Technical Data

001×7 Strong Acid Cation Exchange Resin

PRODUCT DESCRIPTION

001×7 is a high capacity premium grade bead form conventional gel polystyrene sulphonate cation exchange resin designed for use in industrial or household water conditioning equipment. It removes the hardness ions, e.g. calcium and magnesium, replacing them with sodium ions. When the resin bed is exhausted and hardness ions begin to break through, capacity is restored by regeneration with common salt.

The capacity obtained depends largely on the amount of salt used in the regeneration. **001×7** is also capable of removing dissolved iron, manganese, and also suspended matter by virtue of the filtering action of the bed.

Typical Physical & Chemical Characteristics

Polymer Matrix Structure	Crosslinked Polystyrene Divinylbenzene
Physical Form and Appearance	Clear spherical beads
Whole Bead Count	95% min.
Functional Groups	$R\text{-}SO_3$
Ionic Form, as shipped	Na^+
Shipping Weight	770-870 g/l
Particle Size Range	0.315mm-1.25 mm≥95%
Moisture Retention, Na^+ form	45– 50%
Swelling $Na^+ \rightarrow H^+$	8% max.
$Ca^{2+} \rightarrow Na^+$	8% max.
Specific Gravity, moist Na^+ Form	1.25-1.29
Total Exchange Capacity, Na^+ form, wet, volumetric dry, weight	 1.8 eq/l min. 4.5 eq/kg min.
Operating Temperature, Na+ Form max.	150ºC
pH Range, Stability pH Range Operating, Na^+ cycle	0 - 14 6 - 10

Standard Operating Conditions

Operation	Rate	Solution	Minutes	Amount
Service	8 - 40 BV/h	Influent water	per design	per design
Backwash	5 - 12 m/h	Influent water 5º- 30ºC	5 - 20	1.5 - 4 BV
Regeneration	2 - 7 BV/h	8 - 20% NaOH	15 - 60	60- 320 g/l
Rinse, (slow)	2 - 7 BV/h	Influent water	30 approx.	2 - 4 BV
Rinse, (fast)	8 - 40 BV/h	Influent water	30 approx.	3 - 10BV
Backwash Expansion 50% to 75% Design Rising Space 100%				

OPERATING PERFORMANCE

The operating performance of **001×7** sodium cycle depends on:

a) The amount and concentration of regenerant used.

b) The total hardness of the water to be treated and its sodium content.

c) The flowrate of the influent water through the bed.

Performance is usually assessed in terms of residual hardness in the treated water (traditionally expressed as ppm of $CaCO_3$, where 1 ppm corresponds to a divalent cation concentration of 0.02 meq./l). In municipal water softening, low regeneration levels and high removal efficiency are usually required. Acceptable water quality is usually obtained by a split-stream operation in which a fully-softened stream is blended with the raw to give the final product. For industrial use, a suitable treated water, with less than 5 ppm of hardness, can be obtained with a level of 70 to 80 kg salt per cubic metre (4.5 to 5 lb/ft3) of resin. If the softening is being carried out in order to feed a conventional low pressure boiler, where the requirements are for less than 1 ppm of hardness, at least double this level of regenerant will be required.

Hardness leakage under the standard operating conditions is normally less than 1% of the total hardness of the influent water, and the working capacities are not significantly affected unless the raw water contains more than about 25% of its exchangeable cations as sodium (or other univalent) ions. In residential softening, residual hardness at these comparatively low levels is not usually required, and quite high flowrates are often in use with negligible effect on the operating capacity. It is worth remembering, however, that the most efficient use of regenerant can be achieved by using high concentrations of salt, and giving adequate contact time. The subsequent displacement of the spent regenerant from the bed should also be slow, but the final removal of excess salt should be carried out at normal service flow rates.

Both the operating capacity and the average leakage of hardness during the run may be calculated for a wide range of conditions. Refer to Figs. 3 through 6.

HYDRAULIC CHARACTERISTICS

The pressure drop (headloss) across a properly classified bed of ion-exchange resin depends on particle size distribution, bed depth, void volume of the exchanger, and on the flow rate and viscosity (and hence on the temperature) of the influent solution.

