

Installation and Operations Manual

SICRIT® LC/SFC Module



Release November 2024

Plasmion GmbH – Am Mittleren Moos 48 – 86167 Augsburg - Deutschland

This manual must be stored carefully and must be at hand to any user of the described system. In addition to this manual, Plasmion GmbH provides further installation documentation e.g.:

- *Installation Manual for SICRIT® MS Interface TX 2/3*
- *Hardware and Operations Manual for SICRIT® SC-30X Ionization Set*

Please check for further and updated versions of this manual on www.plasmion.com.



Attention!

Please read and understand this manual before operating the described system. In case you discover obvious errors or contradictions for your product, contact the manufacturer before operating the system.

The content of this document has been checked thoroughly and is considered to be reliable. However, Plasmion GmbH does not take responsibility for damage of foreign or own products and instruments resulting from improper use. Plasmion GmbH is not liable for consecutive damage resulting from integration and/or operation of its products in/with other systems. If the system is used in any manner not specified by Plasmion GmbH, the protection of the system could be impaired. Plasmion GmbH is not responsible for ignoring the outlined safety guidelines or the misuse of this system.

The technology and application of the system described in this manual is covered by patents and patent applications and is used under license.

All trademarks are property of their respective owners.

Declaration of conformity

The products outlined in this manual are engineered and built according to the requirements of electrical safety and health protection as outlined in the EC low voltage directive and electromagnetic compliance (EMC) directive. Any change or modification of any of the referred products, not verified by Plasmion GmbH, voids this declaration.

Plasmion GmbH certifies that the

SICRIT® LC/SFC Module

is designed and built to meet the EU Regulation No. 2014/35/EU (low voltage directive) and the Guideline 2014/30/EU (EMC Directive). The product fulfills the following safety requirements and safety standards for electrical measurement, control, and laboratory use:

IEC 61010-1:2010

ICE 61010-1:2010/AMD1:2016

EN 61010-1:2010/A1:2019

IEC 61010-2-010:2019

EN IEC 61010-2-010:2020

The product fulfills the following directives for electromagnetic compliance of electrical measurement, control and laboratory use:

IEC/EN 61326-1:2012, Class A

CISPR 11/EN 55011:2009

The product is compliant with RoHS-Guideline 2011/65/EU.



IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	Laboratory Equipment
Name and address of the applicant	Plasmion GmbH Am Mittleren Moos 48 86167 Augsburg GERMANY
Name and address of the manufacturer	Plasmion GmbH Am Mittleren Moos 48, 86167 Augsburg, GERMANY
Name and address of the factory	Plasmion GmbH Am Mittleren Moos 48, 86167 Augsburg, GERMANY
Ratings and principal characteristics	see page 2
Model/type Ref.	SICRIT Control Unit SC-30 SICRIT Ion Source SICRIT GC/SPME Module
A sample of the product was tested and found to be in conformity with	IEC 61010-1:2010 IEC 61010-1:2010/AMD1:2016 IEC 61010-2-010:2019
as shown in the Test Report Ref. No. which forms part of this certificate	713213704

Page 1 of 2
This CB Test Certificate is issued by the National Certification Body

CB 116004 0001 Rev. 00
Date, 2022-02-25

Siemon

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Product Service



Ref. Certif. No.

DE 3 - 31730

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

Ratings and principal characteristics (continued)

SICRIT Control Unit SC-30:

Rated Voltage:	100-240 VAC
Rated Frequency:	50-60 Hz
Rated Power:	max. 400 W
Protection Class:	II
IP-Code:	IP30
Output High Voltage:	2 x 0 – 1100 VAC
Output High Voltage Frequency:	10 – 50 kHz
Output Module Voltage:	24 VDC

SICRIT Ion Source:

Rated Voltage:	Supply by SICRIT Control Unit SC-30
Protection Class:	2 x 0 – 1100 VAC
IP-Code:	II
	IP40 (gas-tight connection to ion source)

SICRIT GC/SPME Module:

Rated Voltage:	Supply by SICRIT Control Unit SC-30
Protection Class:	24 VDC
IP-Code:	III
	IP20

Remarks:

- When installing requirements of test standards and installation guide must be fulfilled.
- This equipment is for indoor use, operated by qualified personnel skilled in its use.
- The Ion source must be protected in final application by an Interface.

Page 2 of 2

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Product Service

Safety Instructions

The following safety labels on the product and within this manual indicate safety risks and necessary precautions that arise during installation or from operating the products.

	<p>[Attention!], marks possible dangers to your safety and health.</p>
	<p>[Dangerous Voltage!], indicates parts and situations where there is the risk of exposure to dangerous electrical voltages.</p>
	<p>[Attention Hot Surface!], indicates potentially hot surfaces that might cause burning injuries if touched without protective gear.</p>
	<p>[Note], marks important information or advice, not related to safety issues.</p>

Table of Content

Declaration of conformity	3
Safety Instructions.....	6
1. Intended Use of the SICRIT® LC/SFC Module	8
1.1 The SICRIT® Technology	8
1.2 The SICRIT® LC/SFC Module.....	8
2. Technical Data.....	9
3. Setup and Operation Modes of the SICRIT® LC/SFC Module.....	10
4. Installation and Operation of the SICRIT® LC/SFC Module.....	11
4.1 Installation prerequisites	11
4.2 Initial operation of the SICRIT® LC/SFC Module.....	12
4.3 Mounting the SICRIT® LC/SFC Module.....	12
4.4 LC-SICRIT®-MS measurements.....	21
5. Vendor-specific Operation Information	23
5.1 Shimadzu	23
5.2 SCIEX	24
5.3 Waters	25
5.4 Thermo Scientific	26
5.5 Agilent	26
5.6 Bruker.....	26
6. Service and Maintenance.....	27
6.1. Cleaning and decontamination.....	27
6.2. General maintenance and service of the SICRIT® LC/SFC Module.....	27
6.3. Bake out and cleaning of the SICRIT® LC/SFC Module	28
6.4. Adjusting the Nebulizer	28
7. Risk Avoidance or Residual Safety Risks.....	29
8. Operation with Potentially Harmful Substances.....	29
9. Troubleshooting the SICRIT® LC/SFC Module	30
9.1. Problem description: The TIC is spiking unexpectedly	30
9.2. Problem: Error Message: THERMOFUSE TRIPPED.....	30
10. Spare Parts.....	31

1. Intended Use of the SICRIT® LC/SFC Module

The system described is intended for use only in laboratory and/or R&D environment. If the system is used in a way not specified by the manufacturer, misused or modified causing an infringement of the safety measures, Plasmion GmbH refuses any liability for consecutive damage in any form.

