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**Leica**  
MICROSYSTEMS

# Leica EM ACE200 Service Manual



**Revision Record**

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|                     |                       |                  |                         |

# **Service Documentation**

## **Leica Service Manual**

### **EM ACE 200**

### **Version 1.0**

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**Chapter 1**

**Introduction**

**&**

**Safety instructions**

**Version 1.0**

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## 1.1 General information

### 1.1.1 Documentation

The information, numerical data, notes and value judgments contained in this manual represent the current state of scientific knowledge and state-of-the-art technology as we understand it following thorough investigation in this field. We are under no obligation to update the present manual periodically and on an ongoing basis according to the latest technical developments, nor to provide our customers with additional copies, updates etc. of this manual. For erroneous statements, drawings, technical illustrations etc. contained in this manual we exclude liability as far as permissible according to the national legal system applicable in each individual case. In particular, no liability whatsoever is accepted for any financial loss or consequential damage caused by or related to compliance with statements or other information in this manual.

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#### 1.1.1 Dokumentation

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### 1.1.2 Designated use

|   |  |
|---|--|
| <p>The instrument may only be operated within the scope of its designated use and in accordance with the operating manual.</p> <p>Any other use of the instrument is considered improper.</p> | <p><b>1.1.2 Bestimmungsgemäße Verwendung</b></p> <p>Das Gerät darf nur gemäß seiner Bestimmung und den Vorgaben in der Bedienungsanleitung betrieben werden. Jeder andere Gebrauch stellt eine unzulässige Verwendung dar.</p> |
|---|--|

### 1.1.3 Ordering spare parts

|  |  |
|--|--|
| <p>To order replacement parts or modules, specify the following information for each part ordered:</p> <ol style="list-style-type: none"> <li>1. Product model and serial number.</li> <li>2. Leica Part number.</li> <li>3. Part description.</li> <li>4. Quantity required.</li> </ol> <p><b>Spare parts can be obtained from your local Leica office or from:</b><br/>Leica Microsystems GmbH</p> <p>Hernalser Hauptstraße 219<br/>1170 Vienna<br/>Austria<br/>Phone: +43 1 48899-0<br/>Fax: +43 1 48899 8350</p> <p><b>Technical Service - Hotline</b><br/>The service hotlines for customer service and requests:<br/>Information can be given regarding spare parts, possibilities for repair, service documentation, adjustment and alignment requests etc.</p> <p><b>Telephone:</b><br/>Phone: +43 1 48899-0</p> | <p><b>1.1.3 Ersatzteilbestellung</b></p> <p>Um Ersatzteile oder Ersatzbaugruppen zu bestellen, geben Sie bitte die folgenden Informationen für jedes bestellt Teil bzw. jede bestellte Einheit an:</p> <ol style="list-style-type: none"> <li>1. Gerätebezeichnung und Seriennummer.</li> <li>2. Leica-Teilenummer.</li> <li>3. Teilebeschreibung.</li> <li>4. Gewünschte Menge (Anzahl).</li> </ol> <p><b>Ersatzteile erhalten Sie von Ihrer Leica-Vertretung vor Ort oder direkt von:</b><br/>Leica Microsystems GmbH</p> <p>Hernalser Hauptstraße 219<br/>1170 Vienna<br/>Austria<br/>Phone: +43 1 48899-0<br/>Fax: +43 1 48899 8350</p> <p><b>Service - Hotline</b><br/>Die Service-Hotlinenummern stehen zu Ihrer Verfügung, über die Sie Informationen zu den folgenden Themen erhalten:<br/>Ersatzteile, Reparaturmöglichkeiten, Servicedokumentation, sowie Anfragen zur Vorgehensweise bei Justierungen und Abgleichen.</p> <p><b>Telefon:</b><br/>Phone: +43 1 48899-0</p> |
|--|--|

### 1.1.4 Warranty and service

#### Warranty

Leica Microsystems GmbH guarantees that the contractual product delivered has been subjected to a comprehensive quality control procedure based on the Leica in-house testing standards, and that the product is faultless and complies with all technical specifications and/or agreed characteristics warranted.

The scope of the warranty is based on the content of the concluded agreement. The warranty terms of

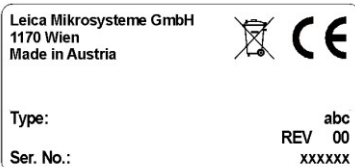
your Leica sales organization or the organization from which you have purchased the contractual product shall apply exclusively.

#### Technical service information

If you require technical service or replacement parts, please contact your Leica sales representative or dealer who sold the product.

Please provide the following information:

- Model name and serial number of the instrument.
- Location of the instrument and name of the person to contact.
- Reason for the service call.
- Date of delivery.



#### Decommissioning and disposal

The instrument or parts of the instrument must be disposed of in compliance with the local laws.

### 1.1.4 Gewährleistung und Service

#### Gewährleistung

Leica Microsystems GmbH steht dafür ein, dass das gelieferte Vertragsprodukt einer umfassenden Qualitätskontrolle nach den Leica-hausinternen Prüfungsmaßstäben unterzogen wurde und, dass das Produkt nicht mit Mängeln behaftet ist und alle zugesicherten technischen Spezifikationen und/oder vereinbarten Eigenschaften aufweist.

Der Gewährleistungsumfang richtet sich nach dem Inhalt des abgeschlossenen Vertrages.

Bindend sind nur die

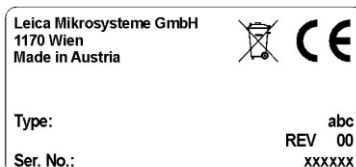
Gewährleistungsbedingungen Ihrer zuständigen Leica-Verkaufsgesellschaft bzw. der Gesellschaft, von der Sie das Vertragsprodukt bezogen haben.

#### Serviceinformation

Wenn Sie den technischen Kundendienst oder Ersatzteile benötigen, wenden Sie sich bitte an Ihre Leica Vertretung oder den Leica Händler, von dem Sie das Gerät gekauft haben.

Folgende Angaben zum Gerät sind erforderlich:

- Die Modellbezeichnung und die Seriennummer des Gerätes.
- Den Standort des Gerätes und einen Ansprechpartner.
- Den Grund für die Kundendienstanforderung.
- Das Lieferdatum.



#### Stilllegung und Entsorgung

Das Gerät oder Teile des Gerätes müssen unter Einhaltung der jeweils geltenden gesetzlichen Bestimmungen entsorgt werden.

## 1.2 Safety instructions

### 1.2.1 Electrical hazard

While the instrument is in operation, certain components of the unit are inevitably live, carrying currents which can cause severe injuries or death.

In order to reduce the risk of death and/or injury, it is essential to use the precautions mentioned below.

1. Only qualified personnel (see following page), who are familiar with both the instrument and the instructions supplied together with it, may search the instrument for faults and troubleshoot and/or repair it.
2. Installation of the instrument must be carried out in compliance with the applicable safety regulations (e.g. DIN, VDE, UL) as well as with any other pertinent national or local rules. Adequate grounding, dimensioning of conductors and corresponding short-circuit protection must be provided, in order to ensure operational safety.
3. During normal operation, all covers have to be installed and must remain closed.
4. Prior to doing visual inspections and/or maintenance work, make sure that the AC power supply is switched off and the instrument is unplugged from mains.  
Danger! - prior to cutting off the AC power supply, the instrument is live!
5. If certain measurements have to be done with the current supply on, never touch the electrical connections!  
The plastic covers and insulations at the power supply unit, mains input, mains switch and all other voltage-carrying distributors must be installed. Remove all jewelry from your wrists and fingers. Make sure the test devices are in good, operationally safe working order.
6. When working on the instrument while it is switched-on, always stand on insulated ground, i.e. make sure that there is no grounding.
7. Once all maintenance and service work has been completed, prior to reinstalling the instrument housing check the following: all safety devices such as PE, groundings, plastic covers and insulations must be in faultless condition and fully operational.
8. This list does not necessarily contain all

### 1.2.1 Gefährliche elektrische Spannung

Beim Betrieb dieses Gerätes stehen zwangsläufig bestimmte Geräteteile unter gefährlicher Spannung, die zu schweren Körperverletzungen oder zum Tod führen kann. Die folgenden Vorsichtsmaßnahmen müssen unbedingt befolgt werden, um die Gefahr für das Leben bzw. Verletzungsgefahr zu verringern.


1. Nur qualifiziertem Personal (siehe nächste Seite), das mit diesem Gerät und den mitgelieferten Informationen vertraut ist, ist die Störungssuche, Störungsbeseitigung oder Reparatur dieses Gerätes gestattet.
2. Die Aufstellung des Gerätes muss in Übereinstimmung mit den Sicherheitsvorschriften (z.B. DIN, VDE, UL) sowie allen anderen relevanten staatlichen oder örtlichen Vorschriften erfolgen. Es muss für eine ordnungsgemäße Erdung, Leiterdimensionierung und entsprechenden Kurzschluss-Schutz gesorgt sein, um die Betriebssicherheit zu gewährleisten.
3. Während des normalen Betriebes sind alle Abdeckungen anzubringen und geschlossen zu halten.
4. Das Gerät steht vor dem Abschalten der Wechselstromversorgung unter gefährlicher Spannung.  
Vor Durchführung von Sichtprüfungen, Wartungs- und Servicearbeiten ist sicherzustellen, dass die Wechselstromversorgung sicher abgeschaltet und der Stecker vom Netz getrennt wird.
5. Wenn Messungen bei eingeschalteter Stromversorgung durchgeführt werden müssen, keinesfalls die elektrischen Anschlußstellen berühren.  
Kunststoffabdeckungen und Isolationen am Netzteil, Netzeingang, Netzschalter sowie allen anderen Netzspannung führenden Verteilern müssen angebracht und im einwandfreien Zustand sein.  
Allen Schmuck von Handgelenken und Fingern abnehmen. Sicherstellen, dass die Prüfmittel in gutem, betriebssicherem Zustand sind.
6. Bei Arbeiten am eingeschalteten Gerät auf einem isolierten Untergrund stehen, also sicherstellen, dass keine Erdung vorliegt.

|  |  |
|--|--|
| <p>measures that may be necessary for safe operation of the instrument. If you need further information or if specific problems occur, please contact your local Leica office.</p> | <p>7. Nach Beendigung der Wartungs- und Servicearbeiten muss vor dem Anbringen aller Gehäuseabdeckungen sichergestellt werden, dass alle Sicherheitseinrichtungen wie PE-Erdungen, Kunststoffabdeckungen und Isolationen in einwandfreiem Zustand sind und ihre Funktion erfüllen.</p> <p>8. Diese Liste stellt keine vollständige Aufzählung aller für den sicheren Betrieb des Gerätes erforderlichen Maßnahmen dar. Sollten Sie weitere Informationen benötigen oder sollten spezielle Probleme auftreten, wenden Sie sich bitte an die örtliche Leica-Niederlassung.</p> |
|--|--|

**1.2.2 Qualified personnel**

|   |  |
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| <p>as defined in this service manual, are persons who are familiar with installation, maintenance, repair and operation of the product Leica IP S, and who have received adequate training in order to carry out their responsibilities. Adequate training is e.g.:</p> <ul style="list-style-type: none"> <li>• Professional training, or receiving specific instructions from a professional, or being licensed to connect / disconnect, ground and label electric circuits and instruments / systems according to all applicable safety regulations.</li> <li>• Professional training, or receiving specific instructions from a professional on how to use/maintain applicable safety regulations, the training itself being carried out according to all applicable safety regulations.</li> </ul> | <p><b>1.2.2 Qualifiziertes Personal</b></p> <p>im Sinne dieser Service-Anleitung sind Personen, die mit Aufstellung, Montage, Inbetriebsetzung und Betrieb des Produktes vertraut sind und über die ihrer Tätigkeit entsprechenden Qualifikationen verfügen.</p> <p>Dies sind z.B.:</p> <ul style="list-style-type: none"> <li>• Ausbildung oder Unterweisung bzw. Berechtigung, Stromkreise und Geräte/Systeme gemäß den Standards der Sicherheitstechnik ein- und auszuschalten, zu erden und zu kennzeichnen.</li> <li>• Ausbildung oder Unterweisung gemäß den Standards der Sicherheitstechnik in Pflege und Gebrauch angemessener Sicherheitstechnik.</li> </ul> |
|---|--|

**1.2.3 Instrument type**

|   |
|---|
| <p>All information in this service manual applies only to the instrument type indicated on the title page.<br/>A nameplate with the serial number is attached to the back of the instrument.</p> <div data-bbox="161 1727 533 1908">  <p>Leica Mikrosysteme GmbH<br/>1170 Wien<br/>Made in Austria</p> <p>Type: abc<br/>REV 00<br/>Ser. No.: xxxxxx</p> </div> |
|---|



### 1.2.4 How to ensure safe operation

|   |  |
|---|--|
| <p>To ensure trouble-free operation of the instrument at all times, the following instructions and warnings should be observed:</p> <ul style="list-style-type: none"> <li>• The protective devices on the instrument and its accessories must not be removed or modified.</li> <li>• Only service engineers authorized by Leica may access, service and repair the internal components of the instrument.</li> </ul> | <p><b>1.2.4 Betriebssicherheit</b></p> <p>Um eine einwandfreie Funktion des Gerätes zu gewährleisten, sind folgende Hinweise und Warnvermerke zu beachten:</p> <ul style="list-style-type: none"> <li>• Die Schutzeinrichtungen an Gerät und Zubehör dürfen weder entfernt noch verändert werden.</li> <li>• Das Gerät darf nur durch von Leica autorisierte Service-Techniker geöffnet und repariert bzw. gewartet werden.</li> </ul> |
|---|--|





### 1.2.5 Liability

|   |  |
|---|--|
| <p>This document is strictly for the use of qualified service engineers with the requisite technical skills. Only persons who have successfully completed the appropriate service training provided Leica Microsystems GmbH and are in the employ of a company in the Leica Group or of an agency, distributor, or service workshop duly authorized by Leica Microsystems GmbH have the status of qualified service engineer. Leica Microsystems GmbH accepts no liability whatever for direct or indirect damage that may occur due to the unauthorized or improper use or interpretation of this document by any person who is not a qualified service engineer in accordance with the above definition. Service technicians have the following obligations:</p> <ul style="list-style-type: none"> <li>• To understand and follow the safety information and instructions on the product and in the user manual.</li> <li>• To be familiar with up-to-date local regulations regarding industrial and nonindustrial accident prevention.</li> <li>• To inform Leica immediately in writing if the equipment becomes unsafe.</li> </ul> | <p><b>1.2.5 Haftung</b></p> <p>Dieses Dokument richtet sich ausschließlich an qualifizierte Servicetechniker und Servicetechnikerinnen, welche über die notwendigen Fachkenntnisse verfügen. Qualifizierte Servicetechniker und Servicetechnikerinnen sind solche, die den entsprechenden Servicekurs bei Leica Microsystems GmbH erfolgreich besucht und in der Leica-Gruppe oder bei einer von Leica Microsystems GmbH autorisierten Vertretung oder Servicewerkstatt tätig sind. Wird dieses Dokument von nicht-qualifizierten Servicetechnikern und Servicetechnikerinnen verwendet, so lehnt Leica Microsystems GmbH jegliche Haftung ab für direkte und indirekte Schäden, die durch nicht fachgemäße Anwendung und/oder Interpretation dieses Dokumentes entstehen. Für die Servicetechniker und Servicetechnikerinnen gelten folgende Pflichten:</p> <ul style="list-style-type: none"> <li>• Sie verstehen und befolgen die Sicherheitsinformationen und die Instruktionen auf dem Produkt sowie in der Betriebsanleitung.</li> <li>• Sie kennen die ortsüblichen gesetzlichen, betrieblichen und außerbetrieblichen Unfallverhütungsvorschriften im Wissen, dass sich diese auf dem aktuellsten Stand befinden.</li> <li>• Sie benachrichtigen Leica schriftlich, sobald an der Ausrüstung Sicherheitsmängel auftreten.</li> </ul> |
|---|--|












### 1.2.6 Symbols used in this manual

|   |  |
|---|--|
| <p>Important safety- and instrument-related information in this manual is provided together with graphical symbols. These are intended to:</p> <ul style="list-style-type: none"> <li>• allow the service engineer to access procedural information more easily and efficiently,</li> <li>• alert persons to a specific hazard,</li> <li>• safeguard against operational errors.</li> </ul> <p>To avoid accidents, personal injury and property damage follow the safety messages given in this document!</p> | <p><b>1.2.6 Symbole im Text u. die Bedeutung</b></p> <p>Wichtige sicherheits- und gerätetechnische Hinweise sind in diesem Service-Handbuch durch Symbole gekennzeichnet. Sie dienen dazu,</p> <ul style="list-style-type: none"> <li>• Arbeiten am Gerät zu erleichtern,</li> <li>• vor konstruktiv bedingten Gefahren zu warnen,</li> <li>• vor Fehlanwendungen zu schützen.</li> </ul> <p>Die Hinweise sind unbedingt zu befolgen, um</p> |
|   |  |

|   |                            |
|---|----------------------------|
|    | General Warning /Attention |
|   | Important information      |
|  | Maintenance recommendation |
|  | Danger                     |
|   |                            |

## 1.2.7 Labels on the instrument:

| Label  | Legend   | Component  |
|--|--|--|
|  <p><b>⚠ WARNING</b><br/> <b>Hazardous Voltage Enclosed</b><br/> Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lockout power before servicing.</p>                           | Electrical Hazard  | On HV power supply and service cap HV                  |
|  <p><b>⚠ CAUTION</b><br/> <b>Pinch point hazard.</b><br/> <b>Keep hands clear.</b></p>  | Pinch Point Hazard   | Always on a table flange                               |
|  <p><b>⚠ WARNING</b><br/> <b>Burn hazard.</b><br/> <b>Hot surface inside.</b><br/> Allow to cool before servicing.</p>  | Burn Hazard  | Ion source(in front of chamber)                        |
|  <p><b>⚠ WARNING</b><br/> <b>HOT or COLD surface.</b><br/> <b>Do NOT touch.</b><br/> To avoid serious burns or frostbite, follow documented safety procedures before accessing or disconnecting fluid lines.</p> | Burn Hazard  | On Cooling stage                                       |
|  <p><b>⚠ WARNING</b><br/> <b>Lifting hazard.</b><br/> Single person lift could cause injury. Use assistance when moving or lifting.</p>   | Lifting Hazard   | On Dewar   |
|   | Frostbite Hazard   | On Dewar   |
|   | This symbol announces relevant information inside the manual. To ignore them may result in damages at the unit or hazards for persons. | On Dewar and on top of chamber                         |
|   | Wear Gloves!   | In manual Service vacuum system, ion-Gun, table flange |

|   |                      |   |
|---|----------------------|---|
|  | Wear Safety Glasses! | In Manual<br>Use with LN2 (refill<br>Dewar) |
|---|----------------------|---|

### 1.2.8 Abbreviations:

|                 |                             |
|-----------------|-----------------------------|
| CO <sup>2</sup> | Carbon Dioxide              |
| PC              | Process Chamber             |
| linit           | Initialisation              |
| ES              | End Switch                  |
| Tc              | Process Chamber temperature |
| Pc              | Process Chamber pressure    |
| LN2             | Liquid Nitrogen             |
| AR              | Argon                       |

### 1.2.9 Hazard Warning Carbon Dioxide CO<sup>2</sup>:



#### Emergency Overview Carbon Dioxide CO<sup>2</sup>

- Simple asphyxiant
- Contents under pressure
- Keep at temperatures below 52°C / 125°F

**Appearance:** Colorless    **Physical State:** Compressed gas    **Odor:** Odorless

## Safety Instructions Carbon Dioxide, CO<sup>2</sup>

### Potential Health Effects:

|                                       |   |
|---------------------------------------|---|
| <b>Principle Routes of Exposure:</b>  | Inhalation.   |
| <b>Acute Toxicity</b>                 |   |
| <b>Inhalation:</b>                    | <p>Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen deficient atmosphere (&lt;19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death.</p> <p>Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves.</p> <p>Lack of sufficient oxygen may cause serious injury or death.</p> <p>Depending on concentration and duration of exposure to carbon dioxide may cause increased respirations, headache, mild narcotic effects, increased blood pressure and pulse, and asphyxiation.</p> <p>Symptoms of overexposure become more apparent when atmospheric oxygen is decreased to 15-17%</p> |
| <b>Eyes:</b>                          | None known  |
| <b>Skin:</b>                          | None known  |
| <b>Skin Absorption Hazard:</b>        | No known hazard in contact with skin.   |
| <b>Ingestion:</b>                     | None known  |
| <b>Chronic Effects:</b>               | Chronic harmful effects are not known from repeated inhalation of concentrations below PEL/TLV.   |
| <b>Aggravated Medical Conditions:</b> | Respiratory disorders.  |

### First Aid Measures:

|                            |  |
|----------------------------|--|
| <b>Eye Contact:</b>        | None under normal use. Get medical attention if symptoms occur.  |
| <b>Skin Contact:</b>       | None under normal use. Get medical attention if symptoms occur.  |
| <b>Inhalation:</b>         | <p>PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE.</p> <p>RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.</p> |
| <b>Ingestion:</b>          | None under normal use. Get medical attention if symptoms occur.  |
| <b>Notes to Physician:</b> | Treat symptomatically.   |

### Fire-Fighting Measures:

|  |   |
|--|---|
| <b>Flammable Properties:</b>                       | Not flammable.  |
| <b>Suitable Extinguishing Media:</b>               | Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.   |
| <b>Explosion Data:</b>                             |   |
| <b>Sensitivity to Mechanical Impact:</b>           | None  |
| <b>Sensitivity to Static Discharge:</b>            | None  |
| <b>Specific Hazards Arising from the Chemical:</b> | Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists. |

## Safety Instructions Carbon Dioxide, CO<sup>2</sup>

### Accidental Release Measures:

|                                   |  |
|-----------------------------------|--|
| <b>Personal Precautions:</b>      | Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment. Monitor oxygen level.  |
| <b>Environmental Precautions:</b> | Prevent spreading of vapors through sewers, ventilation systems and confined areas.  |
| <b>Methods for Containment:</b>   | Stop the flow of gas or remove cylinder to outdoor location if this done without risk. If leak is in container or container valve, contact a appropriate emergency telephone number. |
| <b>Methods for Cleaning Up:</b>   | Return cylinder to an authorized distributor.  |

### Handling and Storage:

|                  |  |
|------------------|--|
| <b>Handling:</b> | <p>Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap.</p> <p>Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur.</p> <p>Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.</p> <p>Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy® A, B, &amp; C and Monel®. Ferrous nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.</p> |
| <b>Storage:</b>  | <p>Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.</p>  |




### Exposure Controls / Personal Protection:

|  |   |
|--|---|
| <b>Engineering Measures:</b><br>concentrations | Local exhaust ventilation to prevent accumulation of high and maintain air-oxygen levels at or above 19.5%. |
| <b>Ventilation:</b>                            | Ensure adequate ventilation, especially in confined areas   |

### Personal Protective Equipment

|  |   |
|--|---|
| <b>Eye/Face Protection :</b>                   | Wear protective eyewear (safety glasses).   |
| <b>Skin and Body Protection:</b><br>cylinders. | Work gloves and safety shoes are recommended when handling  |
| <b>Respiratory Protection</b>                  |   |
| <b>General Use:</b>                            | No special protective equipment required.   |
| <b>Emergency Use:</b>                          | Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%) |

1.2.10 Hazard Warning LIQUID NITROGEN (LN<sup>2</sup>):**HAZARD WARNING****LIQUID NITROGEN, LN<sub>2</sub>**

|  |  |
|--|--|
|   | <p><u>Suffocation</u></p> <ul style="list-style-type: none"> <li>- Any vessel containing LN<sub>2</sub> is a potential hazard</li> <li>- One litre LN<sub>2</sub> produces 700 litres N<sub>2</sub> gas</li> <li>- N<sub>2</sub> gas is odourless and tasteless</li> <li>- Oxygen levels can quickly drop in confined spaces due to displacement of oxygen by N<sub>2</sub> when using or dispensing large volumes of LN<sub>2</sub></li> <li>- This can cause immediate fainting and unconsciousness</li> <li>- Always use LN<sub>2</sub> in well-ventilated areas</li> <li>- Treat it with respect!</li> </ul> |
|   | <p><u>Storage</u></p> <ul style="list-style-type: none"> <li>- For reasons mentioned above do not store full LN<sub>2</sub> Dewars in confined spaces</li> </ul>   |
|  | <p><u>Burns</u></p> <ul style="list-style-type: none"> <li>- LN<sub>2</sub> boils at -196°C. It is extremely cold and can cause serious burns. Please read the safety instructions provided with all Leica products for the correct handling of liquid nitrogen!</li> </ul>  |

## 1.2.11 Safety data sheet ARGON (AR):



### Safety data sheet Argon, compressed.

Creation date : 27.01.2005  
Revision date : 01.04.2011

Version : 1.3

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**SECTION 1: Identification of the substance/mixture and of the company/undertaking**
**1.1. Product identifier**

Product name  
Argon, compressed.

EC No (from EINECS): 231-147-0  
CAS No: 7440-37-1

Index-Nr. -

Chemical formula Ar

REACH Registration number:

Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH),  
exempted from registration.

**1.2. Relevant identified uses of the substance or mixture and uses advised against**
**Relevant identified uses**

Industrial and professional. Perform risk assessment prior to use.

