

Rev. CO065000

Packed Column  
for Ion Exchange Chromatography

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TSK-GEL® STAT Series

# INSTRUCTION MANUAL





**TOSOH CORPORATION**

## Safety Precautions

To help protect you and/or your property from potential damage, please read this manual thoroughly before using the product.

### [Notation Conventions]

Notation	Explanation
 <b>WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation which could result in injury.

### **WARNING**

#### ■ **Keep away from fire**

Not taking proper precautions when using flammable solvents could result in fire, explosion, or poisoning.

### **CAUTION**

#### ■ **Use only in well-ventilated areas**

In case of insufficient ventilation, flammable and toxic solvents can cause fire, explosion, or poisoning.

#### ■ **Do not spill solvents**

Spillage and leakage can cause fire, electric shock, poisoning, injury, and corrosion.

Wear appropriate protective gear when cleaning up a spill.

#### ■ **Wear protective eye gear and gloves**

Organic solvents and acids should not come in direct contact with the skin.

#### ■ **Handle the package with care**

Inappropriate handling may cause rupturing and/or splattering of the product.

#### ■ **Only use this product as intended**

This product is for separation and purification. Do not use for any other purpose.

#### ■ **Make sure compounds are safe**

Check that obtained compounds and solutions after separation and purification are safe.

#### ■ **Proper disposal**

Dispose in accordance with local laws and regulations.

### NOTE

Keep this manual with the product for future reference.

## Precautions: Shipping Solvent

First Aid	Skin exposure	<ul style="list-style-type: none"> <li>Wash exposed area with plenty of soap and water.</li> </ul>
	Eye exposure	<ul style="list-style-type: none"> <li>Open eyes as wide as possible and rinse with clean water for at least 15 minutes.</li> <li>Call for medical attention immediately.</li> </ul>
	Ingestion	<ul style="list-style-type: none"> <li>Wash the mouth with plenty of water and immediately call for medical attention.</li> </ul>
Handling and Storage	Container handling	<ul style="list-style-type: none"> <li>Container may break if not handled with care.</li> </ul>
	Wear appropriate protective equipment	<ul style="list-style-type: none"> <li>Use solvent-resistant gloves and protective eye gear when using this product.</li> </ul>
	Storage	<ul style="list-style-type: none"> <li>If the column is left at below 0 °C, shipping solvent may freeze and container may break.</li> </ul>

Shipping solvent: Ion-exchanged Water (Q-STAT, DNA-STAT, SP-STAT, CM-STAT)

## Precautions: Packing Material

First Aid	Skin exposure	<ul style="list-style-type: none"> <li>Wash exposed area with plenty of soap and water.</li> </ul>
	Eye exposure	<ul style="list-style-type: none"> <li>Open eyes as wide as possible and rinse with clean water for at least 15 minutes.</li> <li>Immediately call for medical attention.</li> </ul>
	Ingestion	<ul style="list-style-type: none"> <li>Rinse the mouth with plenty of water and call for medical attention immediately.</li> </ul>
Handling and Storage	Container handling	<ul style="list-style-type: none"> <li>Container may break if not handled with care.</li> </ul>
	Wear appropriate protective equipment	<ul style="list-style-type: none"> <li>Use solvent-resistant gloves and protective eye gear when using this product.</li> </ul>
Waste Disposal	Disposal methods	<ul style="list-style-type: none"> <li>This product can be incinerated or buried for easy disposal. See below for additional precautions.</li> </ul>
	General considerations	<ul style="list-style-type: none"> <li>Please pay attention to all safety precautions with respect to the handling and storage of this product.</li> </ul>
	Disposal precautions	<ul style="list-style-type: none"> <li>Dispose in accordance with local laws and regulations. This product can be incinerated safely.</li> <li>Assure that appropriate countermeasures are taken when incinerating anion exchange packing material since it contains ammonium functional group. Fumes produced during incineration may contain nitrogen oxides. These include the following TSK-GEL<sup>®</sup> products: Q-STAT, DNA-STAT</li> <li>Assure that appropriate countermeasures are taken when incinerating cation exchange packing material since it contains sulfonate functional group. Fumes produced during incineration may contain sulfur oxides. These include the following TSK-GEL<sup>®</sup> products: SP-STAT</li> </ul>

Packing material: Vinyl polymer

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## 1. Introduction

This INSTRUCTION MANUAL contains crucial information on how to care for and use these columns in a proper manner, so as to make the most effective use of their high performance capabilities.

Be sure to carefully read instructions in this manual prior to use of these columns.

## 2. Prior to Use

Be sure to inspect the packaging and the exterior of the column for any signs of damage prior to use. If any damages are evident, contact your local Tosoh sales representative at the address listed at the end of this manual.

