1. Introduction

The SilFlow® Deans' switch is a new chromatography solution using Trajan's proprietary SilFlow microchannel technology. SilFlow is an innovation in design and fabrication resulting in a highly efficient and reliable microfluidic platform.

The SilFlow Deans' switch is based on the famous Deans' principle, incorporating advanced technical improvements. The Deans' switch forms the core of most multidimensional chromatography configurations.

SilFlow Deans' switch kit is manufactured as a capillary column gas flow switching system. Applications are numerous such as heart cutting, column back flushing, inlet switching, column switching, detector switching, solvent venting etc.

Features of SilFlow Deans' switch

- Chemically deactivated internal channels, resulting in analysis with enhanced quantitative accuracy and high reproducibility. Can be incorporated into your system without impacting your chromatography.
- Low dead volume connections.
  SilTite FingerTite® metal ferrules result in a reliable zero dead volume connection, giving you optimized peak shapes.
- Superb operational stability.
  Thermal lag - tracks oven temperature up to 20°C/min, the design alleviates cold spots and sample condensation.
  Maximum temperature - No practical temperature limit. Limited only by the temperature rating of the GC column being used (420°C).
- Easy to install and leak free.
  The kit incorporates SilTite FingerTite fittings that are easy to setup and can be tightened using finger force to achieve a reliable seal, even for the most sensitive MS systems – no wrenches are required.

Figure 1. SilFlow Deans' switch

2. Contents

SilFlow Deans' switch kit (part number 1237031) contains accessory parts, tools and the installation manual. Parts and tools are listed in Table 1.

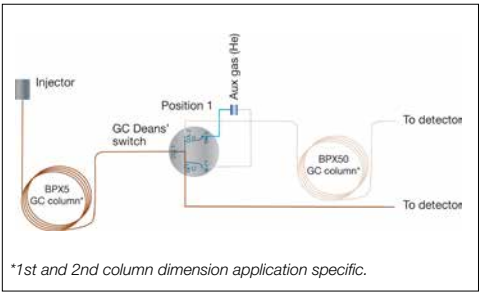
Part number	Description	Pack size
1237261	SilFlow Deans' switch	-
-	Mounting bracket	-
-	Screw for mounting bracket	
-	Balance tube assembly 79.5 mm	-
123751	2 m x 100 µm/363 µm VSD tubing	-
123755	2 x 1.1 mm OD SS tubing with 1/16" sleeve x 1 m	-
123706	SilFlow SilTite ferrule 0.4 mm	10
123707	SilFlow SilTite ferrule 0.5 mm	10
123705	SilFlow SilTite ferrule 1.1 mm	5
123704	SilTite FingerTite nuts	6
123717	FingerTite tool	
-	Pre-swage tool, 0.4 mm	
-	Pre-swage tool, 0.5 mm	

Table 1. Parts and tools in the SilFlow Deans' switch kit.

3. Installing the SilFlow Deans' switch kit

In these instructions it has been assumed the configuration is for heart cutting two dimensional gas chromatography applications (Figure 2).

Please email techsupport@trajanscimed.com for specific application requirements.



*1st and 2nd column dimension application specific.

Figure 2. SilFlow Deans' switch setup for heart cutting two dimensional gas chromatography.

3.1 Installing the mounting bracket

Prior to installation ensure the GC oven is turned off and cooled. Installing the mounting bracket is straightforward. Make sure the interior of the oven is free from obstacles such as GC columns and column holders as this will make the installation easier.

i. Identify a convenient location in the GC oven. Consider the fact that after installation it should be easy to access the components of the system: columns, detectors, injectors and accessories.
ii. Find an appropriate hole in the location of the oven wall or carefully drill a 3.2 mm sized hole in order to attach the screw.
iii. Secure the bracket against oven wall and align the screw to the fitting and into the wall (Figure 3).
iv. Tighten the screw carefully with a screwdriver.

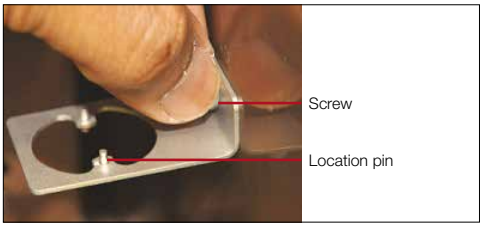


Figure 3. Attaching the mounting bracket.

3.2 Attaching the SilFlow Deans' switch

i. Mount the SilFlow Deans' switch to the oven bracket with the guidance of the locator pins ensuring it sits on the bracket firmly (Figure 4). Make sure the bosses face the correct direction for easy access to install the tubing.

