



# Operating Manual

## GC-APPI Interface for:

Orbitrap Fusion™ Tribrid™ MS,  
and Orbitrap Fusion™ Lumos™  
Tribrid™ MS

P/N: MC513000

Revision B



# GC-APPI-Interface

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Original Operating Instructions

**The manual describes the installation and operation of the GC-APPI-Interface for the Orbitrap Fusion series MS systems.**

Revision History:

Revision A: published in December 2018

Revision B: published in May 2019

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## Trademarks

Fusion, Tribrid, Lumos, Orbitrap, Thermo Scientific, Trace, Trace GC Ultra, and Xcalibur are registered trademarks of Thermo Fisher Scientific Inc. in the United States.

## Safety Instructions

Please read all of these instructions carefully before starting the installation of the GC-APPI-Interface and follow all recommendations.

- 1) Set the mass spectrometer to "off" mode.
- 2) Cool down the heated capillary of the mass spectrometer
- 3) When removing the ESI sprayer be aware that the heated capillary may still be hot.
- 4) **Caution:** don't squeeze your fingers when closing the cover of the interface
- 5) Please use nitrile gloves, or similar ones, to ensure your own safety and avoid contamination.
- 6) **Always** unplug the heater cable before detaching the interface from the mass spectrometer. **Never** connect the interface heater cables when the APPI interface is not attached to the mass spectrometer. There is a **high risk** of over-heating because the fan is not running.



### **Caution: hot surface with high risk to get burned!**

During operation, the Interface housing may warm up to 65 deg. C. When the interface is opened, the heater is automatically turned off but the source may still be very hot (up to 330 deg. C, depending on the operating temperature).

We also recommend watching the GC-APPI-Interface installation video to familiarize yourself with the procedure. This video has been provided on a USB stick with the interface. Alternatively, you can download it using the following link:  
<http://www.mascom-bremen.de/html/en/downloads/gc-appi-information>



## Important information

**Any changes or modification to the GC-APPI interface, undertaken without our consent, may endanger the functionality and/or safety, and will result in the termination of the declaration of conformity.**

## Tools required for source switching

Changing from ESI to GC-APPI on the Exactive or LTQ Orbitrap series instruments only requires a few tools:



**Figure A:** Screwdriver for removing the spray cone and for tighten the plug on the APPI lamp

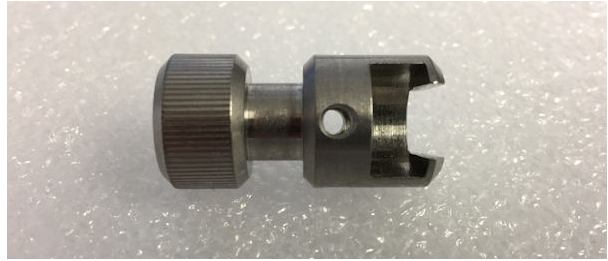


**Figure B:** 5/16-wrench for the dopant gas connection



**Figure C:** 6 mm Allen screwdriver for locking and unlocking the interface on the Orbitrap Fusion systems





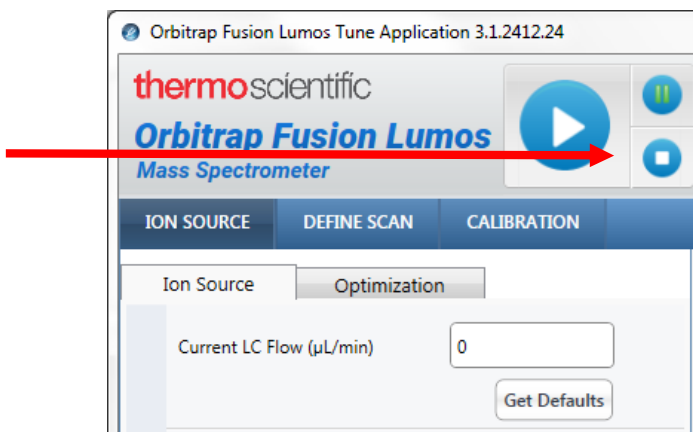
**Figure D:** Special tool for removing the transfer tube on Obritrapp Fusion only

Tools used for the GC column connection on the GC injector are described in the GC manual.

## Installation of the GC-APPI Interface

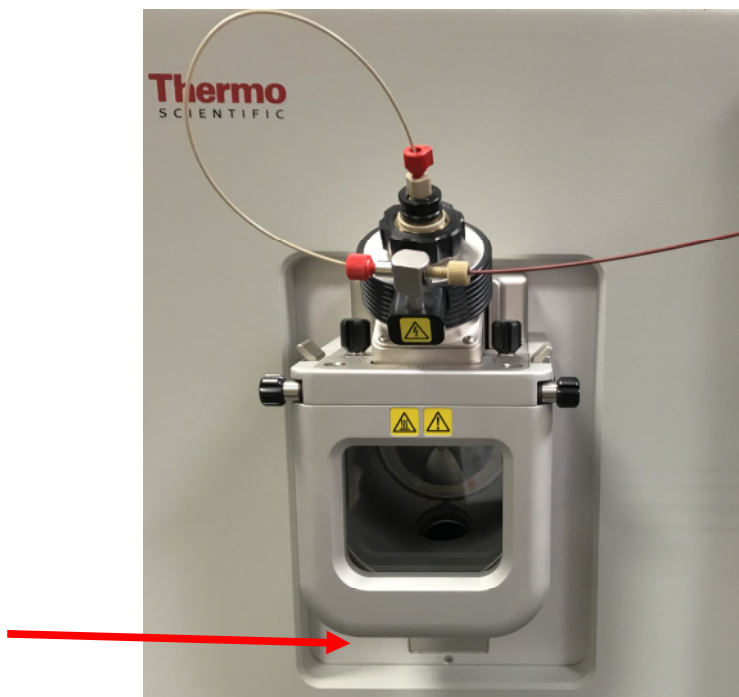
Before installing the GC-APPI-Interface you have to remove the ESI sprayer. Make sure the mass spectrometer is set to "Off", and the heated ion transfer tube is set to room temperature (see Figure 1 and 4).

