microflex™

User Manual

Bruker Daltonics

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Document History
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Warranty
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Safety Information
Safety Class

The microflex with the closed safety cover is a **Class I Laser** product. With safety cover opened it becomes a **Class III B Laser** product. It has been designed and tested in accordance with IEC Publication 1010-1 (Pollution Degree 2) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

WARNING
Connecting an instrument to a power source that is not equipped with a protective earth contact creates a shock hazard for the operator and can damage the instrument. Likewise, interrupting the protective conductor inside or outside the instrument or disconnecting the protective earth terminal creates a shock hazard for the operator and can damage the instrument.

WARNING
The instrument must be disconnected from its power source before any cover is removed or it is opened!

WARNING
All connections of the instrument must be used in correct way. The instrument should only be used with the wires and cables delivered with the system or otherwise provided by the manufacturer.

Noise Declaration

70 dB operator position normal operation per ISO 7779: 1988

Instrument Identification

Each instrument is identified by a serial number. This number is located on the rear of the instrument.

When corresponding with Bruker Daltonik GmbH about your instrument, be sure to include the model name and the full serial number. Write the serial number of the instrument here for reference:

Instrument Serial #

Part Numbers

In this manual, Bruker Daltonik GmbH part numbers are generally listed in parentheses after the name of the part. A few tools and supplies listed have no part numbers and are not available from Bruker Daltonik GmbH. Most of these can be obtained from laboratory supply companies.

Manual part number:

 # 226 920

Content

Technical Assistance

If problems arise with your system please contact:

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Table of Changes

Version	Date	Changes
1.0	2004-07-21	First edition
1.1	2008-06-24	Editorial revision
1.2	2008-08-29	Editorial revision for mircoflex and microflex LT

1 INTRODUCTION

The **microflex series instrument** is a **MALDI** (**M**atrix **A**ssisted **L**aser **D**esorption/**I**onization) bench top reflector Time Of Flight mass spectrometer with the Bruker microSCOUT ion source, and a vertically arranged ion flight tube that contains the optional reflector, and dual microchannel plate detectors. The instrument is designed for automated Protein Identification and Characterization, Biomarker Detection, Oligonucleotide Quality Control, and SNP Genotyping.

1.1 Weights and Measures

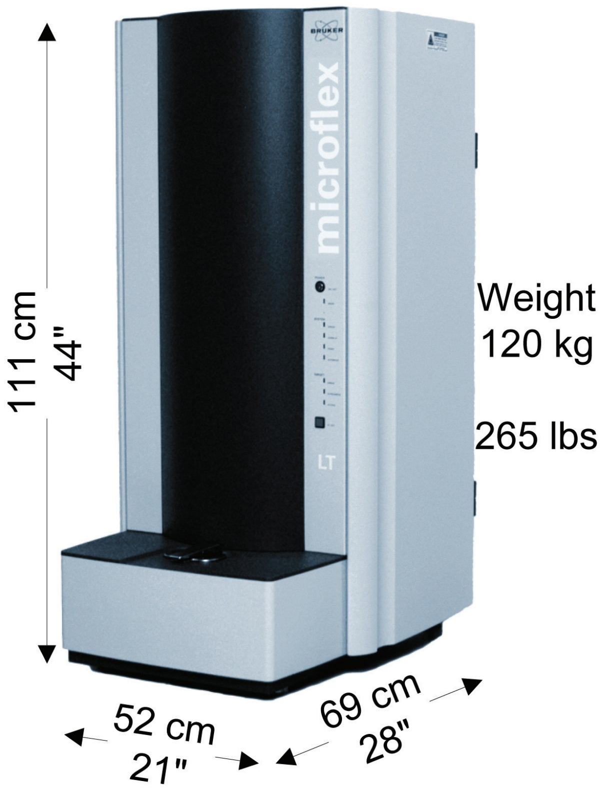


Figure 1-1 Weight and measures of the microflex LT

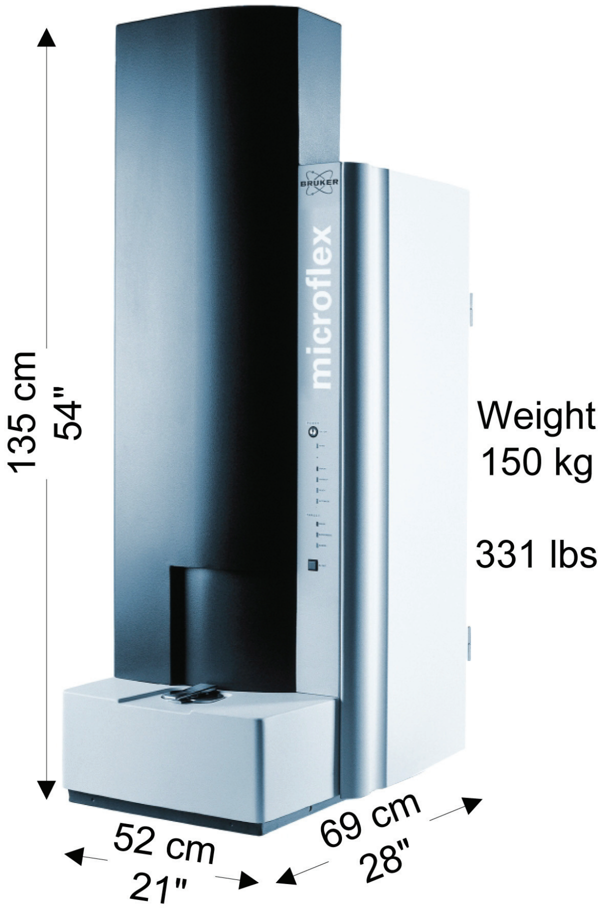


Figure 1-2 Weight and measures of the microflex

1.2 Safety

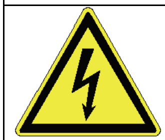
Safety considerations for the microflex spectrometer include:

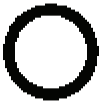
- microflex Safety Symbols (section 1.2.1)
- Manual Conventions and Symbols (section 1.2.2)
- Operating Precautions (section 1.2.3)
- Regulatory (section 1.2.4)
- Electrical Safety (section 1.2.5)

1.2.1 Safety Symbols

The following symbols may be found on or near various components of the mass spectrometer:

Table 1-1 Safety Symbols

Symbol	Description
	Indicates that an operation or condition on the instrument could cause instrument damage if precautions are not followed. This can be any type of hazard. When this symbol is observed, refer to the safety pages in the manual for further information.
	Indicates the danger of electric shock due to the presence of high voltage, if precautions are not followed.
	Indicates that laser light may be present. The microflex with the closed safety cover is a **Class I Laser** product. With safety cover opened it turns to a **Class III B Laser** product.
	Indicates that a terminal either receives or delivers alternating current or voltage.

Symbol	Description
	Indicates that a protective grounding terminal must be connected to earth ground before any other electrical connections are made to the instrument.
	Indicates the <u>OFF</u> position of the main power switch.
	Indicates the <u>ON</u> position of the main power switch.

1.2.2 Manual Conventions and Symbols

The following graphic text formats and symbols are used to set apart important safety information:

Note: Indicates important information in a procedure or description.