**Uses advised against**

Consumer use.

**1.3. Details of the supplier of the safety data sheet**
**Company identification**

BOC, Priestley Road, Worsley, Manchester M28 2UT  
E-Mail Address ReachSDS@boc.com

**1.4. Emergency telephone number**

Emergency phone numbers (24h): 0800 111 333

**SECTION 2: Hazards identification**
**2.1. Classification of the substance or mixture**

Classification acc. to Regulation (EC) No 1272/2008/EC (CLP/GHS)

Press. Gas (Compressed gas) - Contains gas under pressure; may explode if heated.

Classification acc. to Directive 67/548/EEC & 1999/45/EC

Not classified as hazardous to health.

Asphyxiant in high concentrations.

Risk advice to man and the environment

In high concentrations may cause asphyxiation.

Compressed gas.

**2.2. Label elements**
**- Labelling Pictograms**

**- Signal word**

Warning

**- Hazard Statements**

H280

Contains gas under pressure; may explode if heated.

EIGA-As

Asphyxiant in high concentrations.

**- Precautionary Statements**

Precautionary Statement Prevention

None.

Precautionary Statement Response

None.

**Precautionary Statement Storage**

P403

Store in a well-ventilated place.

**Precautionary Statement Disposal**

None.

**2.3. Other hazards**

None.

**SECTION 3: Composition/information on ingredients**

Substance / Mixture: Substance.

**3.1. Substances**

Argon, compressed.

CAS No: 7440-37-1

Index-Nr.: -

EC No (from EINECS): 231-147-0

REACH Registration number:

Listed in Annex IV/V of Regulation (EC) No 1907/2006 (REACH),  
exempted from registration.

Contains no other components or impurities which will influence the  
classification of the product.

**3.2. Mixtures**

Not applicable.

**SECTION 4: First aid measures**
**4.1. Description of first aid measures**
**First Aid General Information:**

Remove victim to uncontaminated area wearing self contained

breathing apparatus. Keep victim warm and rested. Call a doctor.

Apply artificial respiration if breathing stopped.

**First Aid Inhalation:**

Remove victim to uncontaminated area wearing self contained

breathing apparatus. Keep victim warm and rested. Call a doctor.

Apply artificial respiration if breathing stopped.

**First Aid Skin / Eye:**

Adverse effects not expected from this product.

**First Aid Ingestion:**

Ingestion is not considered a potential route of exposure.

**4.2. Most important symptoms and effects, both acute and delayed**

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

**4.3. Indication of any immediate medical attention and special treatment needed**

None.

**SECTION 5: Fire fighting measures**
**5.1. Extinguishing media**

Suitable extinguishing media

All known extinguishants can be used.

**5.2. Special hazards arising from the substance or mixture**
**Specific hazards**

Exposure to fire may cause containers to rupture/explode. Non flammable.

Hazardous combustion products

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None.

**5.3. Advice for fire-fighters****Specific methods**

If possible, stop flow of product. Move container away or cool with water from a protected position.

**Special protective equipment for fire-fighters**

In confined space use self-contained breathing apparatus.

**SECTION 6: Accidental release measures****6.1. Personal precautions, protective equipment and emergency procedures**

Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

**6.2. Environmental precautions**

Try to stop release.

**6.3. Methods and material for containment and cleaning up**

Ventilate area.

**6.4. Reference to other sections**

See also sections 8 and 13.

**SECTION 7: Handling and storage****7.1. Precautions for safe handling**

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Refer to supplier's handling instructions. Only experienced and properly instructed persons should handle gases under pressure. Protect cylinders from physical damage; do not drag, roll, slide or drop. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Ensure the complete gas system has been (or is regularly) checked for leaks before use. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminants particularly oil and water. Never attempt to transfer gases from one cylinder/container to another. Do not smoke while handling product. The substance must be handled in accordance with good industrial hygiene and safety procedures.

**7.2. Conditions for safe storage, including any incompatibilities**

Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent falling over. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep

away from ignition sources (including static discharges). Keep away from combustible materials. Secure cylinders to prevent them from falling.

**7.3. Specific end use(s)**

None.

**SECTION 8: Exposure controls/personal protection****8.1. Control parameters**

No occupational exposure limit.

**8.2. Exposure controls****Appropriate engineering controls**

Product to be handled in a closed system. Oxygen detectors should be used when asphyxiating gases may be released. The substance must be handled in accordance with good industrial hygiene and safety procedures. Consider work permit system e.g. for maintenance activities. Systems under pressure should be regularly checked for leakages. Provide adequate general or local ventilation.

**Personal protective equipment****Eye and face protection**

Wear eye protection to EN 166 when using gases.

**Skin protection**

Wear leather safety gloves and safety shoes when handling cylinders.

**Respiratory protection**

Not required

**Thermal hazards**

Not required

**Environmental Exposure Controls**

Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

**SECTION 9: Physical and chemical properties****9.1. Information on basic physical and chemical properties****General information**

**Appearance/Colour:** Colourless gas.

**Odour:** No odour warning properties.

**Melting point:** -189 °C

**Boiling point:** -186 °C

**Flash point:** Not applicable for gases and gas mixtures.

**Flammability range:** Non flammable.

**Vapour Pressure 20 °C:** Not applicable.

**Relative density, gas:** 1,38, Heavier than air.

**Solubility in water:** 61 mg/l

**Autoignition temperature:** Not applicable.

**Explosive properties:**

Explosive acc. EU legislation: Not explosive.

Explosive acc. transp. reg.: Not explosive.

**Oxidising properties:** Not applicable.

**Molecular weight:** 40 g/mol

**Critical temperature:** -122,3 °C

**Relative density, liquid:** 1,4

**9.2. Other information**

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

**SECTION 10: Stability and reactivity**

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**Special protective equipment for fire-fighters**

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No occupational exposure limit.

**8.2. Exposure controls****Appropriate engineering controls**

Product to be handled in a closed system. Oxygen detectors should be used when asphyxiating gases may be released. The substance must be handled in accordance with good industrial hygiene and safety procedures. Consider work permit system e.g. for maintenance activities. Systems under pressure should be regularly checked for leakages. Provide adequate general or local ventilation.

**Personal protective equipment****Eye and face protection**

Wear eye protection to EN 166 when using gases.

**Skin protection**

Other protection  
Wear leather safety gloves and safety shoes when handling cylinders.

**Respiratory protection**

Not required

**Thermal hazards**

Not required

**Environmental Exposure Controls**

Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

**SECTION 9: Physical and chemical properties****9.1. Information on basic physical and chemical properties****General information**

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cap nut or plug (where provided) is correctly fitted. Ensure that the valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

### SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture  
Seveso Directive 96/82/EC: Not covered.

15.2. Chemical safety assessment  
A CSA does not need to be carried out for this product.

### SECTION 16: Other information

Ensure all national/local regulations are observed. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. The hazard of asphyxiation is often overlooked and must be stressed during operator training.

#### Advice

Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted. Details given in this document are believed to be correct at the time of going to press.

#### Further information

##### Note:

When using this document care should be taken, as the decimal sign and its position complies with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2,000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

---

End of document

# Chapter 2

# Product description

## Version 1.0

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## 2.1 Product description

### Technical Data Sheet

**Product Name:**

**Leica EM ACE200**  
**Low Vacuum Coater**  
 Version 08/ 2012

**Electrical connection**

Supply/connecting voltage  
 Frequency

100/115/230 V, mains supply fluctuation: -  
 10% /+ 15% of the nominal voltage  
 50 / 60 Hz

Power consumption  
 Fuses

200W  
 Coater: automatic 10A  
 Pump relay: automatic 10A

USB port

usable for  $\leq$  4GB memory sticks

**Operating gas connection**

Process gas (for sputter coater)  
 Connection for Argon gas

Argon (4.0), 0,5 bar, 99.99% purity  
 6 mm (G 1/8") diameter push fit connector for  
 polyamide hose

Gas consumption

approx. 0,3 mbar l/sec.

**Vacuum connection**

Connection hose

ISO KF25

**Operational data**

Min. vacuum  
 Power consumption  
 Sputtering power  
 Open-circuit voltage

$7 \times 10^{-3}$  mbar  
 Max 200W  
 max. 100 W  
 approx. 1000 V DC

Pumping time to  $2 \times 10^{-2}$  mbar  
 \* Instrument with a KF 25 connection and  
 metal hose and a rotary vane pump 5 m<sup>3</sup>/h,  
 prepumped

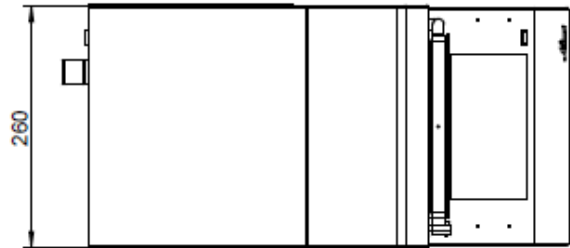
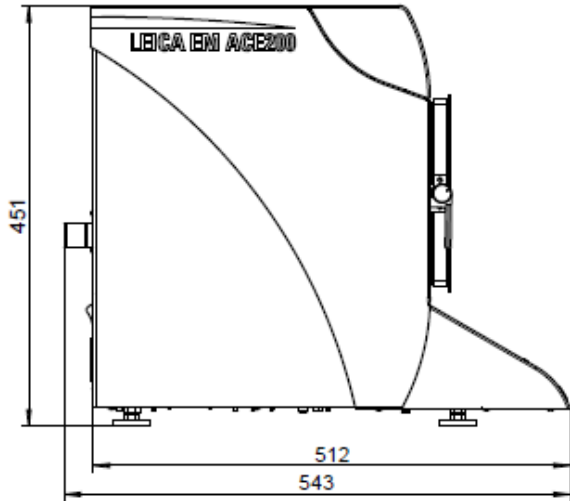
approx. 2 min.

**User interface**

Integrated touch panel

**Dimensions and weight**

|            | <b>Width</b> | <b>Depth</b> | <b>Height</b> | <b>Net weight</b> |
|------------|--------------|--------------|---------------|-------------------|
| Basic Unit | ~260mm       | ~510mm       | ~450mm        | ~34 kg            |
| Packed     | 750mm        | 480mm        | 570mm         |                   |



|                | <b>Width</b> | <b>Height</b> | <b>Depth</b> |
|----------------|--------------|---------------|--------------|
| Vacuum chamber | 140mm        | 150mm         | 145mm        |

Specimen table (diameter)  
 Diameter 80 mm, flat with 18 holes for SEM stubs  
 Optional  
 Diameter 80 mm, flat with recess for glass slide (76x26/3x1 inch)  
 Optional: Planetary, diameter 80mm for 4x4 SEM stubs, 30° pre-tilted

Foil target (diameter)  
 Carbon Thread  
 54 mm, max 1mm thickness  
 Leica single or double carbon thread (4 sections)

|                                | <b>Minimum</b> | <b>Maximum</b> |
|--------------------------------|----------------|----------------|
| Working distance (from source) | 30mm           | 100mm          |

Time  
 Thickness  
 1-999 s  
 1-100nm

QSG resolution  
 0,1 nm accuracy

Environmental  
 Operating temperature  
 Storage temperature  
 Atmospheric humidity  
 Pump requirements  
 +15°C to +30°C  
 +5°C – 40°C  
 80%  
 capacity of 5m<sup>3</sup>/hour or higher with an ultimate vacuum of at least 5x10<sup>-7</sup>



# **Chapter 3**

# **Unpacking & Packing**

## **Version 1.0**






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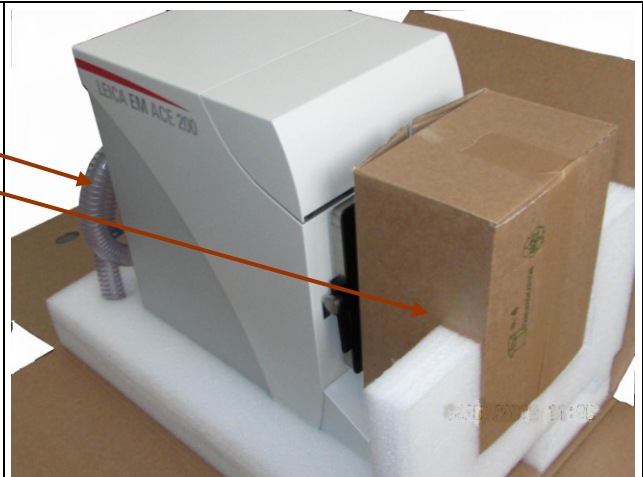
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### 3.1 Unpacking & Assembly

#### 3.1.1 Unpacking

|   |  |
|---|--|
| <p>Unpack the rotary pump</p>   |    |
| <p>Fill in the rotary pump oil<br/>To the level indicated by the white bar.</p> <p>Min. / max. Level indication</p> |   |
| <p>Lift up the top cover of the box for the coating unit.</p>   |  |

Folding down the side pieces of the box and remove vacuum hose and accessories box



Lift out the unit and place it on a table.



Connect rotary pump, Argon gas and mains cable.



### 3.1.2 Packing

Packing has to be done in reverse order of steps described in chapter

# **Chapter 4**

# **Installation**

## **Version 1.0**

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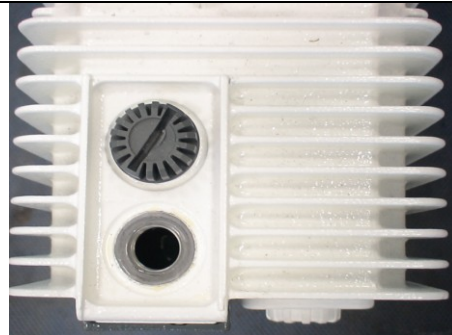
## 4.1 Installation

### 4.1.1 Packaging and Visual Inspection

- Check packaging for transportation damage and document any damage with photos
- Unpack instrument (2 persons!)
- Check for any damage of the housing (document with photos if any!)
- Check packing list delivered in the package

### 4.1.2 Rotary pump oil filling / exchange

Remove oil screw on top



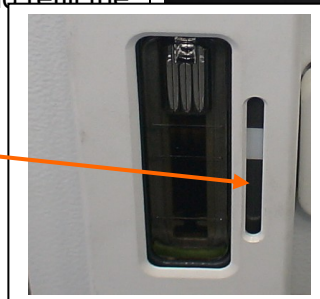
Open the drain screw on the bottom for emptying the oil.




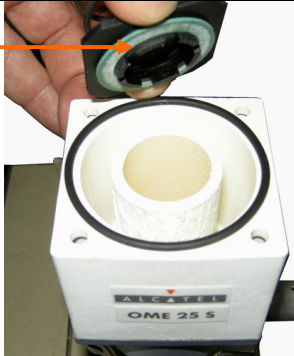

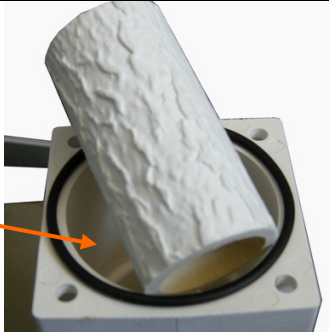
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Close the oil screw on the bottom and refill the oil. Do not overfill!!

Fill the oil within the white marking

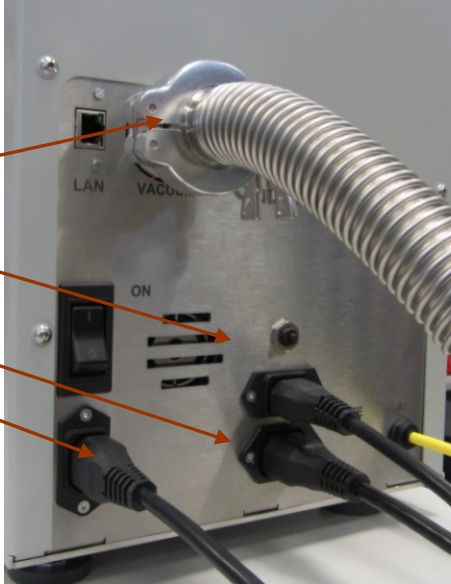
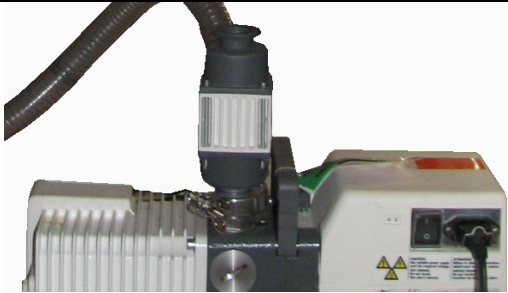



### 4.1.3 Oil mist filter insert/exchange

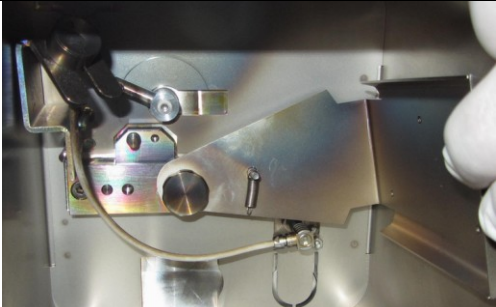
|   |  |
|---|--|
| <p>Open oil mist filter</p>   |  A top-down view of the oil mist filter assembly mounted on a microscope. The assembly consists of a grey cylindrical top cap with a central opening, mounted on a white base. The base has the text 'ALCATEL' and 'OME 25 S' printed on it. Two brass-colored screws are visible on the sides of the top cap. |
| <p>Remove spring and press plate</p>  |  A close-up view showing a hand using a green-handled screwdriver to lift the grey top cap of the filter assembly. The cap is being held above the white base, which contains a yellowish filter insert. An orange arrow points from the text 'Remove spring and press plate' to the top cap.                 |
| <p> Exchange filter insert</p> |  A close-up view showing a new, white, cylindrical filter insert being placed into the white base of the filter assembly. The insert has a textured, porous surface. An orange arrow points from the text 'Exchange filter insert' to the filter insert.   |




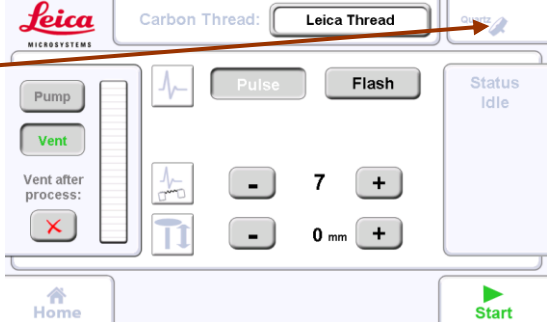
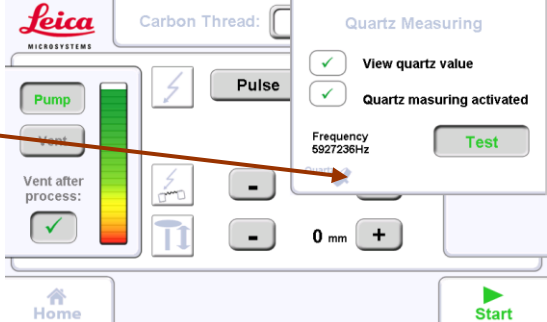
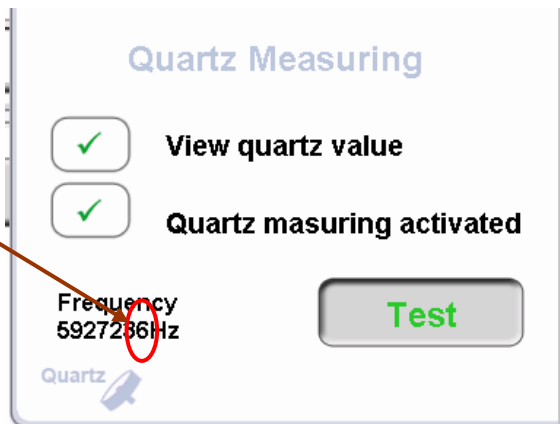
#### 4.1.4 Start Instrument

|  |  |
|--|--|
| <ul style="list-style-type: none"> <li>Place the ACE 200 on a stable area (workplace)</li> <li>Place the rotary pump on the floor</li> <li>Connect vacuum house to the rotary pump and vacuum connector of the ACE200</li> <li>Connect MAINS IN cable for rotary pump</li> <li>Connect MAINS OUT cable to rotary pump</li> <li>Connect mains cable 90 – 260 VAC</li> </ul> |    |
| <ul style="list-style-type: none"> <li>Install oil mist filter to rotary pump exhaust flange.</li> </ul>   |   |
| <ul style="list-style-type: none"> <li><b>For sputtering process only:</b> Connect Argon gas. Purge argon line before connecting. Regulate argon cylinder pressure to 0.5 bar over atm.</li> <li>Connector size: 6mm</li> </ul>  |  |

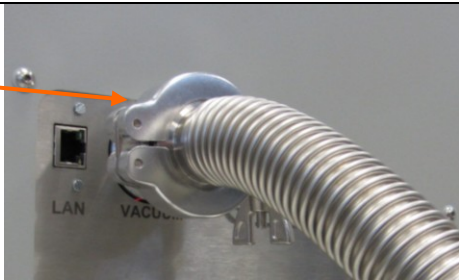

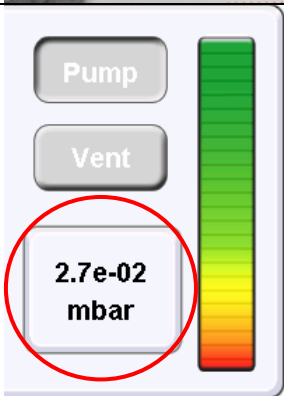
#### 4.1.5 Quartz Crystal thickness measurement preparation

|  |  |
|--|--|
| <p>Mount quartz head, holder and connect the measuring cable.<br/>Remove the sample stage to have better access.</p> |  |
|--|--|





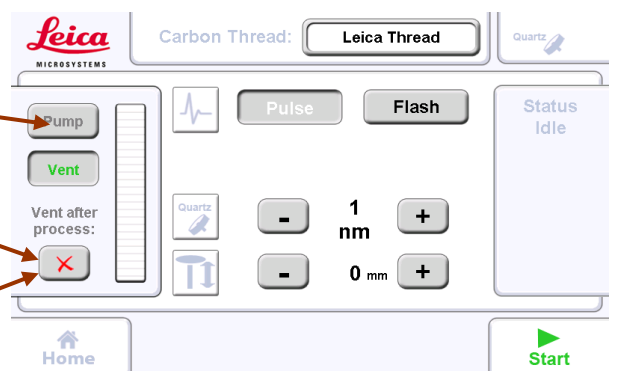


|   |  |
|---|--|
| <p>Install sample table again</p>   |    |
| <p>Switch on the mains switch of the unit and press "Quartz" button</p>   |    |
| <p>Press "Test" to see the actual quartz crystal frequency</p>  |   |
| <p>The frequency of a new crystal is ~6 MHz. and should be stable! The latest number can slightly move.<br/>The quartz is useable between 3.9 – 6 Mhz<br/>Below 3.9 Mhz the quartz should be exchanged.</p> |  |

### 4.1.6 Pumping Test

|  |   |
|--|---|
| <p>Tight all hose clamps<br/>Of the vacuum hose<br/>before pumping down.</p>   |   |
|  |   |
| <p>Pumping down the chamber to <math>3 \times 10^{-2}</math> mbar .</p> <p><b>When vacuum does not achieves <math>3 \times 10^{-2}</math> mbar , ultimate vacuum of the Rotary pump, according to the pump manual has to be tested or vacuum leak needs to be found!</b></p> |  |

