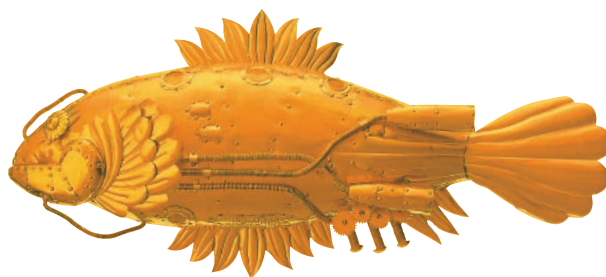


Shodex™



HPLC Columns

MANUAL

Asahipak GF/GS series

SHOWA
DENKO
EUROPE

Columns manufactured by Showa Denko K.K Japan
Made in Japan

Shodex HPLC Columns
Europe, Middle East, Africa, Russia

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Operation Manual

Shodex™ Asahipak™ GF-HQ and GS-HQ series

(Please read this manual carefully before using the column to keep its good performance and life.)

1. Introduction

Shodex Asahipak GF-HQ and GS-HQ series, packed with synthesized high molecular weight hard gel, both operate mainly in the Size Exclusion mode. The theoretical plate number and resolution are greatly improved compare to previous versions. GF-HQ series are Multi-solvent columns that work with both aqueous and organic solvents. GS-HQ series Multi-mode columns use aqueous solutions and, as the name suggested, separate based on Size Exclusion, Distribution/Adsorption, and Ion· Exchange modes.

2. Instructions in handling < Important >

CAUTION FOR NEW INSTALLATION! *Flush all flow lines with 30% methanol aqueous solution before installing the column. Set flow rate at 0.2 mL/min and connect the column. Wash the column at 0.2 mL/min for about one hour. Then pump the eluent to the column at 0.2 mL/min for at least three hours.

CAUTION FOR NORMAL OPERATION! *Use the column in accordance with the column specifications (see bullet point 3. below). There is a danger of performance deterioration when it is handled beyond the permissible range even for a short time.

3. Specifications

Column size:	Analytical columns	7.5mmID x 300mmL
	(GF-310 HQ 8D	8.0mmID x 150mmL)
	Guard columns	7.5mmID x 50 mmL
Connecting screws:	Swagelock type (inch)	
Column material:	SUS-316	
In-column solvent:	30% methanol aqueous solution	
Temperature:	4 – 60°C	

Table 1: Analytical columns

*) Estimated value

Type	Grade	Particle Size (μm)	Exclusion limit M.W. (Pullulan)	Theoretical Plate Number (per column)	Flow rate (mL/min.)		Max. Pressure (MPa)	pH range
					Normal	Max		
Multi-solvent column	GF-310 HQ	5	40000	>19000	0.4~0.6	1.0	7.0	2-9
	GF-510 HQ	5	300000	>19000	0.4~0.6	1.0	6.5	2-9
	GF-710 HQ	9	10000000*)	>11000	0.4~0.6	1.0	2.5	2-9
	GF-7M HQ	9	10000000*)	>13000	0.4~0.6	1.0	4.5	2-9
	GF-310 HQ 8D	5	40000	>10000	0.4~0.7	1.2	4.0	2-9
Multi-mode column	GS-220 HQ	6	3000	>19000	0.4~0.6	1.0	6.0	2-9
	GS-320 HQ	6	40000	>19000	0.4~0.6	1.0	5.0	2-12
	GS-520 HQ	7	300000	>18000	0.4~0.6	1.0	3.0	2-12
	GS-620 HQ	7	2000000	>18000	0.4~0.6	1.0	3.5	2-12

Table 2: Guard columns

Grade	Columns guarded
GF-1G 7B	GF-310 HQ, GF-510 HQ, GF-710 HQ, GF-7M HQ, GF-310 HQ 8D
GS-2G 7B	GS-220 HQ, GS-320 HQ, GS-520 HQ, GS-620 HQ

4. Important notes for using aqueous salts solution

(1) Strong electrolytic salts

Total salts concentration should be 0.5M or less. Aqueous solution of NaCl, KCl, Na₂SO₄, (NH₄)₂SO₄ and other such salts can be used as eluents. Phosphate, acetate, citrate and tris-HCl buffer solutions can be also used, either independently or in combination with these salts.