1.1 The SICRIT® Technology

Soft Ionization by Chemical Reaction In Transfer (SICRIT®) is a flow through ionization technique to be coupled with LC mass spectrometers featuring an API. Inside the ion source a cold plasma is used for ionization of the analytes passing through. This enables direct gas phase measurements as well as coupling with chromatographic systems such as GC or HPLC. While the former one can be conducted with the GC/SPME Module, the latter is done via the LC/SFC Module and explained in this manual.

1.2 The SICRIT® LC/SFC Module

The LC/SFC Module is designed for coupling of the SICRIT® Ion sources with liquid chromatography (LC-SICRIT®-MS) or supercritical fluid chromatography (SFC). Therefore, the module is directly connected to the SICRIT® Ion source, which is mounted onto the mass spectrometer (MS) inlet. Further details regarding installation of the ion source and mounting of the SICRIT® MS Interfaces are provided in the respective manuals. The SICRIT® LC/SFC Module is empowered and controlled via the SICRIT® SC-30 Control unit.

The module features a nebulizer and a solid steel heating chamber for evaporation of the liquid delivered by means of a ceramic heater. A drain is located at the bottom of the module to divert condensed or non-evaporated residues into a drain bottle. The module is operated with N₂ as nebulizing and optional sheath gas. In the heating chamber the analyte is vaporized and then drawn through the SICRIT® Ion source into the MS inlet.

2. Technical Data

SICRIT® LC/SFC Module



Dimensions	220 x 50 mm
Weight	0.5 kg
Supply Voltage	Supply by SICRIT® Control unit SC-30: 24 VDC, 75 W
Electrical Connectors	1.4 m cable with plug for SC-30 Control unit
IP-Code	IP20
Protective Class	III
Operation Conditions	5 °C to 65 °C surface temperature 0 bis 80% RH (non condensating)
Maximum Operation Temperature (carrier gas temperature)	500°C
Storage Conditions	5 °C to 50 °C
Operation Humidity	up to 31°C: < 80% RH (non condensating) at 40°C: < 50% RH
Maximum Operating Altitude	2,000 m
Possible mobile Phases	MeOH, ACN, H ₂ O, THF Hexane, DCM, CO ₂ , others* *contact the manufacturer for further information
Note	A specific nebulizer assembly (Art.-Nr. 13-002) and tubing kit (Art.-Nr. 12-003) is required for connection and operation For mounting, the mounting system (Art.-Nr. 26-011) is required

3. Setup and Operation Modes of the SICRIT[®] LC/SFC Module

The SICRIT[®] LC/SFC Module is intended for use in combination with LC and SFC devices. Also, the interfacing with micro- and nano-LC is possible. Therefore, a dedicated nebulizer is required:

a) Normal-flow (>25 $\mu\text{L}/\text{min}$)



b) Low-flow (<50 $\mu\text{L}/\text{min}$)



Figure 1: Different nebulizers options available for the LC/SFC module.

The module is designed to vaporize any liquid stream coming from the chromatography unit and focus it onto the inlet of the SICRIT[®] Ion source, where the gaseous analyte is then ionized and detected via the adjacent MS.

The module features two gas inlets. One on the nebulizer and one at the side of the module for the (optional) sheath gas. These gas streams help with the nebulization, drying and transport of the effluent. The SICRIT[®] Ion source can be connected by a plug-in adapter.



Figure 2: Components of the SICRIT[®] LC/SFC Module.

4. Installation and Operation of the SICRIT® LC/SFC Module

The SICRIT® LC/SFC Module is installed by mounting it on the respective SICRIT® MS-Interface, using the universal mounting system (Art.-Nr. 26-011). Each SICRIT® MS source housing features two mounts to fix the linear rails of mounting kit for horizontal (e.g. GC application) or vertical (LC application).

The following installation procedure is described exemplarily for a Shimadzu LC-MS system and the corresponding SICRIT® MS Interface SZ2. However, it applies similarly for other systems and interfaces.

A short [installation video](#) can be found on YouTube.

4.1 Installation prerequisites

Before mounting the SICRIT® LC/SFC Module to your MS, install your specific SICRIT® MS-Interface and the SICRIT Ion source following the steps in the provided manuals:

- *Installation Manual for SICRIT® MS Interface*
- *Hardware and Operations Manual for SICRIT® SC-30X Ionization Set*

Shimadzu Source Housing (Art.-Nr. 26-010)

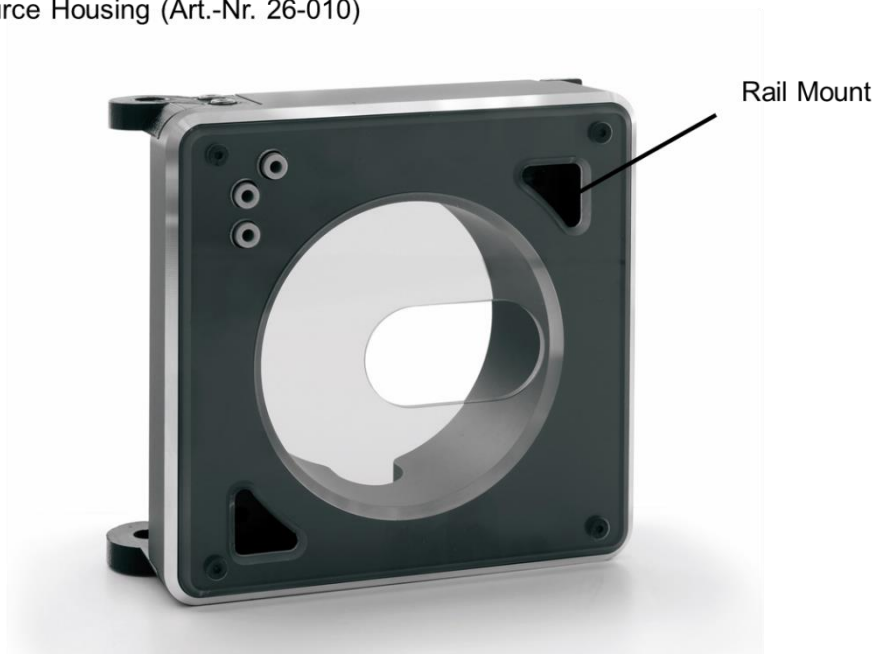


Figure 3: SICRIT® Shimadzu Source housing with rail mounts for optional module installation.