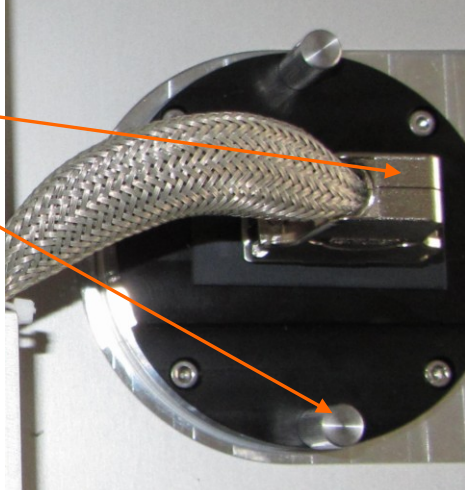
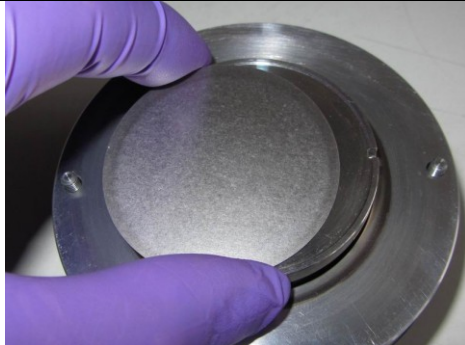
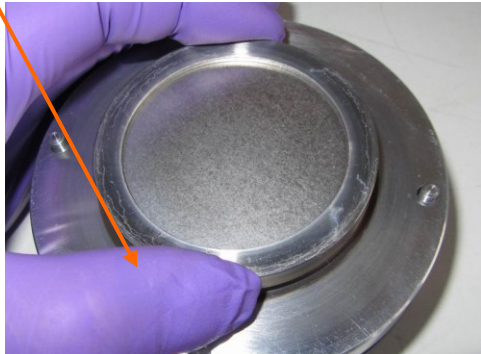
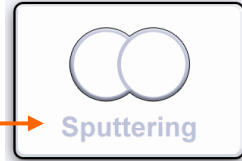
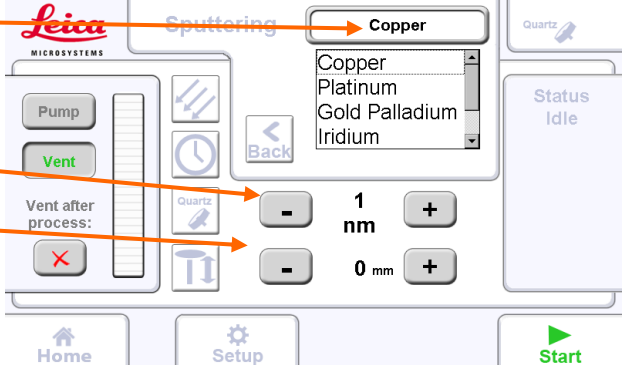
4.1.7 Carbon thread evaporation process preparation

|   |  |
|---|--|
| <p>Open the flange hood,<br/>Disconnect the evaporation flange and<br/>unscrew the flange screws<br/>For removing the flange.<br/>Prepare the flange and mount it again.</p>  |    |
| <p>For the preparation of the carbon thread evap.<br/>Flange open all clamp screw and lead the<br/>carbon thread in one piece through the<br/>contacts to get the maximum of 4 evaporation<br/>sources.<br/>Finally tight the screws again</p>    |   |
| <p>Close chamber door and lock it by the safety<br/>handle.</p> <p>Test locking sensor:<br/>When chamber door is not locked ,it must be<br/>indicated on display</p>  |  |
| <p>Switch on the mains switch at unit backplane:<br/>Start screen will appear</p> <p>Press Pump button to start pumping</p> <p>Vent after process:  Vent after process is deactivated</p> <p>Vent after process:  Vent after process is activated</p> |  |

|  |  |
|--|--|
|  |  |
| <p>Press vacuum indication bar for display indication in mbar</p>  |  |
| <p>During pump down to <math>3 \times 10^{-2}</math> mbar select all process settings for correct thickness measurement during coating:<br/>Cut off thickness<br/>Stage height</p> |  |
| <p>When vacuum of <math>3 \times 10^{-2}</math> was achieved, Press Start</p>  |  |
| <p>Follow to the process Status:</p>   |  |

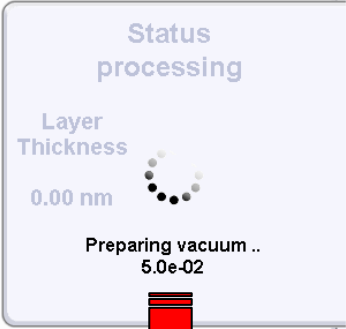
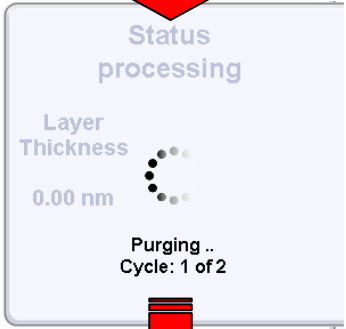
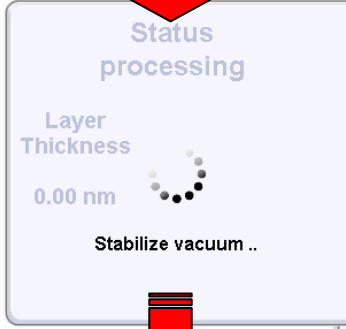
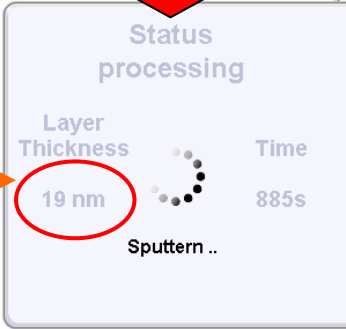
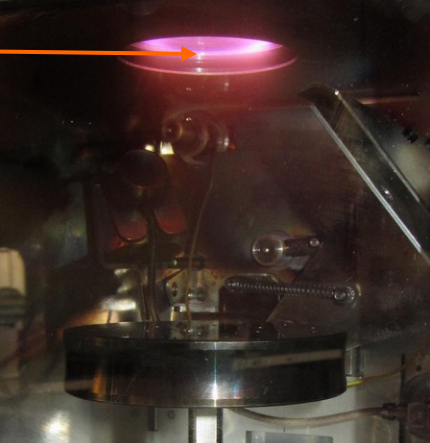
|   |  |
|---|--|
| <p>Detecting of the threads :</p>   | <p>The screenshot shows the 'Status processing' screen with 'Pulse Nr. 0 of 6' and 'Layer Thickness 0 nm'. A progress indicator shows 4 out of 6 threads detected. The text at the bottom reads '4 Threads detected. Waiting for Vacuum.'</p>  |
| <p>After out gassing Thread1 has finished, evaporation of thread 1 will start ,then, same procedure will go on for thread 2 , 3 and 4 ,until coating thickness has reached!</p> | <p>The screenshot shows the 'Status processing' screen with 'Pulse Nr. 0 of 6' and 'Layer Thickness 0 nm'. The text at the bottom reads 'Out gassing Thread 1 for 45.0 seconds'. A red arrow points down from the previous screenshot.</p>   |
|   | <p>The screenshot shows the 'Status processing' screen with 'Pulse Nr. 0 of 6' and 'Layer Thickness 0 nm'. The text at the bottom reads 'Waiting after Pre-heat 1'. A red arrow points down from the previous screenshot.</p>  |
| <p>Coating in progress:</p>   | <p>The screenshot shows the 'Status processing' screen with 'Pulse Nr. 4' and 'Layer Thickness 3 nm'. The text at the bottom reads 'Pulse Number: 4'. A red arrow points down from the previous screenshot.</p>  |
| <p>Coating has finished:</p>  | <p>The screenshot shows the Leica Microsystems control panel. On the right, a 'Status venting' window displays 'Vent Time 47s' and 'Layer Thickness 0 nm'. Below this, the text 'PULSE finished!' is circled in red. Other controls include 'Pump', 'Vent', '2.2e-02 mbar', and 'Carbon Thread: Leica Thread'.</p> |
| <p>Chamber can be vented now, in case of exchanging of the carbon threads, flange needs to be cleaned from loose coating particles.</p>   |  |

4.1.8 Sputter coating process preparation

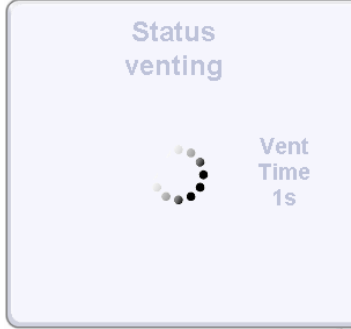
|   |  |
|---|--|
| <p>Open the flange hood ,<br/>Disconnect the sputter flange,<br/>unscrew the flange screws<br/>and remove the flange.<br/>Prepare the flange and mount it again.</p>  |    |
| <p>Place sputter target, fix it by the target supporting ring and mount flange again.</p>   |   |
|   |  |
| <p>Switch on the mains switch at unit backplane:<br/>Start screen will appear</p> <p>Press "Sputtering" button</p>  |  |
| <p>Press button<br/>To select coating material</p> <p>For the use of thickness measurement choose<br/>thickness using + and -</p> <p>Choose (WD) Coating distance</p> |  |

|  |  |
|--|--|
| <p>When no thickness measurement is available, choose process time using + and -</p>   |  |
| <p>Press "Pump" button for start pumping</p> <p>Press vacuum indication bar for display indication in mbar</p>   |  |
|  |  |
| <p>When vacuum of <math>3 \times 10^{-2}</math> was achieved , Press Start</p> <p><b>Start</b> button can be pressed at any time ,process will start automatically when <math>3 \times 10^{-2}</math> mbar was achieved.</p> |  |
|  |  |

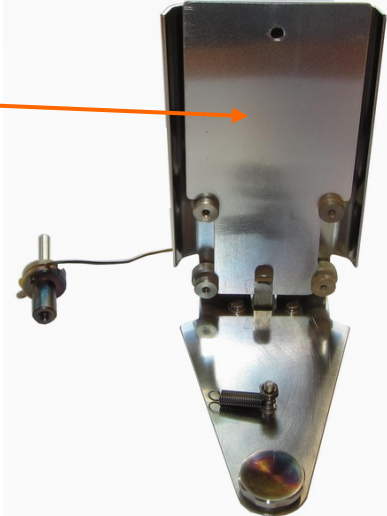
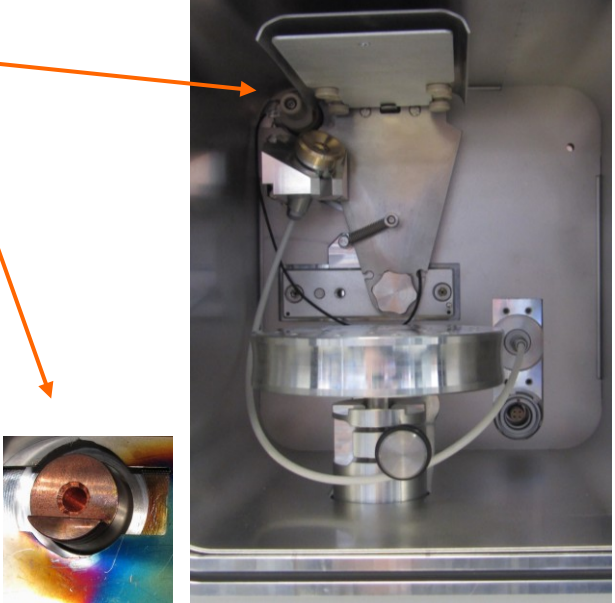



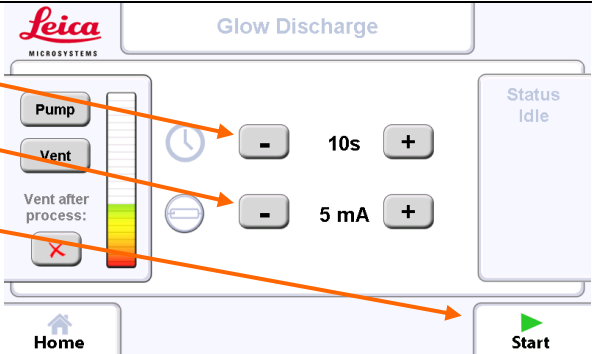
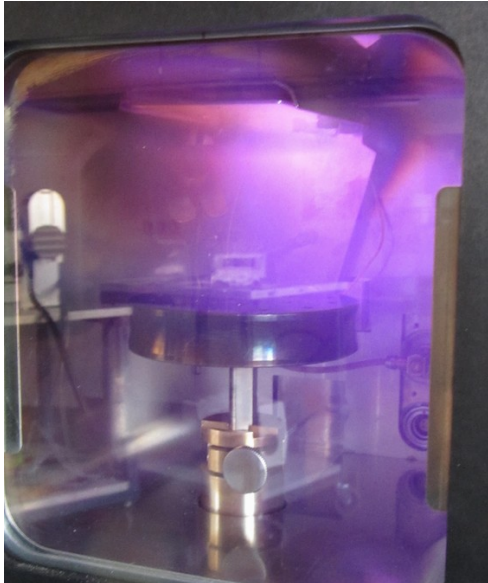
|  |  |
|--|--|
| <p>Follow to the process Status:<br/>Preparing argon flow for purging</p>  |    |
| <p>Purging</p>   |    |
| <p>Stabilize argon flow to process vacuum</p>  |   |
| <p>When sputter process is activated, check plasma on target.<br/>Follow thickness measurement<br/>Actual coating thickness is indicated</p> |  |
| <p>Sputter plasma</p>  |  |



|  |  |
|--|--|
| <p>When process has finished, Vent can be activated.</p> |  |
|--|--|

**4.1.9 Glow Discharge process preparation**

|  |  |
|--|--|
| <p>Prepare shutter with glow Discharge plate inserted</p>  |   |
| <p>Mount shutter and connect HV - Cable</p>  |  |
| <p>Switch on the mains switch at unit backplane:<br/>Start screen will appear</p> <p>Press "Glow Discharge" button</p> |  |
|  |  |

|  |   |
|--|---|
| <p>Select glow discharge time and current (15mA max.)</p> <p>Then press Start</p>  |   |
| <p>After gas (air) flow regulation has finished, high voltage switches on and Glow Discharge plasma between HV- plate and stage appears.</p> |  |

## 4.1.10 Inspection protocol (check list)



| Item  | Ok<br>(Yes/No) | Comment (pls write in capital letters) |
|---|----------------|--|
| Packaging                                   |                |  |
| Housing                                     |                |  |
| Packing List                                |                |  |
| Mains Voltage 115/230V                      |                |  |
| Argon gas connected and adjusted to 0.5 bar |                |  |
| Rotary pump , filled up the oil             |                |  |
| Thickness measurement tested                |                |  |
| Sputter process tested                      |                |  |
| Carbon thread evap. Process tested          |                |  |
| Planetary drive sample table tested         |                |  |
| Chamber door locking sensor tested          |                |  |
| Instruction to customer                     |                |  |

Further comments regarding the installation: (pls write in capital letters)

# **Chapter 5**


# **Instrument Overview**

## **Version 1.0**



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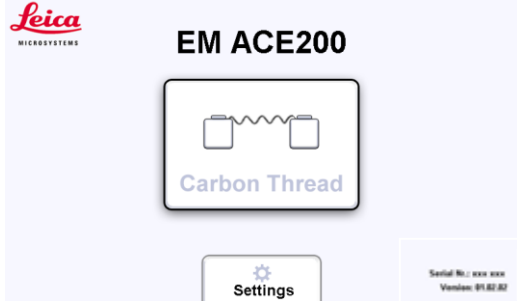
## 5.1 Schematic Instrument Overview

|   |  |
|---|--|
|  <p>EM ACE200</p> <p>Version: 01.01.06</p>   | <p><b>LEICA EM ACE200 – Low Vacuum Sputter and Carbon Coaters</b></p> <p>230 V / 50 – 60 Hz</p> <p>115 V / 60 Hz</p> |
| <p><b>The basic instrument is pre-configured either as a Sputter or a Carbon Thread coater or with both options (interchangeable), defined when ordered, assembled in factory, no later change possible</b></p> |  |

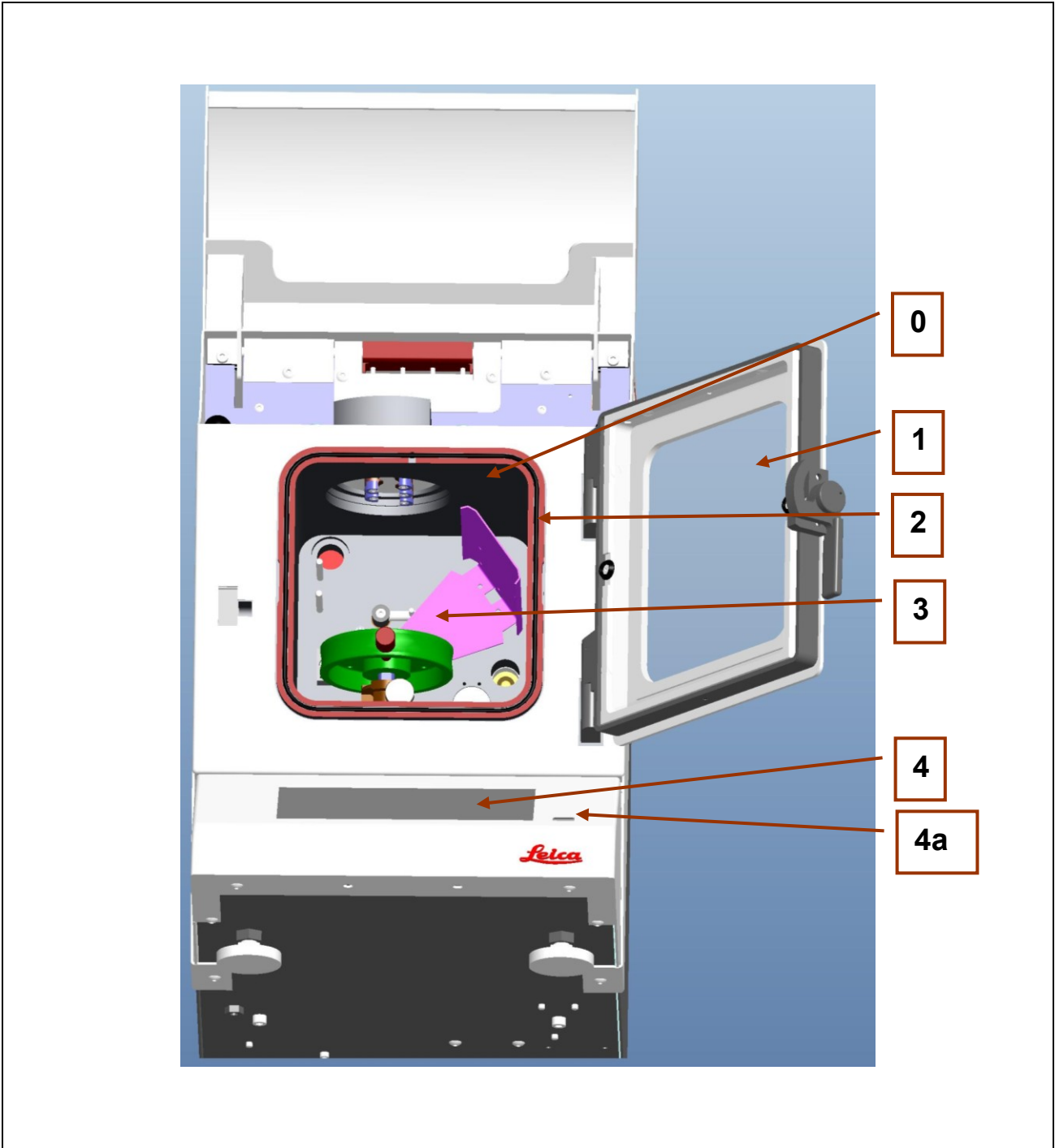
### 5.1.1 EM ACE 200 CARBON THREAD Coater (16771580)

|   |                        |   |
|---|------------------------|---|
|   | <p><b>16771580</b></p> | <p><b>Leica EM ACE200 Carbon Thread Coater</b></p> <ul style="list-style-type: none"> <li>- Basic Unit consisting of:             <ul style="list-style-type: none"> <li>• Metal vacuum chamber</li> <li>• Integrated power supply for carbon thread evaporation</li> <li>• Height adjustable specimen table to hold 18 SEM Stubs</li> <li>• Removable door with large exchangeable safety glass window</li> <li>• Mains cable</li> </ul> </li> <li>- Carbon head             <ul style="list-style-type: none"> <li>• Easily exchangeable no tools required</li> <li>• Torx wrench for loading carbon thread</li> <li>• Brush for cleaning head from thread remains</li> <li>• 3.5m carbon thread spool</li> </ul> </li> <li>- Automated target shutter, easily removable</li> <li>- Touch screen</li> <li>- Triple safety system (door, cover and software sensors)</li> <li>- Mains cable</li> <li>- Operating manual</li> </ul> |
|---|------------------------|---|

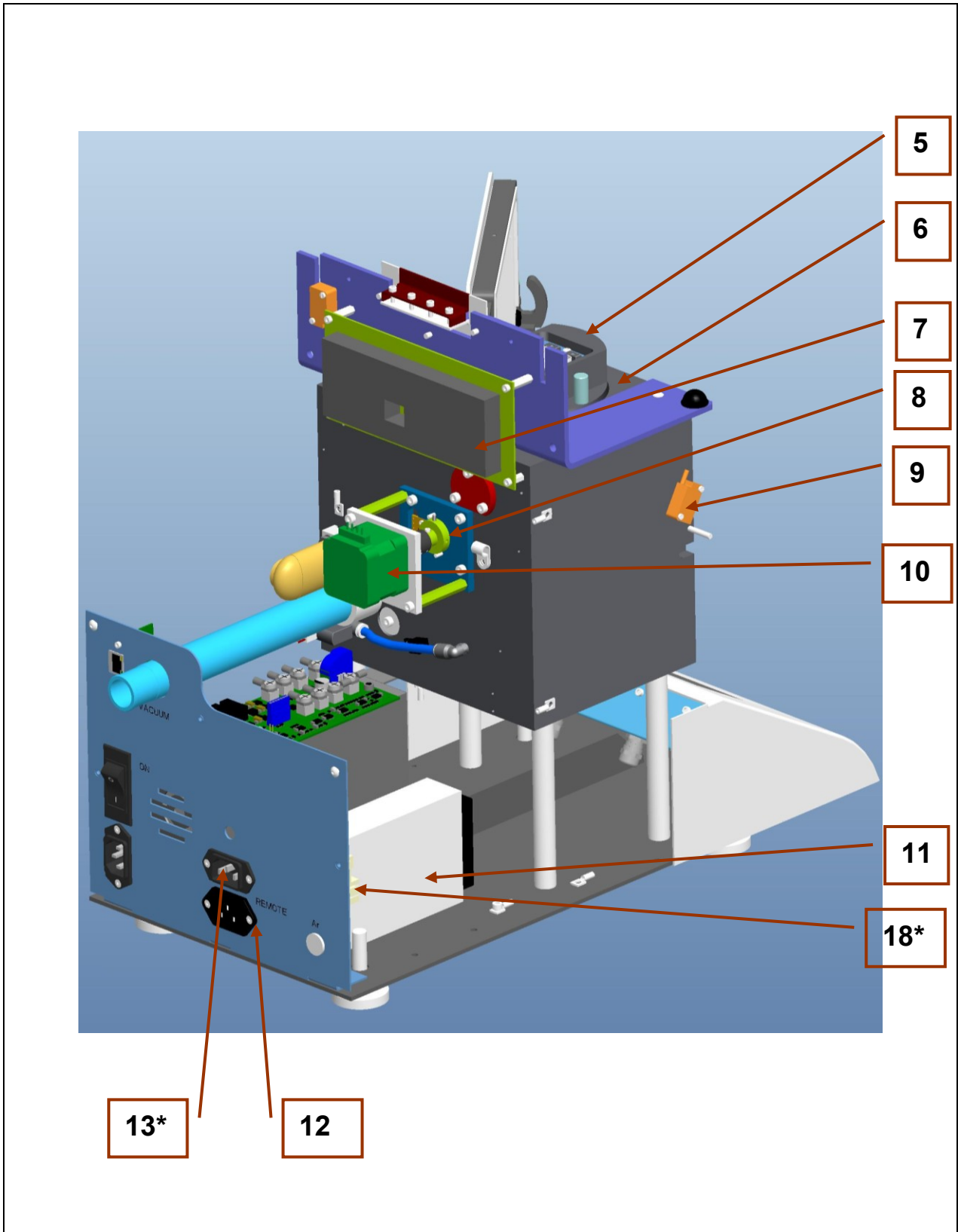
### 5.1.2 Carbon Thread “Display Screenshot”

|   |   |
|---|---|
|  <p>EM ACE200</p> <p>Version: 01.01.06</p> |  <p>EM ACE200</p> <p>Carbon Thread</p> <p>Settings</p> <p>Serial No.: xxx xxx<br/>Version: 01.02.02</p> |
|---|---|