Caution: Indicates an operation that could cause instrument damage if precautions are not followed.

Warning: Indicates that an operation could cause personal injury if precautions are not followed.

High Voltage: Indicates that an operation could cause personal injury if precautions are not followed.

1.2.3 Operating Precautions

To protect yourself from harm and prevent system malfunction, observe the following guidelines:

- Before using the instrument, read all warnings presented in the beginning of this manual.
- Wear appropriate protective clothing, including safety glasses and gloves, when preparing samples and solutions for use with this instrument.
- Follow the correct safety procedure and the manufacturer's recommendations when using solvents.
- Clean the exterior surfaces of the instrument with a soft cloth dampened with a mild detergent and water solution. Do not use abrasive cleaners or solvents.
- Exercise caution when lifting as the microflex mass spectrometer weighs 125 kg and can cause injury to the back. Wear appropriate clothing and support gear when carrying or moving the instrument.
- The microflex mass spectrometer contains a Class III B pulsed ultraviolet laser (150 µJ at 337 nm). Wear appropriate eye protection and never look directly into the laser when any of the protective covers are removed. In operation, laser light is directed onto the analysis chamber sample target. The same interlocks that assure the analysis chamber vacuum integrity, also assure that no laser light escapes through the target loading port. If the vacuum system fails and system allows the load port lid to be opened, the laser cannot be fired.

Caution: When shipping or transporting the instrument it is critical that the target is in the OUT position. Failure to do so will result in damage to the instrument.

Caution: Do not restrict ventilation air intake at the rear of the instrument or the exhaust at the top of the instrument.

To ensure proper operation check the ventilation air filter at the instrument rear every three months and replace, if necessary, as explained in chapter 5 Instrument Maintenance.

1.2.4 Regulatory

Read this section before proceeding to the rest of the chapters.

Instrument Classification

United States:
This product is classified as a digital device used exclusively as industrial, commercial, or medical test equipment. It is exempt from the technical standards specified in Part 15 of the FCC Rules and Regulations, based on Section 15.103 (c).

Europe:
All information concerning EMC standards is in the Declaration of Conformity and these standards will change as the European Union adds new requirements.
The microflex mass spectrometer is intended for use in industrial and commercial locations. EN 55011, Group 1, Class A, ISM radio frequency limits may not be suitable in certain situations where the equipment is used on low voltage power supply networks which supply buildings used for domestic purposes.

Compliance

The instrument conforms to the requirements of:

- EN55011, 1991, Group1, Class A
- EN61000-3-2, 2001, Section 2, Class A
- EN61000-3-3, 1995, Section 3, with A1(2001)
- EN61326(2002)
    - EN61000-4-2, ESD
    - EN61000-4-3, Radiated
    - EN61000-4-4, EFT
    - EN61000-4-5, Surge
    - EN61000-4-6, Conducted
    - EN61000-4-11, Dips and Dropouts
- EN61010-1:03.94 and Amendment 1:07.95
- EN 60825- 1:1994, Radiation Safety of Laser Products

  Registered per:

  21 CFR 1040.10 and 1040.11 - CDRH Laser product.

1.2.5 Electrical Safety

Electrical safety considerations consist of the following sections:

- **General Safety**: Before installing or operating the microflex mass spectrometer, read the following information concerning hazards and potential hazards. Ensure that anyone involved with installation and operation of the instrument is knowledgeable in both general safety practices for the laboratory and safety practices for the microflex mass spectrometer. Seek advice from your safety engineer, industrial hygienist, environmental engineer, or safety manager before installing and using the instrument.
- Position the microflex mass spectrometer in a clean area that is free of dust, smoke, vibration, and corrosive fumes, out of direct sunlight, and away from heating units, cooling units, and ducts.
- Verify that there is an adequate and stable power source for all system components.
- Verify that the power cord is the correct one for your laboratory and that it meets the national safety agency guidelines for the particular country of use.

Warning: The microflex mass spectrometer contains elements at high voltage (up to 20kV)!

Warning: DO NOT operate the instrument with any covers or parts removed!

Warning: Unplug power plug before removing cover!

Warning: DO NOT attempt to make adjustments, replacements or repairs to this instrument. Only a Bruker Daltonics Service Representative or similarly trained and authorized person should be permitted to service the instrument.

Warning:

When it is likely that the electrical protection of the microflex mass spectrometer has been impaired:

1. Power off the microflex mass spectrometer.
2. Disconnect the line cord from the electrical outlet.
3. Secure the instrument against any unauthorized operation.

Warning:

The microflex mass spectrometer and MALDI-TOF analyses use very high voltages. Under normal operation, the instrument requires NO user access to the inner components of the instrument. NEVER OPERATE the microflex mass spectrometer with the protective panels removed as this exposes the user to risk of severe electrical shock and harmful, invisible, ultraviolet laser radiation.

Caution: Use only fuses with the required current and voltage ratings and of the specified type for replacement.

Caution: Use the instrument according to the instructions provided in this manual. If used otherwise, the instrument-provided protection can be impaired.

Caution: Connect the instrument to an AC line power outlet that has a protective ground connection. To ensure satisfactory and safe operation of the instrument, it is essential that the protective ground conductor (the green / yellow lead) of the line power cord is connected to true electrical ground. Any interruption of the protective ground conductor, inside or outside the instrument, or disconnection of the protective ground terminal, can impair the instrument-provided protection.

1.3 Environmental Conditions

The microflex mass spectrometer is designed for indoor use and functions correctly under the following ambient conditions:

Table 1-2 Environmental Conditions

	Operating Conditions	Storage Conditions
Temperature	10 - 30 °C	–20 - 60°C
Relative Humidity	15-85% noncondensing	15-85% noncondensing

2 INSTALLATION AND SETUP

Installation and setup consists of:

- Facility and Electrical Requirements (section 2.1).
- Unpacking (section 2.2).
- Connections (section 2.3).
- Setup (section 2.4).

2.1 Facility and Electrical Requirements

The facility must provide:

- ~100 to 230 V/ 3-1.5 A / 50–60 Hz. The instrument back panel is fitted with an IEC320–C14 mains inlet (Figure 3-3). The instrument comes with a 3 m long IEC320 line cord and a mains plug, suitable for use in your country.
- The microflex mass spectrometer requires approximately 51 cm x 68 cm (20 ” x 27 ”) of bench space on a surface that can safely support the full 125 kg (275 lbs) instrument weight.
- To ensure proper ventilation and access to the mains switch, maintain 20 cm of clearance behind the instrument.

Warning: The main supply must provide adequate grounding.

Even though the gas load on the system is sufficiently low that ventilation of the pump exhaust is not required, the system has an exhaust port to accommodate venting. This port is located on the rear of the instrument. Individual facilities may have safety guidelines which require ventilation. It is the responsibility of the user to adhere to the requirements of their respective facility.

2.2 Unpacking

The packing list is created for each order and placed in the crate with the instrument.