Anything affecting any of these parameters, for example the presence of particulate matter filtered out by the bed, abnormal compaction of the resin bed, or the incomplete classification of the resin will have an adverse effect, and result in an increased headloss. Typical values of pressure drop across a bed of **001×7** are given for a range of operating flow rates in Fig. 1.

Fig. 1 PRESSURE DROP VS FLOW RATE

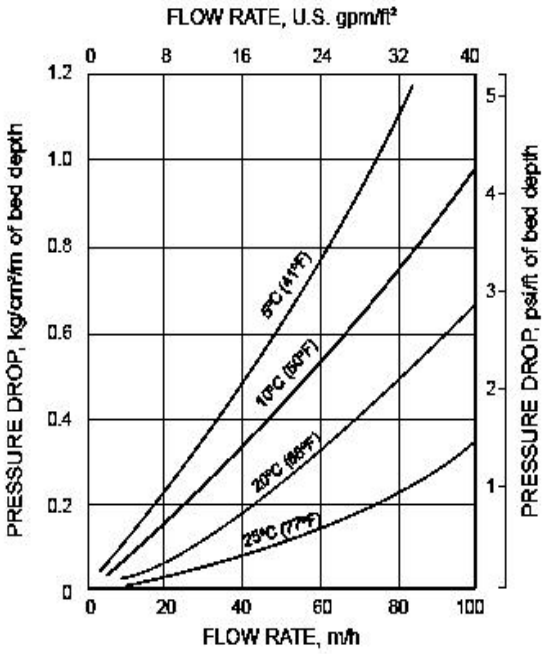
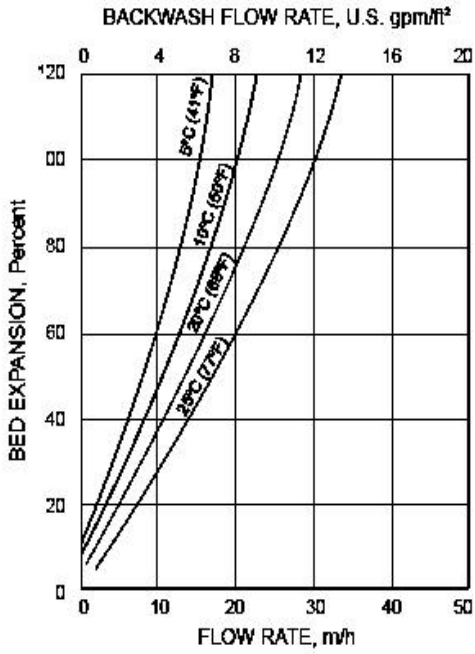


Fig. 2 BACKWASH EXPANSION



During upflow backwash, the resin bed should be expanded in volume by between 50 and 75%. The objective is to remove any particulate matter, to clear the bed of any air pockets or bubbles, and to reclassify the resin particles as much as possible so as to achieve minimum resistance to flow in subsequent operation. Backwash should be initiated gradually to avoid any initial surge and potential carryover of resin particles.

Bed expansion is a function of flow rate and temperature, as shown in Fig. 2. Care should always be taken to avoid loss by accidental over-expansion of the bed.

Conversion of Units

1 m/h (cubic meters per square meter per hour)	= 0.341 gpm/ft^2 = 0.409 U.S. gpm/ft^2
1 kg/cm^2 /m (kilograms per square cm per meter of bed)	= 4.33 psi/ft = 1.03 atmos/m = 10 ft H_2O/ft

CHEMICAL AND THERMAL STABILITY

001×7 is insoluble in dilute or moderately concentrated acids, alkalies, and in all common solvents. However, exposure to significant amounts of free chlorine, "hypochlorite" ions, or other strong oxidizing agents over long periods of time will eventually break down the crosslinking. This will tend to increase the moisture retention of the resin, decreasing its mechanical strength, as well as generating small

amounts of extractable breakdown products. The resin is thermally stable to 150ºC in the sodium form and to 120ºC in the hydrogen form.