**Caution:** Removing the ESI sprayer while the instrument is on or in standby will load the default Tune file and eventually start the capillary heating.



**Figure 1:** Instrument in "Off" mode

Disconnect the waste hose from the bottom of the TNG source, as well as all gas, syringe, and electrical connections.



**Figure 2:** Instrument with ESI sprayer

Carefully remove the ESI sprayer from the mass spectrometer interface and put it aside in a safe place.

Remove the Thermo ion sweep cone as shown in Figure 3, which is the removable spray shield that sits just over the ion transfer tube. Using a small flat-head screwdriver, loosen the set screws on the sides of the spray shield.

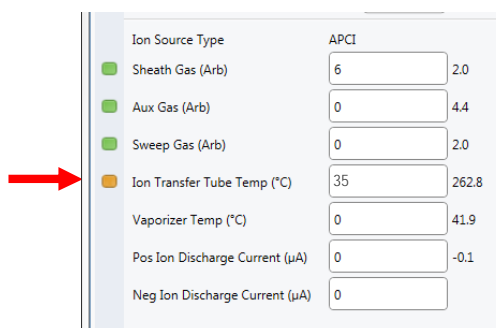


**Caution:** The *ion sweep cone* may still be hot.  
**Be sure to cool down the ion transfer tube.**



**Figure 3:** TNG source with sweep gas cone

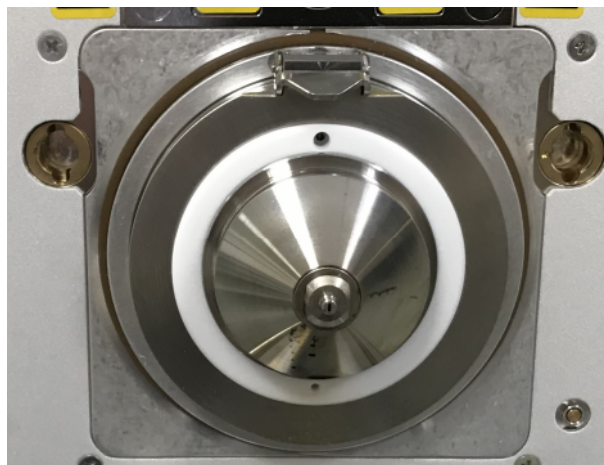
Temperature setting is done on the TUNE page (see Figure 4).



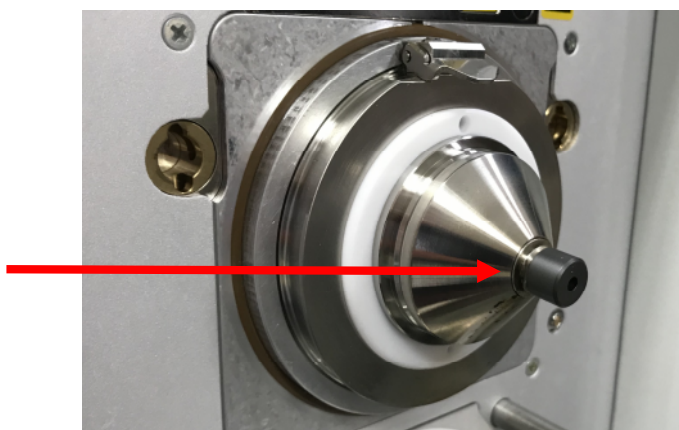
**Figure 4:** Ion transfer tube temperature setting

***The next step (Figure 5 and 6) is for Orbitrap Fusion Lumos only:***

Place the Vespel disk (P/N: MC502620) on the original ion transfer tube (no need to change it as on the Orbitrap Fusion) with the rounded edge towards the APPI-Interface (see Figure 6).



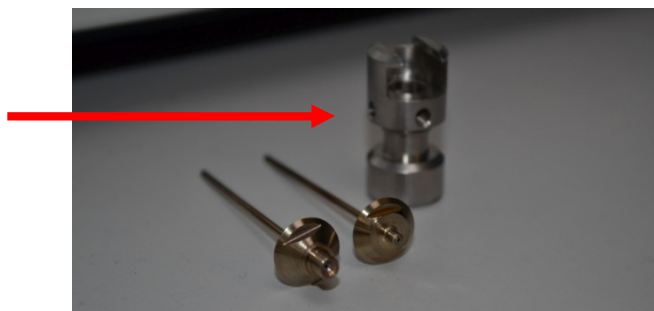
**Figure 5:** Ion source without sweep cone



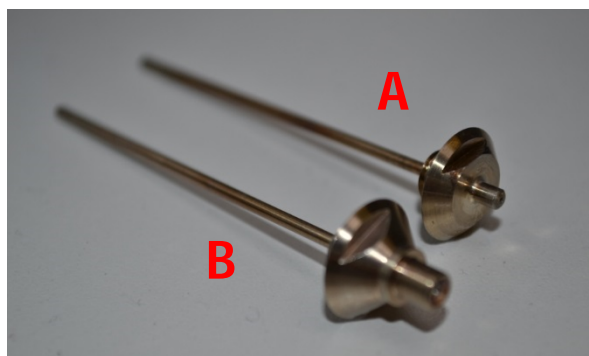
**Figure 6:** Ion transfer tube with Vespel disk

