



# User Manual

## II. Operation Manual

SpinSplit Flow Chemistry Systems



## 1 Revision

Revision number	Certified by	Changes	Date
1.0	Ferenc Ender	Initial	January 2018
1.1	Ferenc Ender	Added iLab install process	June 2018

## 2 Scope of this Document

This document presents the operations of Spinsplit spFlow and netPump Instruments.



# 3 Table of Contents

<b>1</b>	<b>REVISION .....</b>	<b>2</b>
<b>2</b>	<b>SCOPE OF THIS DOCUMENT .....</b>	<b>2</b>
<b>3</b>	<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>4</b>	<b>SPFLOW SYSTEM MODULAR ASSEMBLY .....</b>	<b>4</b>
4.1	UNDERSTANDING MODULARITY .....	4
4.2	SAFETY CAUTIONS .....	4
4.3	MODULE ASSEMBLY .....	5
4.4	INSTALL SPFLOW SYSTEMS .....	6
<b>5</b>	<b>FLUID ACTUATORS .....</b>	<b>6</b>
5.1	SPFLOW DUAL PUMP .....	6
5.1.1	<i>Change syringes</i> .....	6
5.1.2	<i>Connect fluid connectors</i> .....	8
5.1.3	<i>Daily maintenance</i> .....	9
5.1.4	<i>Weekly maintenance</i> .....	9
5.1.5	<i>Replacing the Reagent Syringe Seals</i> .....	9
5.2	NETPUMP .....	11
5.2.1	<i>Install netPump</i> .....	11
5.2.2	<i>Change and install syringes</i> .....	11
5.2.3	<i>Connect fluid connectors</i> .....	12
5.2.4	<i>Maintenance</i> .....	12
<b>6</b>	<b>THERMOSTATS .....</b>	<b>13</b>
6.1	SPFLOW CHEM THERMOSTAT .....	13
6.1.1	<i>Change Column Reactor assembly</i> .....	13
6.1.2	<i>Change Tube Reactor assembly</i> .....	14
6.2	SPFLOW MAGNECHIP THERMOSTAT .....	16
6.2.1	<i>Prepare chip reactor assembly</i> .....	16
6.2.2	<i>Install chip reactor</i> .....	17
<b>7</b>	<b>AUXILIARY MODULES .....</b>	<b>18</b>
7.1	PRESSURE SENSOR .....	18
7.2	BACKPRESSURE REGULATOR .....	18
7.3	EXTERNAL UNITS .....	19
<b>8</b>	<b>CONTACT INFORMATION .....</b>	<b>20</b>

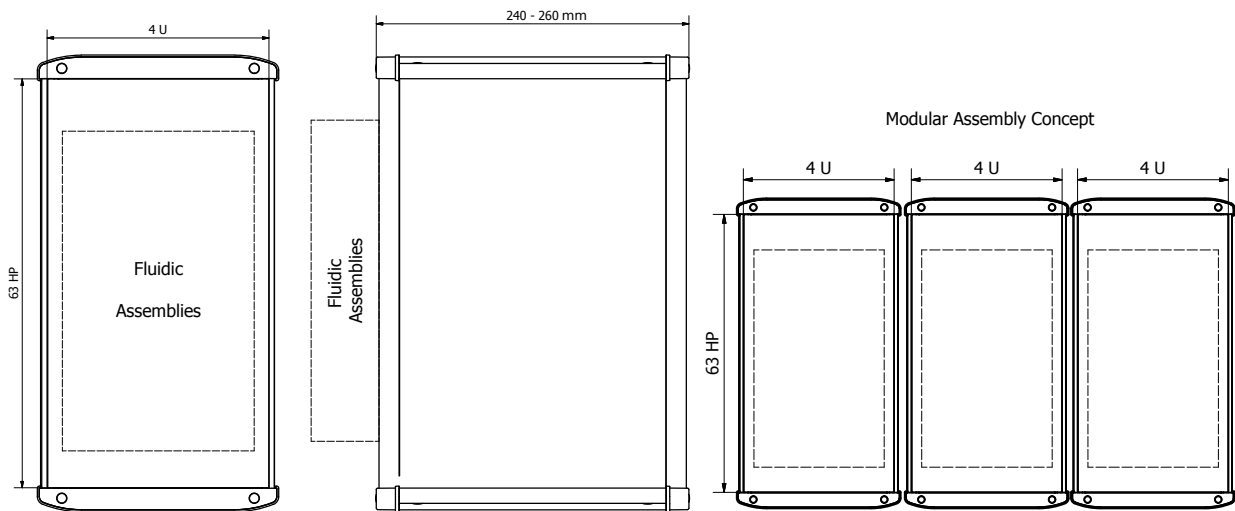


# 4 spFlow System Modular Assembly

## 4.1 Understanding Modularity

SpinSplit spFlow systems are modular instruments composed of several units. Units can be connected to each other through connectors located on the side of the units. Units are 2 U or 4 U (U: rack unit) wide and 63 HP or 42 HP high (HP: horizontal pitch). One of the modules is a master module which is directly connected to the local area network (LAN). The other modules are connected to the master module through a chain link with a limitation of maximum 16 separate modules in a system.

