlet Size (in.)			2”	2”	2”	2,1/2”	4”	4”	4”	4”	4”	4”	4”
Flow Date	Service Flow Rates	average (gpm)	47.7	66.3	84.8	106.1	132.5	159.2	177.6	193.5	220.8	265.1	318.2
		Maximum (gpm)	79.5	110.4	141.3	176.7	220.8	265.1	295.9	322.4	368.1	441.7	530.1
	Regeneration (NaCl Injection)	Brine Flow Rate (gpm)	8.1	11.1	14.1	17.7	22.1	26.5	29.6	32.2	36.8	44.2	53.1
		Min.Req. Duration (min.)	22	22	22	22	22	22	22	22	22	22	22
	Resin	Flow Rate (gpm)	28.6	39.8	50.9	63.6	79.5	95.4	106.5	116.1	132.5	159.1	190.8
		Min.Req. Duration (min.)	17	17	17	17	17	17	17	17	17	17	17
Resin		Bed Height (mm)	1020	1240	1260	1270	1200	1220	1260	1280	1350	1420	1490
		Volume (lit)	450	625	800	1000	1250	1500	1675	1825	2075	2500	3000
Silica Sand		Bed Height (mm)	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100
		Weight (Kg)	219	249	315	390	513	606	657	708	762	876	995
Brine (10% NaCl Solution)		Nacl (Kg)	68	94	120	150	188	225	251	274	313	375	450
		Water (lit)	608	844	1080	1350	1688	2025	2261	2464	2813	3375	4050
		Tank Volume(lit)	800	1000	1500	1700	2000	3000	3000	3000	3300	4200	5000
General Dimention	(H) Total Height (mm)		2400	2650	2750	2800	2800	2950	3050	3050	3150	3300	3450
	Occupied Space (mm x mm)		1380 x 1000	1510 x 1060	1600 x 1150	1770 x 1240	1900 x 1360	2230 x 1470	2280 x 1500	2330 x 1560	2380 x 1610	2480 x 1710	2580 x 1810
Total Pressure Drop (kPa)			43.9	65.3	67.0	67.5	60.8	62.3	66.3	68.6	76.5	83.2	92.7

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