Note: The warranty does NOT cover damage resulting from customer mishandling. Do not open the shipping container unless a BRUKER representative is present. Opening of the container without authorized persons will void the warranty of the instrument. Our service engineers will set up the instrument in customers laboratory.
The surface on which the instrument is placed must be able to safely support the full 125 kg (275 lbs) weight, and computer, monitor and printer as well.

Let the instrument on the palette and wait for the Bruker representative to move the instrument to its desired location!

It takes at least four people to lift the instrument.

2.3 microflex Input and Output Connections

Please refer to section 3.1.2.

2.4 Setup

To setup the instrument:

1. At the rear of the instrument, plug in the following cord and cables into the corresponding connections (Figure 3-3):
    a. Line cord.
    b. 9-pin cable.
    c. Signal cable.
2. Plug the other end of the AC line cord into a suitable AC outlet.

    Caution: Read and follow all electrical and safety precautions described in section 1.2.
3. Plug the data system end of the signal cable connections into the appropriate connections (Figure 2-1).

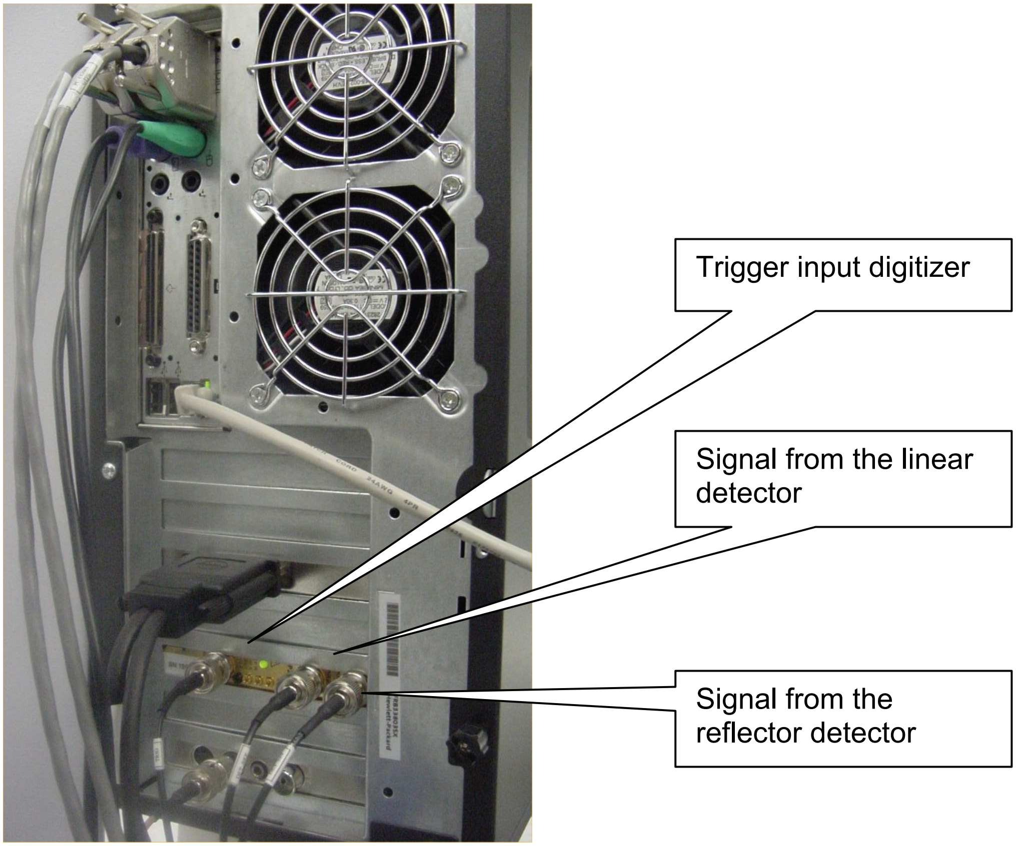


Figure 2-1 Connection at the rear of the PC

4. Plug the data system end of the 9-pin cable into the COM-1 port on the PC.
5. Turn on the AC mains switch.
6. Ensure that the POWER LED is illuminated (Figure 3-2).

After initial power-up it may be as long as 12 hours before the instrument is ready for operation, at which time the Ready LED illuminates (Figure 3-2) .

Note: If any faults occur within the system the Error LED (Figure 3-2) illuminates and the system goes into standby. Contact your authorized service personnel for help.

3 INSTRUMENT VERSION

The Bruker microflex MALDI-TOF is composed of only two main components:

1. Mass spectrometer and
2. Data system (section 3.2).

3.1 Schematic of the Mass Spectrometer

The schematic shown in Figure 3-1 provides an overview of the **microflex** mass spectrometer's working principle.

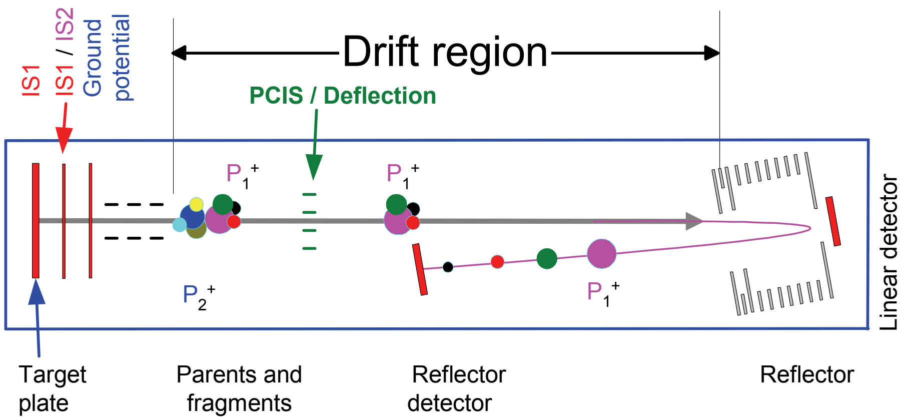
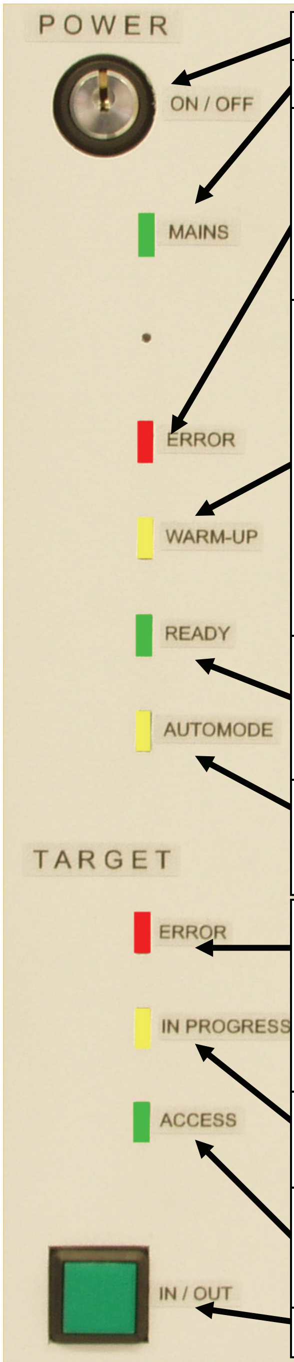


Figure 3-1 Schematic of the instrument

3.1.1 Instrument Controller

When the instrument is ready for operation the three green LED's **Mains**, **Ready**, and **Access** illuminate green light as shown in Figure 3-2.