### 5.1.3 Carbon Thread “Front view”

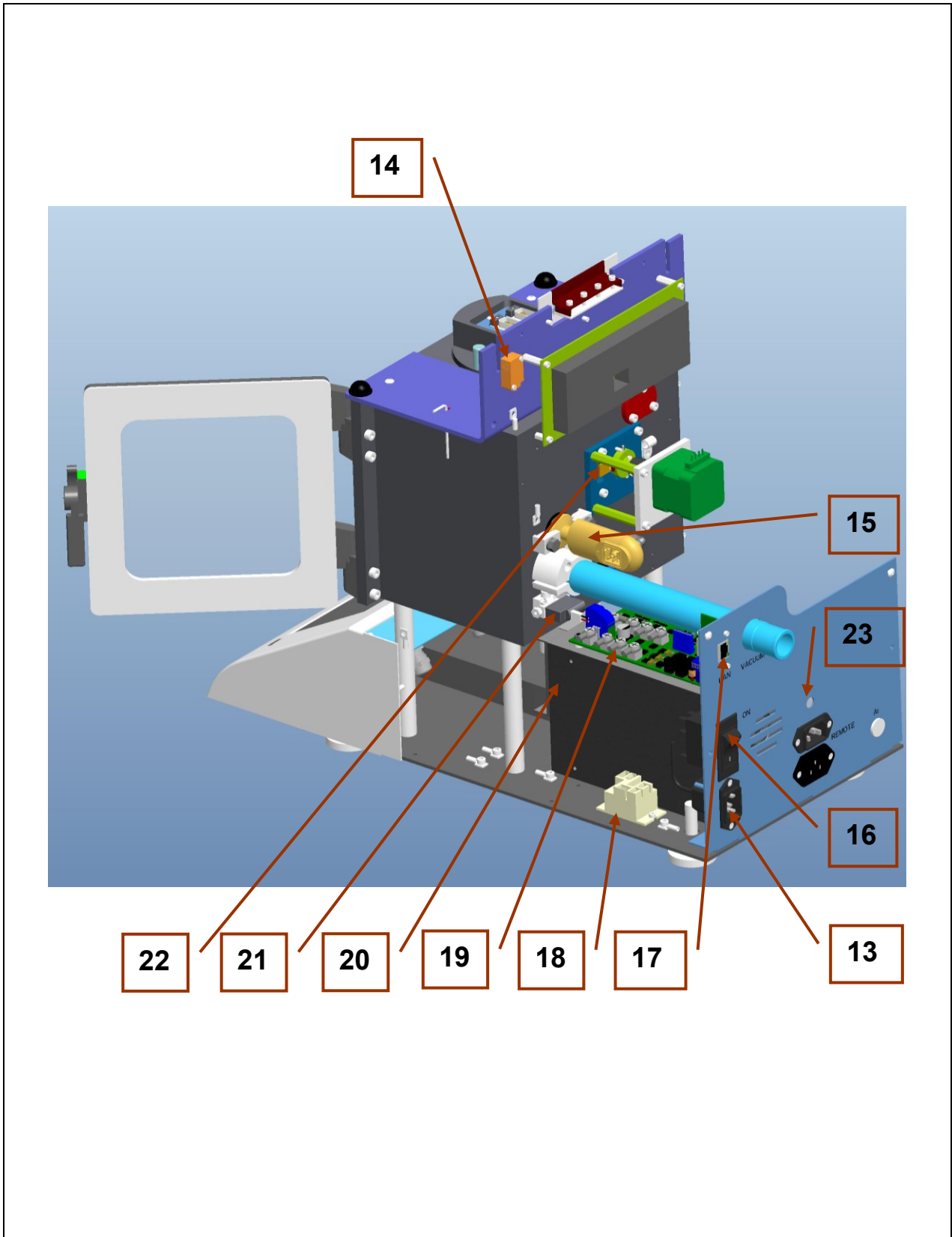


### 5.1.4 Carbon thread “CW view”






### 5.1.5 Carbon thread “CCW view”



### 5.1.6 Components: ACE 200 CARBON THREAD Coater (16771580)

|     | Title                                      |  |
|-----|--|--|
| 00  | Protection frame                           |  |
| 01  | Glass for chamber door                     |  |
| 02  | O-ring for chamber door                    |  |
| 03  | Shutter shield + Shutter spring            |  |
| 04  | Touch screen panel                         |  |
| 04a | USB Port (PSB)                             |  |
| 05  | Carbon Thread evaporation flange complete  |  |
| 06  | O-ring for evaporation flange chamber side |  |
| 07  | Low Vacuum (PCB)                           |  |
| 08  | Shaft seal for shutter                     |  |
| 09  | Safety Sensor (door)                       |  |
| 10  | Shutter Motor                              |  |
| 11  | Power Supply HWS100/24                     |  |
| 12  | Mains Voltage Outlet (for rotary pump)     |  |
| 13  | Mains Voltage Inlet (Coater)               |  |
| 13* | Mains Voltage Inlet (for rotary pump)      |  |
| 14  | Safety Sensor (cover)                      |  |
| 15  | Low Vacuum Gauge                           |  |
| 16  | Mains Switch ON/OFF                        |  |
| 17  | LAN Adapter (PCB)                          |  |
| 18  | Mains Power Relay                          |  |
| 18* | Mains Power Relay (for rotary pump)        |  |
| 19  | Carbon Thread (PCB)                        |  |
| 20  | Power Supply SWS600L-15 (Carbon Thread)    |  |
| 21  | Venting Valve                              |  |
| 22  | Shutter Sensor                             |  |
| 23  | Over Current Protective Switch 10A         |  |
|     | <b>Only for Version CT&amp;GD</b>          |  |
|     | High Voltage Transformer CT & GD           |  |
|     | High Voltage Control (PCB) for CT & GD     |  |

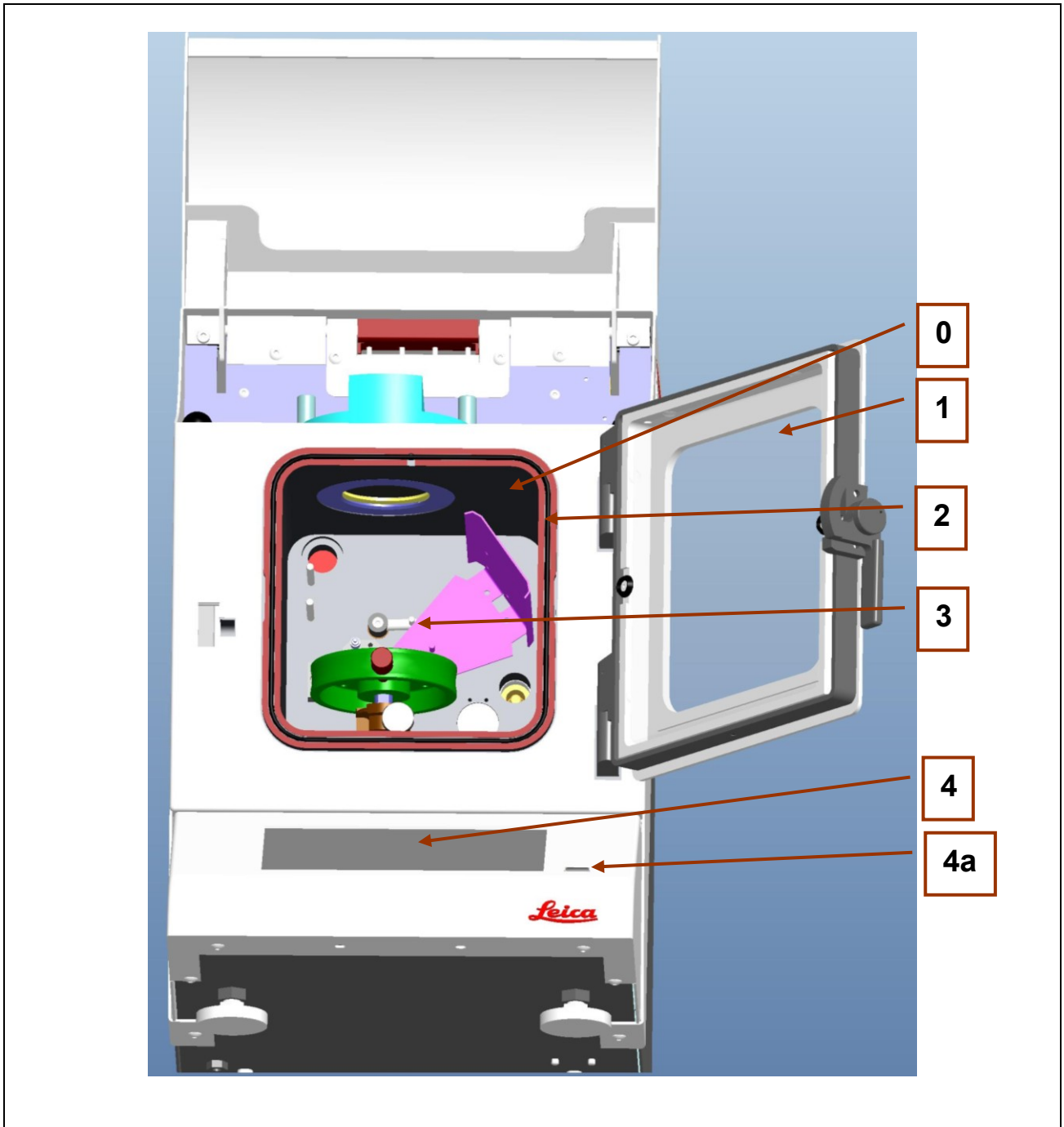
5.1.7 EM ACE 200 SPUTTER Coater

|   |                        |   |
|---|------------------------|---|
|  | <p><b>16771582</b></p> | <p><b>Leica EM ACE200 Sputter Coater</b></p> <ul style="list-style-type: none"> <li>- Basic Unit consisting of             <ul style="list-style-type: none"> <li>• Metal vacuum chamber</li> <li>• Integrated power supply for sputtering</li> <li>• <b>Height adjustable specimen table</b> to hold 18 SEM Stubs</li> <li>• Removable door with large exchangeable safety glass window</li> <li>• Mains cable</li> </ul> </li> <li>- Sputter head             <ul style="list-style-type: none"> <li>• Easily exchangeable target no tools required</li> </ul> </li> <li>- Automated Target shutter easily removable</li> <li>- Touch screen</li> <li>- Triple safety system (door, cover and software sensors)</li> <li>- Mains cable</li> <li>- Operating manual</li> </ul> |
|---|------------------------|---|

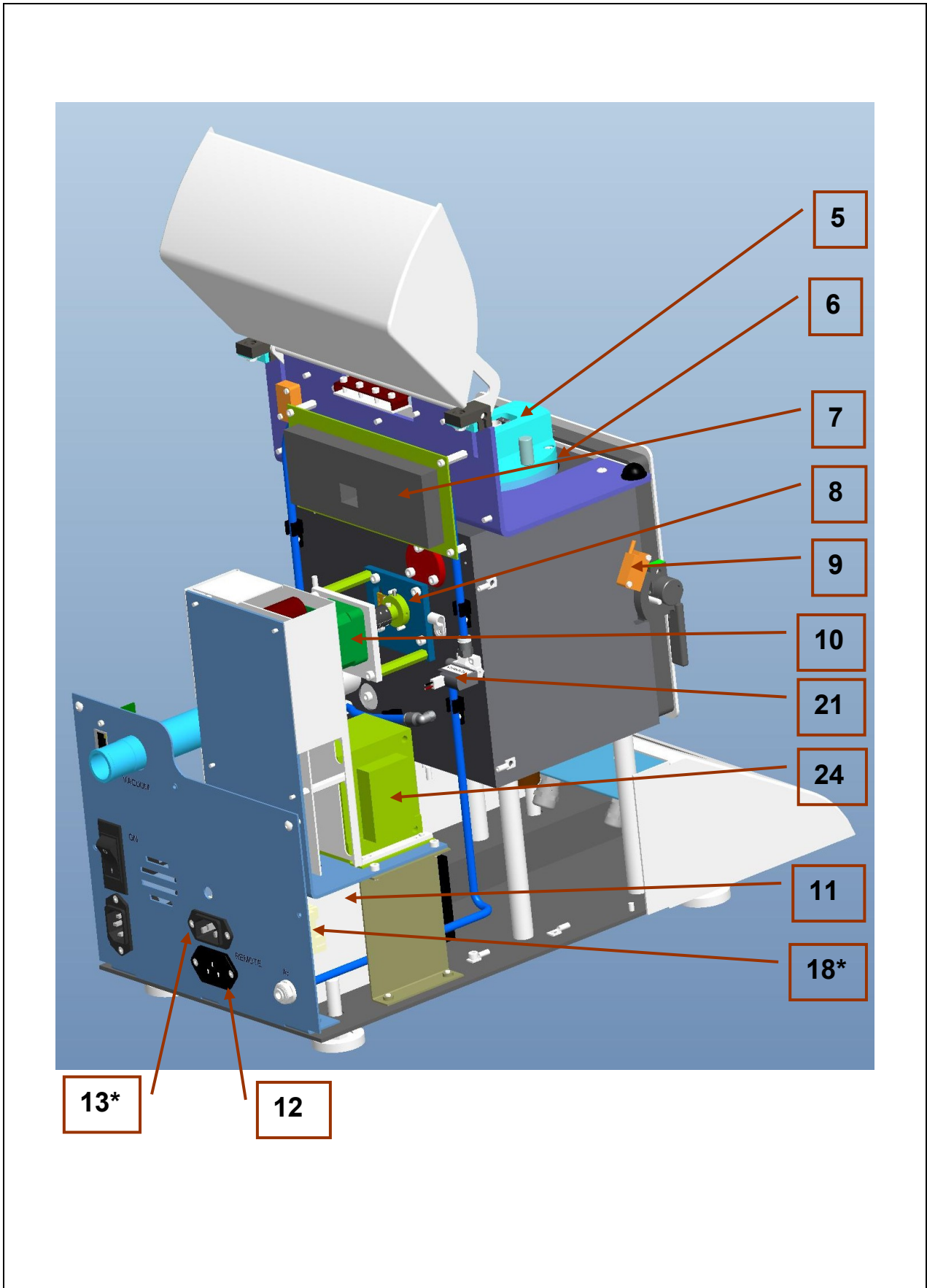
5.1.8 Sputter “Display Screenshot”



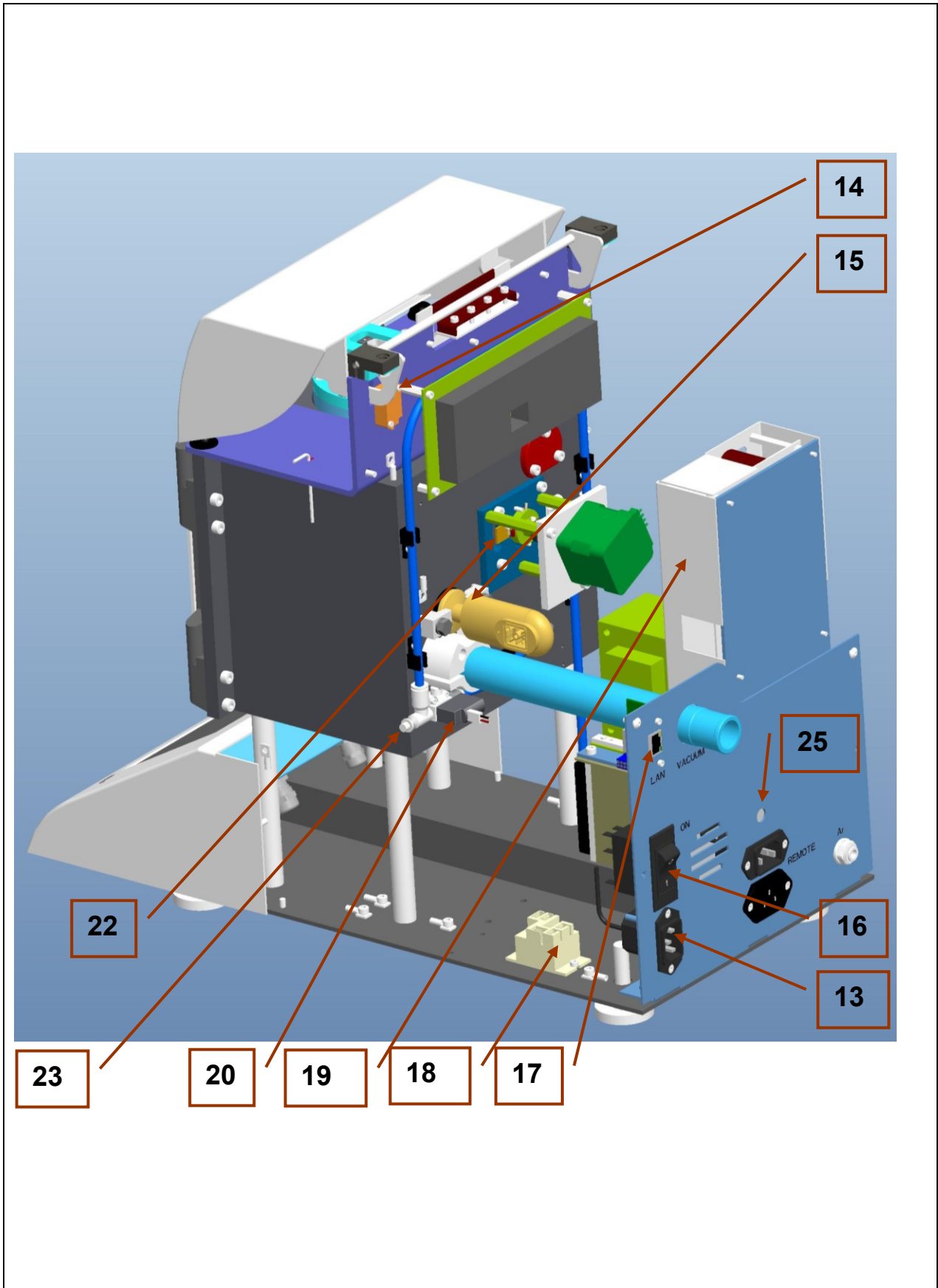
### 5.1.9 Sputter coating "Front view"



### 5.1.10 Sputter coating “CW view”




### 5.1.11 Sputter coating “CCW view”




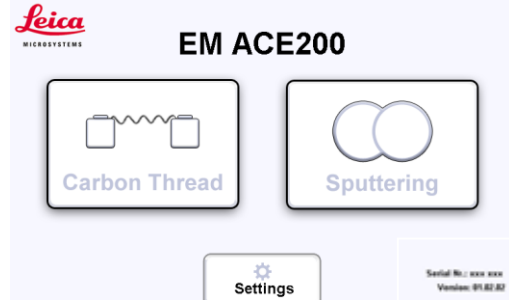
## 5.1.12 Components: ACE 200 SPUTTER Coater (16771582)

|     | Title   |  |
|-----|---|--|
| 00  | Protection frame  |  |
| 01  | Glass for chamber door                                  |  |
| 02  | O-ring for chamber door                                 |  |
| 03  | Shutter shield + Shutter spring                         |  |
| 04  | Touch screen panel                                      |  |
| 04a | USB Port (PSB)  |  |
| 05  | Sputter flange complete                                 |  |
| 06  | O-ring for flange chamber side                          |  |
| 07  | Low Vacuum (PCB)  |  |
| 08  | Shaft seal for shutter                                  |  |
| 09  | Safety Sensor (door)                                    |  |
| 10  | Shutter Motor   |  |
| 11  | Power Supply HWS100/24                                  |  |
| 12  | Mains Voltage Outlet (for rotary pump)                  |  |
| 13  | Mains Voltage Inlet (Coater)                            |  |
| 13* | Mains Voltage Inlet (for rotary pump)                   |  |
| 14  | Safety Sensor (cover)                                   |  |
| 15  | Low Vacuum Gauge  |  |
| 16  | Mains Switch ON/OFF                                     |  |
| 17  | LAN Adapter (PCB)                                       |  |
| 18  | Mains Power Relay (Coater)                              |  |
| 18* | Mains Power Relay (for rotary pump)                     |  |
| 19  | High Voltage Control (PCB)<br>for SP / SP & GD / GD     |  |
| 20  | Venting Valve   |  |
| 21  | Control Valve (only for GD or SP)                       |  |
| 21* | <b>additional:</b><br>Control Valve (only for GD or SP) |  |
| 22  | Shutter Sensor  |  |
| 23  | Throttle Value (only for GD or SP)                      |  |
| 24  | High Voltage Transformer<br>SP / SP & GD / GD           |  |
| 25  | Over Current Protective Switch 10A                      |  |

### 5.1.13 EM ACE 200 SPUTTER and CARBON Thread Coater (COMBI)

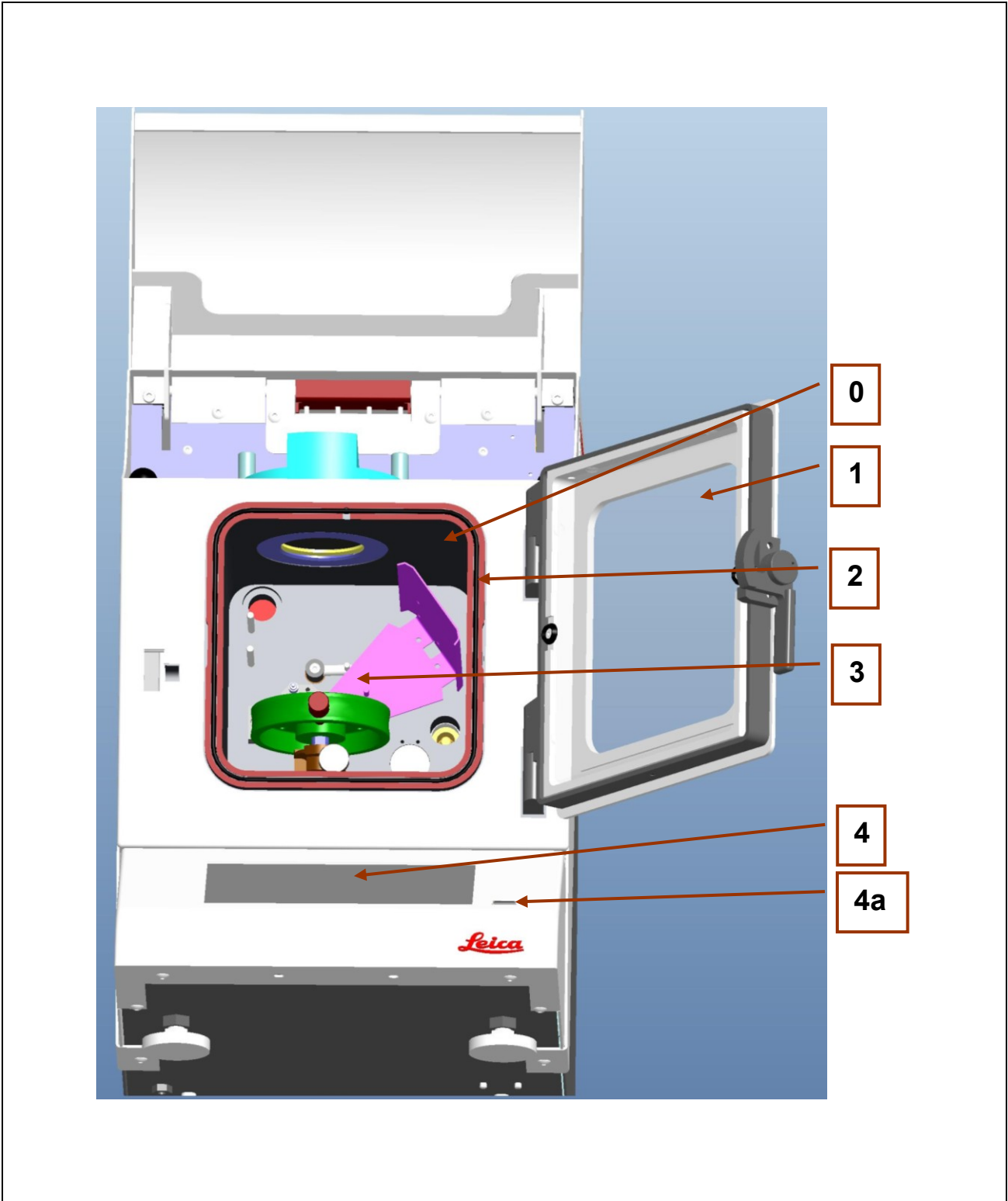
|   |                        |   |
|---|------------------------|---|
|  | <p><b>16771584</b></p> | <p><b>Leica EM ACE200 Sputter <u>and</u> Carbon Thread Coater</b></p> <ul style="list-style-type: none"> <li>- Basic Unit consisting of: <ul style="list-style-type: none"> <li>• Metal vacuum chamber</li> <li>• Integrated power supplies for sputtering and carbon thread</li> <li>• <b>Height adjustable specimen table</b> to hold 18 SEM Stubs</li> <li>• Removable door with large exchangeable safety glass window</li> <li>• Mains cable</li> </ul> </li> <li>- Sputter head and Carbon head <ul style="list-style-type: none"> <li>• Easily exchangeable no tools required</li> <li>• Torx wrench for loading carbon thread</li> <li>• Brush for cleaning head from thread remains</li> <li>• 3.5m carbon thread spool</li> </ul> </li> <li>- Automated target shutter, easily removable</li> <li>- Touch screen</li> <li>- Triple safety system (door, cover and software sensors)</li> <li>- Mains cable</li> <li>- Operating manual</li> </ul> |
|---|------------------------|---|