The modules can be attached to each other with linker parts.



Units are in Rack Units (U) and Horizontal Pitch (HP)

## 4.2 Safety cautions

Proper ventilation is essential for spFlow Instruments. Make sure that the instruments installation place meets the following environmental requirements

Parameter	Value			Units
	Min	Typ	Max	
Temperature	15	20	25	°C
Relative humidity	20	50	80	% RH
Free air space left and right	20	-	-	cm
Free air space behind	20	-	-	cm
Free air space above	20	-	-	cm



Short time deviation from the above requirements may adversely affect the efficiency of thermostat modules.

Long time deviation from the above requirements may adversely affect the lifetime of mechanical and electrical components.

### 4.3 Module Assembly

#### To assembly instrument units

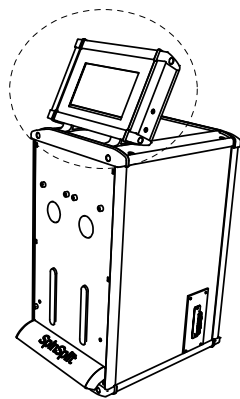
Place two instrument units next to each other.

1. Make sure that the connectors on the sides overlap.
2. Push the rightmost unit carefully towards the unit on the left until the connectors slide into each other.

**To disassembly instrument units**, take the rightmost unit and pull gently until the side connector releases.

**Note**, that MagneFlow and ChemFlow units are not interchangeable.

### 4.4 Install iLab Module



The iLab Module is the touch-screen controller unit of the spFlow Systems and is installed onto

- i. The top of spFlow Dual Pump module if the systems consists such module
- ii. The top of spFlow Chip or Chip-M or Chem module if the system consists of spFlow Power module

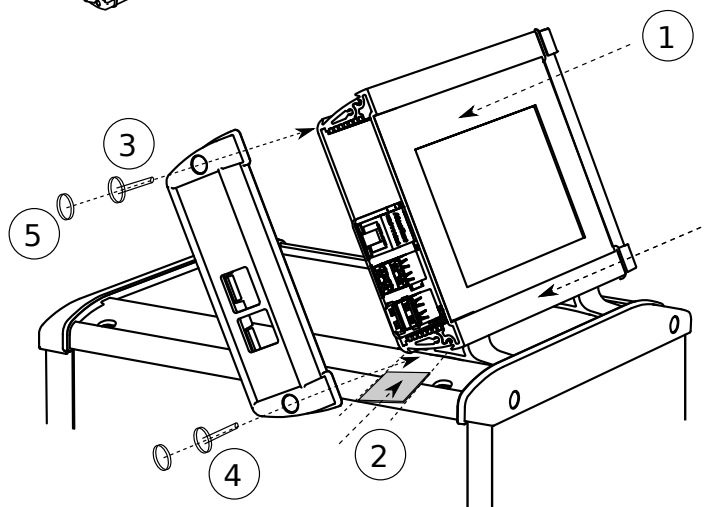
To install iLab module on i) or ii) position

*Preparation:*

1. Loose the two  $\varnothing 3 \times 18$  torx head screws on the **left side** of iLab Unit and release the side cover.

*Assembly iLab Module:*

1. Gently slide the module along the iLab Module Foot (a) on the top of spFlow Instrument. Make sure that the foot lies in the nut on the bottom of the module.
2. Insert the Foot Spacer in the nut.
3. Place the left side cover.



4. Insert the two ø3x18 torx head screws and gently tight the screws.
5. Insert the two screw caps

*Secure electrical and data connections*

1. Connect one of the identical end connectors of iLab Cable to iLab Module.
2. Connect the other end (in case i) or ii))
  - i) to spFlow Dual Pump iLab connector on the top of the instrument
  - ii) to spFlow Power iLab connector on the back plane of the instrument (“BCU” connector)

4.5 Install spFlow systems

**To install an spFlow system,**

1. Connect units as described in chapter 4.3
2. Connect AC power cord to spFlow Dual Pump
3. Connect the power cord to a grounded 230 VAC plug
4. Connect a CAT5 UTP cable to spFlow iLab Module

The network connection used must meet the following requirements

Parameter	Value
Host configuration protocol	Dynamic (DHCP)
Subnetwork	Same as controller PC (running Spinstudio)
Ports with full R/W access	12345 for spFlow instruments 5000 for netPump instruments
Bandwidth	10/100 Mbps
Bandwidth for camera	1000 Mbps