***The next steps (Figure 5x, 6x and 7x) are for Orbitrap Fusion only:***

After removing the ESI sprayer, you can access to the transfer tube of the mass spectrometer.  
Remove the transfer tube with the special tool



**Figure 5x:** Special tool for transfer tube removal

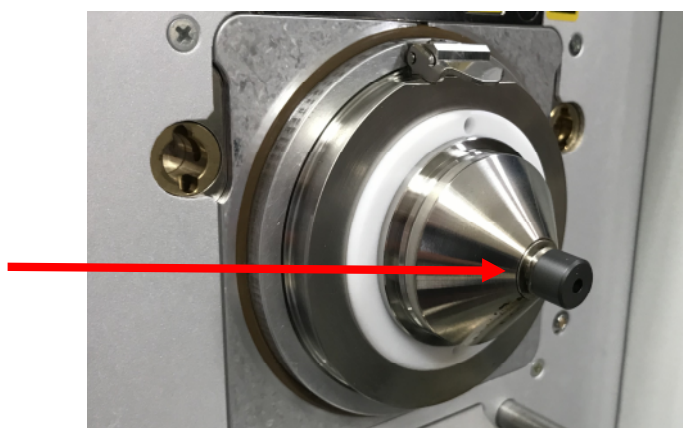


**Figure 6x:** Standard (A) and GC-APPI (B) transfer tubes (P/N: MC501730)

(see Figure 5x) or with the 5/16 wrench as described in the operating manual of the mass spectrometer.

**Caution:** Exchanging the transfer tubes at high temperature is difficult and may damage them.

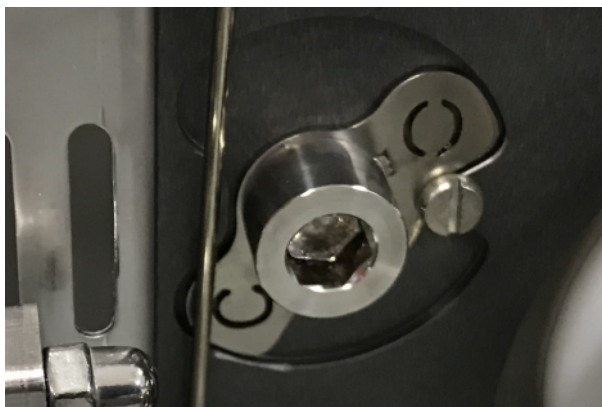
Replace the standard transfer tube (A) with the GC-APPI transfer tube (B) (P/N: MC501730, see Figure 6x.), and place the Vespel disk (P/N: MC502610) on to the transfer tube (Figure 7x). Make sure the disk is clean and free of dust.



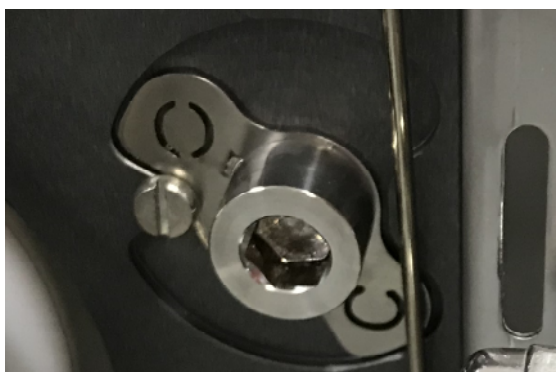
**Figure 7x:** GC-APPI transfer tube with Vespel disk

***All followings steps are for both Fusion type systems.***

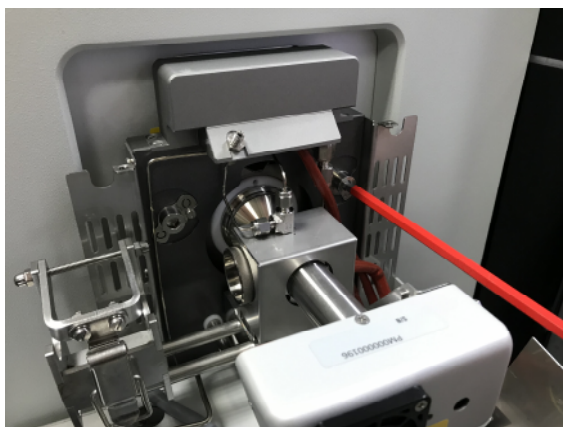
Bring the closed GC-APPI Interface in front of the Mass Spectrometer and arrange the cable for the APPI lamp close to its final position. Mount the interface, open it and lock it (Figure 7a, 7b, 8a and 8b) with a 6 mm Allen wrench.



**Figure 7a:** Locked position of the left GC-APPI-Interface connector



**Figure 7b:** Locked position of the right GC-APPI-Interface connector



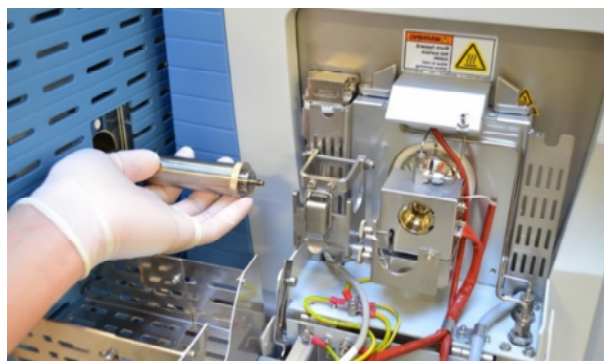
**Figure 8a:** Mounting of the GC-APPI-Interface