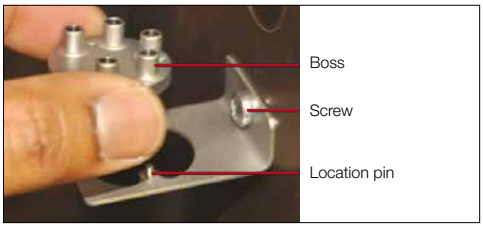


Figure 4. Attaching the Deans' switch.

ii. Identify the appropriate port locations marked on the back of the SilFlow Deans' switch (Figure 5). Locate the appropriate SilFlow ferrules and nuts and prepare to connect the relevant tubing to the SilFlow Deans' switch.

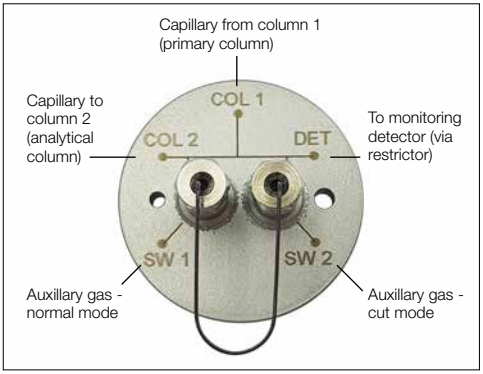


Figure 5. Identifying Deans' switch port locations.

3.3 Installing the columns

i. Re-install any column holders previously removed from the oven in order to attach the mounting bracket.
ii. Hook the GC columns (1st and 2nd dimension) onto the column holders firmly.
iii. Install one end of the 1st dimension GC column (primary) to the injector in accordance to the GC manufacturer's recommendation.
iv. Connect the other end of the 1st dimension GC column to the 'COL 1' port of the Deans' switch.
v. Likewise install the 2nd dimension GC column between the 'COL 2' port of the SilFlow Deans' switch and the detector system (2nd dimension).

When connecting the capillary column to SilFlow Deans' switch, use the SilTite FingerTite jig to pre-swage the ferrule (Figure 6) before attaching the column to the SilFlow Deans' switch boss, ensuring the capillary will not be crushed onto the SilFlow Deans' switch channels.

There are two types of jigs available; one for the 0.4 mm ID ferrules (for 0.36 mm OD capillaries) and one for the 0.5 mm ID ferrules (for 0.43 mm OD capillaries).

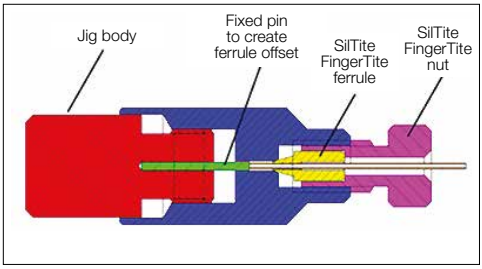


Figure 6. Assembly with SilTite FingerTite jig.

Use the FingerTite tool to tighten the FingerTite nuts (Figure 7) applying finger force only. Never use a wrench.

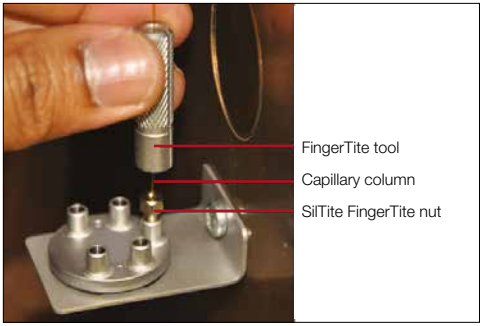


Figure 7. Using the FingerTite tool.

3.4 Installing the restrictor tubing

The dimensions of the restrictor tubing should be carefully selected in such a way that the gas flow resistance is similar to that of the 2nd dimension GC column (analytical). To keep the time lag short as possible for the analytes to reach the 1st dimension detector (monitoring) the restrictor has to be short in length.

The balancing restrictor between both sides of the switch has been incorporated into the design, with two ports at the rear of the SilFlow device.

Two restrictors have been included in the kit, with the standard 66 mm restrictor attached to the SilFlow device (Figure 8).

The longer 79 mm restrictor has nuts and ferrules pre-swaged for ease of installation.

Figure 8. The standard 66 mm restrictor attached to the SilFlow device.