## 5 Fluid Actuators

### 5.1 spFlow Dual Pump

#### 5.1.1 Change syringes

**Please note that** the instrument must be connected in Spinstudio to perform this operation.

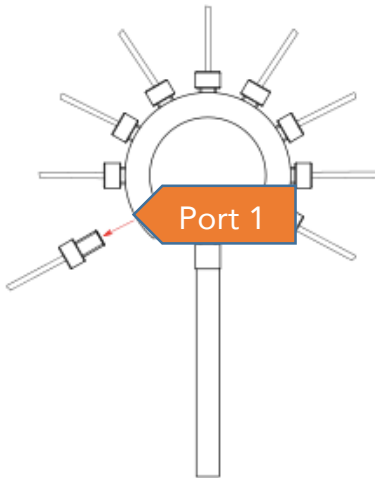
#### Accessing syringe pump driver in Spinstudio

1. Select the Instrument which the Pump module belongs to in Project Explorer
2. Select the tab of the Pump module intended to set up



**Note:** Pump calibration must precede the syringe changing procedure. See User Manual III, chapter 9 for pump calibration.

To access the **Change Syringe wizard** press the Change Syringe button.



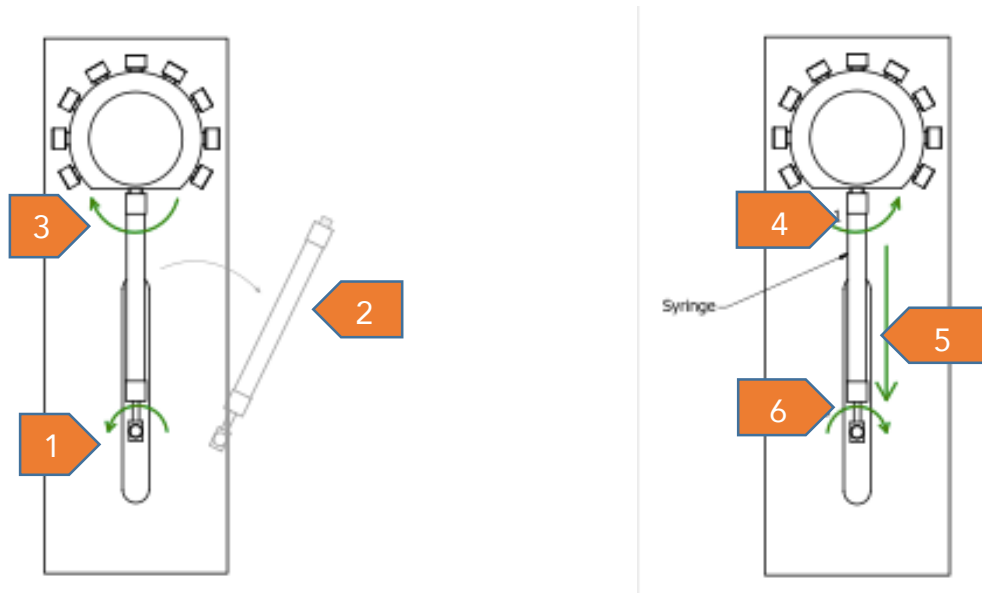
Changing the syringe is a process which must include piston movement as the plunger drive takes the required position for syringe change.

**Note:** During the syringe change process, the valve drive is set to Waste (Port No. 1) position. When the replace syringe is inserted, the plunger moves downwards and may intake fluid during Port No. 1. To avoid contamination, release the fitting of Port No. 1. during syringe change.

Press Next and follow the steps to release the syringe.

1. Release the syringe button by screwing anti-clockwise.
2. Release the syringe by screwing anti-clockwise.
3. Proceed the Set Carriage button to set the plunger drive to syringe changing position. The indicator below shows the completeness of the plunger movement.
4. Insert the new syringe to the distribution port and screw clockwise.
5. Pull and align the plunger button to the carriage mounting hole.
6. Fasten the plunger button to the carriage
7. Proceed the Calibration button to complete the process.
8. Fasten the fitting to Port No.1.



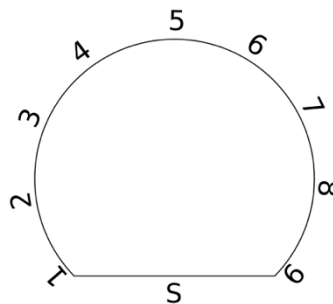


More information on syringe pump usage can be found in User Manual III.

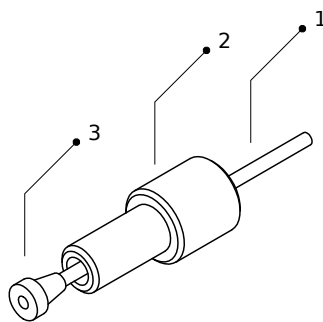
### 5.1.2 Connect fluid connectors

Dual Pump unit consists of two Syringe Pump modules, each equipped with a 9 way distribution valve with 10 ports. The ports are numbered clockwise as follows

Port	Usage
S	Syringe
1	Waste
2-8	Reagents
9	Reactor



Each port features the 1/4 - 28 fitting and flat bottom ports to connect tubings.