Confirm the following documents are included in the package.

- |                       |        |
|-----------------------|--------|
| 1) INSTRUCTION MANUAL | 1 copy |
| 2) INSPECTION DATA    | 1 copy |

## 3. Column Specifications

Specification of TSKgel Q-STAT columns are shown as follows.

Part No.	21960	21961
Column Size mm(ID) × cm(L)	3.0 × 3.5	4.6 × 10
Particle size (μm)	10	7
Functional group	Quaternary ammonium	
Shipping solvent	Ion-exchanged water	

Specification of TSKgel DNA-STAT columns are shown as follows.

Part No.	21962
Column Size mm(ID) × cm(L)	4.6 × 10
Particle size (μm)	5
Functional group	Quaternary ammonium
Shipping solvent	Ion-exchanged water

Specification of TSKgel SP-STAT columns are shown as follows.

Part No.	21963	21964
Column Size mm(ID) × cm(L)	3.0 × 3.5	4.6 × 10
Particle size (μm)	10	7μ
Functional group	Sulfopropyl	
Shipping solvent	Ion-exchanged water	

Specification of TSKgel CM-STAT columns are shown as follows.

Part No.	21965	21966
Column Size mm(ID) × cm(L)	3.0 × 3.5	4.6 × 10
Particle size (μm)	10	7
Functional group	Carboxymethyl	
Shipping solvent	Ion-exchanged water	

## 4. Installation and Operation

### 4-1 Handling

Do not drop, bump, vibrate the column. Peak splitting or broadening may be caused by mutation of packing structure.

### 4-2 Installation

- 1) Connect the column to the tubing according to the direction of arrow shown on the tag attached to the column.
- 2) Use 1/16" tubing and handy connector (Part No. 16566) to connect the column.
- 3) Use the nuts (Part No. 06160, Package of 5 ) and ferrules (Part No. 16180, Package of 10 ), when stainless fittings are used.
- 4) Use the degassed eluent and HPLC system, when the column is attached to the HPLC system.
- 5) When solvent in column is replaced by distilled or ion-exchanged water, feed the solvent slowly under 0.5 mL/min (Q-STAT, SP-STAT, CM-STAT), 0.25 mL/min (DNA-STAT).

#### 4-3 Operation Condition

Grade	Column Size mm(ID)×cm(L)	Suitable Flow Rate (mL/min)	Maximum Pressure (MPa)
TSKgel Q-STAT	4.6×10	0.5~1.4	10
	3.0×3.5	1.0~2.0	10
TSKgel DNA-STAT	4.6×10	0.3~0.6	15
TSKgel SP-STAT	4.6×10	0.5~1.4	10
	3.0×3.5	1.0~2.0	10
TSKgel CM-STAT	4.6×10	0.5~1.4	10
	3.0×3.5	1.0~2.0	10

pH range: 3.0 ~10.0

Temperature range: 10 ~60 °C

Organic solvents : concentration range of organic modifiers : below 50 %

#### 4-4 Removing

After making sure the column reached to the room temperature, stop the pump.

After making sure not to drop the column pressure, remove the column.

#### 4-5 Storage

Always keeps the column filled with storage solvent fastening the end plugs in order to keep the packing materials from drying and store it at room temperature. Storage solvent: Keep the column filled with low ionic strength eluent. When the column are not use again soon the column treatment mentioned above is unsatisfactory, since corrosion by a corrosive buffer may result in column degradation. For long-term storage, replace the solvent in the column with distilled or ion-exchanged water, below the flow rates under 0.5 mL/min (Q-STAT, SP-STAT, CM-STAT), 0.25 mL/min (DNA-STAT).

If the column inlet or outlet dry out and separate out salts from eluent, it may cause flow error by clogging.

If the column is left at below 0 °C, It may freeze and results in degradation of performance.

#### 4-6 Column Cleanup

Prolonged operation with complexed ingredient in various samples may lead to gradual accumulation of contaminants in the column.

This is evidenced by changes in chromatographic behavior.

Column performance may be recovered by cleaning operation as follows.

1) Adsorbed materials can be stripped from the column by repeatedly injecting with following cleaning samples.

- ① 0.1 mol/L NaOH
- ② 20 ~40 % Acetic acid
- ③ Solution containing aqueous organic solvent such as methanol or acetonitrile.
- ④ Solution containing a solubilizer such as urea and non-ionic surfactants.

## 5. Calculation of Theoretical Plate Number and Asymmetry Factor

The theoretical plate number (N) and the asymmetry factor (As) as well as their chromatographic conditions are as shown in the INSPECTION DATA.