Key switch OFF: Vents the instrument.

Permanently illuminating: Main switch is on.

Permanently illuminating: <u>Malfunction</u>, requires intervention of the user or a service technician; details are shown by the tool tips on the PC (**flexControl**™).

Flashing (combined with Target Error): Service mode or firmware update.

Permanently illuminating: The system is not yet ready to measure, e.g., the docking procedure in still in progress, HV is off, etc. It takes some time, even when all parameters comply with the requirements. This state is reflected simultaneously on the PC screen providing details via flexControl™.

Flashing: A subordinated malfunction has occurred, which the user must troubleshoot, e.g., port lid is open.

Permanently illuminating: Ready to acquire spectra, i.e. any interlocks are closed, sufficient vacuum, HV present, etc.

Off: During the docking procedure.

Permanently illuminating: This LED is on as long as AutoXecute™ is in progress. During this run the target plate cannot be retracted by applying the related button.

Permanently illuminating: Malfunction, requires intervention of the user or a service technician; details are shown on the PC (flexControl™).

Flashing (combined with System Error): Service mode or firmware update.

Permanently illuminating: As long as the docking procedure is in progress (Target in/out).

Permanently illuminating: When the tray is either inside or outside the instrument in the final position.

Off: During the docking procedure.

In/Out: Initiates the docking procedure.

Figure 3-2 The control panel at the front of the instrument

3.1.2 Rear Panel

At the rear of the instrument (Figure 3-3), there are the following connections:

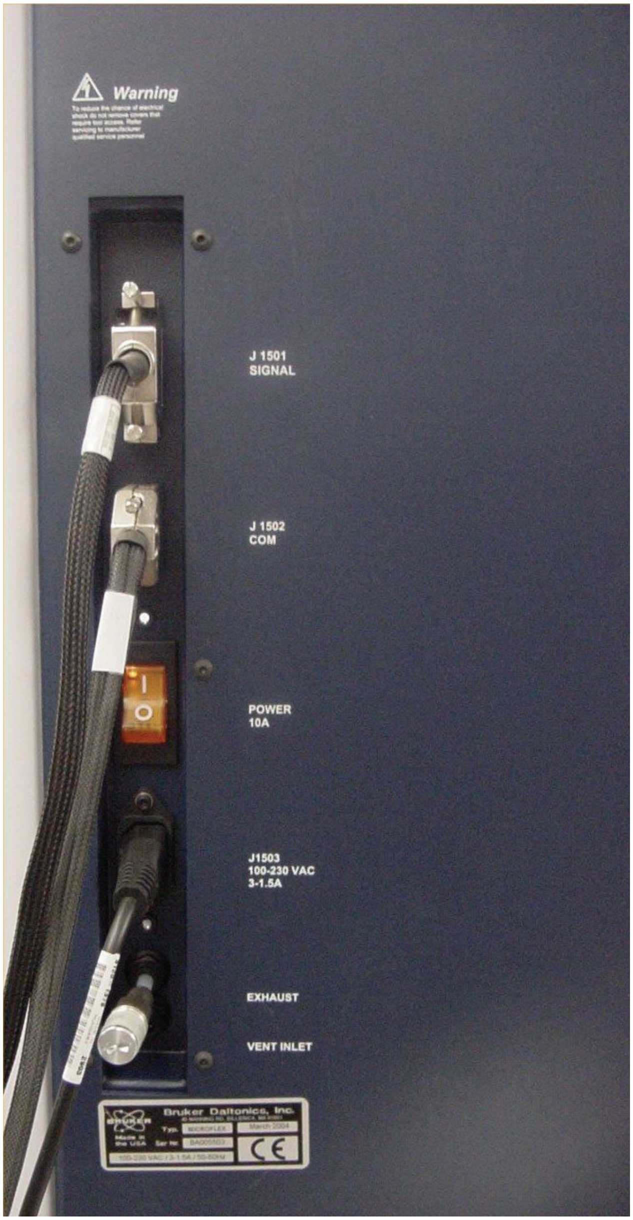


Figure 3-3 Connections at the rear

- **Exhaust**: Accepts 6 mm OD plastic tube, quick release. Internal pumping system exhaust. This is fitted at the factory with a sound damping device. The gas load on the system is sufficiently low that ventilation of the pump exhaust is not required. Individual facilities may have safety guidelines which require ventilation. It is the responsibility of the user to adhere to the requirements of their respective facility.

- **Vent inlet**: Accepts 6 mm OD plastic tube, quick release. Internal vacuum system venting inlet. Only used during service!

- **Mains inlet:** The instrument is fitted with an IEC320-C14 mains inlet.

Below the panel there is an air filter, which should be replaced every three month (Figure 3-4).

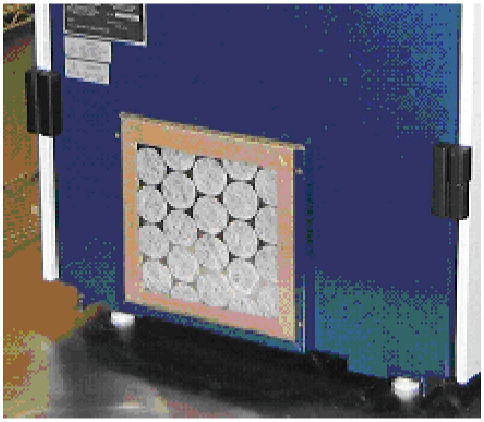


Figure 3-4 Position of the air filter at the rear of the instrument

Caution:

This instrument contains a ***class III B***-laser product emitting ***337 nm UV-light****.* The enclosure surrounding the instrument is designed to protect the user from indirect radiation of the invisible light. Operating the instrument with opened covers can expose the user to harmful laser radiation, which may result in blindness.

Never look directly into the laser beam. Always wear safety goggles before opening the side panels. Make sure other people cannot expose themselves to the laser light. Avoid bringing highly reflecting parts into the beam (screw drivers, watches, rings) because the reflected visible and invisible light could reach your eye, causing irreparable injuries!

3.1.3 Vacuum System

The vacuum system of the instrument consists of two rough vacuum sectors and one high vacuum area. The vacuum chamber and the exhaust of the turbo molecular pump are joined by a T-splitter and guided to the vacuum side of the foreline pump (diaphragm pump). Depending on the system status, e.g., when moving in a target (Figure 3-6), each of both rough vacuum lines can be closed separately by computer-controlled valves. The input of the turbo molecular pump is attached directly to the high vacuum area comprising both the ion source housing and the ion flight tube. The instrument operates at a high vacuum pressure of about $2*10^{-6}$ mbar. The rough vacuum pressure ranges from atmosphere to about 2 mbar.