#### To connect tubing

1. Cut 1/16" OD PTFE tubing to the required length (1)
2. Slip the nut (2) over the tubing, narrow bottom facing towards the end of the tube.
3. Slip the ferrule (3) over the tubing, ensuring the tapered nose of the ferrule is facing away from the nut.
4. Insert the fitting into the receiving port
5. Finger-tight the nut completely clockwise





### 5.1.3 Daily maintenance

Although required maintenance may vary with your application, the following procedures are recommended for optimal performance of the Syringe Pumps.

**To ensure proper operation of the pumps, perform these tasks daily:**

- Inspect the pump(s) for leaks, and correct any problems.
- Wipe up all spills on and around the pump.
- Flush the pump(s) thoroughly with distilled or de-ionized water after each use and when the pump is not in use.

**Note:** Do not allow the pump(s) to run dry for more than a few cycles.

### 5.1.4 Weekly maintenance

All fluid paths of spFlow systems must be cleaned weekly to remove precipitates such as salts, eliminate bacterial growth, and so on.

To clean the pump with weak detergent, program Spinstudio to perform the following steps:

1. Prime the pump with a weak detergent solution (e.g., 2% solution of CONTRAD®, or RoboScrub) and allow the solution to remain in the pump with the syringe fully lowered for 30 minutes.
2. After the 30-minute period, remove the reagent tubing from the detergent and cycle all the fluid from the syringe and tubing into the waste container.
3. Prime the pump a minimum of 10 cycles with distilled or de-ionized water. Leave the fluid pathways filled for storage.

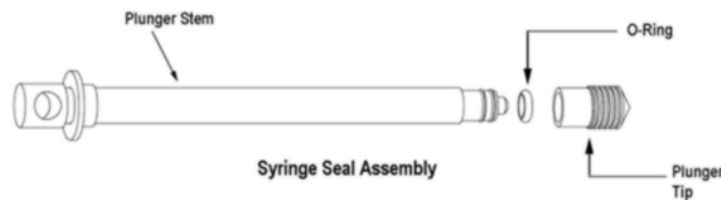
### 5.1.5 Replacing the Reagent Syringe Seals

**To replace the reagent syringe seals, follow these steps:**

1. Remove the syringe from the pump (see description in chapter 5.1.1)
2. Remove the plunger guide.
3. Remove the syringe plunger from the barrel.
4. Using a single edged razor or precision knife, carefully slice the old seal lengthwise and remove them from the plunger.



5. Replace the "O"-ring and wet the new "O" ring and plunger tip with distilled or deionized water.
6. Place the seal in the installation tool with the open end facing up. Press the plunger tip firmly into the hole until it snaps into position.
7. Lay the plunger on a flat table top, and position it so that the seal (from the "O"-ring up) hangs over the edge.
8. Slowly roll the plunger along the table edge pressing firmly on the portion of the seal below the "O"-ring.



9. Rotate the plunger three complete turns. This is necessary to make the sharp raised edge of the plunger bite into the seal for a secure fit.
10. Wet the seal with distilled or deionized water, then insert the plunger/seal assembly into the glass barrel.



## 5.2 netPump

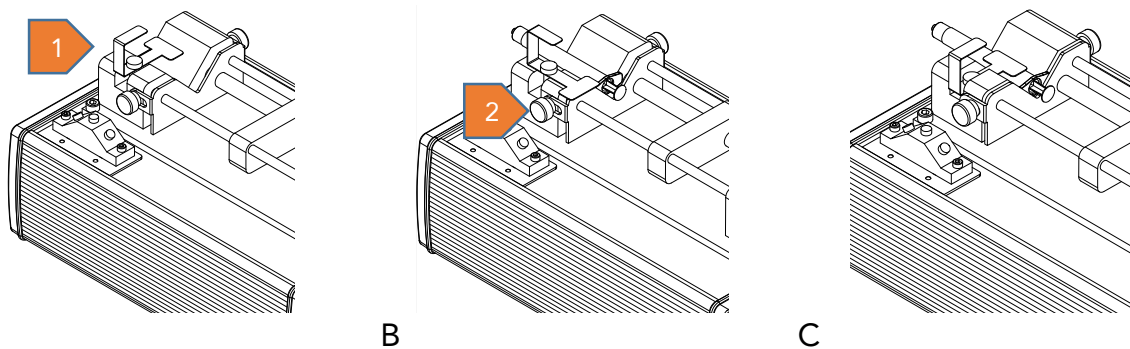
### 5.2.1 Install netPump

#### To install netPump instrument,

1. Plug in the 12 V AC adapter in the 230 VAC wall plug
2. Plug in the CAT5 UTP cable to netPump's RJ45 connector
3. Plug in the adapter cord into netPump's DC inlet
4. Turn on the Power Switch on the backplane of the Instrument
5. After the beep alarm the instrument is ready to use.

### 5.2.2 Change and install syringes

The netPump instrument operates with disposable plastic syringes.



#### To install syringe,

- A. Lift up the syringe holder lever (1), rotate clockwise 90° and release gently.
- B. Untight the bolts of the syringe collar clamp (2), pull the clamp backwards and insert the syringe so the collar fits in the clamp.
- C. Lift up the syringe holder lever, rotate anti-clockwise 90° and release gently.