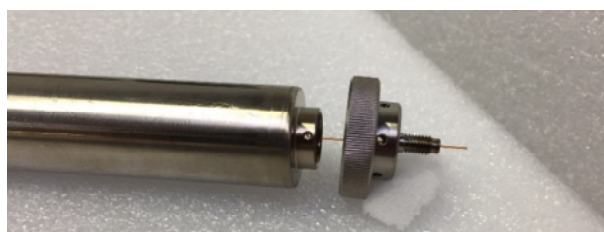


**Figure 8b:** Mounting of the GC-APPI-Interface

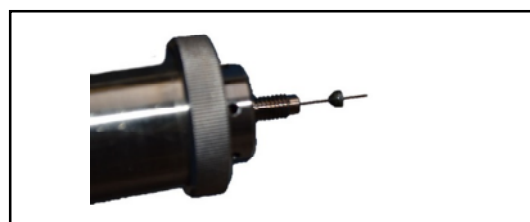
Next, attach the transfer line to the APPI-source. Remove the APPI lamp for better access to the transfer line connection. Place the connector in front of the transfer line (Figure 10) and after inserting the GC column place the graphite ferrule with the conical side towards the transfer line.



**Figure 9:** Transfer line connection to APPI source

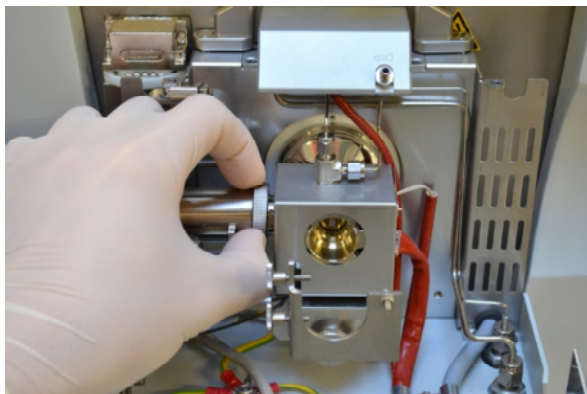


**Figure 10:** Transfer line with connector



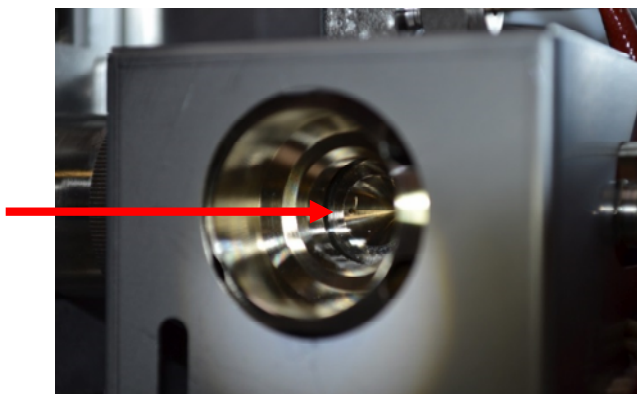
**Figure 11:** Transfer line with connector and ferrule

Attach the transfer line with connector and ferrule to the APPI source and only slightly tighten the connector (see Figure 12).

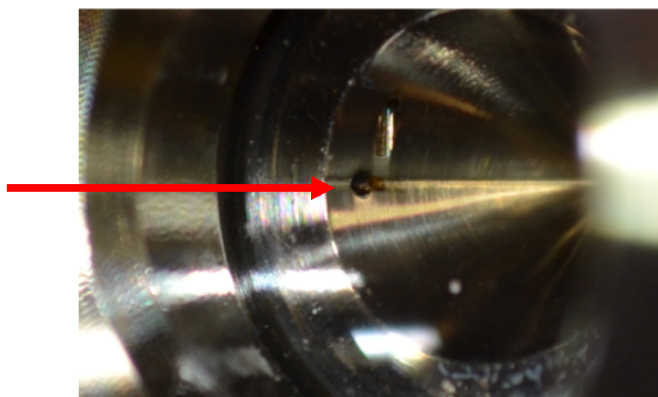


**Figure 12:** Transfer line connection to APPI source

Adjust the GC column before finally tighten the connector. It just has to protrude out of the inner source (see Figure 13a and b) by about 0.5 to 1 mm (check with a flashlight).



**Figure 13a:** GC column inside APPI source



**Figure 13b:** GC column inside APPI source, zoom-in



Finally tighten the transfer line connector and press the transfer line against the connector before fixing it with the clamp (see Figure 15).

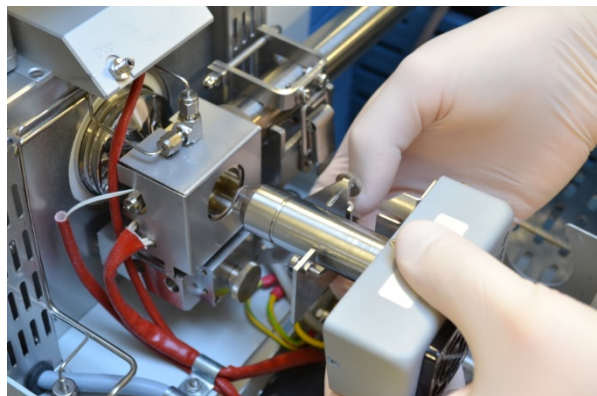


**Figure 14:** Transfer line in its final position

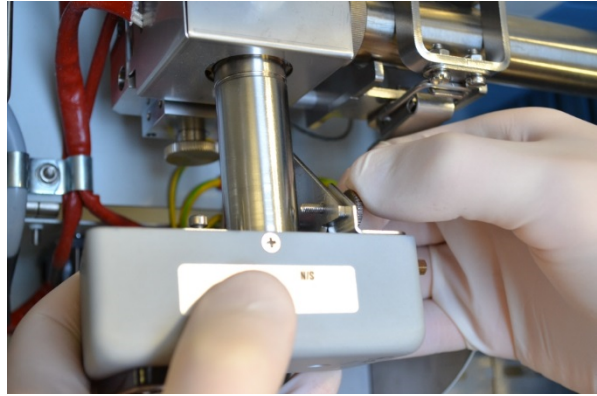
Now insert the APPI lamp into the lamp holder and tighten the two screws to fix the lamp in its final position.