4.2 Initial operation of the SICRIT® LC/SFC Module

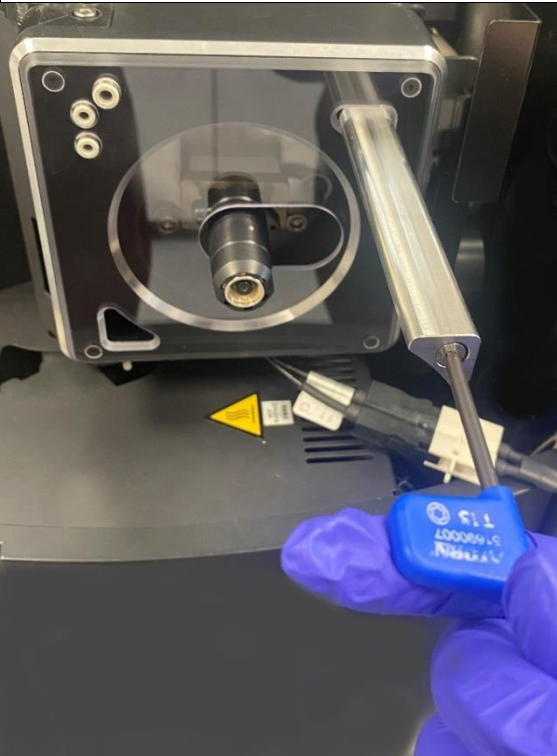
The LC/SFC Module consists of a stainless-steel heating chamber surrounded by an aluminum housing. The gases pass the inside of the heating chamber. To remove possible contaminations due to the manufacturing process, it is recommended to bakeout the module at 400°C for 30 minutes (not connected to the SICRIT® source) to remove potential deposited residues.

4.3 Mounting the SICRIT® LC/SFC Module

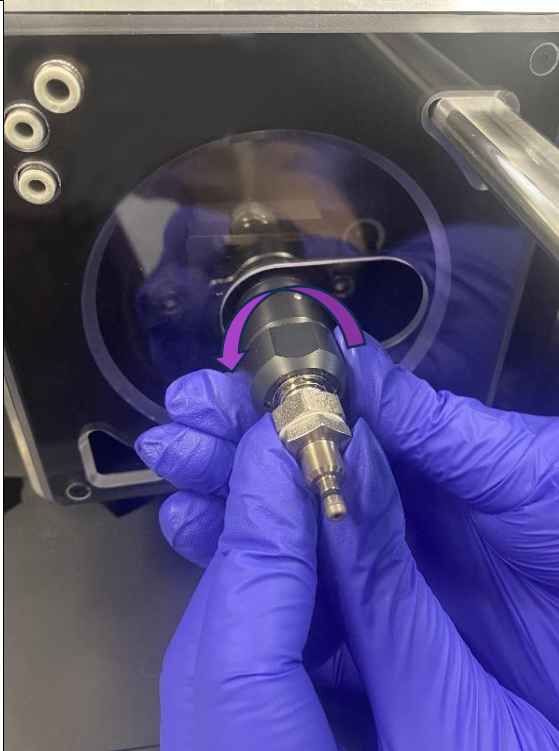
Generally, the mounting rail system allows for easy and flexible alignment of add-on modules for use with the SICRIT® Ionization technology. A lock-lever system enables fine adjustment of the modules in x, y, and z-direction.

During the first installation of the system, some adjustments must be performed to meet the individual space and orientation requirements. These pre-settings can then be used for future installations.

Please follow the step-by-step instructions below:

	Mount source and interface according to the manual going with your MS-system.	
1		Insert the rail of the mounting holder system in the designated rail mount at the top right of the interface and secure it with the provided Torx tool.

2



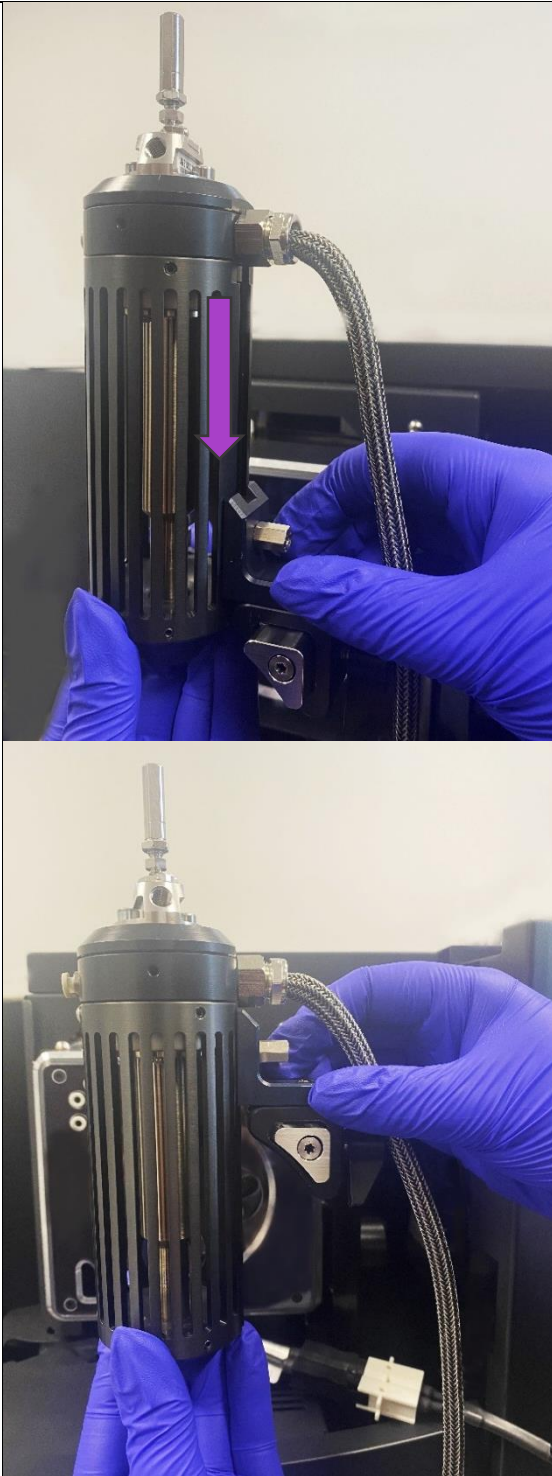
Attach the provided plug-in adapter to the already mounted SICRIT® Ion source by screwing it on till it is hand tight.