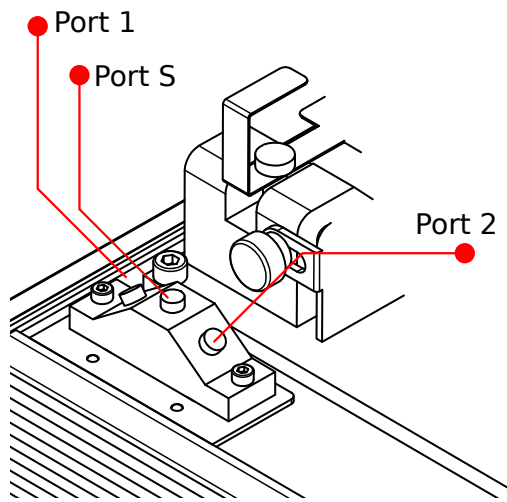
#### To release syringe,

- A. Lift up the syringe holder lever (1), rotate clockwise 90° and release gently.
- B. Untight the bolts of the syringe collar clamp (2), pull the clamp backwards and insert remove the syringe.
- C. Lift up the syringe holder lever, rotate anti-clockwise 90° and release gently.



### 5.2.3 Connect fluid connectors

The netPump instrument can be used either with or without distribution valve.



**The distribution valve** has three ports with the following functions

Port	Usage
1	Reactor
S	Syringe
2	Reagent

**Each time when the piston moves backwards (intake operation),** the valve opens Port 2.

**Each time when the piston moves forwards (dispense operation),** the valve opens Port 1.

**To use netPump without distribution valve,** connect a Luer-lock fitting to the syringe.

#### **To use netPump with distribution valve**

1. Connect the syringe to the Port S of the distribution valve. Use a tubing Luer-lock fitting on one end and a flat-bottom ¼ - 28 fitting at the other end.
2. Connect a reactor to Port 1 of the distribution valve using a flat-bottom ¼ - 28 fitting.
3. Connect a reagent to Port 2 of the distribution valve using a flat-bottom ¼ - 28 fitting.

### 5.2.4 Maintenance

Although required maintenance may vary with your application, the following procedures are recommended for optimal performance of netPump.

#### **To ensure proper operation of netPump, perform these tasks daily:**

- Wipe up all spills on and around the pump.
- Flush the distribution valve thoroughly with distilled or de-ionized water after each use and when the pump is not in use.

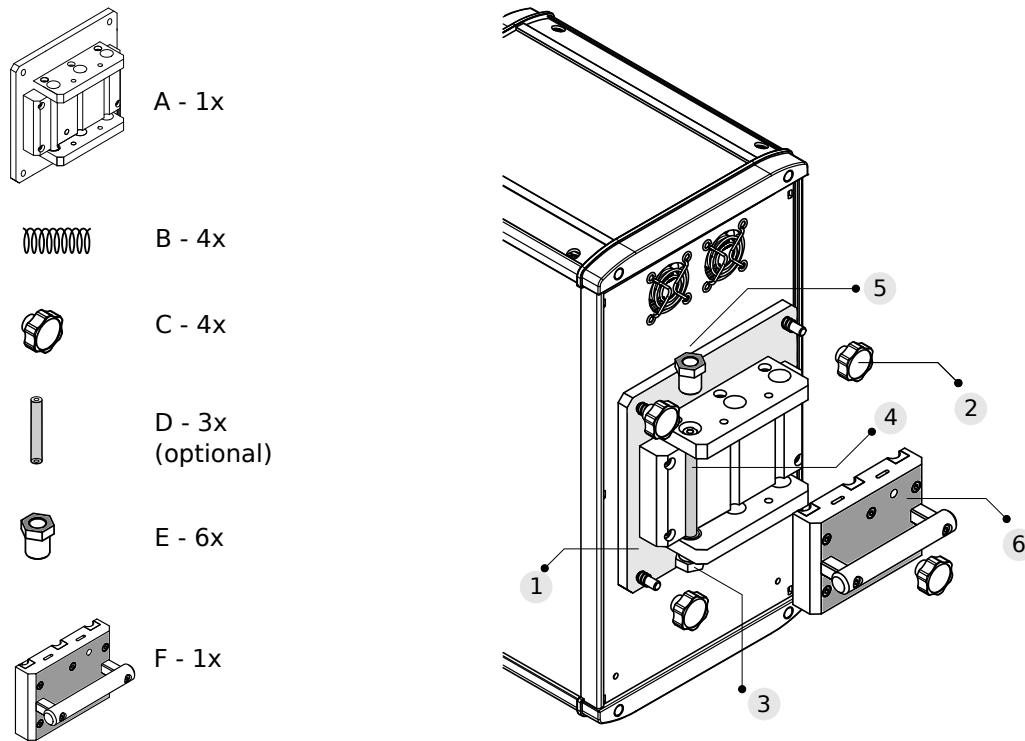


## 6 Thermostats

### 6.1 spFlow Chem thermostat

spFlow Chem thermostat is capable to receive two reactors: Column Reactor and Tube Reactor respectively.