**Figure 15:** Transfer line fixing with clamp

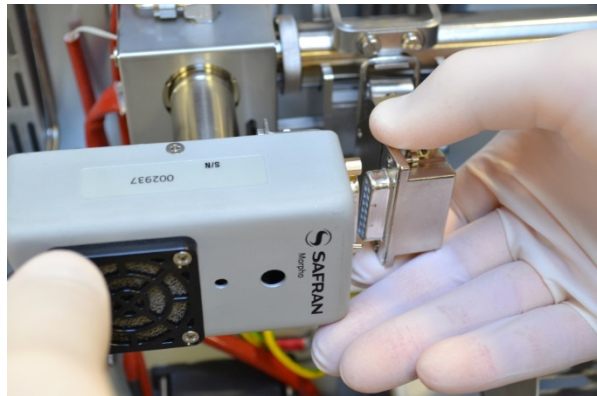


**Figure 16:** Positioning of the APPI lamp



**Figure 17:** Fixing APPI lamp in its final position

When the lamp is inserted and fixed, connect the cable to the lamp and fix the plug with the screws.

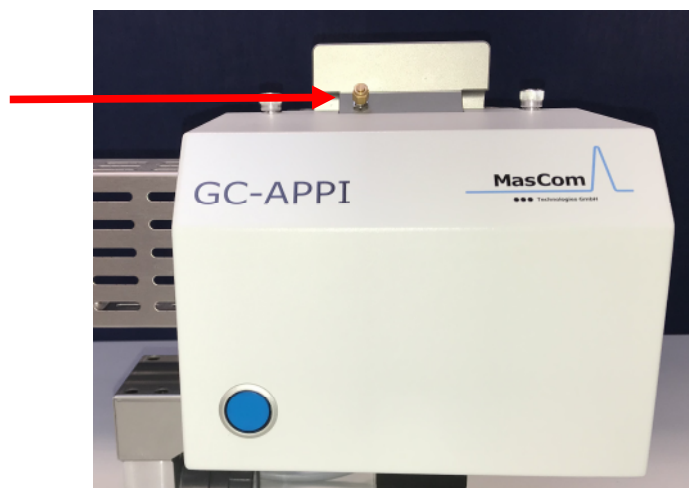


**Figure 18:** Connecting the APPI lamp cable.



**Figure 19:** Fixing APPI cable.

Close the cover of the interface and make sure the protection shield completely covers the transfer line.



**Figure 20:** Closed APPI interface with dopant gas line connected

In case you want to use an optional dopant gas, remove the blind plug and connect the dopant gas line as seen in Figure 20. If you do not want to use any dopant gas, please check if the blind plug is properly tighten.

When everything is attached to the mass spectrometer, you can plug in the power line of the GC-APPI interface either into the Trace 1310 GC or Trace GC Ultra.

When the power line is connected and the cover is closed, check if the fan is running (air stream underneath the interface).



**Figure 21:** APPI source heater connection on Trace 1310 GC



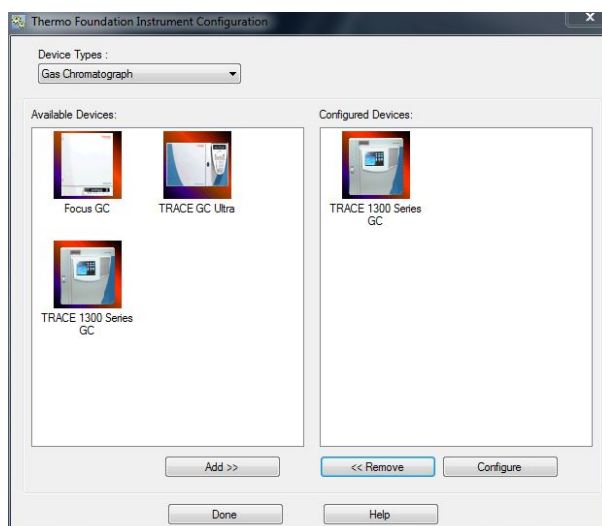
**Caution:** do not connect the heater cable without the interface attached to the mass spectrometer!

Please note: when connecting the heater cable for the first time, it will only be recognized by the GC if the cover is closed.

## Operation of the GC-APPI Interface

### Setting up the Instrument Configuration for Thermo GC Systems

Close all Xcalibur programs and open the Instrument Configuration. Make sure the GC devices are installed and select the Thermo **Focus**, **Trace 2000**, **Trace Ultra** or **Trace 1310** GC from the list of GC devices.

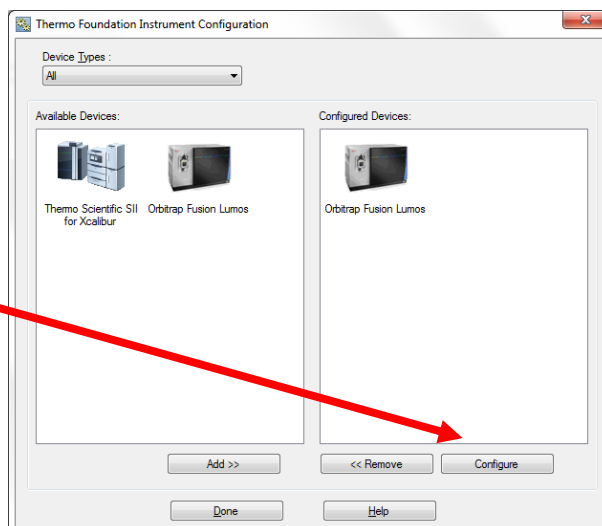


**Figure 22:** Xcalibur Instrument Configuration

If you are using an autosampler, please select it from the list too. Check that the communication of the GC (and autosampler) is correct and close the Instrument Configuration panel.