3

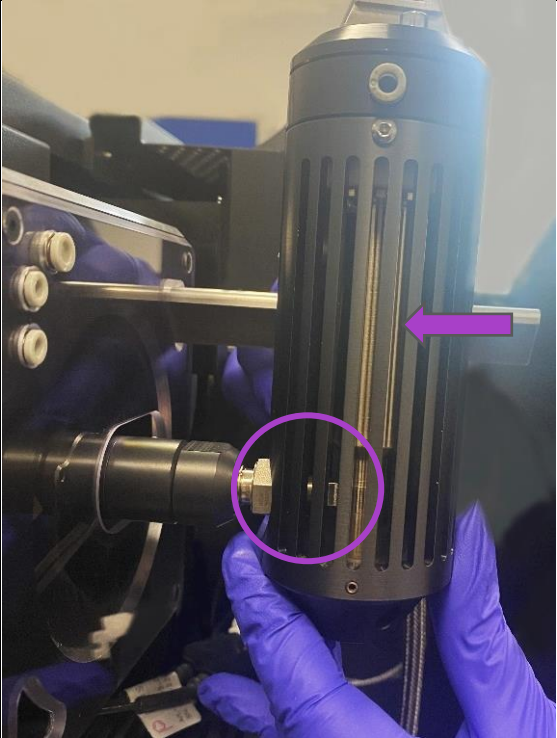





Place the slider with lock lever on the rail.

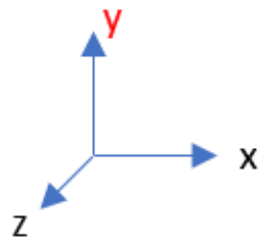
4



Assemble the LC/SFC Module with the holder system and make an initial rough adjustment. Slide the module on the rail and move it in place. Do not lock it yet!

4		<p>Carefully move the LC/SFC Module towards the mounted adapter and insert the plug-in adapter completely into the LC/SFC Module.</p>
5	<p>Wrong</p>  <p>Wrong</p>  <p>Correct</p> 	<p>Make sure that the LC/SFC Module is correctly mounted to the adapter.</p>

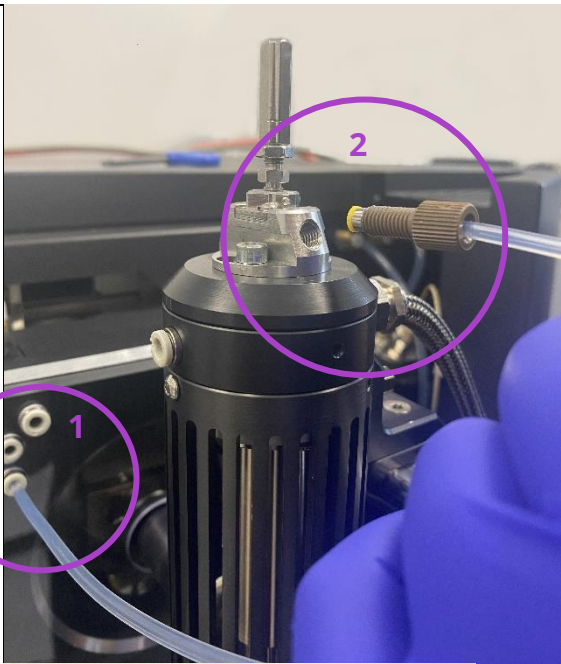
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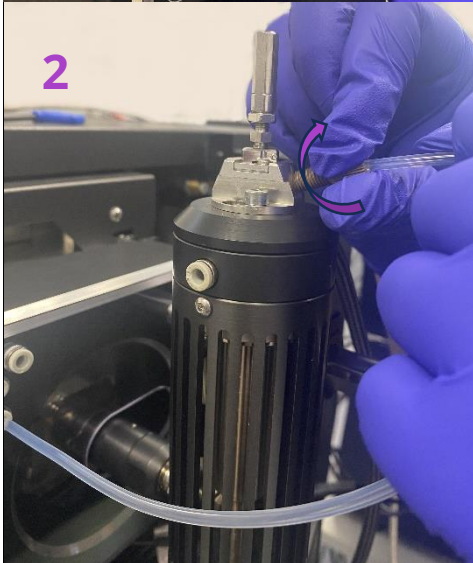
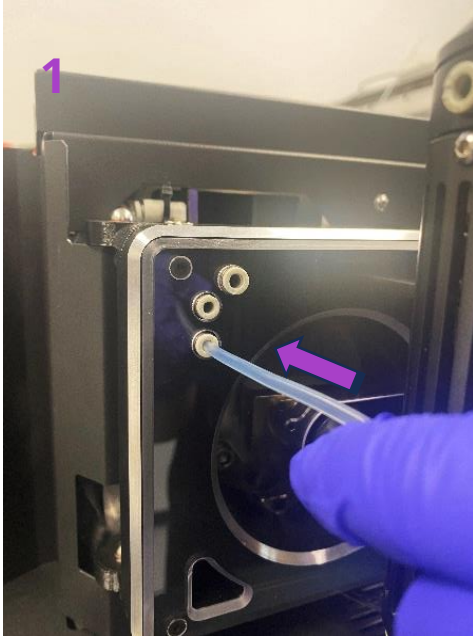
Carefully tighten the levers and fix the y-positioning. You need to determine the y-position only at the first installation.