(2) Aqueous urea and guanidine hydrochloride

These solutions are widely used as protein denaturing agents and can be used with the columns; however, the column should be used exclusively for this purpose. Because denaturing agents concentration is generally high and the column life time may be shorten when the eluent is exchanged to the other lower concentration one.

(3) Use of surfactants

Aqueous solutions containing SDS, Brij-35 or other surfactants can also be used as eluents. Please note that it generally takes longer time to switch one eluent to another when they contain surfactants. In such case, washing with 30% methanol solution first can shorten the replacement time.

(4) Solution with high salt content

After passage of a high-concentration salt solution, ONLY the flow lines should be flushed with water to preventing salt precipitation at the pump and the injector. The column should be removed from the line during flushing in order to maintain longer column life.

5. Compatible organic solvents

GF/GS HQ series columns can be used with organic eluents in accordance with a table below. A considerable increase in column pressure may result when using high-viscosity eluents. Therefore, a high pressure limiter setting may be necessary to protect the column. With eluents of high viscosity, avoid high flow rates and frequent eluent exchange, as either may adversely affect column life.

Table 3. Usable organic solvents and the concentration

Solvent	Concentration in aqueous solution	Viscosity (cp)	GF-HQ series					GS-HQ series				
			310 HQ	510 HQ	710 HQ	7M HQ	310 HQ 8D	220 HQ	320 HQ	520 HQ	620 HQ	
Aqueous Solution	0~0.5M (Conc. of Salts)		○	○	○	○	○	○	○	○	○	
Methanol	50%	1.34	○	○	○	○	○	○	up to 30%	○	○	○
	100%	0.56	○	○	○	○	○	○		○	○	○
Ethanol	50%	2.02	○	○	○	○	○	○	up to 30%			
	100%	1.00	○	○	○	○	○	○				
CH ₃ CN	50%		○	○	○	○	○	○	○	○	○	○
	100%	0.33	○	○	○	○	○	○		×		
THF	50%		○	○	○	○	○	○				
	100%	0.47	○	○	○	○	○	○		×		×
Acetone	50%		○	○	○	○	○	○				
	100%	0.29	○	○	○	○	○	○		×		
Propanol	50%	2.17	○	○			○					
	100%	1.72	○	○			○					
Ethyl acetate	100%	0.43	○	○	○	○	○			×		
DMF	50%		○	○	○	○	○					
	100%	0.83	○	○	○	○	○					
Dioxane	50%		○	○			○					
	100%	1.06	○	○			○					
DMSO	50%		○	○			○					
	100%	1.81	×	×			×					
Chloroform	100%	0.52	○	○	○		○					
Hexane	100%	0.29	×	○			○					

○: Possible ×: Impossible Blank: No Data

6. Important notice for eluent replacement*(1) Aqueous solution to another aqueous solution*

Set flow rate at 0.4mL/min or less. It takes about two hours to achieve complete replacement of the in-column eluent. Please check and follow " *Clause 4: Important notice for using aqueous salts solution*".

(2) Aqueous solution to organic solvent / organic solvent to aqueous solution

Set flow rate at 0.2mL/min or less. It takes about three hours to achieve complete replacement of the in column eluent. Please be extra careful in preventing salt precipitation. When the aqueous solution has high salt concentration, pure water must be used in an intermediate step.

[Example] In the replacement between aqueous salt buffer and acetonitrile

Aqueous salt buffer solution → Pure water → Acetonitrile

Acetonitrile → Pure water → Aqueous salt buffer solution

Please be also careful for miscibility between the aqueous solution and the organic solvent. When the miscibility is low, replacing with the amphiphilic solvent like acetone between the aqueous solution and the organic solvent is necessary.