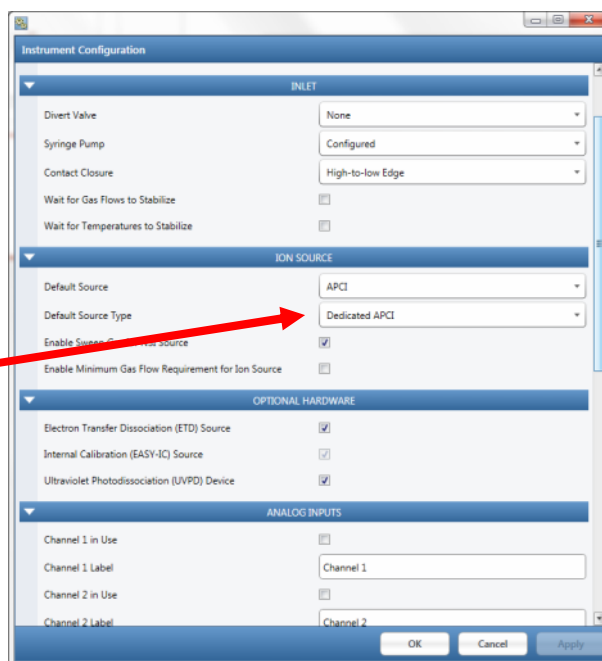
### Setting up the Instrument Configuration for APPI Source usage

In the Instrument Configuration select the Orbitrap Fusion and click on configure (see Figure 23).



**Figure 23:** Xcalibur Instrument Configuration with Orbitrap Fusion selected

Change the Default Source Type to 'Dedicated APCI' and click on 'Apply'. Leave this page with 'OK' (see Figure 24).



**Figure 24:** Xcalibur Instrument Configuration for Orbitrap Fusion

Close the Instrument Configuration, start Xcalibur and wait for all instruments to initialize and to become "Ready for download".

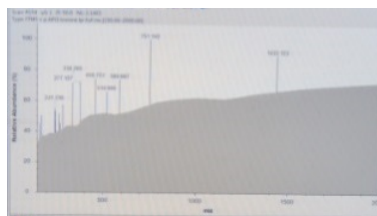
## Tune the MS

Turn on the MS and tune the mass spectrometer in APPI mode. Make sure the APPI lamp switch is in on position (blue LED is on, see Figure 25).



**Figure 25:** APPI source with lamp switch

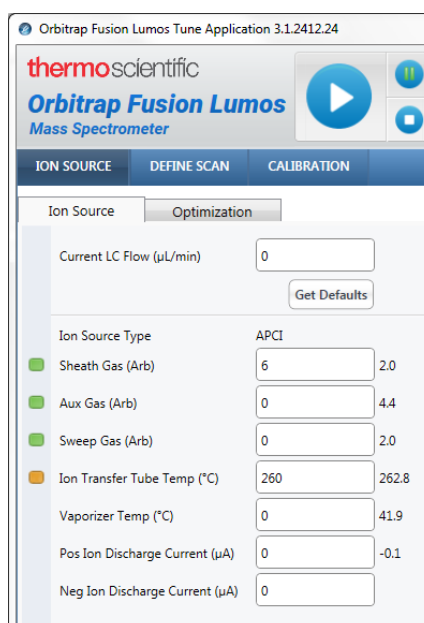
If the APPI lamp is off, the noise level will be very high (see Figure 26).



**Figure 26:** MS tune spectrum when APPI lamp is off

When using a dopant gas you can tune the MS using the dopant gas' molecular ion (i.e.  $m/z$  92 for toluene). Without a dopant gas the easiest way to tune the MS is to select a GC column-bleed ion like  $m/z$  207 or similar.

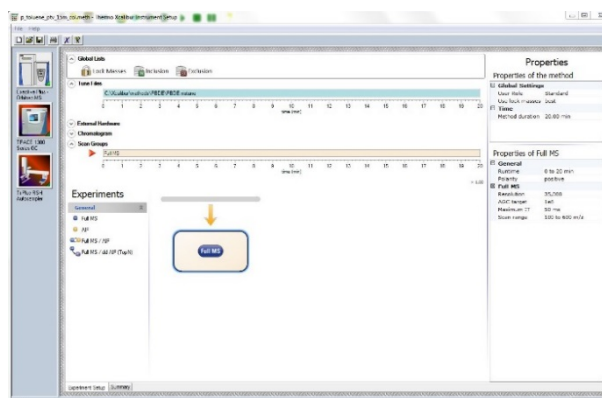
Once the tuning is optimized, save the Tune file (an example can be seen in Figure 27).



**Figure 27:** Example of MS tuning in APPI mode

## Setup the Instrument Method

The following is valid when using the Thermo Scientific Trace 1310 GC. For any other GC, we refer to its dedicated manual.



**Figure 28:** Instrument Method Setup

Open the Instrument Method editor from the Xcalibur Home page. In the editor, you will see the different instruments.

