# 001×7

## Strong Acid Cation Exchange Resins

001×7 resin is a gel-type strong acid cation exchange resin, which is obtained by introducing sulfonic acid groups on the polystyrene-divinylbenzene copolymer framework. The gel-like porous structure can meet the requirements of ion movement and exchange, while having good exclusion properties for large molecules. The strongly ionized sulfonic acid groups can facilitate the exchange and adsorption of relevant cations in the system under different pH environments of the feed liquid. The resin is easy to regenerate and can be used for multiple cycles.

## Scope of Application

001×7 resin is primarily used for the adsorption and removal of metal cations such as $Na^+$, $Ca^{2+}$, $Mg^{2+}$ in the system; for water softening, pure water production; for pH adjustment of the system; as well as for the exchange and adsorption of other positively charged substances in the feed liquid.

## Product Index

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| **Product Model** | 001×7 |
| **Physical Appearance** | Brownish yellow to brown opaque spherical particles |
| **Particle size (0.315–1.25 mm) (%)** | ≥95 |
| **Moisture content (%)** | 45–55 |
| **Shipping Weight (g/ml)** | 0.75–0.85 |
| **True Density (g/ml)** | 1.25–1.28 |
| **Mass exchange capacity (mmol/g)** | ≥4.5 |
| **Volume exchange capacity (mmol/ml)** | ≥1.8 |
| **Factory Ion form** | $Na^+$ |

## Method of Application

**1.**
**Resin Column Packing**
**(Using Wet Packing Method)**

**A Laboratory**

Measuring: Weigh out a certain amount of resin and mix it with deionized water in a beaker. Then pour the resin-water mixture into a graduated cylinder, allowing the resin to settle completely. By adding or removing water, adjust the resin bed level to align with the corresponding graduation mark on the cylinder, completing the resin measurement.

Packing: Close the outlet valve of the ion exchange column. Use water to transfer all the resin from the graduated cylinder into the ion exchange column. Then open the column outlet valve to allow the resin to settle and compact inside the column. Close the outlet valve again, leaving the liquid level 1–2 cm above the resin bed to avoid drying out the column.

**B Industrial Scale**

Before loading new resin into the ion exchange column, the relevant pipelines should be washed with clean water and alkaline solution to remove any welding residue, solid waste, dust, and other impurities attached to the column wall and pipe walls. Then, fill the column with 1/3 volume of water, take a small amount of resin, and load it into the column from the top manhole. Close the manhole, fill the column with water, and simultaneously open the discharge valve at the bottom of the column. Use a ≥80 mesh screen at the discharge outlet to intercept any resin leakage. Observation of a few individual small particles is normal, but if a larger quantity of resin beads appears, it indicates a problem with the bottom filter plate. In this case, the resin and water should be drained out, and the filter plate welds and water cap should be inspected and repaired as needed. After the repairs are completed, repeat the testing process until it is confirmed to meet the requirements. Then, the remaining resin can be added to the ion exchange column.

After the resin has been loaded into the column, first perform a backwash with deionized water at a flow rate of 2–4 BV/h (bed volumes per hour) for approximately 1 hour. This allows the resin to settle naturally after the backwash. Then, perform a forward rinse with deionized water at a flow rate of 4–6 BV/h for around 1 hour. The backwash and forward rinse steps help to remove any impurities or fines that may have been introduced during the resin loading process, and also help to stabilize the resin bed.

**2.**
**Resin Pre-treatment**

First, treat the resin column with a 4% hydrochloric acid (HCl) solution at a flow rate of 1–2 bed volumes per hour (BV/h), with a total treatment volume of 3–4 BV. After the acid treatment, rinse the resin bed and column internals with deionized water to wash out any remaining acid, continuing the rinse until the outlet liquid pH is ≥4. Once the rinse is complete, maintain a liquid layer of at least 20–30 cm above the resin bed.