### 5.1.14 Sputter and Carbon Thread “Display Screenshot”

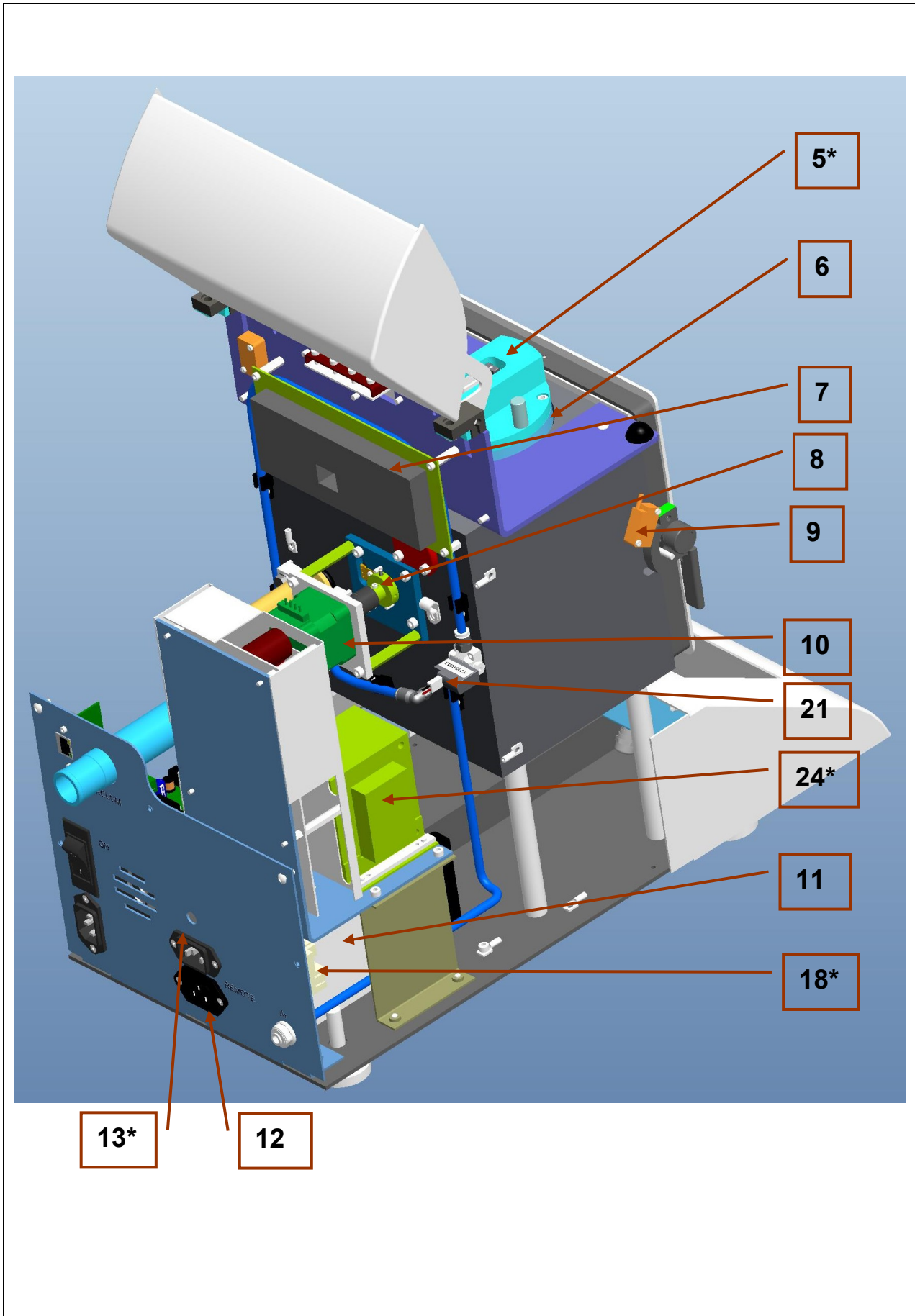
|   |  |
|---|--|
|  <p>EM ACE200</p> <p>Version: 01.01.06</p> |  <p>Leica MICROSYSTEMS</p> <p><b>EM ACE200</b></p> <p>Carbon Thread</p> <p>Sputtering</p> <p>Settings</p> <p>Serial No.: xxx xxx<br/>Version: 01.02.02</p> |
|---|--|



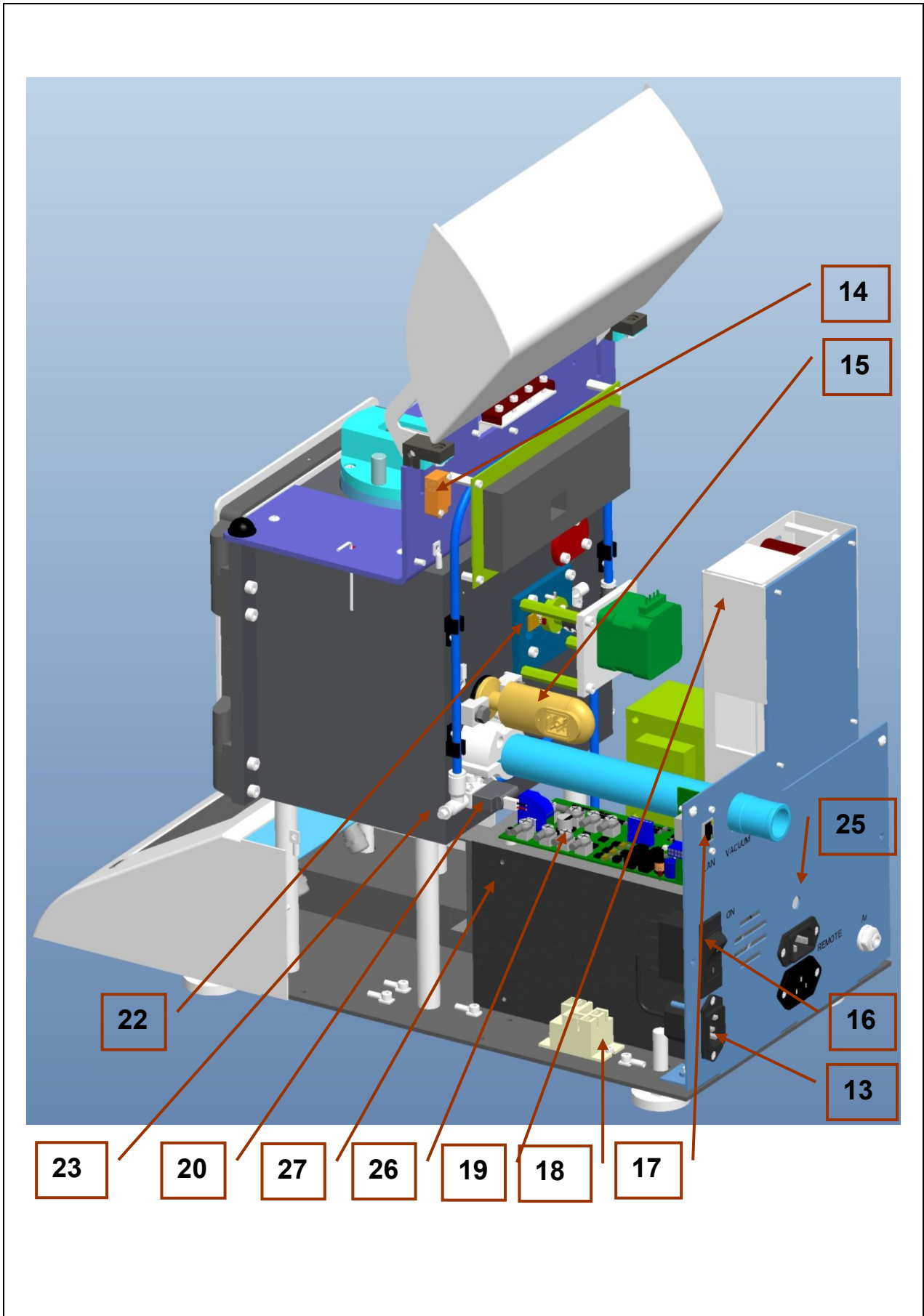
5.1.15 Sputter and Carbon Thread “Front view”



### 5.1.16 Sputter and Carbon Thread “CW view”



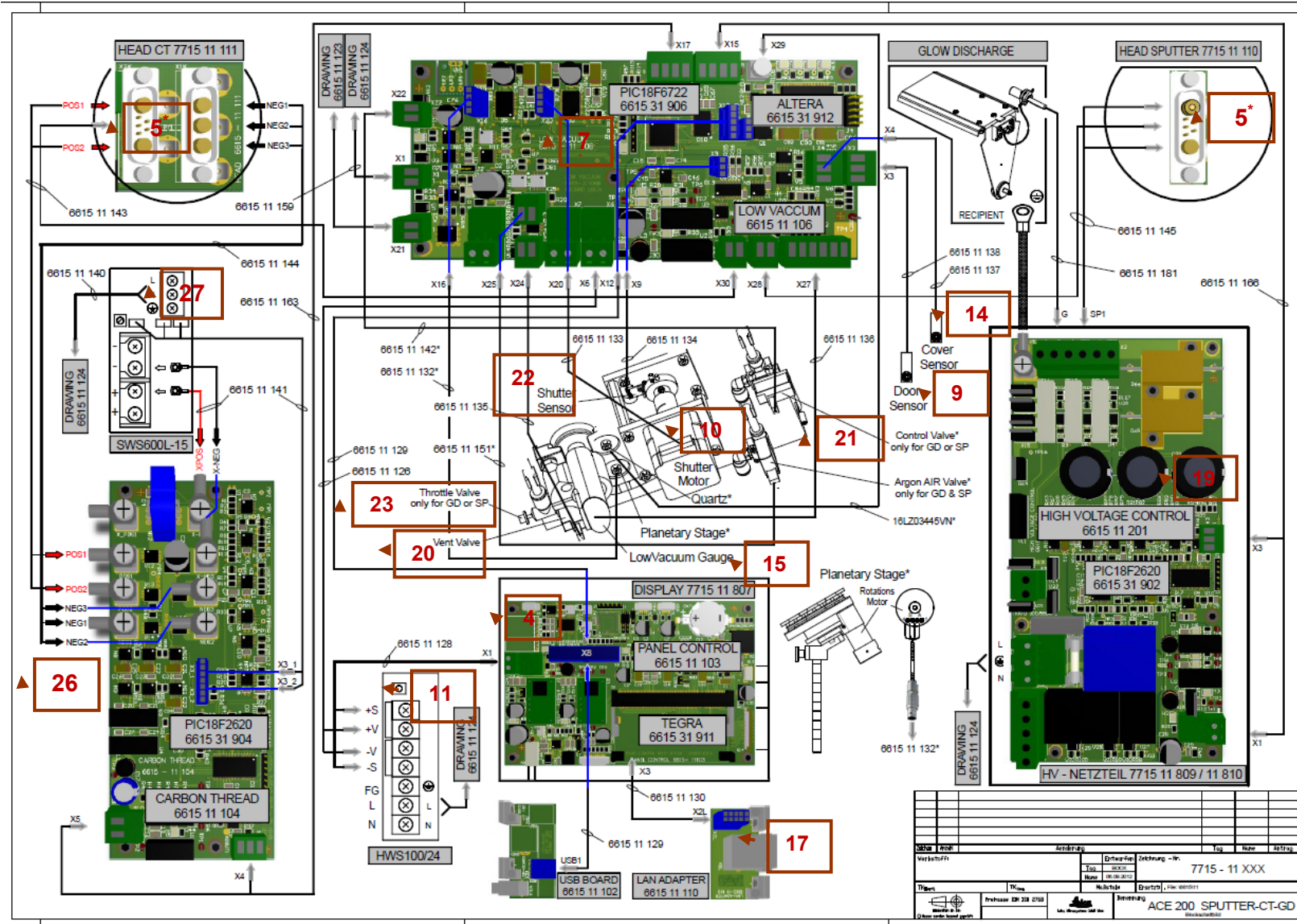
5.1.17 Sputter and Carbon Thread “CCW view”

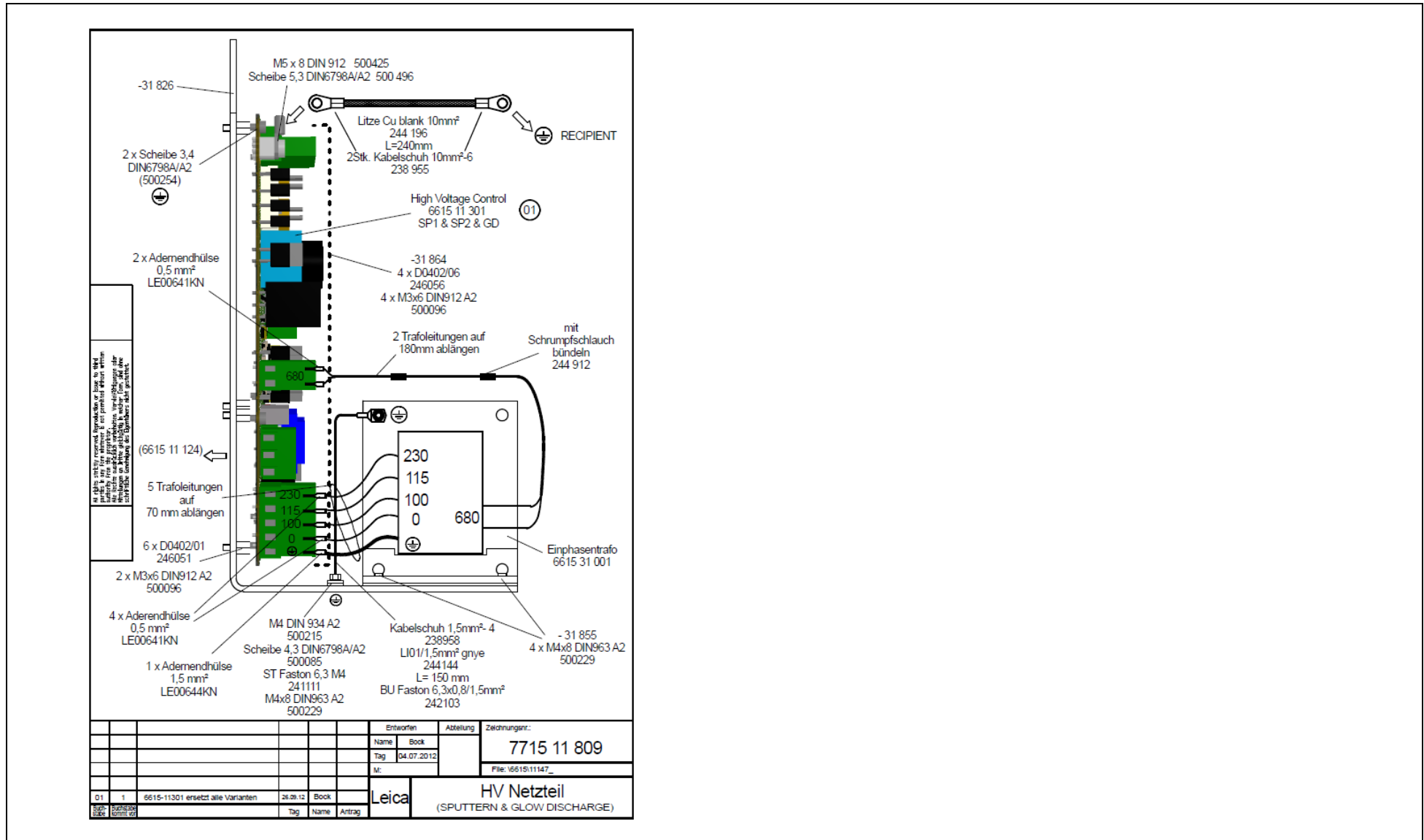


**5.1.18 Components: ACE 200 SP and CT Coater (16771584)**

|     | Title   |  |
|-----|---|--|
| 00  | Protection frame  |  |
| 01  | Glass for chamber door  |  |
| 02  | O-ring for chamber door                                       |  |
| 03  | Shutter shield + Shutter spring                               |  |
| 04  | Touch screen panel  |  |
| 04a | USB Port (PSB)  |  |
| 05* | Carbon Thread evaporation flange complete                     |  |
| 05* | Sputter flange complete                                       |  |
| 06  | O-ring for flange chamber side                                |  |
| 07  | Low Vacuum (PCB)  |  |
| 08  | Shaft seal for shutter  |  |
| 09  | Safety Sensor (door)  |  |
| 10  | Shutter Motor   |  |
| 11  | Power Supply HWS100/24  |  |
| 12  | Mains Voltage Outlet (for rotary pump)                        |  |
| 13  | Mains Voltage Inlet (Coater)                                  |  |
| 13* | Mains Voltage Inlet (for rotary pump)                         |  |
| 14  | Safety Sensor cover   |  |
| 15  | Low Vacuum Gauge  |  |
| 16  | Mains Switch ON/OFF   |  |
| 17  | LAN Adapter (PCB)   |  |
| 18  | Mains Power Relay (Coater)                                    |  |
| 18* | Mains Power Relay (for rotary pump)                           |  |
| 19  | High Voltage Control (PCB)<br>for SP / SP & GD / CT & GD / GD |  |
| 20  | Venting Valve   |  |
| 21  | Control Valve (only for GD or SP)                             |  |
| 22  | Shutter Sensor  |  |
| 23  | Throttle Value (only for GD or SP)                            |  |
| 24  | High Voltage Transformer<br>for SP / SP & GD / CT & GD / GD   |  |
| 25  | Over Current Protective Switch 10A                            |  |
| 26  | Carbon Thread (PCB)   |  |
| 27  | Power Supply SWS600L-15 (Carbon Thread)                       |  |

5.1.19 Sputter and Carbon Thread Schematic diagram







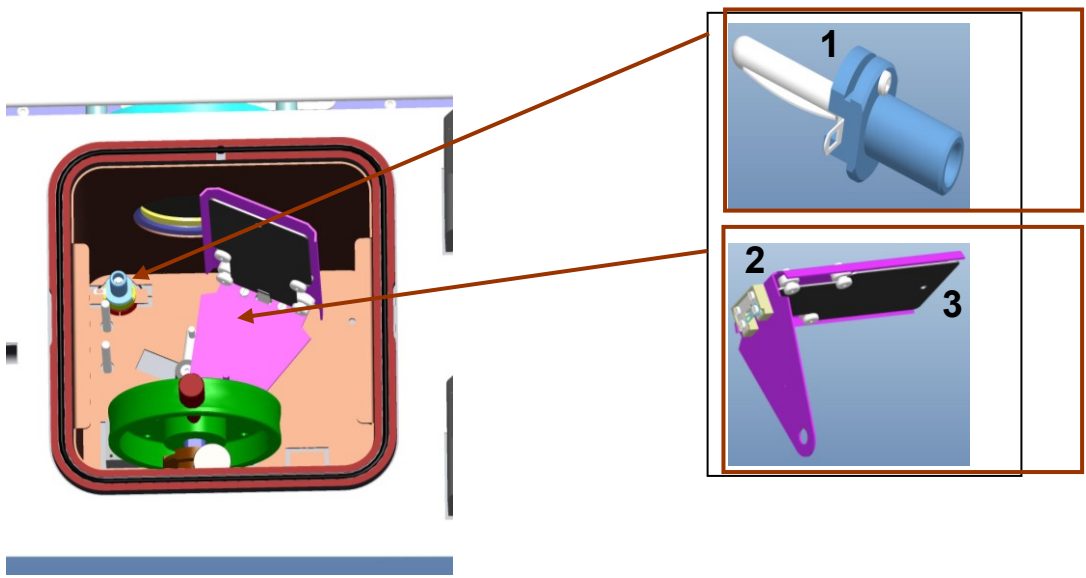
## 5.2 Option for ACE 200

### 5.2.1 Option: "Glow Discharge"

#### Option for – ACE200

**To be ordered at point of configuration. No later upgrade is possible**

|  |                        |  |
|--|------------------------|--|
|  | <p><b>16771583</b></p> | <p><b>Glow discharge</b> unit for <b>Sputter-Coater</b> (16771582) and <b>Sputter-Carbon Thread -Coater</b> (16771584)</p> <ul style="list-style-type: none"> <li>- High Voltage power supply adaptation for glow discharge</li> <li>- Connection to set shutter on current for glow discharge</li> <li>- Operating software</li> </ul> <p><b>This is an <u>optional</u> outfit for a sputter coating unit</b></p> |
|  | <p><b>16771581</b></p> | <p><b>Glow discharge</b> unit for <b>Carbon-Coater:</b> (16771580)</p> <ul style="list-style-type: none"> <li>- High Voltage power supply for glow discharge</li> <li>- Operating software</li> </ul> <p><b>This is an <u>optional</u> outfit for a carbon coating unit</b></p>  |



Components:

|   |                              |  |
|---|------------------------------|--|
| 1 | <b>GD connector complete</b> |  |
| 2 | connector spring             |  |
| 3 | Electrode plate              |  |

5.2.2 Glow Discharge “Display Screenshot”



5.2.3 Upgrade for ACE200


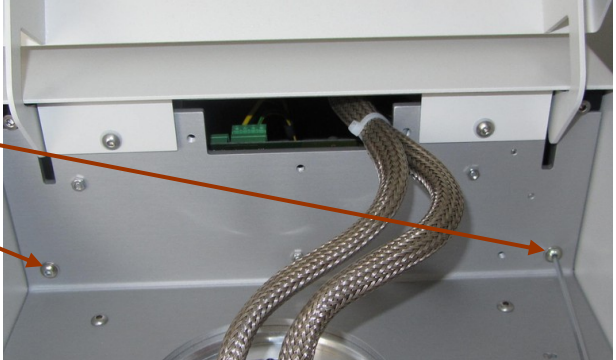
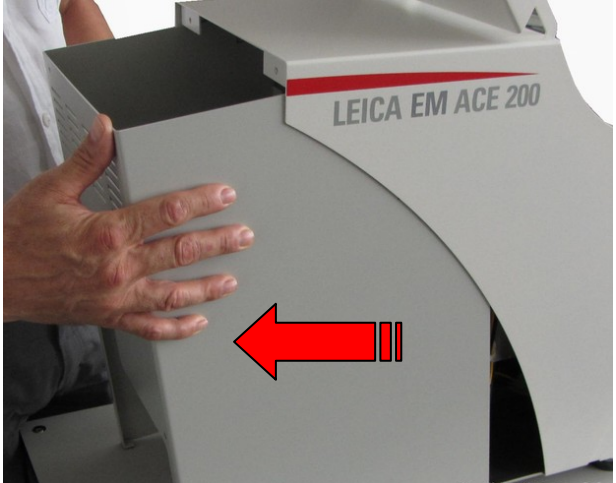
**Upgrades – ACE200**  
 (if not at point of order, installation by service technician)  
**Note: Upgrade installation charges are not included!**

|                     |  |   |
|---------------------|--|---|
|                     |  | <b>Planetary drive stage for ACE 200</b><br>For uniform coatings of highly fissured specimen surfaces |
|                     |  | able of   |
| <b>Coming soon!</b> |  |   |
|                     |  | - Quartz head holder<br>- Set of quartz crystals (Pack of 10)   |

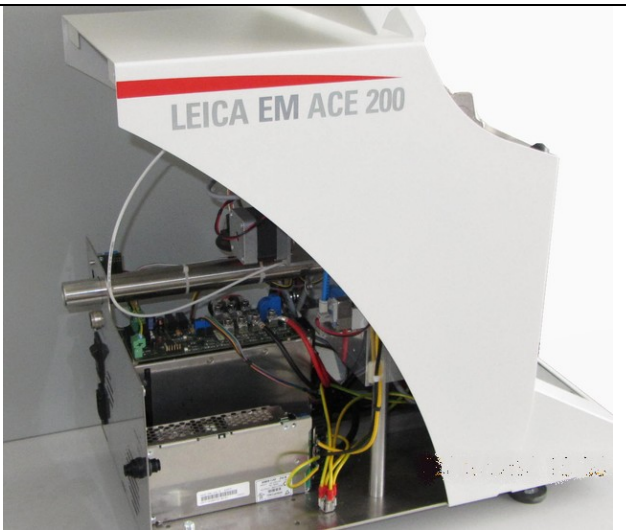


### 5.3 Opening the instrument

#### 5.3.1 Opening the instrument

|   |  |
|---|--|
| <p>Remove 4 screws of the back plane</p>          |  <p>A photograph showing the back of a grey instrument. Four screws are located along the top edge of the back panel. Two orange arrows point from the text 'Remove 4 screws of the back plane' to the top two screws, and two other orange arrows point to the bottom two screws.</p>     |
| <p>Open the flange cover and remove 2 screws.</p> |  <p>A close-up photograph of the instrument's interior. A white flange cover is partially open, revealing a green terminal block and a braided metal cable. Two orange arrows point from the text 'Open the flange cover and remove 2 screws.' to two screws on the metal base plate.</p> |
| <p>Slide back / side cover backward out.</p>      |  <p>A photograph showing a person's hand sliding a grey side cover backward. The side cover has 'LEICA EM ACE 200' printed on it. A large red arrow points to the left, indicating the direction of movement.</p>  |

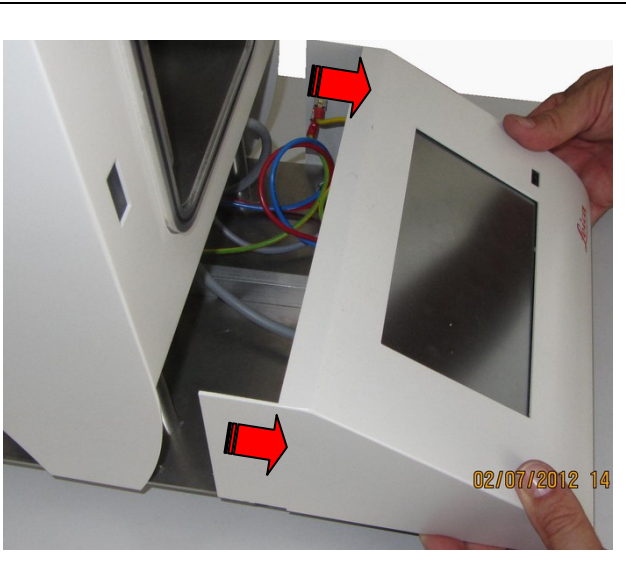
For most service work ,no additional covers needs removing.



For removing of all covers remove display panel first :  
  
Remove screws from both side



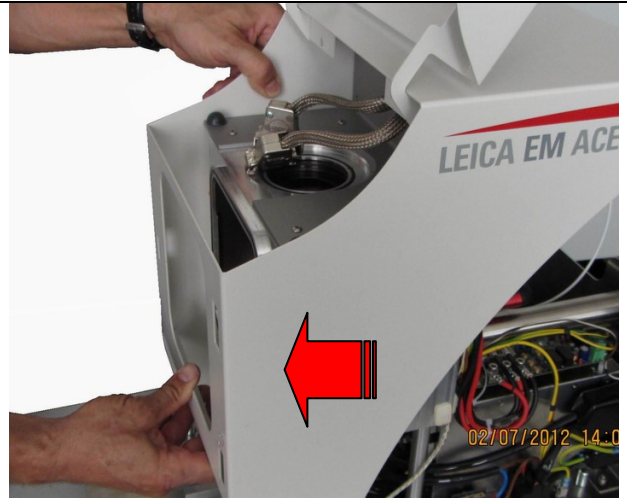
Slide display housing to front to remove.