Select the Trace 1310 GC and setup the desired GC method. On the Aux Temperatures tab you have to enter the temperature of the transfer line and the temperature of the APPI source (listed as Aux. Heater 2, see Figure 29). Both temperatures

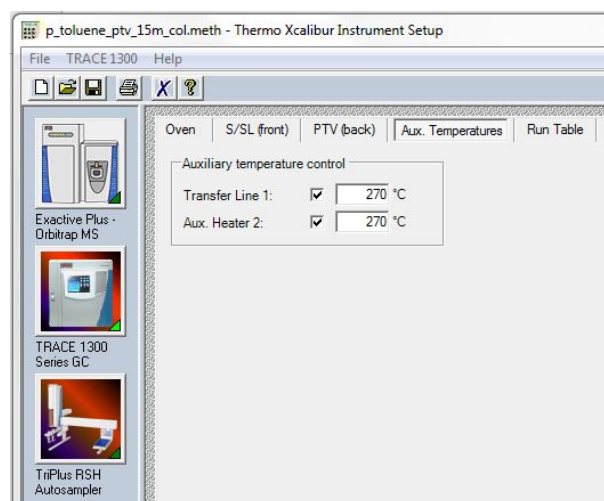


should not differ a lot from each other. Typical temperatures are between 225 and 300 deg. C.

**Please note:**

The maximum temperature of the APPI source is 330 deg. C.

For details of the GC setup and/or programming, we refer to the GC Manual.



**Figure 29:** Aux Temperature for Trace 1310 GC in Instrument Method Setup

Switch to the MS to select or setup the appropriate MS method with the corresponding MS Tune file. If an autosampler is in use, also setup the correct autosampler method. Save the Instrument Method and setup a sequence file.

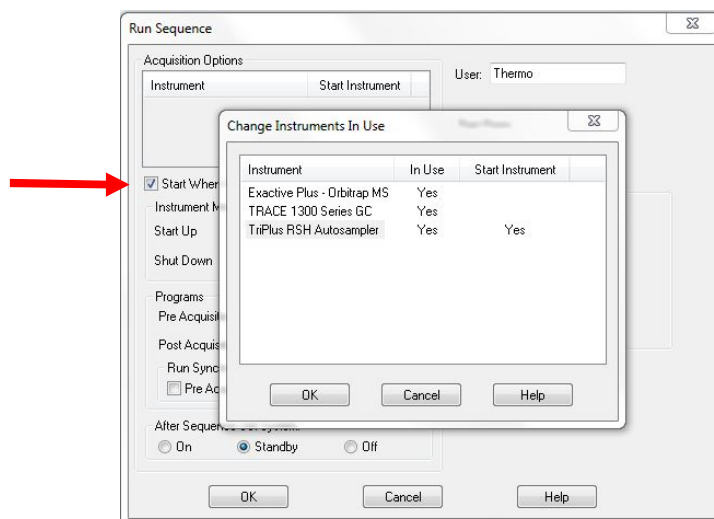
### Setup the Sequence File

From the Xcalibur Home page, select the Sequence editor to setup one or more sample measurements. For details, we refer to the standard MS operation manual.

### Running a GC sample

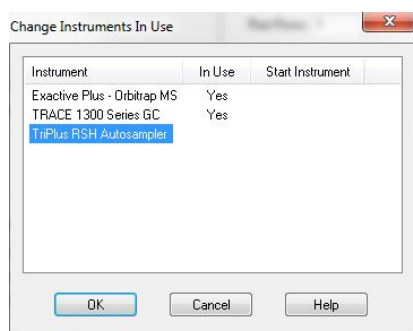
When all instrument devices in Xcalibur are “Ready for download”, you can start the sample or sequence measurement from the sequence setup.





**Figure 30:** "Change Instruments in Use" of Xcalibur

Once you have setup the GC and autosampler as new devices in the instrument method, Xcalibur will ask to "Change the Instruments in Use". Figure 30 shows the setup for using an autosampler as start device. Without an autosampler no "Start Instrument" has to be selected, which will force the instrument devices to wait for the contact closure (see Figure 32).

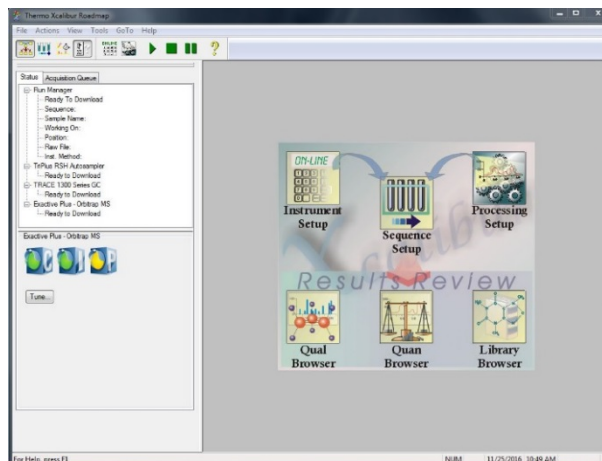


**Figure 31:** "Change Instruments in Use" without Autosampler

After clicking on OK, the instrument method will be downloaded into each device and when everything is ready, the autosampler will start with the injection. Without an autosampler the instruments will be pending with showing the message 'Waiting for contact closure'. This contact closure will be performed when pressing the start button on the GC after a manual sample injection. Make sure the check box 'Start When Ready' is activated (see red arrow on Figure 30).

## Final Remarks

When everything is in place and the communication cables connected, close Xcalibur before switching on the GC and optionally the autosampler. After starting Xcalibur, all devices will be initialized and finally “ready for download” as shown below.



**Figure 32** Xcalibur Home Page showing all devices “Ready for Download”

## Switching back to ESI operation



Before starting with the dismantling of the GC-APPI interface turn off the mass spectrometer, the APPI lamp (turn off the blue switch on APPI source cover shown in figure 25, and unplug the power cable), the source heating and the transfer line heating (unplug both cables).