3.1.3.1 microSCOUT Ion Source

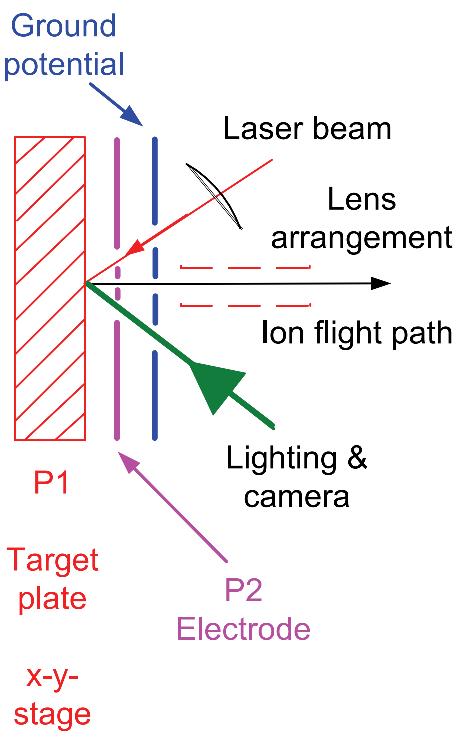


Figure 3-5 Scheme of the microSCOUT Ion Source

The ion source (Figure 3-5) is the part of the mass spectrometer where ions are formed using the **MALDI** technique. The source consists of three main components.

1. The x-y-stage accommodates the target plate, transports it into the ion source, and moves the target inside on x-y-coordinates, according to the selected shot position.
2. The vacuum lock inserts the target from atmosphere to the high vacuum.
3. The ion optics consists of the positively or negatively charged microflex target (P1), a second voltage plate (P2) for time lag focusing and a grounded acceleration electrode. When the laser hits the analyte/matrix mixture the formed ions are accelerated by the delayed applied electrical field and focused by a lens system before they leave the source.

Figure 3-6 Load port containing a Micro SCOUT Plate

3.1.3.2 Pulsed Ion Extraction

MALDI mass spectrometry is restricted by the energy distribution of the formed ions, which is caused by the ionization process. Because not all the ions are desorbed and ionized at the same time and at the same place inaccuracies occur related to energy, location, and time. Also repulsive electrical forces cause an initial energy distribution of the ions. Summarizing all these inaccuracies which happen during the ion formation process cause that **ions of the same mass** do not have the same kinetic energy after passing the acceleration field, but leave the source with a certain energy spread resulting in an arrival at slightly different times on the detector. This effects in broadening of the peak width and thus reducing the resolving power.

Pulsed Ion Extraction (PIE) is a technique to enhance resolution and sensitivity as well of a TOF mass spectrometer.

After desorption ions are delayed extracted (phase 2 and 3, discussed beneath). This method benefits in:

1. A softer acceleration process, because ions do not pass the dense plume of matrix molecules and
2. achieving a time focusing effect provided that the correct parameters are applied.

Involved in the PIE process are three components of the ion source, i.e.

1. the target plate(P1) where the analyte is dropped on,
2. the second voltage plate (P2) which is an electrode mounted some mm apart opposite to the sample position, and
3. the following grounded acceleration electrode (Figure 3-1, Figure 3-5).

Using PIE this arrangement works as follows:

Phase 1:
The target plate P1 with the analyte is always connected to potential IS/1. At first the same potential is applied on plate P2. So the analyte is not yet exposed to any exterior effects until to the laser shot. This event is the transition to

Phase 2:
where molecules and ions are set into motion by laser ionization/desorption with a typical velocity of 700 m/s from P1 towards P2. Meanwhile the analyte is ionized.

There is still no electrical potential the ions are exposed to. Only the MALDI process causes their kinetic energy at this moment, where through the evaporation of the analyte surface particles are explosively pushed to that velocity. During the next few hundred nanoseconds the analyte moves further towards P2.

However not all ions start with the initial velocity of 700m/s. Some (the fast ones) fly further than others that fly only a short way (the slow ones). Without using PIE this velocity distribution decreases the resolution on a TOF mass spectrometer in linear mode without using PIE.

Then at the end of the delay time begins

Phase 3:
where potential P2 is pulsed down from IS/1 to IS/2 generating an electrical field whose strength forces all charged particles to move towards P2.

That means that the fast higher energetic ions that were able to fly further towards the P2 plate before the voltage was switched are exposed to a less electrical potential than the slow ones in the neighborhood of P1. For this reason the slow ones start on a higher potential than the fast ones. Therefore the slow ones will fly faster in the field free region whereas the fast ones will fly slower.

Using the right slope of the potential between P1 and P2 ions of a given mass with different stating velocities will all arrive at the same time on the detector!

3.1.3.3 Target Plates

The target plates used with the microflex are called **MSP** (**M**icro **S**COUT **P**lates). They are available with 96 (Figure 3-7) sample spots. The target size and aspect ratio are exactly ¼ of a microtiter plate. Although reduced in size Micro SCOUT Plates can automatically be handled by the Bruker sample preparation robots, such as the MAPII.

In this case each Micro SCOUT Plate is placed into an adapter target, which accommodates only one Micro SCOUT Plate . These adapter targets are equipped with a programmable semiconductor chip, called transponder. The robot reads the transponder and identifies the Micro SCOUT Plate inside the adapter as such a target.

After sample preparation adapter and target plate are put into a separate **Read/Write Transponder Station** (manual PN 212 308) next to the spectrometer to read the transponder information. Then the target plate is taken out of the adapter and introduced into the spectrometer by hand. The transponder station is connected to the PC via RS 232/485.

The use of adapters in conjunction with transponders also allows for applying the AnchorChip technology. AnchorChip targets are equipped with a special coating improving the crystallization process of MALDI samples. This technique benefits in:

- 10 – 100 fold sensitivity increase because of increased analyte concentration.
- Improved automation because of reduced search for “sweet spots”.

Comprehensive information can be obtained from the manual AnchorChip™ Technology, (manual PN 215 344).

A video CCD camera and a video capture card inside the PC allow high resolved sample observation.

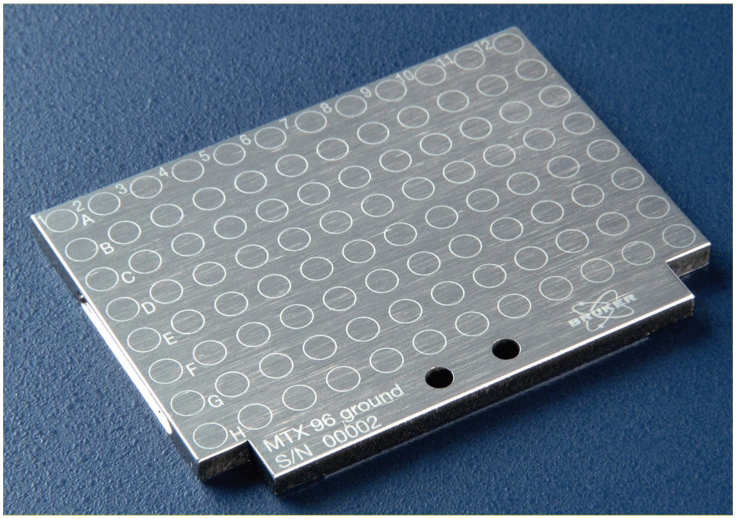


Figure 3-7 Illustration of a 96 spot Micro SCOUT Plate

3.1.3.4 Precursor Ion Selector

The precursor ion selector (PCIS) as shown in Figure 3-8 works as a mass filter to separate a particular parent ion and related fragments from all the other ions for MS/MS analysis.

