

Operation Manual Shodex C18U 2B, 2D

(Please read this operation manual carefully to achieve the best and consistent column performance for a long time.)

Important Handling Instructions

Caution!

- Please consult the Safety Data Sheet (SDS) of reagents and solvents used with the column and understand their proper handling methods to prevent potential health hazards or death from occurring.
- Please wear appropriate personal protective equipment such as lab goggles and gloves when handling organic solvents and acid and alkaline reagents. Avoid any direct physical contact to prevent chemical injuries.

Before Using the Column

- (1) Please visually inspect the column package and the column surface for any damage.
- (2) Please check the product name and serial number (Serial No. or S/N) written on the column package and adhesive label on the column body.
- (3) Please download the Certificate of Analysis (CoA) for the purchased product. The CoA can be downloaded from Shodex website (<https://www.shodex.com/download/>). You will be asked to enter the serial number.

1. Introduction

Thank you for purchasing the Shodex product. Shodex C18U series is high performance chromatography columns which provides reversed phase mode. The organic and inorganic hybrid packing gel is modified with octadecyl (C18) functional group. Its excellent separation performance and high durability over conventional silica-based reversed phase columns allow working it under different analytical conditions. The series is suitable for separating and analyzing a wide variety of compounds

2. Column Components

Please refer to the Shodex website: <https://www.shodex.com/en/da/07.html>

3. Column Specifications

Product Code	Product Name	Column Size (mm)		Particle Size (μm)	*Carbon (%)
		I.D.	Length		
F6654011	C18U 2B	2.0	50	1.9	20
F6654012	C18U 2D	2.0	150	1.9	20

* Includes 8% carbon content of organic and silica hybrid gel

Base Material : Spherical organic and silica hybrid particles modified with octadecyl group

Column Housing : SUS-316

Screw Type : Internally-threaded type No.10-32 UNF

Shipping Solvent : Acetonitrile

4. Usable Conditions

Product Name	Flow Rate (mL/min)	Maximum Pressure (MPa/column)	pH Range	Temperature (°C)	
				Recommended	Maximum
C18U 2B	0.2 - 0.8	100	1 - 12	20 - 40	90 (pH1 - 7)
C18U 2D					50 (pH7 - 12)

Usable solvents are listed below.

- (1) The standard eluent is a mixture of water and organic solvent of any ratio. Up to 100 % water and organic solvent can be used.
- (2) Usable organic solvent includes acetonitrile, methanol, and tetrahydrofuran (THF).

Attention!

- Use the column within above stated flow rate, pressure, and temperature ranges. Using the column outside the given range may damage the column and lower its performance.
- When using a mixture of buffer (or aqueous solution of salt) and organic solvent, make sure there is no precipitation of salt.
- When using highly corrosive salts such as sodium chloride, wash out the salts at the end of analysis. The metal parts of the devices and/or the columns may rust.
- Column pressure is influenced by eluent composition, flow rate, and column temperature. When changing the eluent compositions, adjust the flow rate and column temperature so that the column pressure remains below the usable maximum pressure.
- Continuous use near the maximum pressure and sudden pressure changes can shorten column life.
- In general, conditions with the higher column temperature, buffer solution and/or additive concentration, and the lower organic solvent concentration leads to the higher risk of column deterioration.

Note

- If an extended time use under alkaline condition is required, it is recommended to use an organic solvent (methanol recommended) with a low concentration (1 to 10 mM) buffer such as trimethylamine or glycine at low temperature (less than 30 °C).

5. Eluent Preparation

- (1) Degas the eluent fully to prevent the formation of air bubbles.
- (2) Presence of small debris or insoluble substances may result in deterioration of columns and/or they may appear as noise on chromatograms. Filter the eluent with a 0.2- μ m disposable filter to prevent the problems from occurring.

Attention!