SOFTENING CAPACITY CALCULATION

If the regeneration level, influent water analysis, and service flowrate are known, the capacity and leakage curves may be used directly to determine the operating capacity of the resin in the unit and the residual hardness in the treated water. A specific example of the application of these curves is given below:

INFLUENT WATER

Cation analysis in:	**ppm $CaCO_3$**	**meq/1**	**gr/U.S. gal**
Total hardness	400	8	23
Sodium (& univalents)	100	2	5.8
TDS (total dissolved solids)	500	10	28.8

TREATMENT

Regeneration with: 160 g/1 of NaCl
Service Flowrate: 25 m/h
Leakage endpoint: 5 ppm above permanent (kinetic) leakage figure.

CAPACITY is calculated as follows:

Fig.3→Base Operating Capacity, C_B, @ 160 g/l (10 lb/ft^3) NaCl = 1.45 eq/1

Fig.4→correction factor, C_1 for 25 m/h & TDS 500 = 0.96

Hence calculated Operating Capacity, CB x C_1 = 1.39 eq/1 .
After applying the conventional 90% "design factor" the value of 1.25 eq/1 may be quoted as a design operating capacity.

LEAKAGE is calculated as follows:

Fig.5→Base Leakage @ 160 g/l NaCl = 2.3 ppm $CaCO_3$

Fig.6→correction factor, K_1, for a TDS value of 500 = 1.1

Hence permanent (kinetic) leakage = 2.3 x 1.1 = 2.5 ppm $CaCO_3$

NOTES:

i) The curves given are in fact based on an endpoint leakage of 5 ppm over and above the observed kinetic leakage; operating capacities will differ somewhat if a different criterion is used.

ii) The curves given are applicable only to influent monovalent ion contents less than or equal to the hardness content; if the water to be treated is atypical in this or other parameters, please contact your local sales office for assistance.

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(SOFTENING)