It consists of deflector plates arranged in vertical layers below each other. Consecutive electrodes are coupled to a high voltage supply with alternating polarity, according to the Bradbury-Nielsen principle. The potential difference between the plates generates an electrostatic field perpendicular to the ion flight direction. This field deflects all the ions entering this electrode arrangement.

Although the plates are coupled to the supply voltage due to the Bradbury-Nielsen principle the ion selector is operated as an improved Barowsky precursor ion selector to take advantage of this selection mode. Just in the moment when the selected ions enter the deflection field the deflection is switched off. The potential between the plates is kept to zero until the ions leave the deflector. In this moment the deflection is switched on again, however with the reverse polarity. This mode results in a compensation of the partial deflection, which occurs in the stray areas at both front ends of the electrodes. This technique allows applying extraordinary short selection times, which results again in improved resolving power.

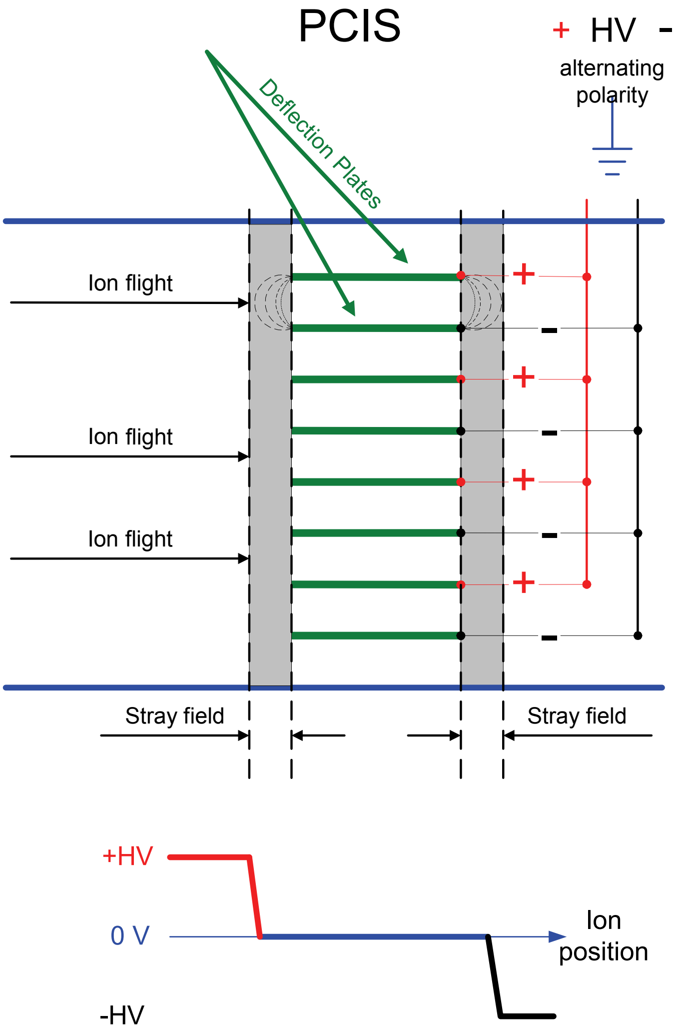


Figure 3-8 The operation principle of the precursor ion selector

3.1.4 Reflector

The main task of a reflector is to compensate flight times of ions with different energies.

The metastable decay of ions is caused by an energy excess obtained during the complex MALDI process. Because parents and fragments continue traveling with the same velocity they hit the linear detector simultaneously thus delivering no fragment spectrum but a single peak. For fragment mass separation a reflector can be incorporated into the mass spectrometer to separate metastable ions. Ions of different masses have different kinetic energies and penetrate to different locations into the electrical field before they are reflected to strike the reflector detector at different times.

To obtain good mass spectra with a reasonable signal-to-noise ratio the geometry of a reflector has to fulfill specific electrical and size requirements, mainly with respect to the dimensions of the flight tube, and type and size of the used reflector detector.

The **microflex** and other TOF mass spectrometers from the "flex"-series use a gridless reflector with ion lenses (Figure 3-9). Fragments that would arise inside the reflector instead of during their flight in the drift region form an undesired high chemical background.

To minimize residence times of ions inside the reflector, a double stage design is employed where the first stage is that one with the stronger field strength. As a result the reflector is shorter and the field free drift length is longer, compared to single stage TOF reflectors. Also this construction deflects all the smaller fragment ions, which would otherwise contribute to the background noise. In addition the gridless entrance lens of the reflector creates a s**pace focusing** effect, which increases the sensitivity.

The reflector is operated at a potential that exceeds the acceleration voltage of the ion source by about two kV.

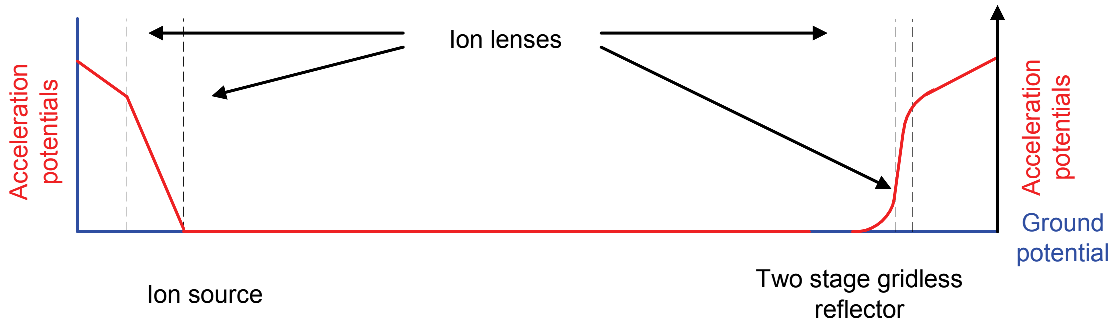


Figure 3-9 Potential distribution in a two stage griddles reflector

3.1.5 Detector

The detector converts an ion current into an electrical current, which is then digitized and delivered to the PC.

Modern detectors used in TOF mass spectrometers are designed as micro channel plate detectors (Figure 3-10). A micro channel plate is a porous solid core assembly with millions of tiny channels (Ø = 5-10µm, length = 0.5-0.8 mm), which are coated inside with a semi-conductive layer. Every one of the microchannels works like an electron multiplier, independent of the adjacent ones. To obtain a maximum electron yield all these channels are electrically connected in parallel.

The multiplication process that takes place in a channel is illustrated beneath.