- Whenever water is required, use ultra-pure water freshly generated by a water purification system or water from a newly opened HPLC grade distilled water bottle. Use of HPLC grade organic solvents of guaranteed quality, which can be used without problems in HPLC is recommended. If organic solvents with different grades are used together, make sure that their qualities are all suitable for the analysis prior to the use. Solvents left in opened bottles for a long time should not be used. The content may have been changed, absorbed moisture, or has been contaminated.
- Always use freshly prepared solvents. Solvents stored for a long time may have changed their compositions and may influence elution patterns and/or damage the column.

Note

- Use of an on-line degasser is recommended.

6. Sample Preparation

- (1) If possible, use the eluent for analysis to dissolve or dilute samples. If this is difficult, use a solvent which has a composition that is as close as possible to the eluent composition and which fully dissolves or dilutes the sample. For gradient elution, samples are recommended to be dissolved or diluted using the eluent used at the beginning of the gradient method.
- (2) Filter diluted sample solutions using disposable 0.2- μ m filters to prevent the column from clogging or deteriorating.
- (3) Suggested injection volume is less than 10 μ L per column.
- (4) When a sample contains high molecular weight compounds such as proteins and polysaccharides or large amount of impurities, remove (pretreat/clean-up) them prior to the sample injection using a solid phase extraction and alike.

Attention!

- When a sample is dissolved in a solvent other than the eluent and if the sample matrix contains components which do not dissolve in the eluent fully, precipitates may form and clog the column.
- Full column performance may not be achieved if a sample concentration is higher or sample injection volume is larger than it should be. It may lead to abnormal peak shapes, poor separations, and/or low reproducibility. In such cases, please adjust the sample concentration and/or the injection volume.

7. Column Usage Procedure**7.1 HPLC System Setting**

The C18U series is a column for ultra high performance liquid chromatography (UHPLC) packed with 1.9 μm particles. Pay attention to the pressure tolerance of the pumps and connecting tubes. It is suitable for the use with UHPLC compatible systems having pressure tolerance of about 60 MPa or higher. Sample diffusion in the system flow path (diffusion outside the column) have large negative effects on the column performance. Follow the below suggestions to optimize the operation conditions.

- (1) Keep the tubes from the injector to the column and from the column to the detector as short as possible, use tubes with small inner diameters (0.15 mm I.D. or less).
- (2) Use a semi-micro injector or a micro injector to minimize the sample loop.
- (3) Use a low-volume type detector flow cell, such as semi-micro or micro type. Set the detector response to 0.1 sec or less and the data sampling rate to 10 points/sec or more to properly detect the UHPLC peaks as the peaks elute fast and appear sharp.

7.2 HPLC System Preparation

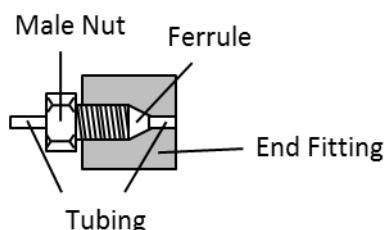
Wash the entire HPLC system prior to column installation, including all flow-lines and sample loop by switching the valves, and then replace the washing solution with the eluent to be used. If desired new eluent has low miscibility/solubility to the eluent of previous analysis, first use the eluent that is miscible/soluble to both eluents, and then replace it with the desired eluent.

Attention!

- If the eluent left in the HPLC system is not compatible with the column to be used, it may damage the column.
- A drastic change in the eluent compositions may remove substances adsorbed on the HPLC system and they may enter and deteriorate the column.

7.3 Column Installation

- (1) Connect the column to HPLC system by following the “flow direction arrow” (→) indicated on the column adhesive label.
- (2) Make sure to insert the tubing all the way to the end fitting and secure it with the male nut. It is important that there is no extra space between the tubing and the column side of the end fitting. Presence of an extra space will let the sample to spread out and may result in wide peaks.



- (3) Set the initial flow rate at less than 0.2 mL/min and start the system. If the column is to be heated during the analysis, keep the low flow rate until the column temperature reaches to the set temperature, and then gradually increase the flow rate to the desired temperature.