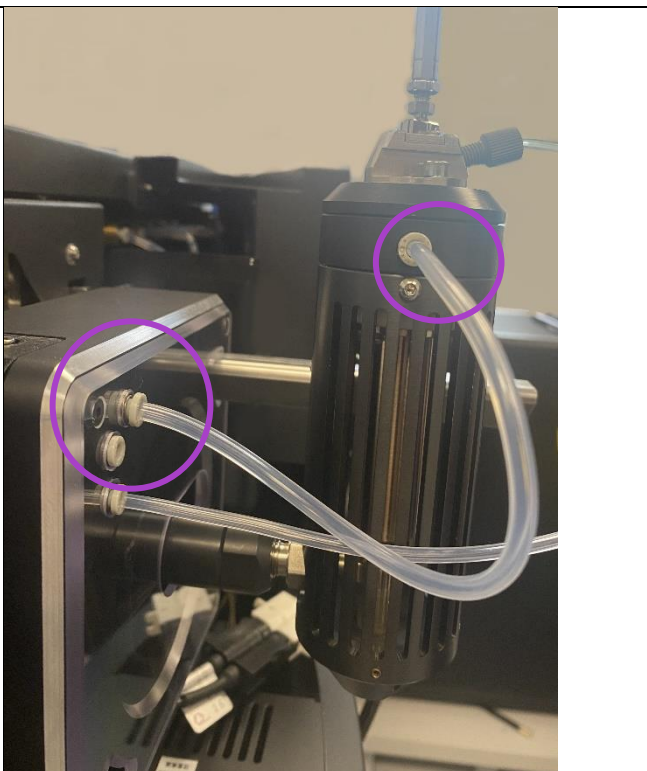
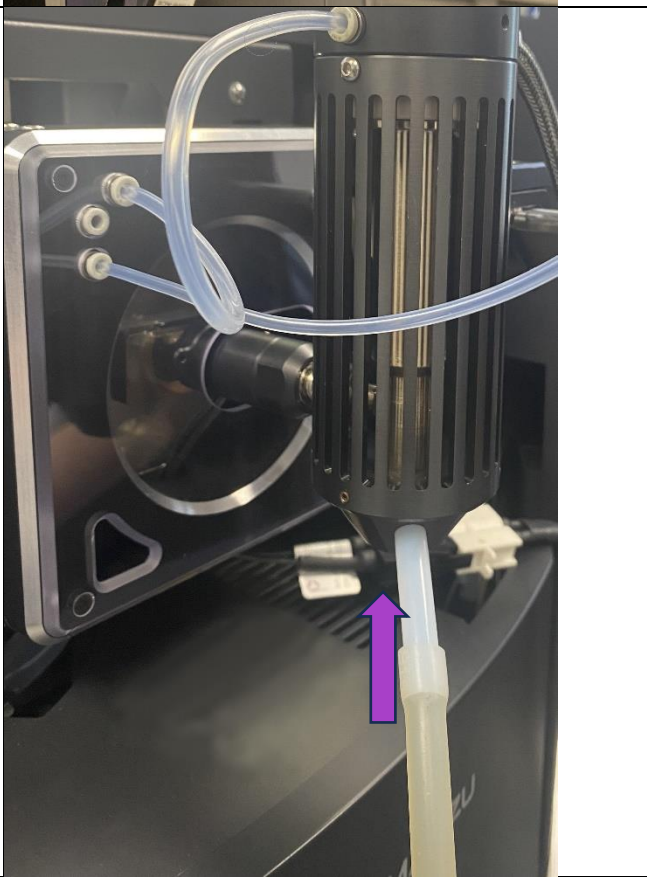
Make sure that both levers are locked hand tight before operating the LC/SFC Module.


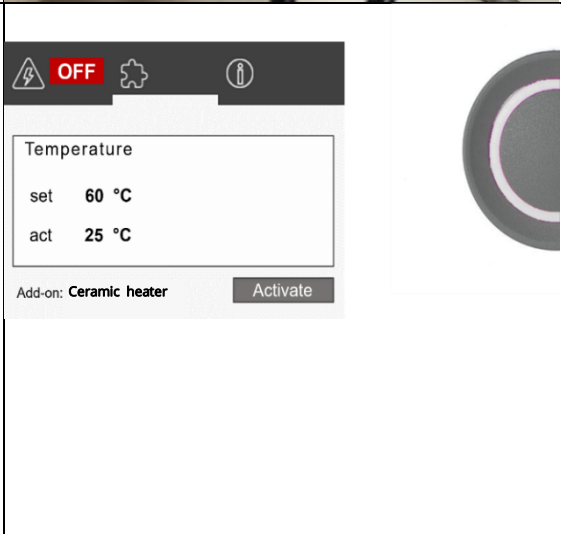
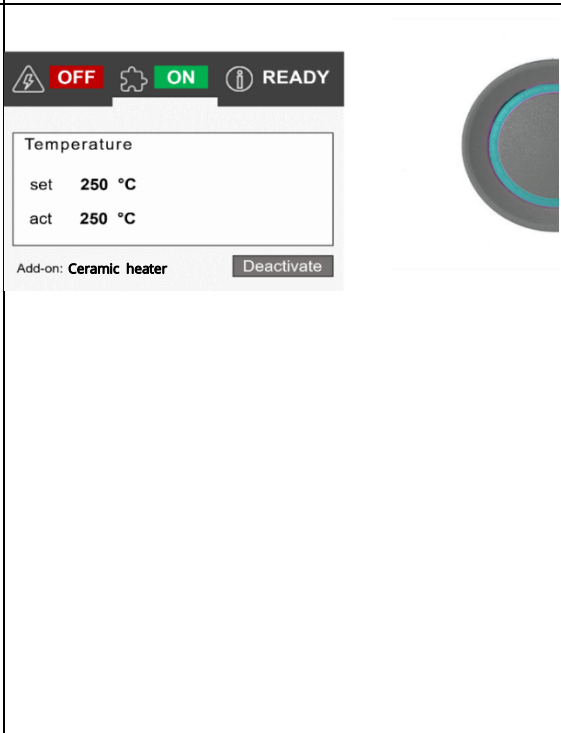
7







Connect the nebulizing gas with the sprayer needle of the LC/SFC Module using the screw fitting of the sprayer needle.