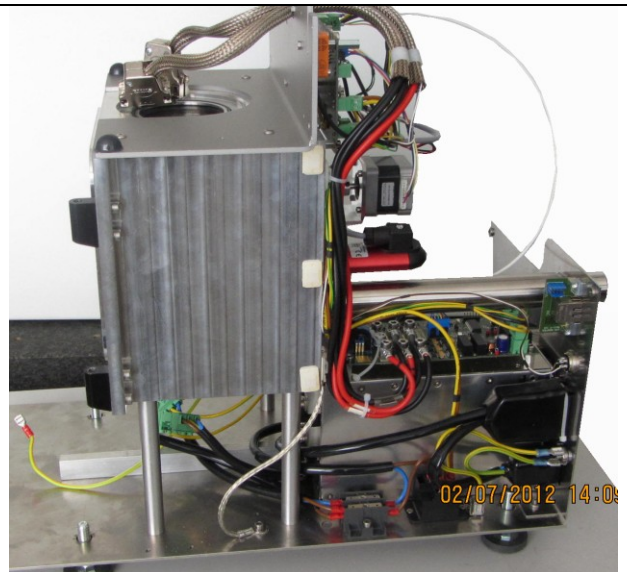
Lift up and remove chamber door.



Slide front cover to the front to remove.



All covers are removed now.



# **Chapter 6**

# **Mechanical**

## **Version 1.0**

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## 6.1 Mechanical & Assembly

### 6.1.1 Schematic Diagram



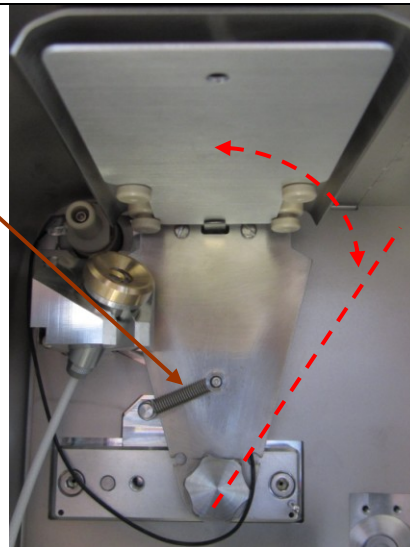
Please visit Chapter 5 Instrument Overview

### 6.1.2 Shutter

#### 6.1.2.1 Shutter Function

The shutter is held in closed position by the spring.  
Open of the shutter to right happens automatically by a eccentric weal driven by a stepper motor.

The shutter is needed for protecting the sample during pre-sputtering for cleaning the target or degassing of the carbon thread.

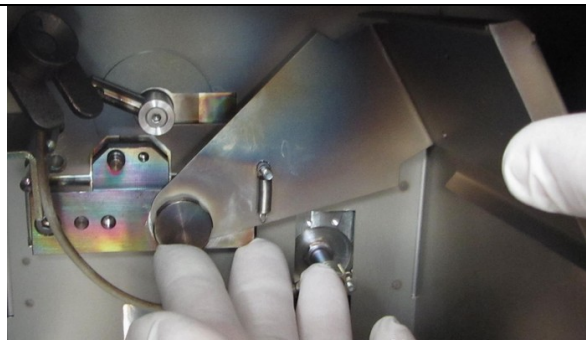


#### 6.1.2.2 Shutter Cleaning

Remove the shutter for cleaning:

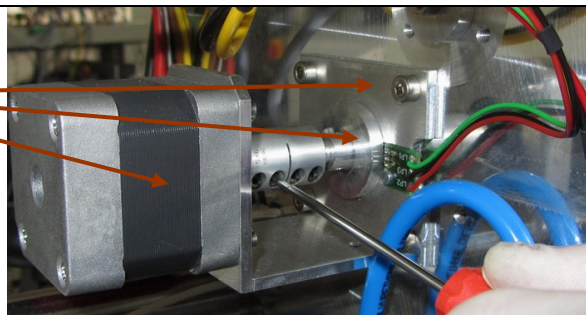
Unhinge the spring and unscrew the centre shutter screw. Shutter can be removed now.

Clean shutter by a sand blast unit, scotch prite, metal brush or sand paper.

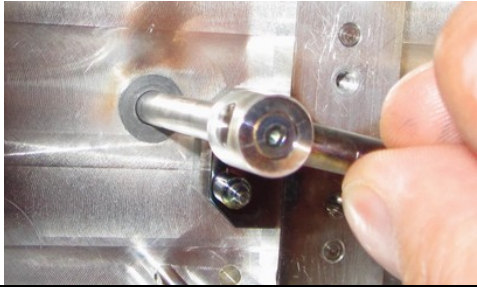

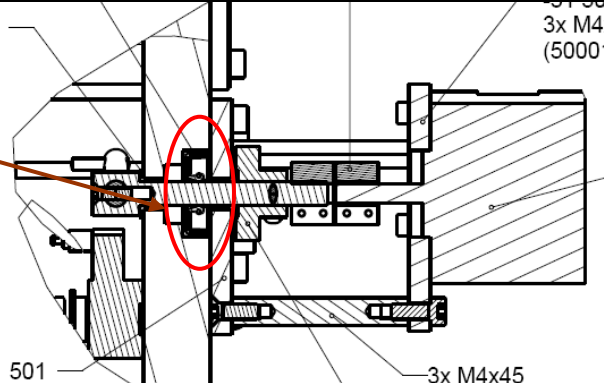


#### 6.1.2.3 Shutter Motor Assembly

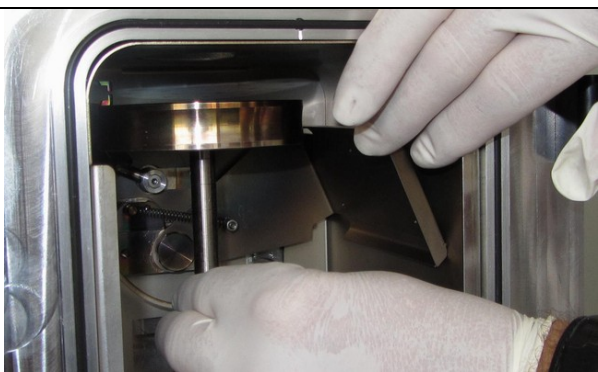
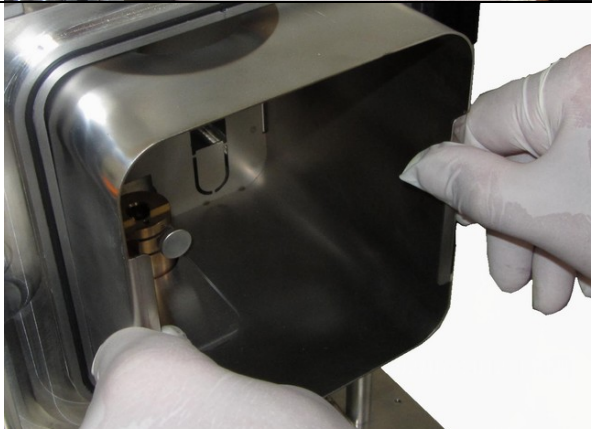
Remove stepping motor, motor support and magnet flange.

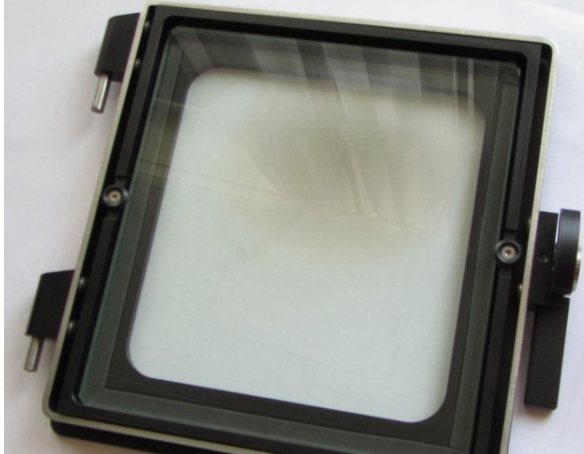
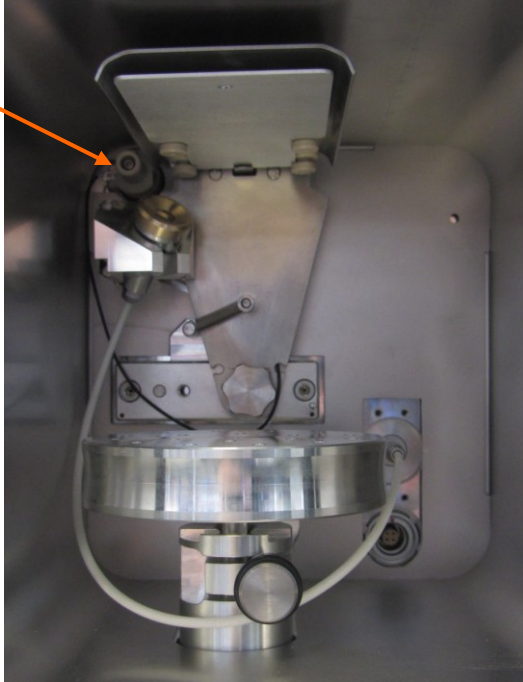




|  |   |
|--|---|
| <p>Pull out the motor shaft from chamber side.</p> |   |
| <p>Seal from stepper motor side view.</p>          |   |
| <p>Now you have access to the vacuum seal</p>      |  |

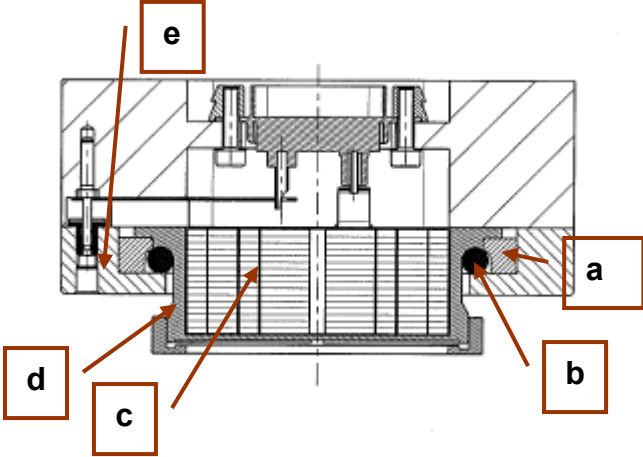
**6.1.3 Chamber cleaning**

|  |  |
|--|--|
| <p>Remove sample stage for cleaning .Use scotch brite followed by ethanol or acetone for cleaning.</p>                                       |  |
| <p>Remove Chamber protection shield for cleaning. Use scotch brite or a sand blasting unit for cleaning, followed by ethanol or acetone.</p> |  |

|   |   |
|---|---|
| <p>Use metal polish ,diamond paste or any dish water cleaner with rubbing function<br/>To clean the chamber door glass.</p> |   |
| <p>Disconnect and remove quartz head for cleaning.</p>  |  |


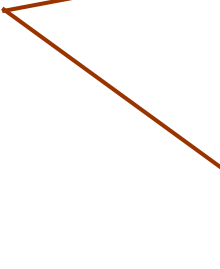
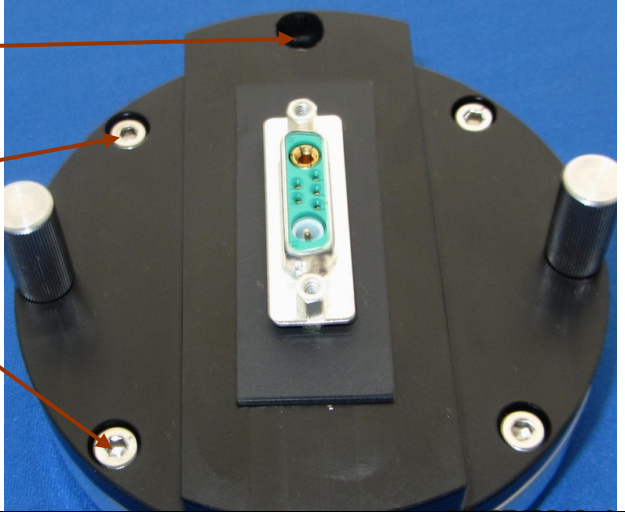
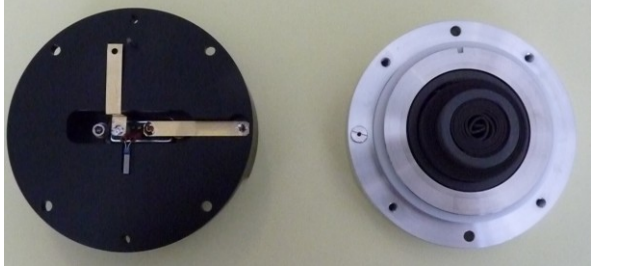





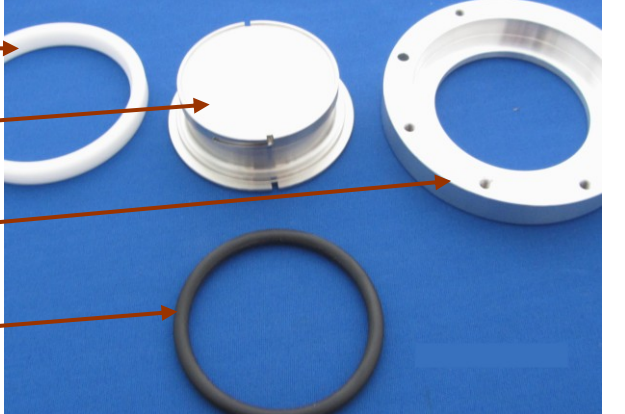

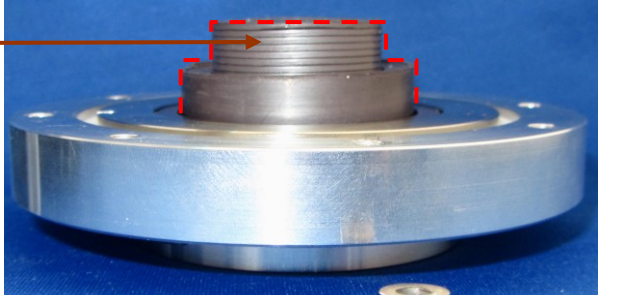
**6.1.4 Sputter Flange**

**6.1.4.1 Sputter Flange Function**

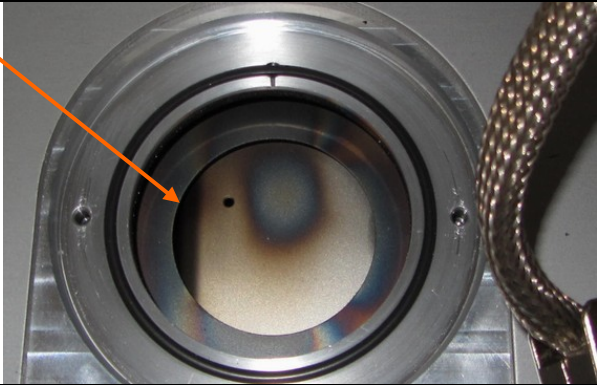
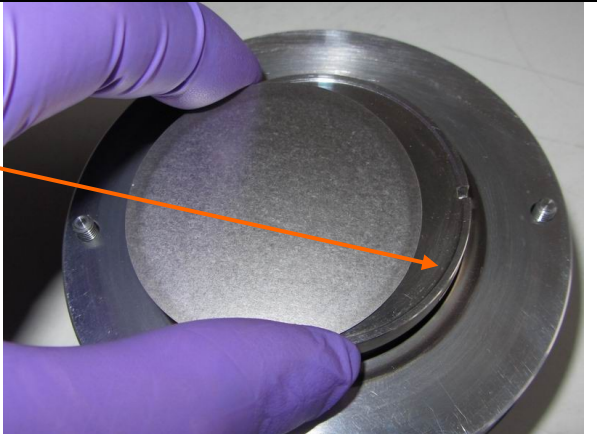
|  |  |
|--|--|
| <p>The sputter target is placed on top of the magnetron housing. The magnetron housing is connected to a voltage of 200 -500 VDC for ionize of the argon. The magnetron focuses the argon plasma towards of the target what starts the sputtering process.</p> |  |
|--|--|



6.1.4.2 Sputter Flange Assembly

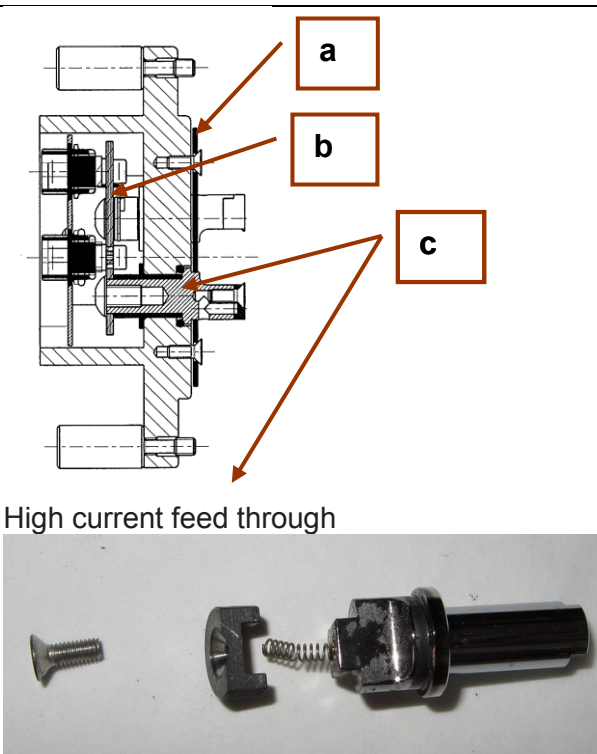
|   |  |
|---|--|
| <p>Remove Ground screw. </p> <p>Remove four flange screws. </p>   |    |
| <p>Lift up the contact plate</p>  |    |
| <p>Take <b>magnet</b> housing apart</p>   |  |
| <p>Isolation ring <b>a</b> </p> <p>Magnet housing <b>d</b> </p> <p>Contact ring <b>e</b> </p> <p>O-ring <b>b</b> </p> |  |
| <p>Magnet <b>c</b> </p> <p>Beware of the correct orientation of the magnet as shown on the picture.</p>  |  |

### 6.1.4.3 Sputter Flange Cleaning

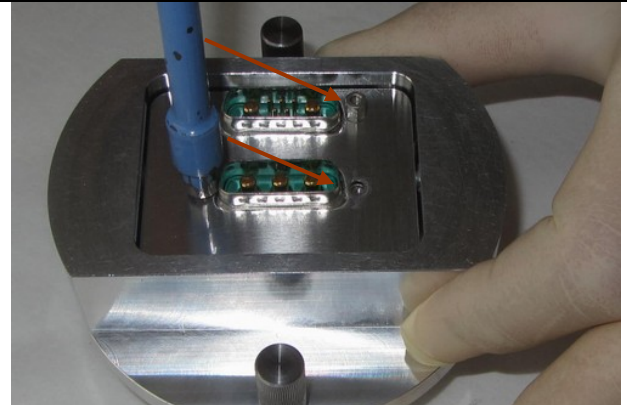

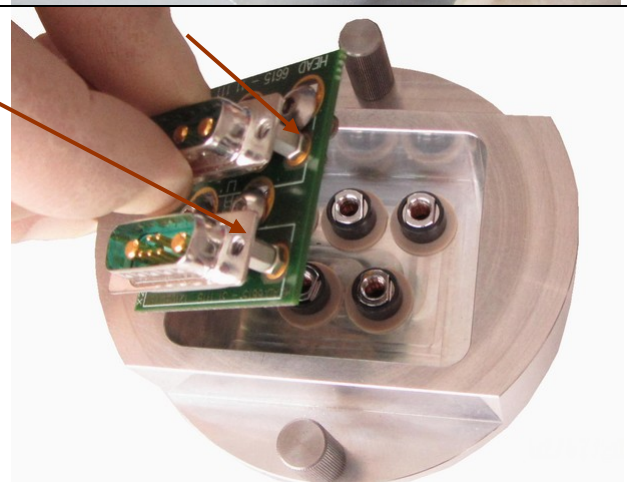

|  |   |
|--|---|
| <p>Remove sputter flange from chamber and then remove anode ring through chamber for cleaning.</p> |   |
| <p>Remove target and clean the magnet housing using scotch brite.</p>                              |  |

### 6.1.5 Carbon Thread Evaporation Flange

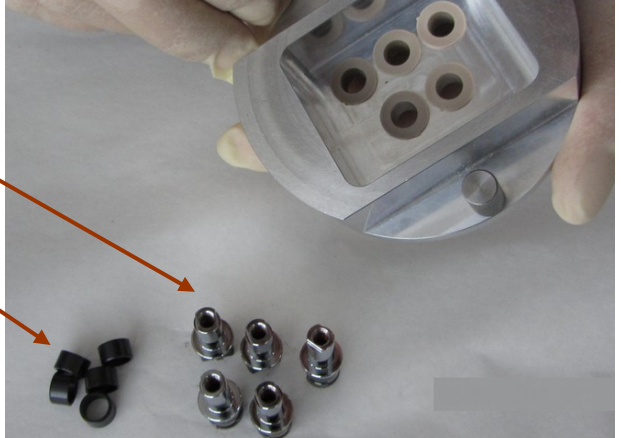
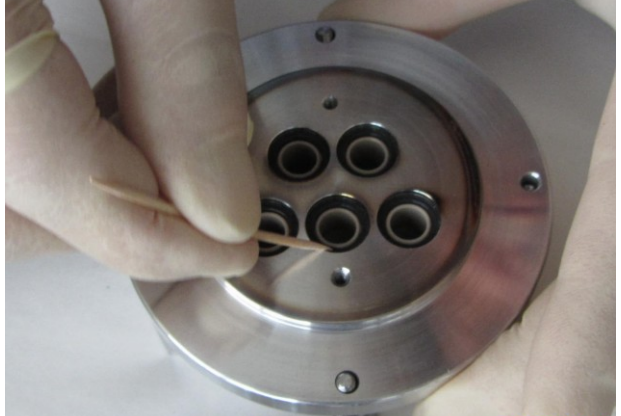
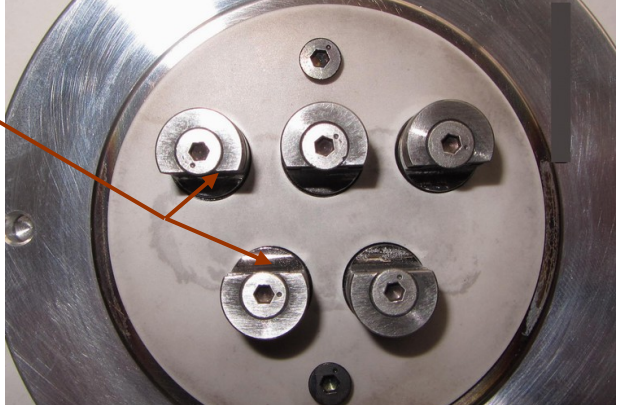
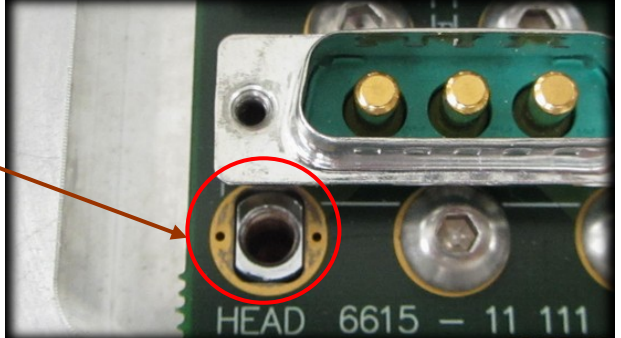
#### 6.1.5.1 Carbon Thread Evaporation Flange Function

|   |   |
|---|---|
| <p>A automatic controlled current of 20 Amps. Max. at a low Voltage of 16 Volt DC is connected to the carbon threads through the high current feed through. This current generates the heat to evaporate the carbon thread.</p> |  <p>High current feed through</p> |
|---|---|

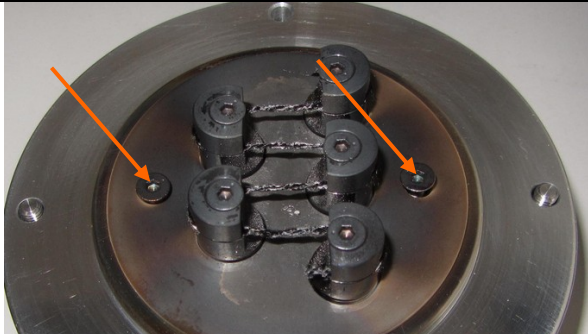

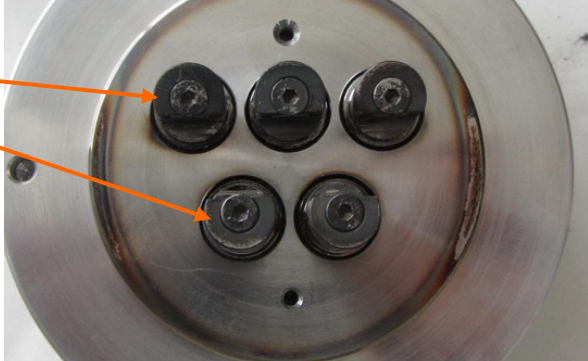
6.1.5.2 Carbon Thread Evaporation Flange Assembly

|   |  |
|---|--|
|   |    |
| <p>Unscrew the five contact screws and lift out the contact plate with putting the screws inside.</p> |   |
| <p>Remove contact plate with screws inside.</p>   |  |
| <p>Contact plate backside view.</p>   |  |



|   |  |
|---|--|
| <p>Feed through can be removed from the front side ,<br/>Distance cartridges from the back.</p>                     |    |
| <p>For removing / exchanging of the O-rings, use a toothpick.</p>   |   |
| <p>For the assembly of the flange , the flat side of the feed through needs to be aligned to the flange centre.</p> |  |
| <p>The profile of the feed through needs to fit to the cut-out of the contact plate.</p>                            |  |