Fig. 3 OPERATING CAPACITY, C_B

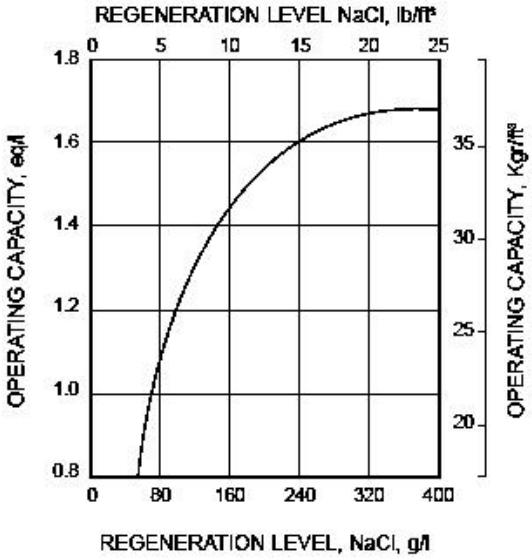


Fig. 4 EFFECT OF FLOW RATE & TDS ON OPERATING CAPACITY

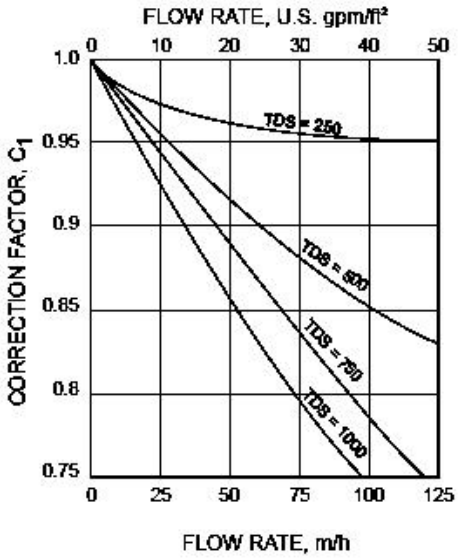


Fig. 5 HARDNESS LEAKAGE

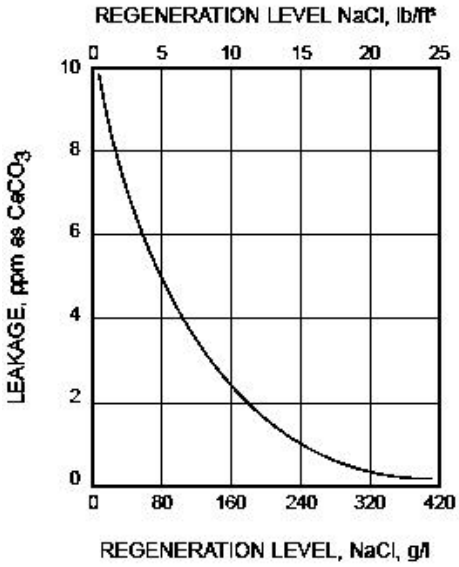
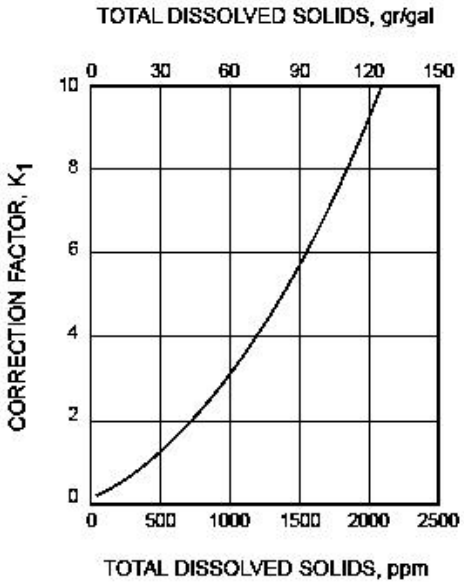


Fig. 6 CORRECTION FOR TDS



Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

001×7 Strong Acid Cation Exchange Resin

Supplier

Shengdong Technology Co., LTD.
No. 88 Zhuhu Road, Tianchang, Anhui Province, China 239300

For non-emergency information contact: 0086-550-7322555

Emergency telephone number

Spill Emergency	0086-550-7322555
Health Emergency	0086-550-7322555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	**CAS-No.**	**Concentration**
Sulfonated divinylbenzene/styrene copolymer, Na^+ ion form	63182-08-1	50.0 - 55.0%
Water	7732-18-5	45.0 - 50.0%

3. HAZARDS IDENTIFICATION

Emergency Overview
Appearance

Form	Beads
Colour	clear

Hazard Summary **CAUTION!**
MAY CAUSE EYE/SKIN IRRITATION

Potential Health Effects

Primary Routes of Entry:	Skin contact Eye contact

Eyes: Direct contact with material can cause the following:
slight irritation
Skin: Prolonged or repeated skin contact can cause the following:
slight irritation

4. FIRST AID MEASURES

Skin contact: Wash off with soap and water. If skin irritation persists, call a physician.
Eye contact: Rinse with plenty of water. If eye irritation persists, consult a specialist.

5. FIRE-FIGHTING MEASURES

Flash point	not applicable
Ignition temperature	500.0 °C
Lower explosion limit	not applicable
Upper explosion limit	not applicable

Suitable extinguishing media:
Use the following extinguishing media when fighting fires involving this material:
water spray
carbon dioxide (CO_2)
foam
dry chemical
Specific hazards during fire fighting: Toxic fumes are generated when material is exposed to fire or fire conditions. Cool closed containers exposed to fire with water spray.
Special protective equipment for fire-fighters: In the event of fire, wear self-contained breathing apparatus.
Further information: Remain upwind.
Avoid breathing smoke.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Appropriate protective equipment must be worn when handling a spill of this material. See SECTION 8, Exposure Controls/Personal Protection, for recommendations.
If exposed to material during clean-up operations, see SECTION 4, First Aid Measures, for actions to follow.
Methods for cleaning up
Keep spectators away.
Floor may be slippery; use care to avoid falling.
Transfer spilled material to suitable containers for recovery or disposal.