8		<p>Optional: connect a Sheath Gas Supply (e.g. Heating Gas at Shimadzu systems) with the sheath gas inlet of the LC/SFC Module, using the tube fitting inlet (Ø 3,2 mm).</p> <p>Gas supply can be provided by the aux gas supply of the MS using the one-touch fitting included in the SICRIT® Interface kit.</p>
		<p>Use the tube to connect the waste outlet of the LC/SFC Module with your waste bottle</p>

9		<p>Connect the LC/SFC Module cable with the SICRIT® Control unit.</p>
10		<p>When you switch on the power of the SICRIT® SC-30 Control unit, the next tab is activated. The display shows the set temperature and the actual temperature of the LC/SFC Module. It will display “ceramic heater” as add-on.</p>
11		<p>Choose the desired set temperature in the module tab of the SICRIT® Control unit and activate it to heat up the module.</p> <p>Make sure that the temperature is high enough for vaporization of the desired LC-flow rate.</p> <p>Recommended temperatures for flow rates and individual solvents are summarized in Table 1 found later in this manual.</p>

12		<p>Connect LC capillary to the sprayer needle of the LC/SFC Module.</p>
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	<p>Attention! Make sure that the LC Pump is switched off during the whole mounting process to avoid liquid entering the MS-System.</p>
	<p>Attention! Avoid bending the cables. Do not place the cable over sharp edges or hot surfaces. Avoid strain on the cables and use strain relief measures.</p>
	<p>If you do not know the flow rate of your MS, the rate may be measured using a flow meter directly connected to the SICRIT® Ion source. If you need further technical assistance, contact Plasmion or its respective sales agent.</p>

4.4 LC-SICRIT®-MS measurements

For LC-MS analysis you can follow your established LC protocol.

Table 1:

Table 1 Recommended **minimum** temperature and gas flow settings for operating the LC/SFC Module with liquid solvents (e.g., Water, ACN, MeOH)

LC-Flow Rate ($\mu\text{L}/\text{min}$)	Min. Temperature ($^{\circ}\text{C}$)	Min. Sheath Gas (L/min)*	Min. Nebulizer Gas (L/min)*
< 100	150	-	0.5
< 200	150	-	1
< 300	250	-	1.5
< 400	300	-	1.5
< 500	350	2	1.5
> 500	400	4	2.5

*Experimental conversion rates of different MS settings to L/min values can be found in chapter 5 of this manual.



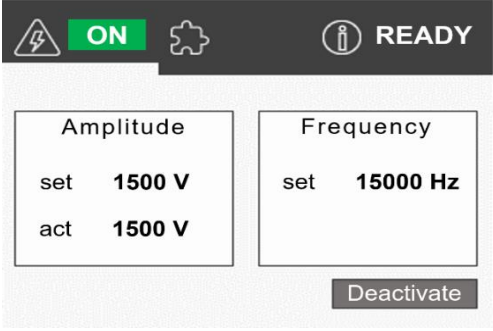
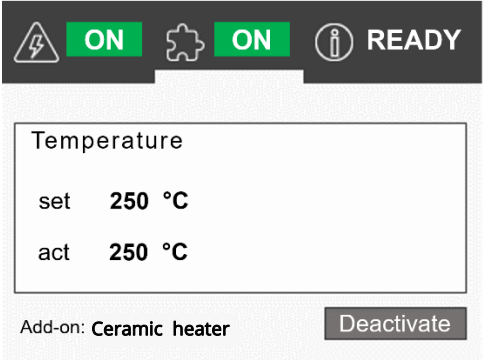

Caution!


Make sure that the nebulizing gas flow is switched on and set to the right flow, then wait till the LC/SFC Module is heated to temperature before introducing the LC flow.

If the LC/SFC Module is not heated completely or the nebulizing gas flow is too low for the solvent flow, liquid might enter the MS system and cause damage.

There is no (fail/safe) communication with the MS and LC/SFC-Module yet! So, the operator is obliged to ensure all settings are correct before starting the measurement.

Plasmion GmbH refuses any liability for any damage arising from improper operation or failure to comply with this requirement!

1	 <p>Amplitude set 1500 V act 1500 V</p> <p>Frequency set 15000 Hz</p> <p>Deactivate</p>	To prepare a LC-MS run turn on the voltage on your SICRIT® Control unit to start the plasma.
2	 <p>Temperature set 250 °C act 250 °C</p> <p>Add-on: Ceramic heater</p> <p>Deactivate</p>	Turn on heating of the LC/SFC Module and then the gas flows of the MS.
3		Make sure not divert the LC-Flow to the LC/SFC-Module before the module is completely heated and the gas flow/s is/are on.
4		Now start your LC-MS measurements like usual

	Before first analytical use each day, please perform at least one blank run for stabilization.
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5. Vendor-specific Operation Information

There is certain vendor and MS specific information for operating the SICRIT® LC/SFC Module. Please select the respective information for your system. If you do not find your or an alike system listed below, please check for an updated version of this manual or contact support@plasmion.com for detailed instructions for your system.

5.1 Shimadzu

For all Shimadzu Systems (with exception of LCMS-2020 and LCMS-2050)

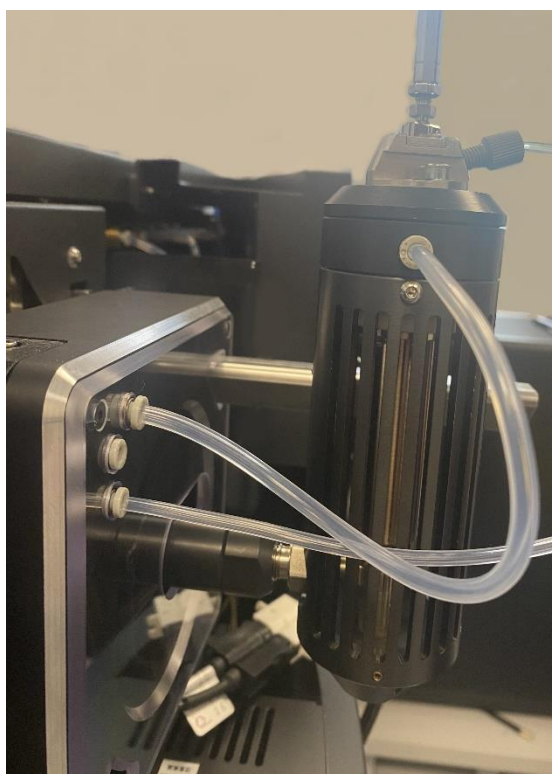


Figure 4: Gas supply on Shimadzu instruments

- a) please use the Heating Gas supply for the sheath gas and the Nebulizer gas line to power the nebulizer.
- b) disable the interface temperature and Drying Gas flow in the LC-MS Method, else the system will not start due to a missing readback.