[Example] In the replacement between water and chloroform

Water → Acetone → Chloroform

Chloroform → Acetone → Water

(3) Organic solvent to another organic solvent

Set flow rate at 0.2mL/min or less. It takes about three hours to achieve complete replacement of the in column eluent.

7. Column Cleaning

Reverse the column on the HPLC system, flow the eluent at 80% of ordinary flow rate. This is effective for the foreign substances remaining in the column, however not effective for the substances adsorbed to the packing material.

For the case of adsorption, flowing organic solvents or aqueous solution which can solve the adsorbed substances may be effective. When you exchange eluents, please check "Table 3: Usable organic solvents and the concentration" and follow the instruction of "*Clause 6: Important notice for eluent replacement*".

8. Column Safekeeping

When the column is not used for a month or more, replace the in column solvent with 30% methanol aqueous solution, close each end with a stopper, and store it at room temperature.

ATTENTION!

- 1) Do not remove the end fittings of the column under any circumstances.
- 2) Do not make a strong impact on the column: such as hitting or dropping on the floor.
- 3) Replace the solvent in the chromatograph with the eluent to be used before connecting the column.
- 4) Connect the column so that the flow direction corresponds to the arrow mark on the tag.
- 5) Filtrate the sample with a disposable filter (0.45 μm) to prevent deterioration by adsorbing insoluble matters.

6) Recommended flow rate is 0.4 ~ 0.6mL/min. When a high-viscosity eluent is used and operation temperature is low, set the flow rate under 0.6mL/min. When you start flowing eluent to the column, you have to set flow rate at 0.2mL/min.

9. Warranty

1) Showa Denko K. K. warrants that the Shodex Column, at the time of delivery to the user, will conform to the specification of the attached Certificate of Analysis, if the Shodex Column is used in accordance with the operating manual. The foregoing warranty is exclusive and is in lieu of all other warranties with respect to the Shodex Column, whether written, oral, implied, statutory or otherwise. No warranties by Showa Denko K. K. are implied or otherwise created, including, but not limited to, the warranty of merchantability and fitness for particular purposes.

2) Any claim of inconformity to the specification must be notified to Showa Denko K.K. within ten (10) days after delivery to the user. User's exclusive remedy and Showa Denko K.K.'s exclusive liability for such claim are limited to the replacement of the Shodex Column in question. In no event is Showa Denko K.K. liable for any indirect, incidental or consequential damage arising out of in connection with the Shodex Instrument, whether or not such damage is allegedly based on breach of warranty, negligence or otherwise.

3) No warranty is made in any of the following cases:

(1) If the Shodex Column is not used in accordance with the operating manual.

(2) If the Shodex Column is remodeled by anyone other than person or firm designated by Showa Denko K.K.

(3) If the Shodex Column is resold by the user without giving prior written notice to Showa Denko K.K.

(4) If the performance of the Shodex Column is not conform to the specification of the attached Certificate of Analysis due to any of the reasons below:

a) Computer virus

b) Impurities contained in the sample, reagent, gas air or cooling water provided by the user

c) Breakdown or malfunction of equipment, apparatus or component used in combination with the Shodex Column

d) Force majeure such as fire, earthquake, flood, other natural disaster, rime, riot, act of terrorism, war or radioactive contamination.

4) In no event is Showa Denko K.K. liable for (i) the results of analyses or preparations using the Shodex Column or any portion of the same, including, but not limited to, the reliability, accuracy, efficacy and safety of said results, and (ii) the occupational hazard in the use of the Shodex Column, whether or not such use is made in accordance with the attached Conditions for use.

5) The Shodex instrument is for laboratory use only. It must not be used for clinical diagnosis. Showa Denko K.K. is not liable for any use of the Shodex Instrument except laboratory use.