### 5-1 Method of Calculating Theoretical Plate Number

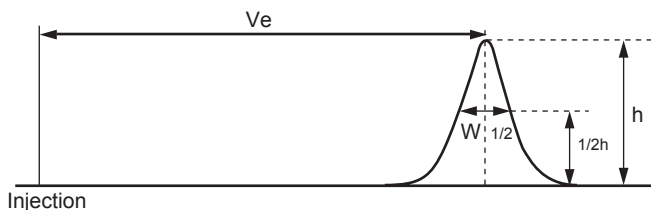


Figure 1 Method of Calculating Theoretical Plate Number

The theoretical plate number (N) of a column is calculated by the half width method shown in Figure 1 and the following equation.

$$N = 5.54 (Ve/W_{1/2})^2$$

Ve : Elution time (min)

W<sub>1/2</sub> : Half width value of peak (min)

h : Peak height

### 5-2 Method of Calculating Asymmetry Factor

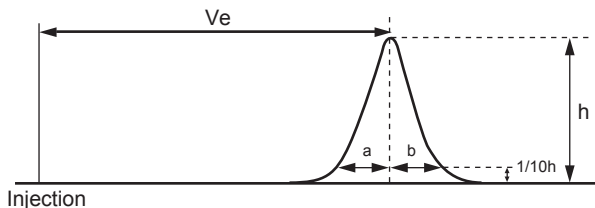


Figure 2 Method of Calculating Asymmetry Factor



The asymmetry factor ( $A_s$ ) of a column is calculated by the 1/10 h method.

$$A_s = b/a$$

## 6. Quality Specifications and Warranty

### 6-1 Conditions for INSPECTION DATA

- 1) TSKgel Q-STAT 3.0 mm(ID)X3.5 cm(L)  
TSKgel Q-STAT 4.6 mm(ID)X10 cm(L)  
TSKgel DNA-STAT 4.6 mm(ID)X10 cm(L)  
Eluent: 10 mmol/L Sodium Sulfate in 20 mmol/L Tris-HCl buffer pH 8.5  
Flow rate: 0.5 mL/min  
Sample: 0.1 g/L Cytidine-monophosphate  
Injection vol.: 5  $\mu$ L  
Detector: UV 260 nm
  
- 2) TSKgel SP-STAT 3.0 mm(ID)X3.5 cm(L)  
TSKgel SP-STAT 4.6 mm(ID)X10 cm(L)  
Eluent: 10 mmol/L Sodium Citrate buffer pH 4.0  
Flow rate: 0.5 mL/min (3.0 mm(ID))  
1.0 mL/min (4.6 mm(ID))  
Sample: 0.1 g/L Cytidine  
Injection vol.: 5  $\mu$ L  
Detector: UV 260 nm
  
- 3) TSKgel CM-STAT 3.0 mm(ID)X3.5 cm(L)  
TSKgel CM-STAT 4.6 mm(ID)X10 cm(L)  
Eluent: 10 mmol/L Sodium acetate buffer pH 5.6  
Flow rate: 0.5 mL/min (3.0 mm(ID))  
1.0 mL/min (4.6 mm(ID))  
Sample: 0.1 g/L Cytidine  
Injection vol.: 5  $\mu$ L  
Detector: UV 260 nm

## 6-2 Quality Specifications

Table 1 Quality Specifications

Grade	TSKgel Q-STAT 3.0 mm(ID)×3.5 cm(L)	TSKgel Q-STAT 4.6 mm(ID)×10 cm(L)
Part No.	21960	21961
Plates	200 or more	4000 or more
Asymmetry	0.8 ~1.8	1.0 ~2.0

Grade	TSKgel SP-STAT 3.0 mm(ID)×3.5 cm(L)	TSKgel SP-STAT 4.6 mm(ID)×10 cm(L)
Part No.	21963	21964
Plates	200 or more	200 or more
Asymmetry	0.8 ~1.8	0.8 ~1.8

Grade	TSKgel CM-STAT 3.0 mm(ID)×3.5 cm(L)	TSKgel CM-STAT 4.6 mm(ID)×10 cm(L)
Part No.	21965	21966
Plates	200 or more	2000 or more
Asymmetry	0.8 ~1.8	1.0 ~2.0

Grade	TSKgel DNA-STAT 4.6 mm(ID)×10 cm(L)
Part No.	21962
Plates	4000 or more
Asymmetry	1.0 ~2.0

## 6-3 Warranty

Check the appearance of the column and test its performance according to Section 5 within two weeks after the receipt of the column.

If the Quality Specifications in Table 1 can not be obtained or the column has been damaged during transportation, contact TOSOH representative within two weeks. TOSOH will replace the column free of charge.

Note that column life is not guaranteed.

No column should be returned to TOSOH without TOSOH's consent.

The specifications of these columns may be improved without notice.



**TOSOH**

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