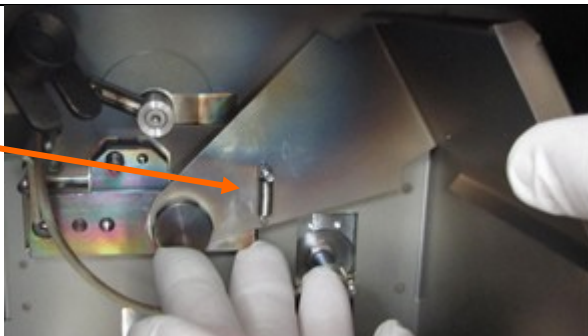
### 6.1.5.3 Carbon Thread Evaporation Flange cleaning

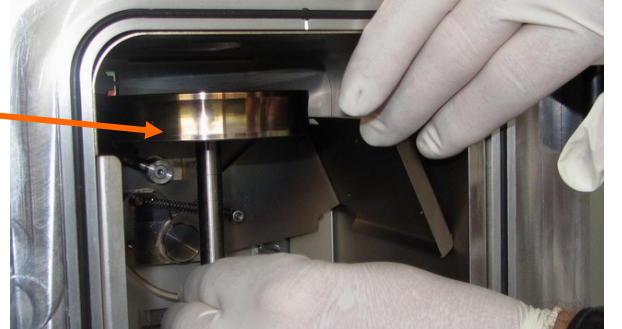
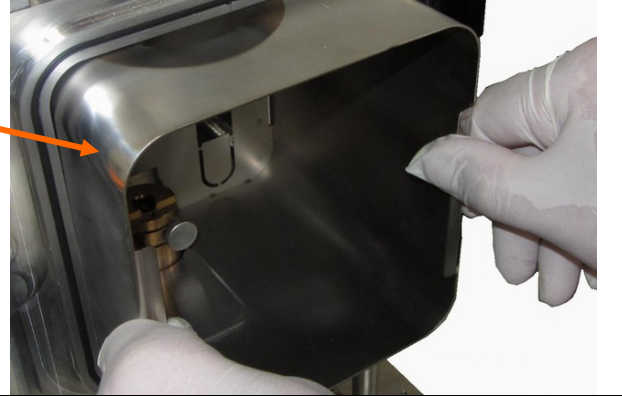
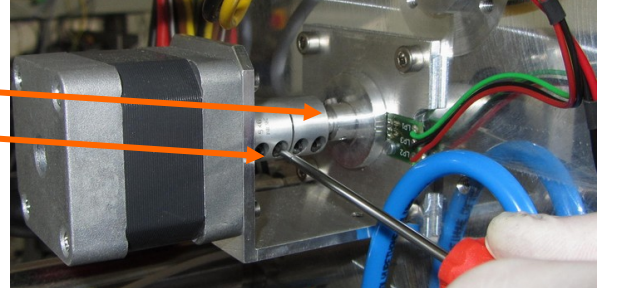
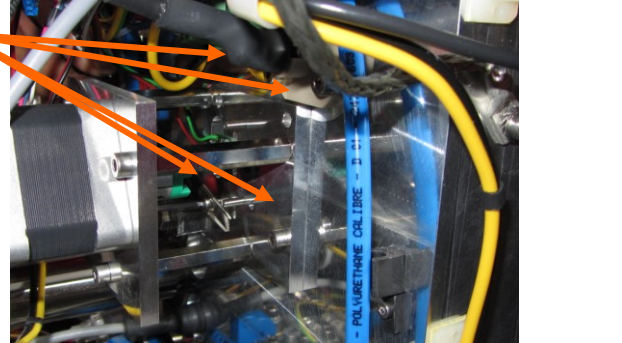

|   |   |
|---|---|
| <p>Remove remaining carbon thread and then unscrew protection plate for cleaning.</p> |   |
| <p>Use sand paper for cleaning of the plate.</p>                                      |   |
| <p>Use a brass brush or scotch brite to clean the feed through</p>                    |  |

### 6.1.6 Exchanging of the shaft seal for shutter (Simmering)

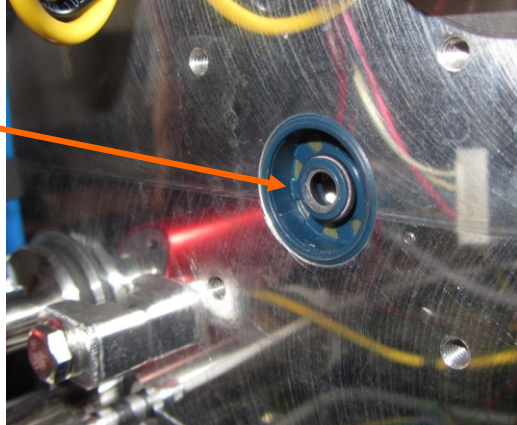
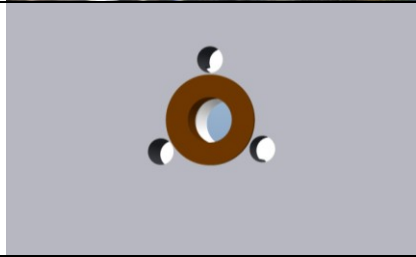
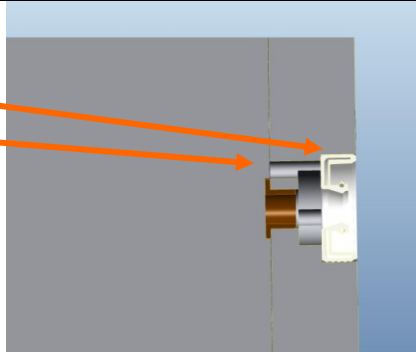
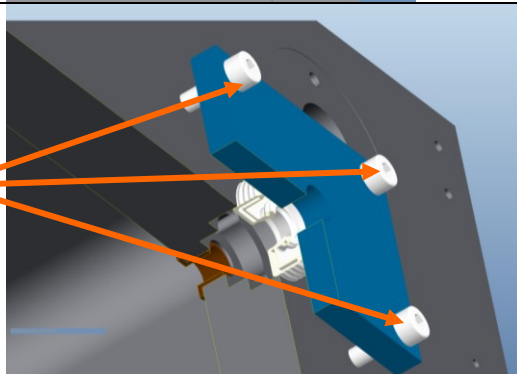


**Before starting the mains cable has to be disconnected, all work has to be done with gloves.**

|   |  |
|---|--|
| <p>Disconnect the spring and remove shutter</p> |  |
|---|--|

|  |  |
|--|--|
| <p>Remove sample stage</p>   |    |
| <p>Remove Chamber protection frame</p>   |    |
| <p>Remove the screw from the flange with magnet.<br/>Loosen the screw of the motor clutch</p>      |   |
| <p>Remove the four screws from the motor flange, and disassemble carefully the complete motor.</p> |  |
| <p>Now remove the shaft for opening the shutter.</p>   |  |



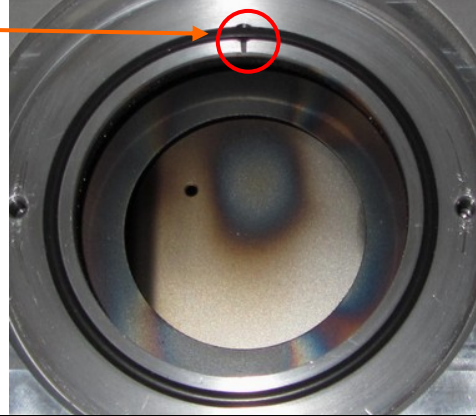
|  |  |
|--|--|
| <p>Now you can see the Shaft seal on the back side of the recipient.</p>   |    |
| <p>Around the slide bearing are three holes for removing the shaft seal.<br/>Use a 3mm allen key to push out the shaft seal.<br/>Be careful do not scratch the recipient surface.</p>  |    |
| <p>Recipient surface<br/>Hole for push out the seal</p>  |   |
| <p>For securely inserting of the new shaft seal use the screws coming with the seal.<br/>Note: screws are only for inserting the seal.<br/><br/>Insert the seal carefully with tighten the screws.<br/><br/>In reverse procedure assemble the motor and the shaft.</p> |  |

### 6.1.7 Chamber O-ring exchange

For removing of the O-rings, use a tooth pick or equal.



Use the cap for picking up the o-ring





# **Chapter 7**

# **Electronics**

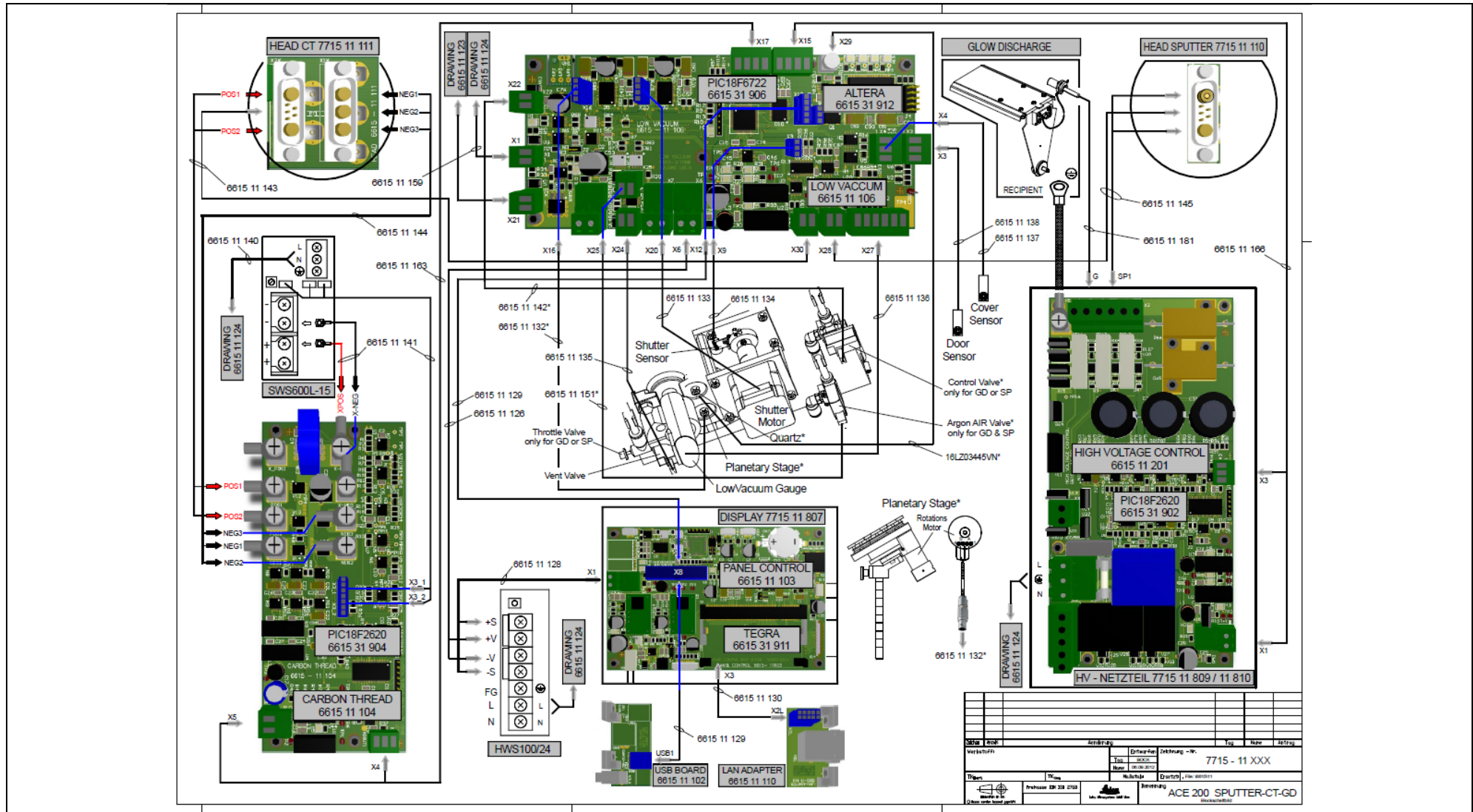
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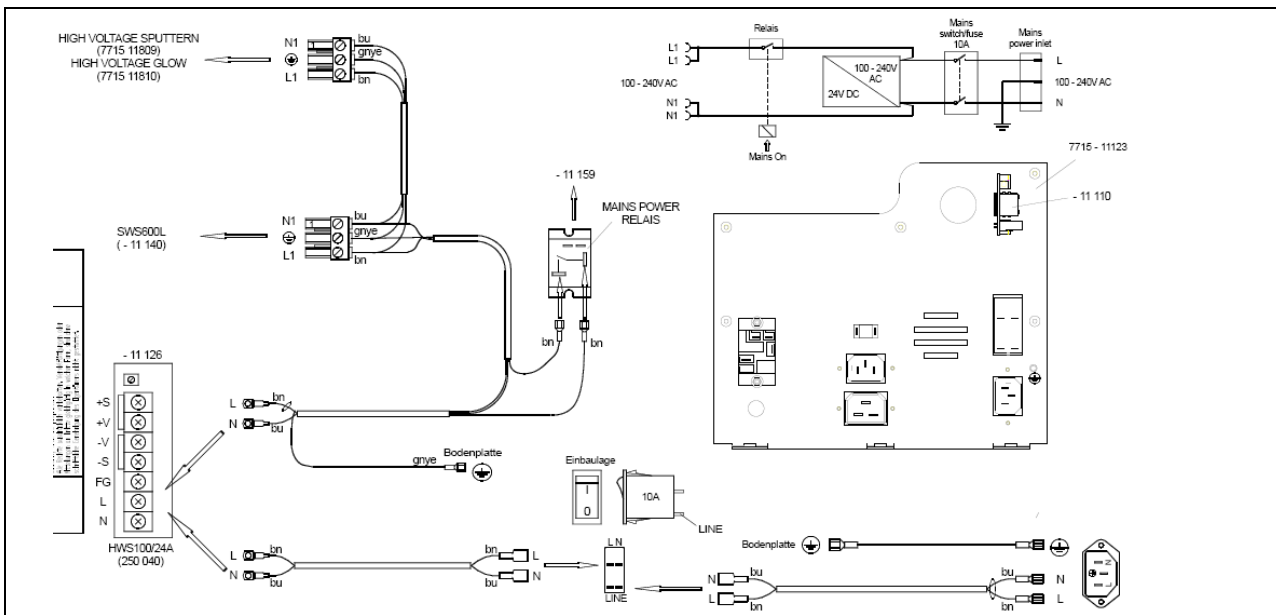
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# 7.1 Electronics

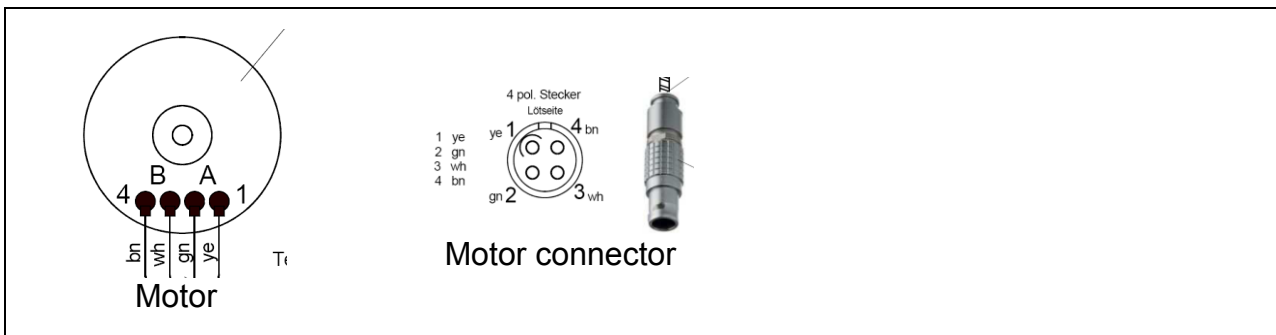
## 7.1.1 Schematic Diagram / Overview



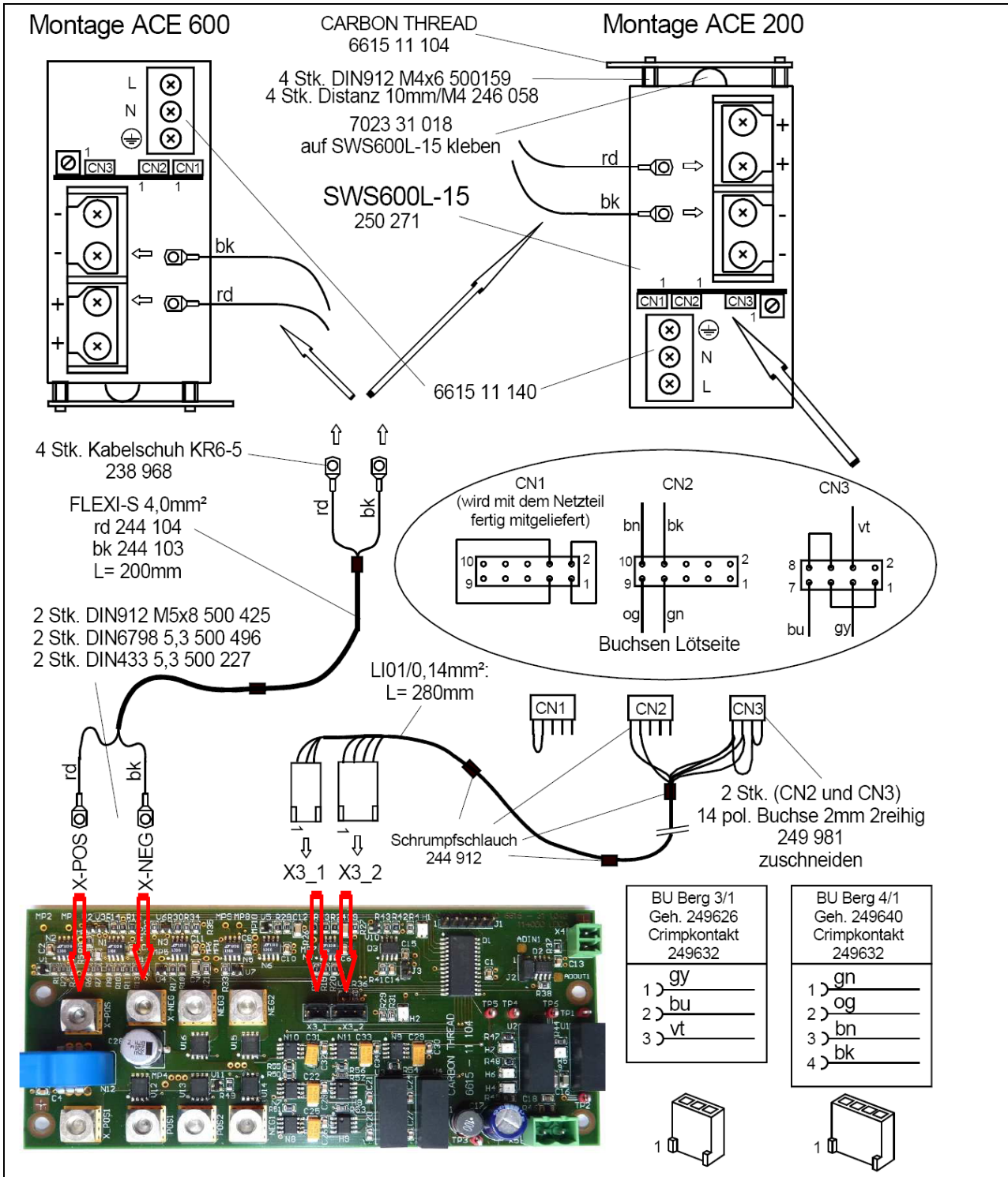
### 7.1.2 Wiring diagram mains



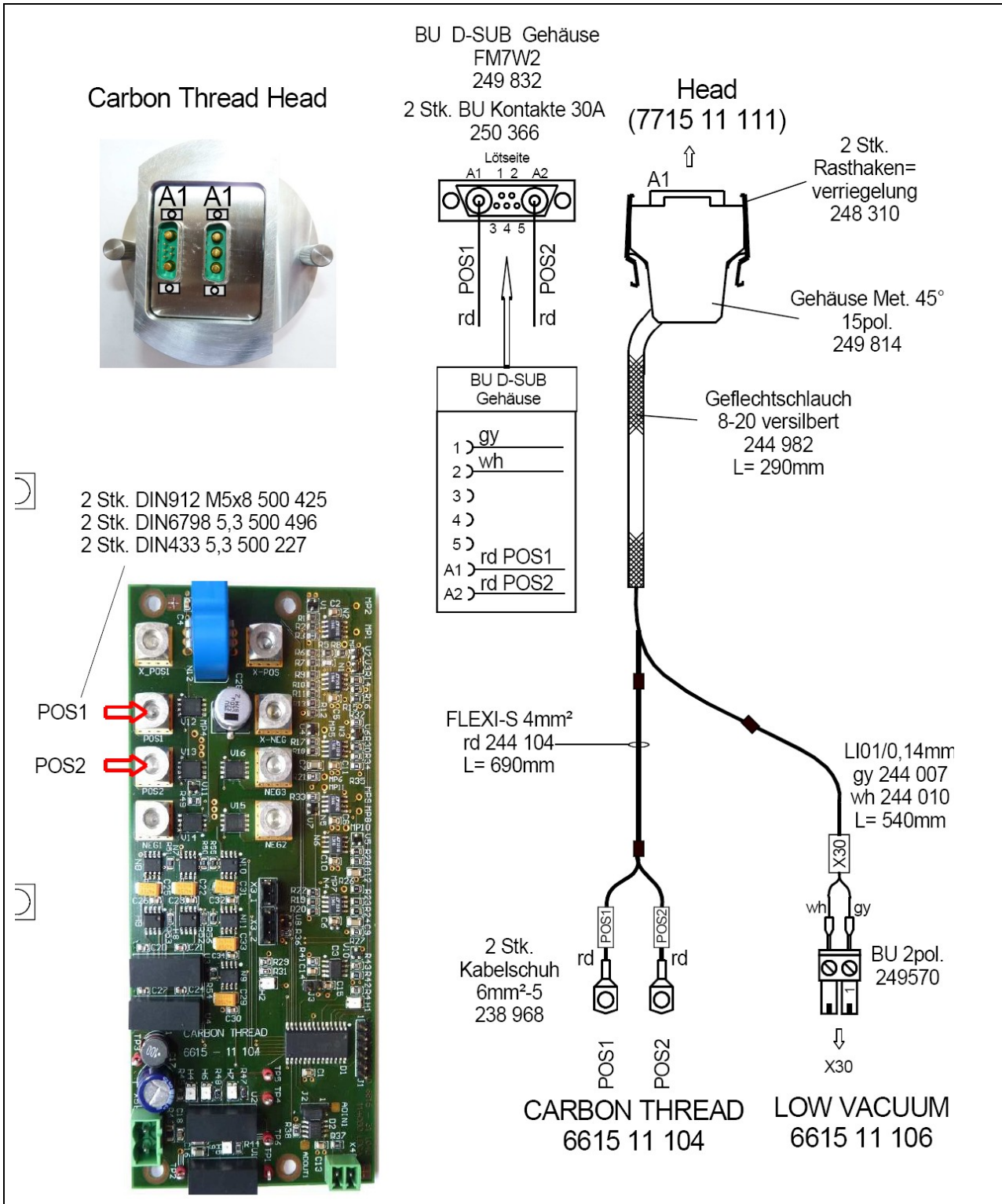
### 7.1.3 Wiring diagram stage rotation motor