7. Handling and storage

Handling
NOTE: This product as supplied is a whole bead resin and may produce slight eye irritation. However, the ground form of this resin should be treated as a severe eye irritant. Worker exposure to ground resins can be controlled with local exhaust ventilation at the point of dust generation, or use of suitable personal protective

equipment (dust/mist air-purifying respirator and safety goggles). Avoid repeated freeze-thaw cycles; beads may fracture. If frozen, thaw at room temperature.

Storage

Further information:

CAUTION: Do not pack column with dry ion exchange resins. Dry beads expand when wetted; this expansion can cause glass column to shatter.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limit(s)

Exposure limits are listed below, if they exist.

Eye protection: Use safety glasses with side shields (ANSI Z87.1or approved equivalent).

Hand protection: Cotton or canvas gloves.

Respiratory protection: No personal respiratory protective equipment normally required.

Protective measures: Facilities storing or utilizing this material should be equipped with an eyewash facility.

Engineering measures: None required under normal operating conditions.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Beads
Colour	amber
pH	7.0 - 9.0Aqueous slurry
Boiling point/range	100 °C Water
Melting point/range	0 °C Water
Flash point	not applicable
Ignition temperature	500 °C
Lower explosion limit	not applicable
Upper explosion limit	not applicable
Vapour pressure	17.0 mmHg at20 °C Water
Relative vapour density	<1.0water
Water solubility	insoluble
Relative density	1.25 - 1.29
Viscosity, dynamic	not applicable
Evaporation rate	<1.00Water
Percent volatility	45 - 50 %

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Hazardous reactions	Stable under normal conditions.
Materials to avoid	Avoid contact with the following: Strong Oxidizers
Hazardous decomposition products	Thermal decomposition may yield the following:, monomer vapors,

11. TOXICOLOGICAL INFORMATION

No data are available for this material. The information shown is based on profiles of compositionally similar materials.

Acute oral toxicity	LD50rat >5,000 mg/kg
Acute dermal toxicity	LD50rabbit >5,000 mg/kg

12. ECOLOGICAL INFORMATION

Limited effects are expected from exposure of the environmental compartments by insoluble plastic beads of large diameter (300 to 1200 microns).

13. DISPOSAL CONSIDERATIONS

Disposal

Waste Classification: When a decision is made to discard this material as supplied, it does not meet RCRA's characteristic definition of ignitability, corrosivity, or reactivity, and is not listed in 40 CFR 261.33. The toxicity characteristic (TC), however, has not been evaluated by the Toxicity Characteristic Leaching Procedure (TCLP).

Unused material may be incinerated or landfilled in facilities meeting local, state, and federal regulations.

Contaminated packaging: Empty containers should be taken to local recyclers for disposal. Refer to applicable federal, state, and local regulations.

14. TRANSPORT INFORMATION

DOT

Not regulated for transport

IMO/IMDG

Not regulated (Not dangerous for transport)

Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations

15. REGULATORY INFORMATION

Workplace Classification

This product is considered non-hazardous under the OSHA Hazard Communication Standard (29CFR1910.1200).

This product is not a'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE III: Section 311/312 Categorizations (40CFR370): This product is not a hazardous chemical under 29CFR 1910.1200, and therefore is not covered by Title III of SARA.

SARA TITLE III: Section 313 Information (40CFR372)

This product does not contain a chemical which is listed in Section 313 at or above de minimis concentrations.

CERCLA Information(40CFR302.4)

Releases of this material to air, land, or water are not reportable to the National Response Center under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or to state and local emergency planning committees under the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304.

US. Toxic Substances Control Act (TSCA) All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

Pennsylvania

Any material listed as "Not Hazardous" in the CAS REG NO. column of SECTION 2, Composition/Information On Ingredients, of this MSDS is a trade secret under the provisions of the Pennsylvania Worker and Community Right-to-Know Act.

16. OTHER INFORMATION

Hazard Rating

	Health	**Fire**	**Reactivity**
HMIS	1	1	0

Legend

ACGIH	American Conference of Governmental Industrial Hygienists
BAc	Butyl acetate
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
STEL	Short Term Exposure Limit (STEL):
TLV	Threshold Limit Value
TWA	Time Weighted Average (TWA):
|	Bar denotes a revision from prior MSDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.