#### 6.1.1 Change Column Reactor assembly



#### To install Column Reactor,

0. (Optional) for measurements above 30 °C, Spinsplit recommends to use thermal interface material (TIM) between the reactor holder and the heat spreader (for instance Wakefield Type 120).
1. Clean the heat spreader plate of spFlow Chem with IPA and apply TIM in a thin layer if needed. Following that, slip the Reactor Holder (A) through the four threaded stems until the Reactor Holder lies solid on the heat spreader. Connect the reactor cord to the connector on the front panel of spFlow Chem.
2. Slip the four springs (B) on the threaded stems and tight the four bolts (C) softly. Following that tight the left top bolt with your fingers, then right bottom, right top, left bottom, respectively.
3. Slip the upstream HPLC tubing and corresponding ferrule through the column holder fittings (E) from the bottom.

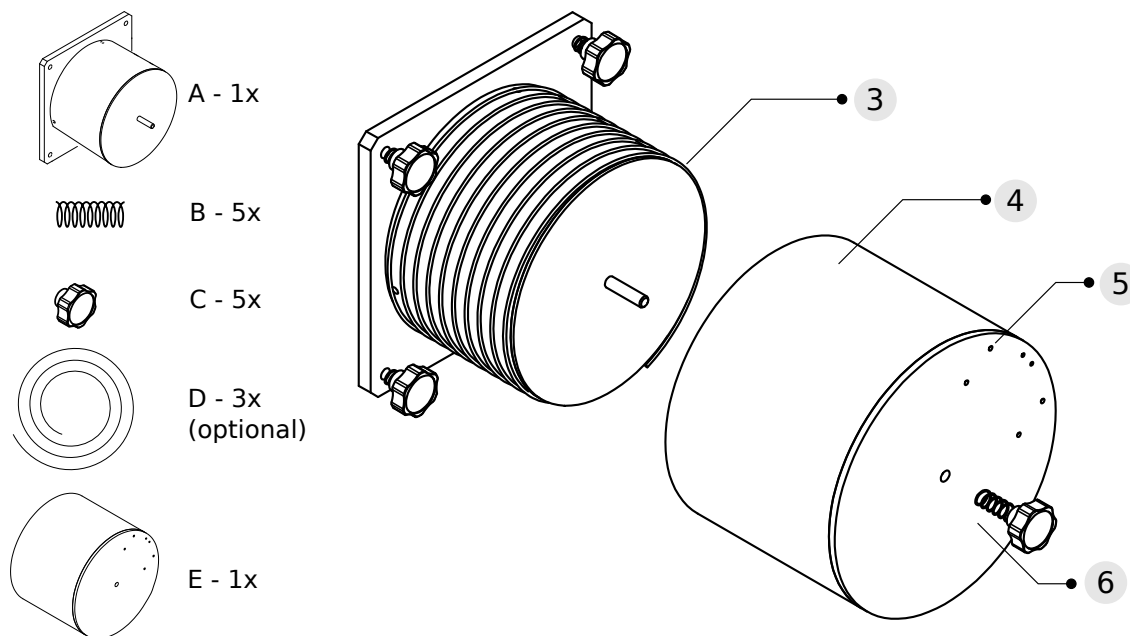


4. Insert one or more columns (D, not included) and precisely insert them on the top of the ferrules. At most three columns can be inserted into the reactor holder.
5. Slip the downstream HPLC tubing and corresponding ferrule through the column holder fittings (E) from the top. Tight the fittings with a 16 mm wrench.
6. Softly slip the Reactor Cover (F) onto the Reactor Holder.

#### To remove Column Reactor,

1. Pull out the reactor cord from the connector on the front panel of spFlow Chem.
2. Follow the steps 6-1 reversely.
3. Clean the heat spreader plate of spFlow Chem.

#### 6.1.2 Change Tube Reactor assembly



#### To install Tube Reactor,

0. (Optional) for measurements above 30 °C, Spinsplit recommends to use thermal interface material (TIM) between the reactor holder and the heat spreader (for instance Wakefield Type 120).
1. Follow step 1 of installing Column Reactor.
2. Follow step 2 of installing Column Reactor.
3. Wound the reactor tubing (D, not included) closely around the reactor cylinder (A).
4. Put the ends of the tubing through the tube reactor cover (E)
5. Slip the reactor cover on the threaded stem of the reactor cylinder and pull through the tubes.



6. Slip a spring (B) on the threaded stem of the reactor cylinder. Following that turn a bolt (C) on the stem and finger tight softly.