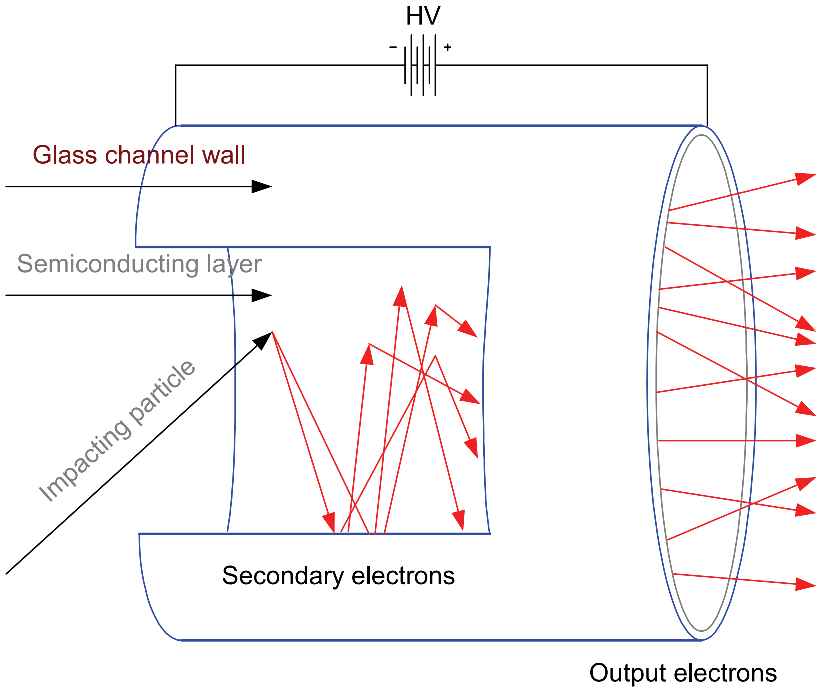


Figure 3-10 Principle of a micro channel

For normal operations a bias of up to 1000 volts is applied across the microchannel. This bias current flowing through the semi-conductive layer supplies the electrons necessary for the avalanching multiplication process.

A further performance parameter is the time response of the detector, important to prevent deterioration of the peak resolution. Microchannel plate detectors deliver an output voltage with a rise time (< 1ns) up to ten times faster than other detector configurations, such as channeltrons or discrete dynode multipliers.

Each detector of the **microflex** contains two MCPs coupled in series. The linear detector is equipped with the gating[1] option to be used to avoid saturation effects, which may be caused by the matrix material.

3.1.6 Digitizer

Beginning with the laser shot the digitizer records the incoming analog signals from the detectors and converts them into digital information. The digitizer card is able to attain a sample rate up to 2 GS/sec. This assembly is incorporated in the PC. Instrument setting are performed by setting up parameters on the ***Detector*** page of **flexControl**.

3.1.7 Laser System

The laser system operates at a repetition rate of 20 Hz maximum. It provides the pulsed laser light to a small spot on the target. The laser system consists of a pulsed UV laser[2], an attenuator that allows fine adjustment of the laser fluence, a lens system to focus the laser beam and a mirror system to direct the beam into the ion source on the target plate. Instrument setting are performed in **flexControl**.

3.1.8 Camera

The camera delivers an image of the sample spot to the **Target Manipulation Segment** in the **Graphical User Interface** of **flexControl**.

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[1] Please refer to the flexControl manual. Gating is an additional feature to detect only ions of interest. All the other ions are suppressed inclusive neutrals to avoid saturation of the linear detector.

[2] Standard is a N2 laser with 337 nm wavelength (pulse energy of150µJ) and 3 ns pulse width for use with matrix components absorbing light of this wavelength (class III B product).

3.2 PC Configuration

The PC controls the mass spectrometer, and acquires and stores data. This device corresponds to the required configuration on delivery, e.g.,

- 18-inch LCD display, resolution 1280 x 1024, True Color;
- Laser Printer;
- Windows 2000 operating system;
- Software packages **flexControl** / **flexAnalysis**.

3.3 Remote Service Capability

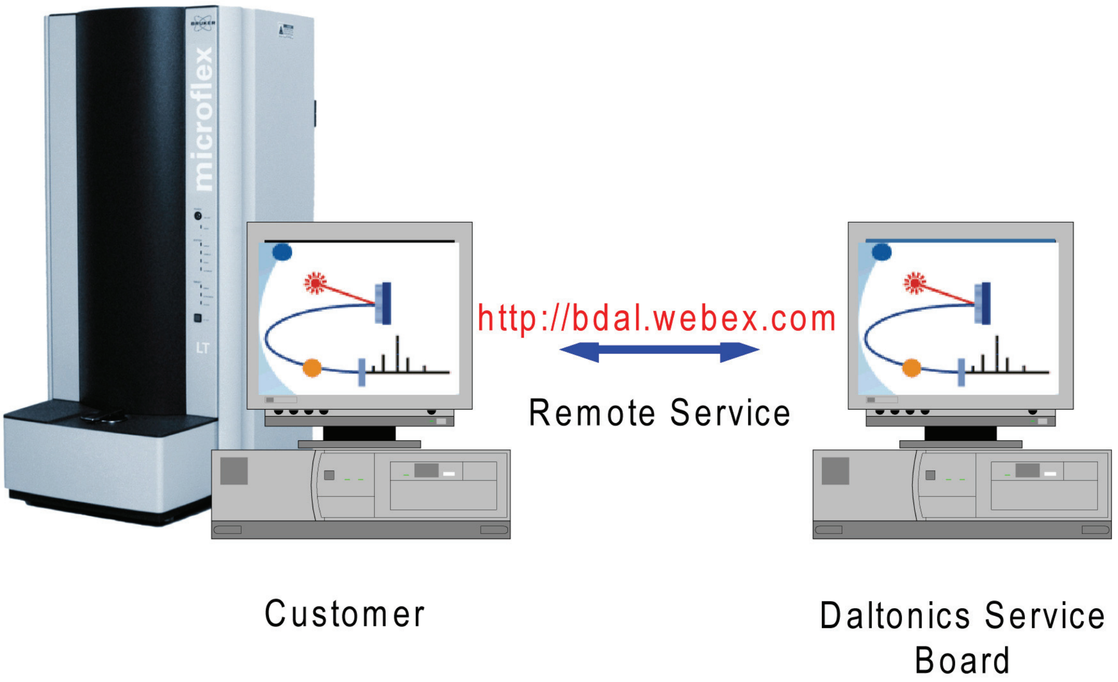

Figure 3-11 Operating principle of the remote service

To obtain a maximum operating time the **microflex** is equipped with a remote service capability (Figure 3-11). This feature allows for troubleshooting via the internet. Thus problems can often be solved efficiently with the customer PC being fully controlled by the Daltonics Service Board. For example, both software and firmware update is possible.

Moreover the service process can be speeded up, as the service engineer can arrive on site with the appropriate spare part, after remote diagnosis.

Prerequisite: The customer must have Internet access on the Control PC of the **microflex**.