Table 2: Flow setting conversion table (measured on LCMS 9030 QToF)

Software Set Value	Empiric SICRIT conversion Formula
Nebulizing Gas	Set value = Flow in L/min
Heating Gas	Set value = Flow in L/min

5.2 SCIEX

For all SCIEX systems

- a) please use the Source Gas 1 supply for the sheath gas and the Bath Gas to power the nebulizer
- b) the Bath gas of Sciex is not regulated and will result in a fixed flow of 0.5 L/min when connected to the nebulizer (measured on a 4600Q TOF)

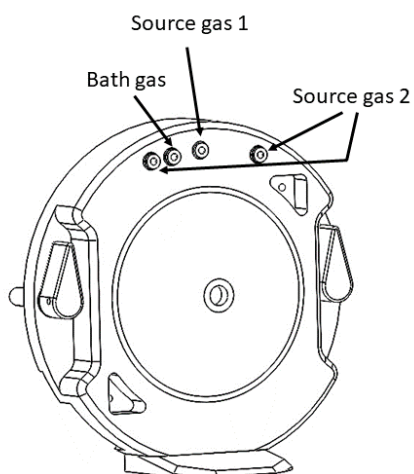


Figure 5: Gas supply on SCIEX instruments

Table 3: Flow setting conversion Table (measured on 4600 QToF)

Software Set Value	Empiric SICRIT conversion Formula
Source Gas 1	Set value x 0.12 + 1 = Flow in L/min
Source Gas 2	-

5.3 Waters

For all Waters systems (except QDA and RDA)

- a) please use the API gas supply for the sheath gas and the nebulizer line to power the nebulizer.
- b) the nebulizer pressure cannot be regulated within the Waters software.
- c) using provided flow-meter and flow controller, set the nebulizer flow to 1.5 L/min. For purge gas settings, use the table below. Please note that optimal gas settings may differ based on LC flow rate used.

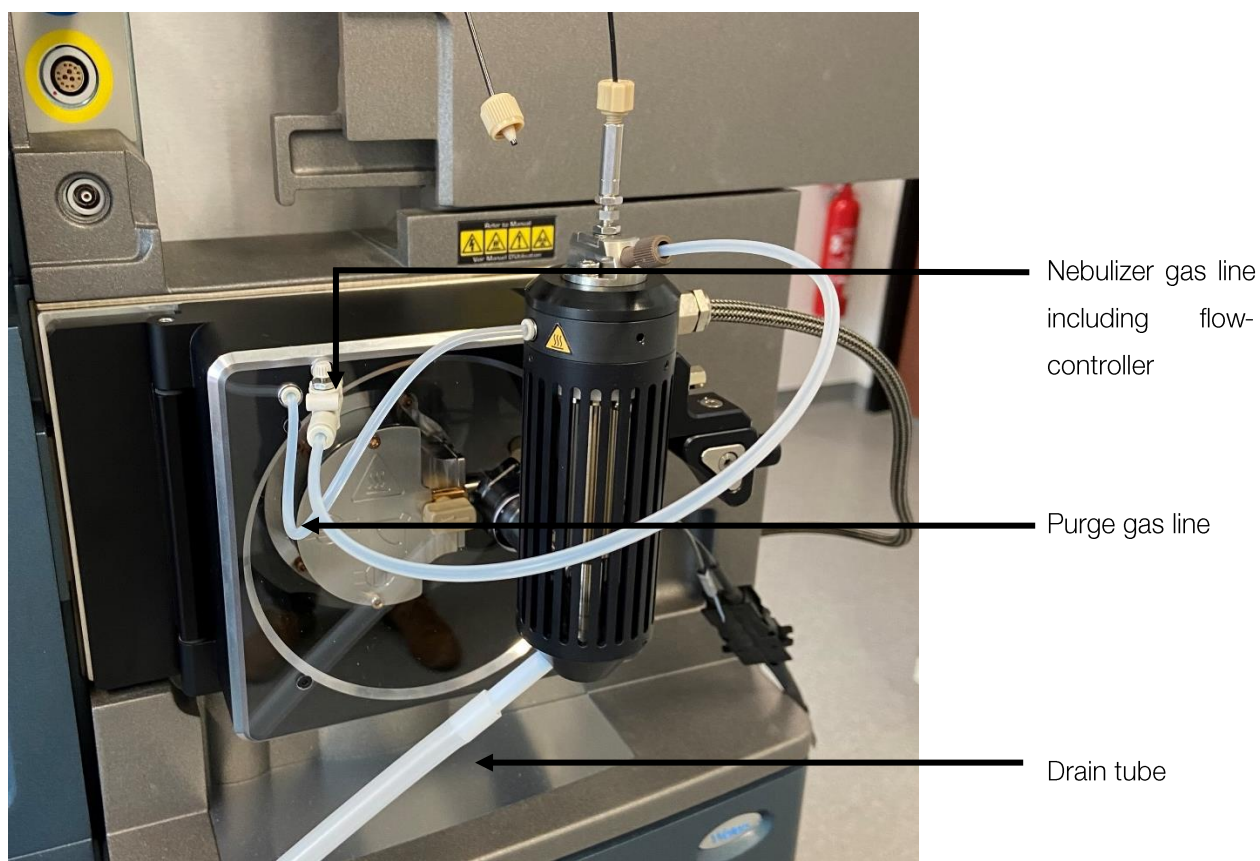


Figure 6: Gas supply on Waters instruments

Table 4: Flow setting conversion Table (measured on Xevo G2-XS QTOF)

Purge Gas flow calculation formula	
Software Set value x 0.021 = Flow in L/min	
Recommended Value (LC flow rate ~ 0.4 mL/min)	
Purge gas	Flow (L/min)
100	2.1

5.4 Thermo Scientific

For all Thermo systems

- a) please use the Aux Gas supply for the sheath gas and the Sheath Gas to power the nebulizer.
- b) do not set the temperature of the Ion Transfer Tube higher than 250°C!

Table 5: Flow setting conversion table measured on Orbitrap LTQ XL)

Software Set Value (arb.)	Flow (L/min)
Sheath Gas	Set value * 0.04 + 0,2 = Flow in L/min
Aux Gas	Set value * 0.45 + 2,3 = Flow in L/min

5.5 Agilent

For all Agilent systems

- a) please use the Nebulizer Supply to power the nebulizer.
- b) the Agilent system only provides one gas line in ESI configuration.
- c) make sure to block the inlet of the sheath gas on the LC/SFC Module with the provided plug to the quick connector of the gas outlet.