**To remove Tube Reactor,**

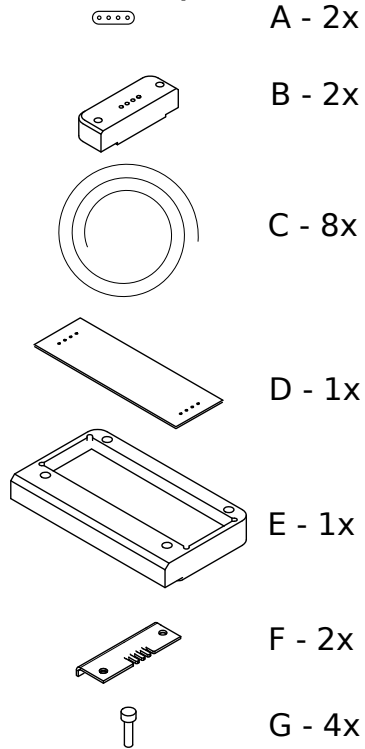
1. Pull out the reactor cord from the connector on the front panel of spFlow Chem.
2. Follow the steps 6-1 reversely.
3. Clean the heat spreader plate of spFlow Chem.



## 6.2 spFlow MagneChip and spFlow Chip thermostat

### 6.2.1 Prepare chip reactor assembly

To install chip microreactor, prepare the following parts:

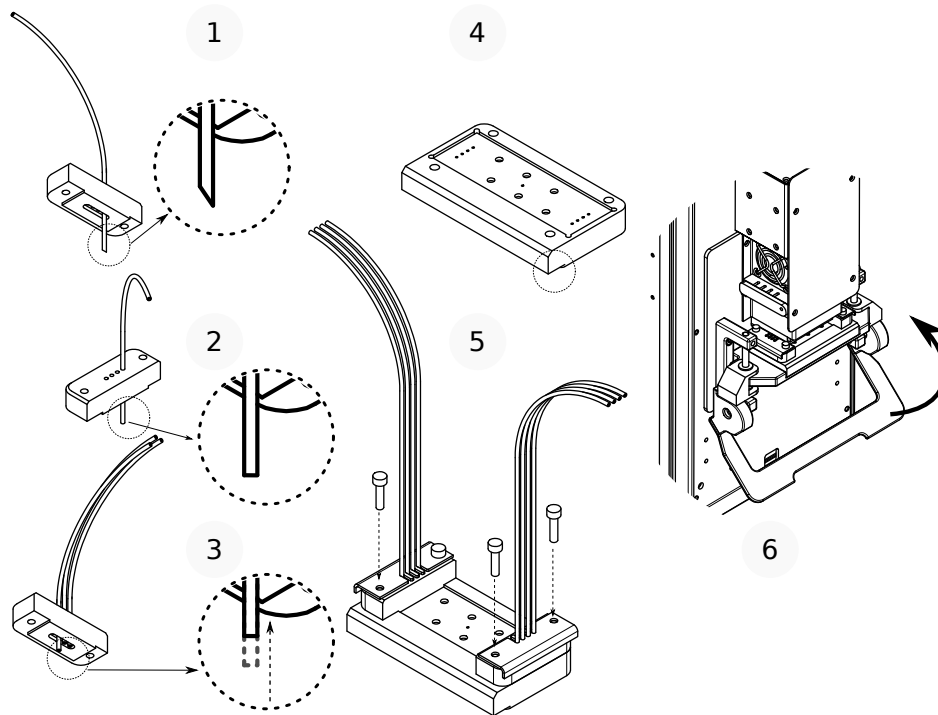


	Description	Count required
A	Sealing for chip connector interface	2
B	Chip connector interface <b>Note:</b> Left and right side items are different	1x Left 1x Right
C	PTFE tubing 1/16" OD	One per port used, max. 8
D	Microreactor chip <b>Note:</b> not included, order separately	1
E	Microreactor chip holder	1
F	Tube guide	2
G	PEEK screws	4





## 6.2.2 Install chip reactor



### To install chip reactor,

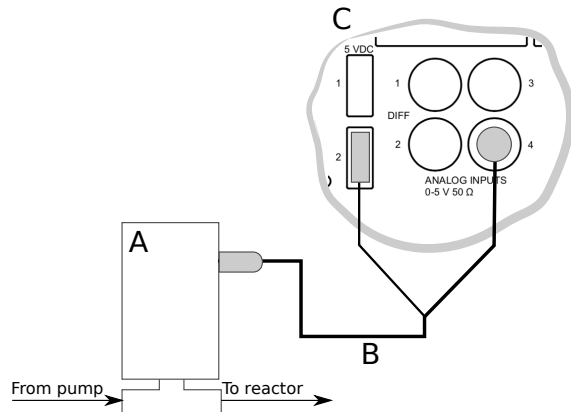
1. Softly insert the seals (A) into the groove on the bottom of the chip interface (B), sharp cut the end of tubes (C) and slip the tubes through the interface with seal face to bottom. Repeat this step with each ports of the chip microreactor.
2. Flat cut the bottom end of the tubes.
3. Push the tubes back towards the seal until the end of the tubes lie on plane of the seal
4. Insert the Microreactor chip (D) into the Chip holder (E). Make sure that the groove runs along the bottom side of the Chip holder faces outside.
5. Precisely place the chip interfaces on the sides of the Chip holder. Note that the interfaces differ on the left and right sides. Gently slip the tube guides (F) through the tubes and tight the interfaces with the PEEK screws (G). The Microreactor Cassette is ready.
6. Turn down the chip holder lever of MagneFlow, slip the Microreactor Cassette on the chip holder tray groove facing outside. Elevate the chip holder lever.