An example how to obtain Remote Service in Europe :

1. Select http://bdal.webex.com. Figure 3-12 appears.
2. Select `Join` on the web page. Figure 3-13 appears.

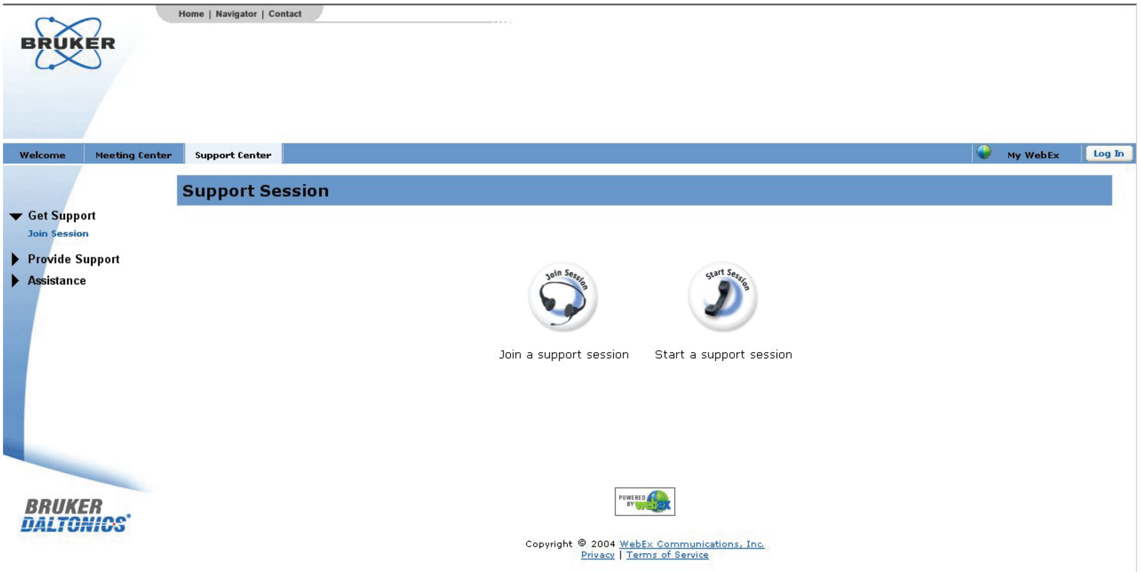

Figure 3-12 Webpage of Bruker Enterprise

Note: The “http”-connection changes to a “https”-connection, coded with 128-bit to provide the highest possible level of security!

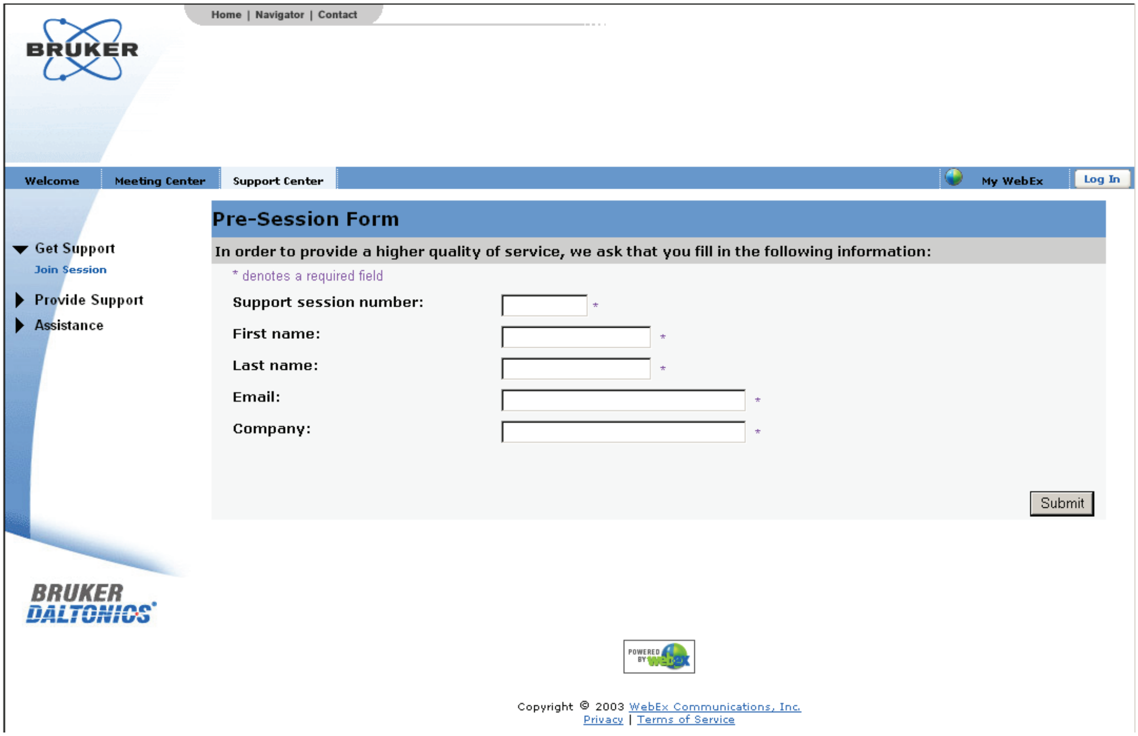

Figure 3-13 Enter the required information

Please, enter the required information.

A call to Bruker Service on +49 (341) 2431 395, will provide you with the Support Session Number. Press the “Submit” button and follow the instructions to successfully connect the remote service to your **microflex**.

4 OPERATION

4.1 Turning the Instrument On or OFF

Instrument power is controlled with Key Switch on the front panel and the mains switch (Figure 3-3), where:

- 0 = Off.
- I = On.

The front panel Power LED (Figure 3-2) illuminates when the instrument is properly powered up.

Note: The instrument is dead by applying the mains switch to 0!

4.2 Checking for Instrument Operational Readiness

The front panel Ready LED (Figure 3-2) illuminates when the instrument is ready for acquisition. If the Ready LED does not illuminate, either the target is in the out position or the pressure inside the analyzer is too high for proper operation.

4.3 Moving Targets In

To move a target in:

1. Open the load port lid (Figure 3-6) and place the MSP-target into the target platform.

   Note: If the lid does not open easily, then the target carrier may be in the IN position. Perform the target out process first.

   Caution: Take care not to drop any debris into the load port or onto the black O-ring, doing so can prevent proper operation.

2. Shut the load port lid.
3. Press the "TARGET IN/OUT" button momentarily (Figure 3-2).

   Wait for the READY LED to illuminate before beginning acquisition. The total time from initiating the target in routine by pushing the button to when the READY LED illuminates should not exceed five minutes and is typically less than two and a half minutes.

4.4 Moving Targets Out

To move a target out:

1. Press the "TARGET IN/OUT" button momentarily.
2. Open the load port lid, remove the target, and close the load port lid.

Note: Move a target out only after the new target is ready to be moved in! If at present no new target plate is ready move the target platform in (without target) and move it out again, when the new sample target will be available. Close the lid as soon as possible.

Please be aware that disregard of this instruction does not damage the instrument, however, changing the target plate may take up to 30 min!

4.5 Instrument Control in Analytical Operations

How to control the mass spectrometer in analytical operations is described in the **flexControl User Manual**.

5 INSTRUMENT MAINTENANCE

Inspect the ventilation air filter every three months. Replace the filter when it is visibly clogged with dust to ensure proper instrument function.

The filter must be replaced (# 555841).

Replace the filter by lifting the old filter up and out of the holder and slide in a new one (Figure 3-4).

6 INDEX