The restrictors' lengths will affect the switch performance, with the standard 66 mm restrictor designed for use with 0.25 mm to 0.53 mm ID tubing. The longer 79 mm restrictor will improve switching when using higher pressures in the switch and when using tubing with IDs of 0.25 mm and below.

i. Calculate the dimension of the restrictor tube based on the operating pressures of the GC system and dimensions of the 2nd dimension GC column. An example is shown in Table 2, restrictor tube has to be accurately trimmed until the flow rate matches that through the 2nd dimension GC column.
ii. Connect one end of the restrictor to the 'DET' port of the Deans' switch. Use the FingerTite jig to pre-swage the ferrule.
iii. Install the other end of the restrictor to the 1st dimension detector system (monitoring) in accordance to the GC manufacturer's recommendation.

For operating pressures of the GC system, refer to the recommendations of the column manufacturer and consider method conditions. As an example, method parameters for a heart cutting two dimensional gas chromatography technique using BPX5 and BPX70 columns for the analysis of essential oil are listed in Table 2.

1st dimension GC column	30 m x 0.25 mm x 0.25 µm BPX5 GC column
2nd dimension GC column	30 m x 0.25 mm x 0.25 µm BPX70 GC column
Restrictor	0.1 mm ID VSD tubing 0.75 m in length
Carrier	Helium
Inlet pressure	41.7 psi
Mid point (auxiliary) pressure	27.5 psi
Inlet temperature	250°C
Oven temperature	140°C
Detectors	FID at 300°C

Table 2. Method parameters for a heart cutting two dimensional GC chromatography – Analysis of essential oil.

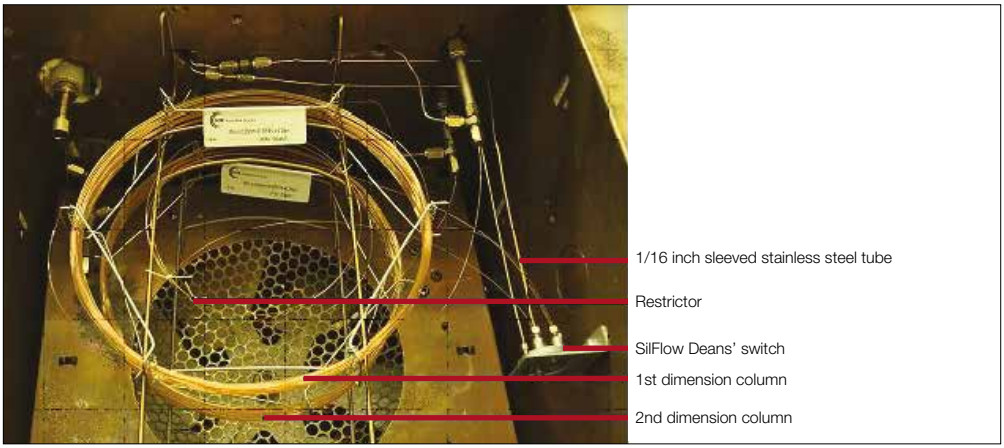


Figure 9. Hardware setup for heart cutting two dimensional gas chromatography.

3.5 installing the stainless steel tubing for auxiliary gas

i. Install 1.1 mm OD end of the 1/16 inch sleeved stainless steel tube to the 'SW 1' port of the SilFlow Deans' switch. Use the SilFlow ferrule 1.1 mm and a FingerTite nut for the connection.
ii. Likewise connect one end of the other 1/16 inch sleeved stainless steel tube to the 'SW 2' port of the SilFlow Deans' switch.
iii. Run the stainless steel tubes through the oven ceiling and exit to the location where the solenoid valve is installed. If your GC is not equipped with EPC, we recommend the Parker VSO®-EP (see www.parker.com/precisionfluidics). Bend the tubes and align in such a way that they run closely against the oven walls. This provides easy access to the oven (Figure 9).
iv. Connect 1.1 mm OD end of the stainless steel tubes to the two outputs of the solenoid valve using the appropriate connection. Refer to the manufacturer's user manual for correct installation.

4.Taking care of your SilFlow Deans' switch system

Tubing to the SilFlow Deans' switch can be disconnected and reconnected many times without removing the pre-swaged ferrules. However, it is very important to inspect the capillary end carefully before reconnecting to the SilFlow Deans' switch. Make sure the end is not squashed or cracked. If the capillary does not have a clean square end, the column end has to be cut again and a new ferrule to be pre-swaged.

When the SilFlow Deans' switch is not connected, protect it from particulates and dust contaminating the internal channels. Make sure to block the bosses using either self-sealing nuts or pre-swaged ferrule to pieces of metal wire and appropriate SilTite FingerTite nuts.

Information and support

Visit www.trajanscimed.com or contact techsupport@trajanscimed.com

Specifications are subject to change without notice.

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