## 7 Auxiliary modules

### 7.1 Pressure sensor

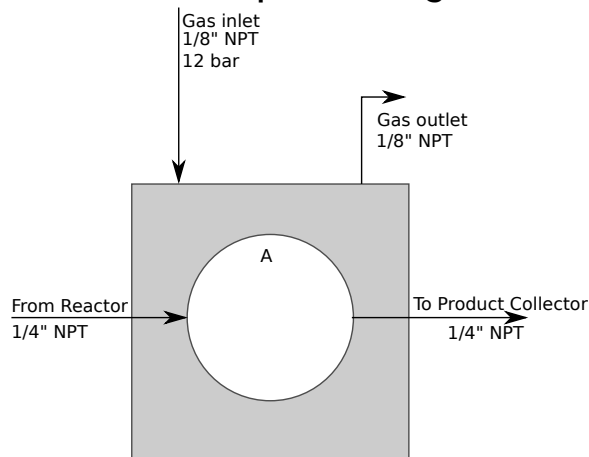
#### To connect Pressure Sensor



1. Link the pressure sensor (A) between a pump and a reactor using 1/16" OD tubing and 1/4 -28 fittings
2. Plug the micro-USB connector of the pressure sensor cord (B) into the sensor.
3. Plug the coax-plug into the backside Analog In connector (#3 or #4) of MagneFlow (C)
4. Plug the DC plug into the backside 5 VDC connector of MagneFlow.

### 7.2 Backpressure regulator

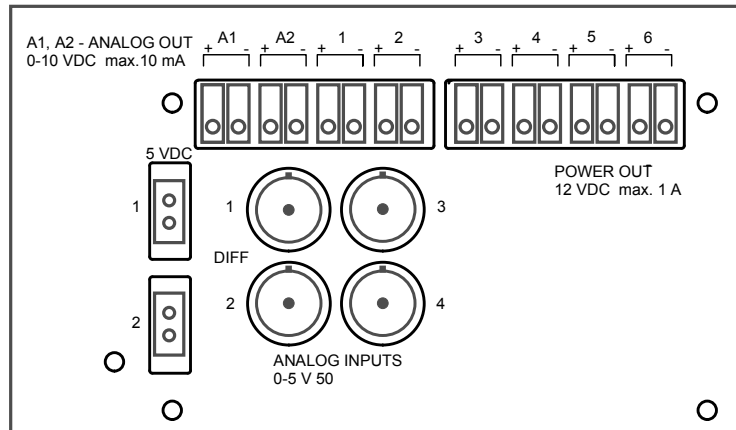
#### To connect Backpressure regulator



1. Make sure 1/8" NPT 12 bar gas inlet and 1/8" NPT gas outlet ports are connected\*
2. Connect Reactor output to BPR (A) input port with 1/4" NPT connector
3. Connect the product collector to the outlet port of BPR with 1/4" NPT connector



## 7.3 External Units



External units can be connected to spFlow Instruments equipped with External Module Interface (EMI). EMI connectors are located on the backside of the Instrument.

### To connect or disconnect external modules to Analog Out ports

- **Connect:** Connect the module wires to A1 or A2 + and – terminals. For electrical parameters see User Guide I.
- **Disconnect:** Press the orange button with a flat jeweler’s screwdriver and pull out the wire
- **Note:** For electrical parameters see User Guide I.

### To connect or disconnect external modules to Analog Input ports

- **Connect:** Push the coaxial plug towards the coaxial connector and turn the bayonet lock clockwise
- **Disconnect:** Turn the bayonet lock anticlockwise and pull out the plug
- **Note:** For electrical parameters see User Guide I.

### To connect or disconnect modules to switched power outputs

- **Connect:** Connect the module wires to 1..6 + and – terminals.
- **Disconnect:** Press the orange button with a flat jeweler’s screwdriver and pull out the wire
- **Note:** For electrical parameters see User Guide I.

### To connect or disconnect modules to 5 Volts power output

- **Connect:** Connect the module DC plug to the connector by pushing softly until click.
- **Disconnect:** Gently pull out the plug while pressing the wings of the plug
- **Note:** For electrical parameters see User Guide I.



## 8 Contact information

**SpinSplit Technical Research and Development LLC**  
Registry no.: 01-09-281957

**Contact address:**

H-1082  
Leonardo da Vinci str. 43 B  
Budapest  
Hungary

T: +36704531907

[info@spinsplit.com](mailto:info@spinsplit.com)

[www.spinsplit.com](http://www.spinsplit.com)