Caution!

- Verify that there is no solvent leak. The solvent leak may cause electronic leakage, rust, and/or chemical injury.

Attention!

- Make sure not to let air bubbles enter the column while installing the column. The air bubbles may damage the column.

- When restarting the system after column installation or after holding the eluent flow, start the system at less than half of recommended flow rate. A rapid increase in pressure can damage the column.
- If the column was heated during the analysis, lower the flow rate to less than half of recommended flow rate at the end of analysis. Then, turn off the column oven to let the column temperature returns to room temperature before stopping the pump. This is to prevent creating an empty space in the column, which deteriorates the column. Since if the pump was stopped while the eluent inside the column is still hot, the eluent volume decreases and creates an empty space when the eluent temperature decreases.

Note

- It is recommended to set the pump limiter to avoid exceeding the maximum pressure.

7.4 Solvent Exchange

To replace the solvent, start the system at less than 0.2 mL/min flow rate. Recommended solvent volume to introduce at each step is 3 to 5 times of the column volume.

- (1) Check miscibility/solubility of the desired new solvent and the solvent currently filled in the column.
- (2) When replacing with a solvent having low miscibility/solubility to the current solvent, first use a solvent that is miscible/soluble to both (new and current) eluents, and then replace it with the new solvent.
e.g. When replacing highly concentrated buffer solution or salt solution to water/acetonitrile, first run water and then replace it with the eluent.
- (3) When using a gradient method, changes in the eluent compositions may increase the column backpressure. Adjust the flow rate and column temperature so that the column backpressure remains below the usable maximum pressure throughout the analysis.

7.5 Column Cleaning

Problems in peak shapes and elution time changes or elevated column pressure are often caused by the deposition of insoluble or adsorbing components from the sample/flow-line inside the column. These problems may be resolved by cleaning the column.

In case multiple number of analytical columns are used together, wash them separately. During the column cleaning, disconnect the detector and collect the washing solution directly from the column outlet into a waste container (i.e., do not let the solution go through the detector).

If the column performance does not improve (recover) after performing the column cleaning, please replace the column with a new one.

<Cleaning method>

- (1) Insoluble components that block the column inlet may be removed by reversing the flow direction, i.e., introducing the eluent from the column outlet, with flow rate at less than half of the recommended flow rate.
- (2) Follow below cleaning steps for adsorbing components. For an efficient cleaning, reverse the flow direction. Set the flow rate at less than 0.2 mL/min. Recommended solvent volume to introduce is 5 to 10 times of the column volume.

Method 1:

Apply after using the column under an eluent without a buffer or salt.

Introduce the eluent with increased organic solvent content. Up to 100 % organic solvent can be used.

Addition of THF may be effective for removing the adsorped lipid components.

Method 2:

Apply after using the column under an eluent with a buffer or salt.

Replace the eluent with an eluent without the buffer or salt (keeping the same aqueous/organic solvent ratio). Then follow the Method 1.

Attention!

- Washing the column with 100 % water after using the column with an eluent close to the pH limit may damage the column. Wash the column with a mixture of water and organic solvent in this case.

8. Column Storage

Remove the column from HPLC system after replacing the in-column solvent with the initial shipping solvent. Securely tighten the end caps and store the column at a location with stable temperature (a cool and dark space is recommended). Refer to section 7.4 Solvent Exchange for how to replace the eluent.

Attention!

· Never allow inside the column to dry. It can damage the column.

9. Additional Warnings

- (1) Do not remove end fittings.
- (2) Do not make a strong impact on the column. Do not drop or hit the column on a hard surface.
- (3) Please follow a proper waste disposal method specified by your local regulations.

Please refer to the Shodex website (<https://www.shodex.com/>) for product details and their applications. For additional assistance, contact the distributor from whom you purchased the column or contact your regional Shodex support office (https://www.shodex.com/en/support_office/list).