Then, treat the resin column with a 4% sodium hydroxide (NaOH) solution at a flow rate of 1–2 bed volumes per hour (BV/h), with a total treatment volume of 3–4 BV. After the alkaline treatment, rinse the resin bed and column internals with deionized water to wash out any remaining alkali, continuing the rinse until the outlet liquid pH is ≤10. Once the rinse is complete, maintain a liquid layer of at least 20–30 cm above the resin bed.
Finally, treat the resin column again with a 4% hydrochloric acid (HCl) solution at a flow rate of 1–2 bed volumes per hour (BV/h), with a total treatment volume of 3–4 BV. After the acid treatment, rinse the resin bed and column internals with deionized water to wash out any remaining acid, continuing the rinse until the outlet liquid pH is ≥4. Once the rinse is complete, maintain a liquid layer of at least 20–30 cm above the resin bed, and the resin is ready for use.

**3.**
**Resin Adsorption**

The feed solution must undergo necessary filtration pretreatment before being loaded onto the resin column, in order to remove any solid impurities that could clog the resin pores and affect the adsorption performance. The adsorption process is generally carried out using a forward flow through the column, with a recommended flow rate of 1–3 bed volumes per hour (BV/h). The adsorption status is determined by monitoring the target component concentration in the outlet solution.

**4.**
**Post-Adsorption Washing**

After the adsorption process is completed, the resin column is rinsed forward with deionized water at a flow rate of 1–2 bed volumes per hour (BV/h) for 1–2 hours. This rinse is performed to remove any residual feed solution and water-soluble impurities from the column.

**5.**
**Resin Elution and Regeneration**

After the rinse step, the resin can be eluted and regenerated by passing a 4–6% hydrochloric acid (HCl) or sulfuric acid ($H_2SO_4$) solution through the column at a flow rate of 1–2 bed volumes per hour (BV/h), with a total treatment volume of up to 3 BV. Alternatively, an 8–10% sodium chloride (NaCl) solution can be used for the elution and regeneration, also at a flow rate of 1–2 BV/h and a maximum volume of 3 BV.

**6.**
**Post-Elution Rinse**

After the elution and regeneration process, the resin column is rinsed forward with deionized water at a flow rate of 1–2 bed volumes per hour (BV/h) for 1–2 hours. This rinse is performed to remove any residual elution agent (acid or salt solution) from the column.

**7.**
**In-Depth Resin Regeneration**

After a period of operation, if the exchange capacity of the resin decreases, the following in-depth regeneration methods can be applied:

**(1) Alkaline Regeneration**

Passing a 4% sodium hydroxide (NaOH) solution through the resin column in the forward direction at a flow rate of 1–2 bed volumes per hour (BV/h) for approximately 1.5 hours. After the hot alkaline regeneration, rinse the resin with deionized water in the forward direction at a flow rate of 2–3 BV/h until the outlet pH is ≤10.

**(2) Acid Regeneration**

After the alkaline regeneration and water rinse, treat the resin with a 4% hydrochloric acid (HCl) solution in the forward direction at a flow rate of 1–2 BV/h for about 1.5 hours. Following the acid regeneration, rinse the resin with deionized water in the forward direction at a flow rate of 2–3 BV/h until the outlet pH is ≥5.

*Note: The above pretreatment and application methods for the resin are general guidelines, and may vary depending on the specific application and requirements. Consultation with professional technical personnel is recommended for any differences in the application methods and pretreatment procedures.*

## Attention

1. During use, avoid repeated loading and unloading of the resin as much as possible to prevent uneven resin bed layers that could lead to channeling.
2. For short-term shutdown, the resin should be regenerated, thoroughly rinsed, and kept submerged in clean water.
3. For long-term shutdown or during winter when the ambient temperature is below 5°C, the resin should be soaked in a 15% sodium chloride (NaCl) or 10% sodium hydroxide (NaOH) solution to prevent bacterial growth and freezing of the resin.
4. Before loading the feed solution, it must undergo necessary filtration treatment to remove any solid impurities and prevent clogging of the resin pores, which could affect the adsorption performance.

## Package & Storage

1. Maintain the integrity of the resin's inner and outer packaging to prevent contamination and dehydration of the resin.
2. Prevent the resin from freezing or overheating; the resin should be stored at room temperature and away from direct sunlight.
3. Avoid storing the resin together with substances that have an odor, are toxic, or have an oxidizing nature.