### **Wait until everything is cooled down!**

When all parts are at room temperature, you can uninstall the GC-APPI interface and re-connect the ESI sprayer onto the mass spectrometer. Do not forget to mount the sweep gas cone and to change back to ESI from APCI in the instrument configuration of the Orbitrap Fusion (see Figure 23 and 24).

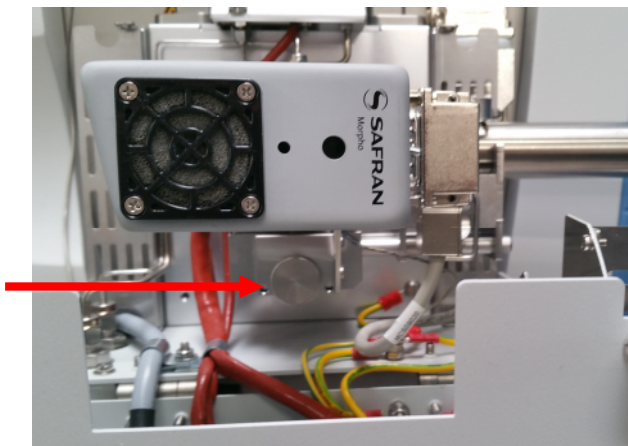
## Final Disposal

In case you want to finally dispose the GC-APPI interface, you can return it to us with a corresponding declaration of decontamination (form can be downloaded on our web site).

## Troubleshooting

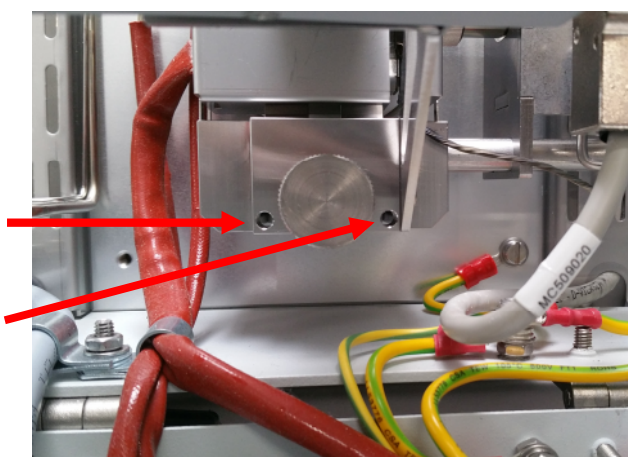
When the vacuum is not in the range of  $10 \times 10^{-1}$  mBar (make sure the Vespel disk is in place, see Figure 6), the position of the interface to the MS might be wrong and needs to be re-adjusted.

For that, you have to loosen the knurled screw



**Figure 33** Knurled screw, which fixes the interface adjustment

(see Figure 33) and adjust the distance of the interface with the two Allen screws (see Figure 34) by watching the vacuum readback of the mass spectrometer. Turning the screws out will bring the interface closer to the MS and result in better vacuum.



**Figure 34** Allen screws for interface adjustment

## Spare Part List

The following spare parts are available:

<b>Part No.</b>	<b>Description</b>
MC502240	– MgF <sub>2</sub> Window
MC505000	– PID-Lamp, 10.6 eV Kr
MC502610	– Vespel Disk for Orbitrap Fusion
MC502620	– Vespel Disk for Orbitrap Fusion Lumos
MC501730	– Transfer Tube for Orbitrap Fusion
MC502350	– Gold Gasket for MgF <sub>2</sub> Window
SG-073109	– Graphite Ferrule for Transfer Line Connector ID 0.25 (pack of 10)
SG-073111	– Graphite Ferrule for Transfer Line Connector ID 0.32 (pack of 10)
SG-073113	– Graphite Ferrule for Transfer Line Connector ID 0.45 (pack of 10)
MC502450	– Filter Cartridge, Triple Filter F301
0523630S	– Reducing Union 1/8"-1/16", stainl. Steel for TX-Line, requires exchange of stainless steel ferrule with appropriate graphite ferrule listed above.

## Optional Items for GC-APPI

The following items are available as option:

### **Pneumatic Table for GC or HPLC**

P/N: MC600200

- work surface size 60 x 80 cm
- lift able columns
- adjustable height from 76 to 121 cm
- integrated 3 IEC power plugs
- table on caster wheels for easy transport



# EU-Konformitätserklärung

## EU-Declaration of Conformity

Name des Herstellers: MasCom Technologies  
Name of manufacturer

Adresse des Herstellers: Sophie-Germain-Str. 4  
Address of manufacturer 28201 Bremen  
Germany

Der Hersteller erklärt hiermit, dass das Produkt  
The manufacturer herewith declares that the following product

### GC-APPI-Interface

Part-Nummer: MC513000  
Part number: MC513000

alle anwendbaren Anforderungen folgender EG-Richtlinien erfüllt:  
fulfills all applicable provisions of the following EC Directives:

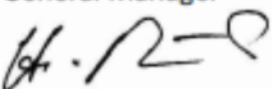
Richtlinie 2006/42/EG	Richtlinie 2004/108/EG
Directive 2006/42/EC	Directive 2004/108/EC

Die folgenden harmonisierten Normen wurden angewendet:  
the following harmonized standards were applied:

EN ISO 12100:2010	Schutzanforderungen der Richtlinie 2006/95/EG gemäß Anhang I Nr. 1.5.1 der Richtlinie 2006/42/EG Safety objectives of Directive 2006/95/EC according to Annex I No. 1.5.1 of Directive 2006/42/EC
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Bremen, Germany, 26. November 2018

Geschäftsführer:  
General Manager

  
(Dr. Helmut Münster)