Table 6: Flow setting conversion table (measured on Agilent Ultivo)

Software Set Value (psi)	Flow (L/min)
Nebulizer Gas	Set value * 0.04 + 0.2 = Flow in L/min

5.6 Bruker

For all Bruker systems

- a) please use the Nebulizer Supply to power the nebulizer.
- b) the Bruker systems do only provide one gas line in ESI configuration.
- c) make sure to block the inlet of the sheath gas on the LC/SFC Module with the provided plug to the quick connector of the gas outlet.

Table 7: Flow setting conversion Table (measured on Bruker Impact II)

Software Set Value (Bar)	Empiric SICRIT conversion Formula
Nebulizer	Set value * 0.7 + 0.2 = Flow in L/min

6. Service and Maintenance

The SICRIT® LC/SFC Module does not require any internal service or maintenance in routine operation. The only serviceable parts are the plug-in adapter for connection with the LC-Ion source and the nebulizer on top of the module.



Do not open the module without reading the following section! In case of technical question or problems, please contact Plasmion via support@plasmion.com or its respective sales agent.

6.1. Cleaning and decontamination

In an unplugged state, the surface of the module may be cleaned with a humid cloth. To remove contaminations a 50:50 methanol:water mixture can be used. If you use other solvents check the persistence of the anodized aluminum surfaces against these cleaning agents.

Any contact of the inner cables and components with liquids must be avoided! Before next operation, the module must be completely dry.

In case of chemical contaminations visible in your measurements you should clean or replace the plug-in connector and “Bake out” the module.

For servicing of the LC/SFC Module you can find a short [video tutorial](#) on YouTube.

6.2. General maintenance and service of the SICRIT® LC/SFC Module

The operational status of the module can be checked using the display of the control unit. After plugging in the cable of the module and turning on the control unit, the actual temperature of the module should be displayed and the temperature should be adjustable by the rotary encoder. If there is no or a lost connection the display will show [--] for set and actual value.

If there is an overheating of the system, the control unit will stop operation and display a warning.

Correct heating of the module should show a response of the actual temperature value within 20 seconds in the display of the control unit.

Do not operate the system if the housing shows obvious damage.

In case of unrealistic actual temperature values or fluctuations in the displayed values without heating of the module, there is a defect of the module or the control unit. Please contact Plasmion or its respective sales agent for further advice.

In case of abnormal heating of the module there is a defect of the controller. Please do not further use the module and contact Plasmion or its respective sales agent.

To remove contaminations a 50:50 methanol:water mixture can be used. If you use other solvents check the persistence of the anodized aluminum surfaces against these cleaning agents.

Any contact of the inner cables and components with liquids must be avoided! Before next operation, the module must be completely dry.

In case of chemical contaminations visible in your measurements you should clean or replace the plug-in connector and “Bake out” the module.

6.3. Bake out and cleaning of the SICRIT® LC/SFC Module

For decontamination or cleaning of the LC/SFC Module, disconnect the Module from the LC and the Ion source. Turn on a standard nebulizing gas flow (e.g. 1.5l/min) make sure the module is still securely mounted, and the drain is connected. Turn the Heater to 500°C for 120 minutes. This will bake out the module and any volatile residues that might have build-up during use.

The plug-in adapter can be cleaned using water/methanol and sonication for 30 minutes. Please make sure to dry it properly before reinstallation.

The same procedure can be performed for the metal body of the module. Please carefully follow the disassembling steps according to the [video tutorial](#).

If there are still contaminants visible after repeatedly running the bakeout procedure, please contact Plasmion (support@plasmion.de) for additional cleaning protocol.

6.4. Adjusting the Nebulizer

The Nebulizers supplied with the LC/SFC module are standard high-performance nebulizer from Agilent. Each nebulizer is carefully adjusted before shipment. If you want to check or realign the nebulizers after modification, please refer to the following documentation for Adjustment and cleaning. (Adjustment kit not included)

https://www.agilent.com/Library/usermanuals/Public/G1960-90470_NebulizerAdjustmentKit.pdf

7. Risk Avoidance or Residual Safety Risks

Regularly check the casing and cables for damage.

Ensure that access to the system is restricted for any unauthorized or untrained personnel.

Do not expose the control unit's display to large mechanical stress, as the glass can break.

Visually check the contact pins of the connectors for changes and damage.

Check if all connections are engaged before operating the system.

Never use the system without the connected ion source.

8. Operation with Potentially Harmful Substances

The risks of operation and handling of harmful or toxic substances that can be analyzed with the SICRIT® Ion Source fall to the operator. Stick to all safety guidelines and take all necessary precautions. Ensure that the substances introduced do not damage the system. The materials used in the SICRIT® Ion Source are PEEK, stainless steel and ceramics. Consider also the durability at higher temperatures.

The device itself does not contain harmful substances.

For recycling of the system, please contact the manufacturer.

9. Troubleshooting the SICRIT® LC/SFC Module

In the following section problems are discussed that might occur during operation of the system. If you do not feel confident to solve the problems after this brief troubleshooting guide, please contact Plasmion or its respective sales agent for further advice.



Please support us in the further development of the devices by sending us a short description of the error, its occurrence and/or the solution via email to support@plasmion.com we appreciate your efforts!

We are further happy to receive feedback on the handling or operation since we are always eager to improve our customers' experience.

9.1. Problem description: The TIC is spiking unexpectedly

Error: Fast spiking TIC (vertical flanks) signals indicate water droplets have been drawn into the system that change the ionization efficiency drastically.

- Make sure that the heating of the LC/SFC and the Gas flows of the MS are turned on. If necessary, increase the flow(s) and temperature!

9.2. Problem: Error Message: THERMOFUSE TRIPPED

The LC/SFC Module is equipped with a resetting thermofuse to prevent the module from unintended overheating in case of hard- or software error. Tripping the fuse will result in switching off the heating and showing the error message in the display.

- Check, if the LC/SFC Module is freely positioned and the air can circulate. Don't cover the housing with thermal insulation material.
- If the thermofuse has been tripped, wait >1 hour before heating again for resetting of the fuse.

10. Spare Parts

Description	Part No.
LC/SFC Module assembly	15-010
Nebulizer Assembly (standard flow)	13-002
LC/SFC tubing kit	12-003
Mounting System for SICRIT® Modules (must be ordered separately!)	26-011