7.1.4 Wiring diagram carbon thread power supply

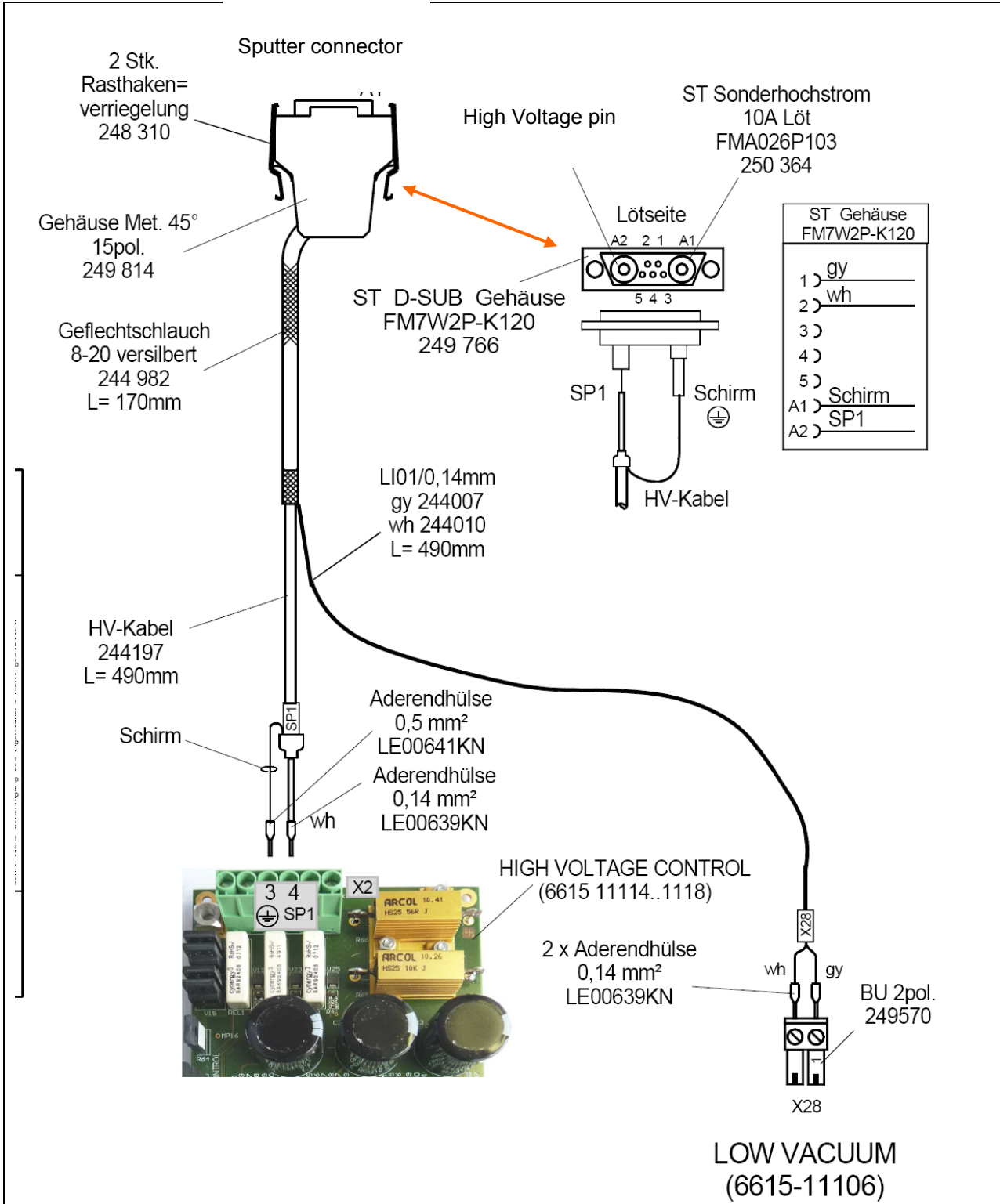


7.1.5 Wiring diagram carbon thread flange

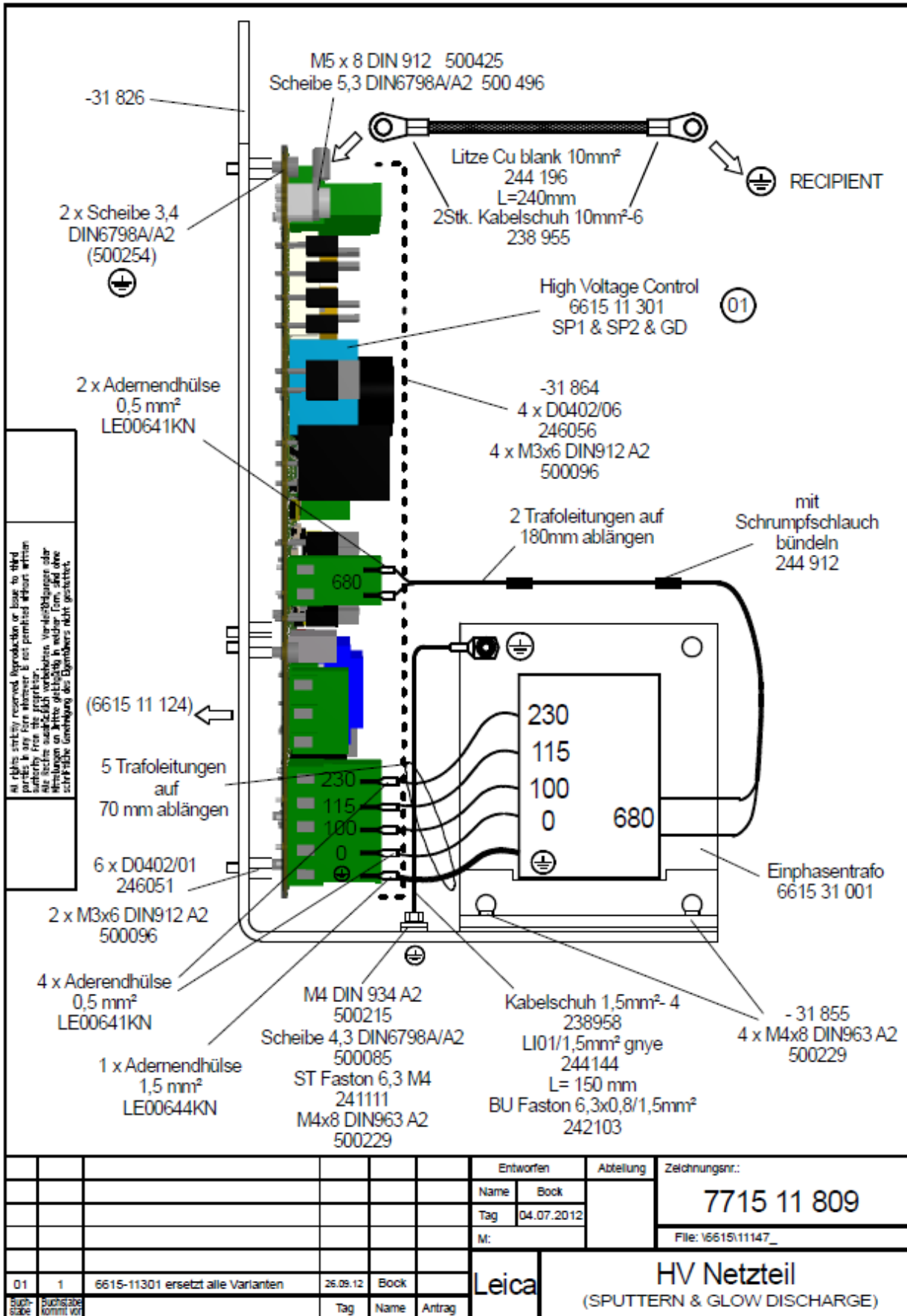




7.1.6 Wiring diagram sputtering

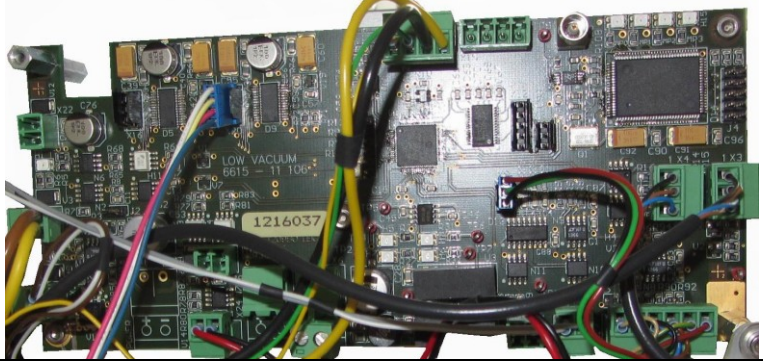
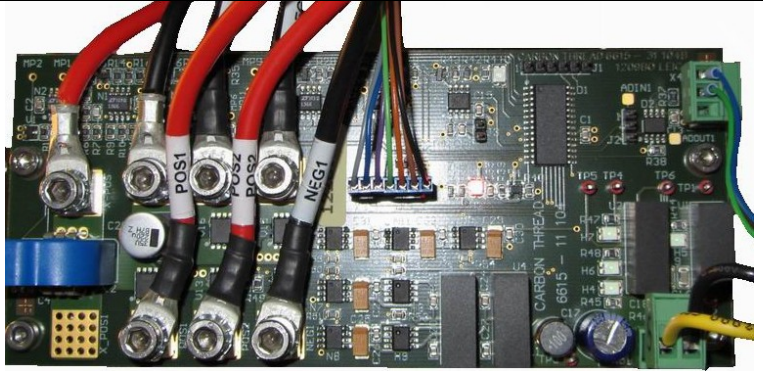
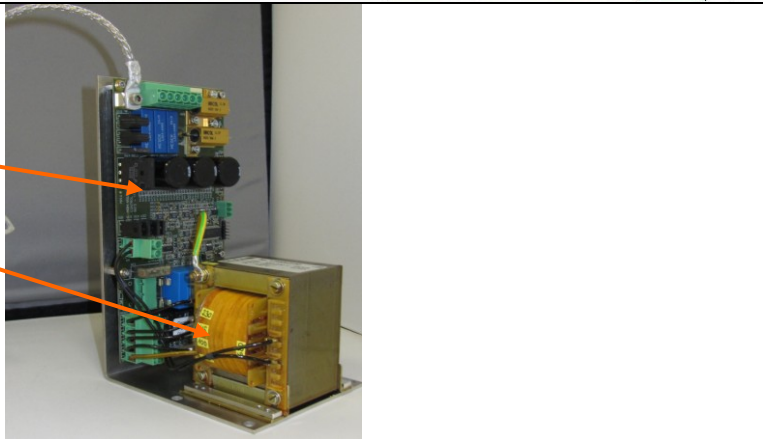



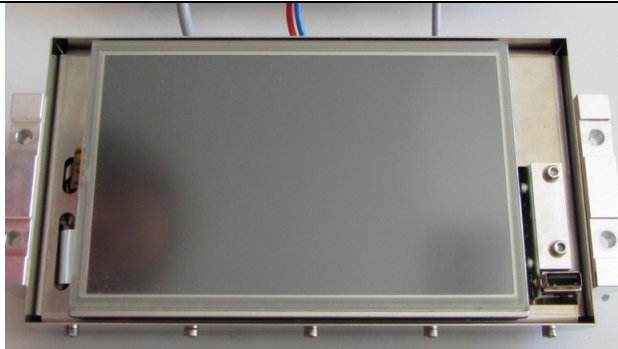
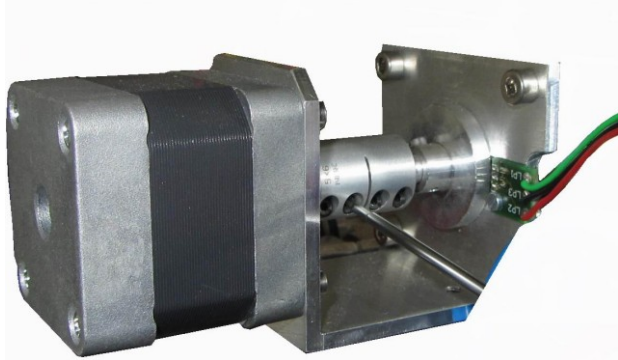

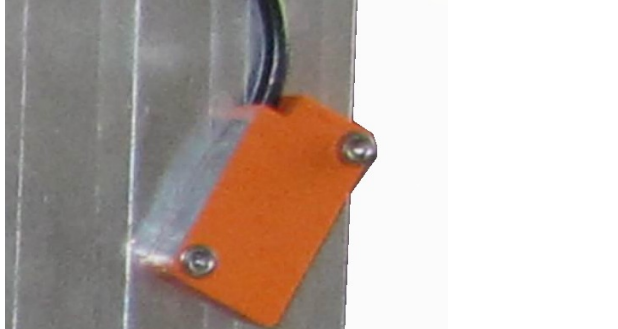
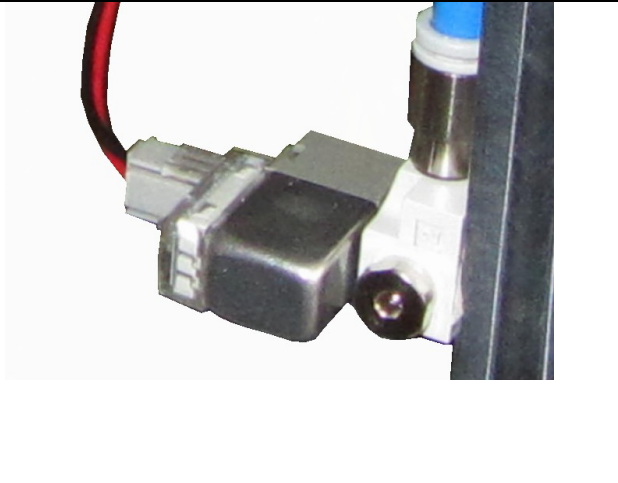
7.1.7 High Voltage Control (PCB)





7.1.8 Electronic components

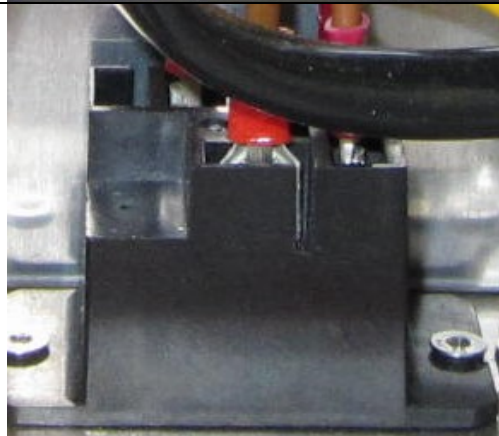
|   |  |
|---|--|
| <p>Control Board</p>  |  <p>A photograph of a green printed circuit board (PCB) densely packed with electronic components. It features various integrated circuits, capacitors, and connectors. A label on the board reads "LOW VACUUM 8615 - 11 106" and "1216037". Numerous colored wires are connected to the board's edge connectors.</p>      |
| <p>Power Supply for carbon thread evaporation</p>                                       |  <p>A close-up photograph of a green PCB with several large cylindrical components, likely capacitors or inductors, mounted on it. Four thick cables with metal connectors are plugged into the board, labeled "POS1", "POS2", "NEG1", and "NEG2". The board also has a label that says "CARBON THREAD 8615 - 11 106".</p> |
| <p>Power Supply for Sputtering<br/>         HV - Board<br/>         HV- Transformer</p> |  <p>A photograph showing a vertical assembly of electronic components. An orange arrow points from the text "HV - Board" to a green PCB with various components. Another orange arrow points from "HV- Transformer" to a large, yellow, rectangular transformer unit mounted on a metal base.</p>                         |
| <p>24Volt Power Supply for control functions</p>  |  <p>A photograph of a silver metal power supply unit. Two labels are visible: one with a barcode and the text "HWS100-24/A EHFP 2PT-238H72-0121 5431", and another with technical specifications: "HWS100 - 24/A INPUT: 100-240VAC 1.4A 50/60Hz OUTPUT: 24VDC 4.5A TDK-Lambda MADE IN MALAYSIA".</p>                     |

|  |  |
|--|--|
| <p>Touch screen display and USB board</p>                    |  A photograph showing a rectangular touch screen display panel mounted on a metal frame. To the right of the screen, a USB board is visible, featuring a USB port and other electronic components.             |
| <p>Shutter motor with control sensor</p>                     |  A photograph of a silver metal shutter motor. It has a black cylindrical component on top and a control sensor assembly on the side with three colored wires (green, red, black) connected to it.             |
| <p>Low vacuum gauge</p>                                      |  A photograph of a red cylindrical low vacuum gauge. It has a black sensor head on top and a metal fitting on the side. A white label with a CE mark and technical specifications is visible on the red body. |
| <p>Safety Sensor for door and flange hood</p>                |  A close-up photograph of an orange safety sensor mounted on a metal surface. The sensor is a small, rectangular component with two screws.  |
| <p>Solenoid valve for Argon regulation and vent function</p> |  A photograph of a solenoid valve assembly. It consists of a silver metal solenoid coil connected to a white plastic valve body with a blue cap and a metal fitting.   |

Quartz head for thickness measurement



Solid-state relay for OFF/ON function for rotary pump



# **Chapter 8**

# **Vacuum**

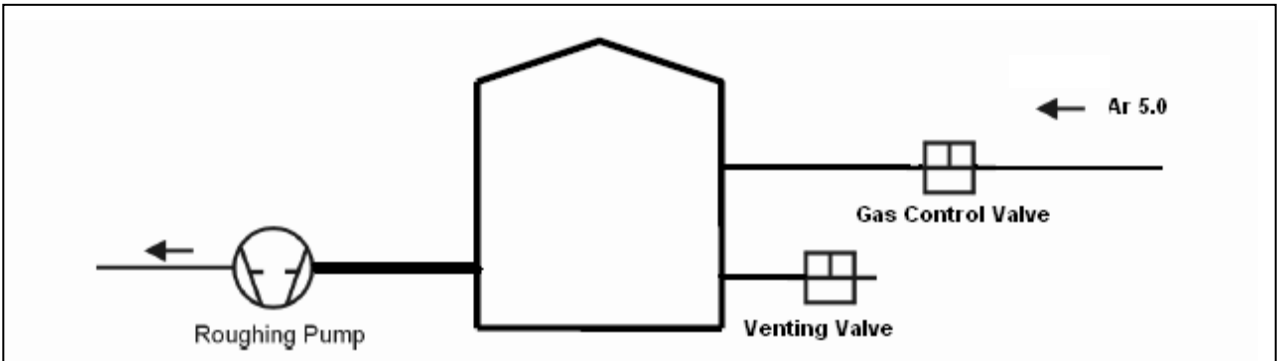
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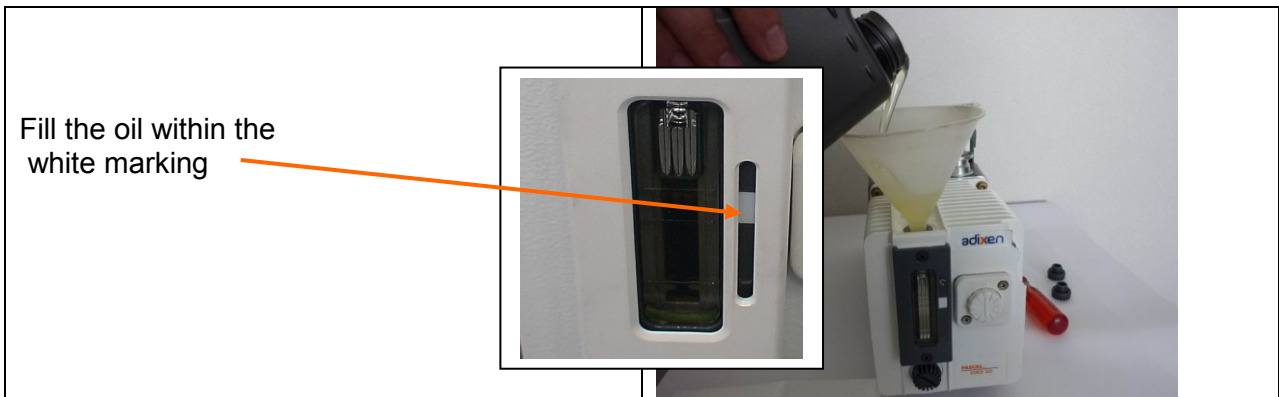
|                                      |          |
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## 8.1 Vacuum System

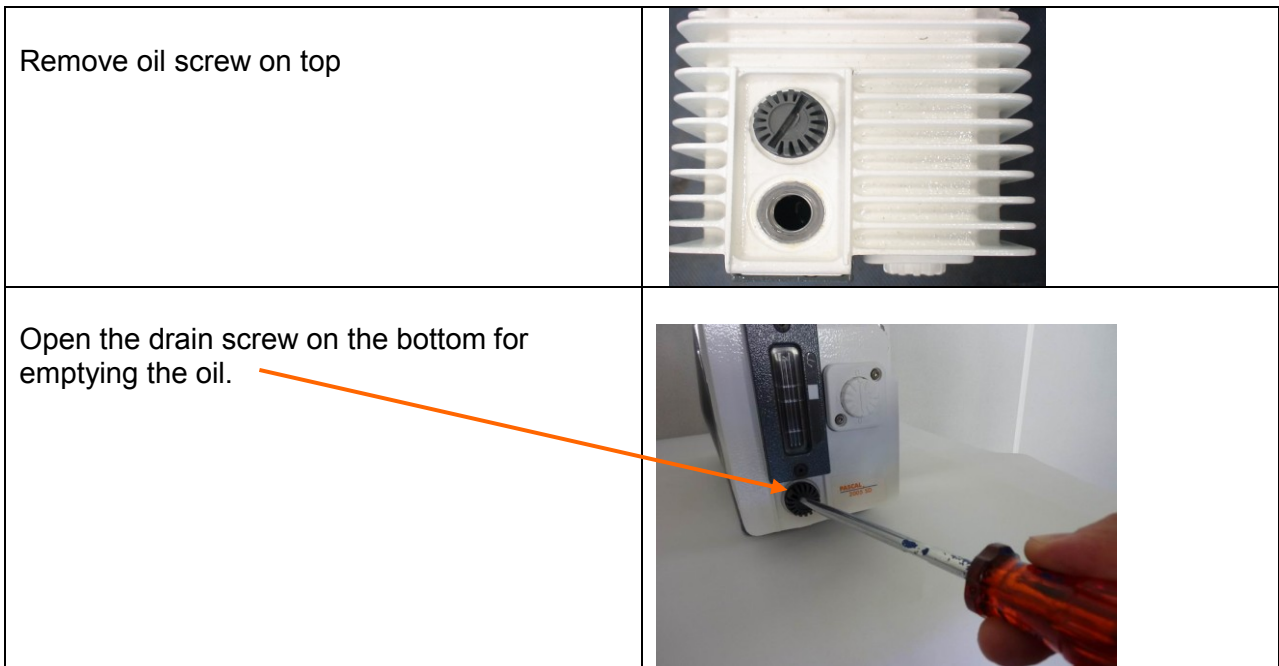
### 8.1.1 Schematic Diagram



### 8.1.2 Rotary pump oil filling



### 8.1.3 Rotary pump oil exchange





## 8.1.4 Maintenance

## Maintenance

## Maintenance frequency

|      | Frequency | Operating conditions  |
|------|-----------|-----------------------|
| Oil  | 6 months  | "normal", 24 / 24h    |
|      | 1 year    | "normal", < 12h / day |
| Pump | 1 year    | "normal", 24 / 24h    |
|      | 2 years   | "normal", < 12h / day |

The frequency values are minimum values for «normal» operating conditions: pressure < 1 mbar (0.75 Torr), clean gas and non-corrosive gas.

**An incorrect ultimate vacuum or a reduction in pumping speed are signs that the oil has deteriorated.**

The periodic inspection of the state of the oil is performed by comparison with a sample of new oil in order to check the level of contamination or deterioration of the lubricant.

The frequency at which oil is renewed is adapted to the type of operation:

- if the oil is cloudy, this indicates that condensables have been absorbed during pumping. The oil can be regenerated using the gas ballast (*see page 27*).
- a thickening of the oil, together with a blackish color and a "burnt" smell indicate that the oil has deteriorated.

Drain the pump and flush it.

**The oil should be changed every 6 months. This value is given as a guide only.** It may be extended to 1 year if the ultimate vacuum required is sufficient (for primary vacuum pumps). Similarly, **if the pump is stopped frequently for long periods, the oil should be changed at intervals of 6 months to a maximum of 1 year** (oil may become sticky).

**Note:** Every pumping operation is different. This oil must therefore be changed at intervals adapted to each specific application. The use of certain accessories (*see page 13*) can reduce the frequency of these maintenance operations.

## Draining

 **WARNING**

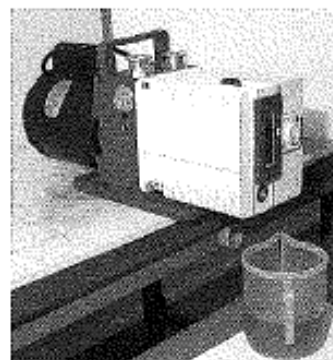
**The draining operation places the contaminated pumping circuit in communication with the outside atmosphere. Take all necessary steps to ensure personal safety.**

The pump must be drained when hot and after the oil case has been vented to atmospheric pressure. For this:

- switch off the pump;
- isolate the pump or disconnect from the installation;
- tilt the pump;
- unscrew the draining plug on the side of the oil case and the filling plug on the top of the oil case.

When all the oil has drained, replace the two plugs temporarily and run the pump for about 10 seconds leaving the intake open. Take care with the oil mist which may appear at the exhaust. This operation removes the oil from the functional block;

- drain this oil by removing the draining plug;
- replace the draining plug and fill with fresh oil to the appropriate maximum level of the oil case oil sight glass through the filling orifice (*see page 18*).



**Flushing**

The draining operation can be followed by a flushing operation if the oil is particularly dirty. This operation requires a volume of oil equal to the capacity of the pump.

After draining the oil case (*see page 37*), replace the draining plug. Remove the intake filter, clean it and replace it. Run the pump at atmospheric pressure, pour the flushing oil **very slowly** through the inlet orifice. Take care with oil mist which may develop at the exhaust. Stop the pump and drain the flushing oil via the draining plug. Replace the plug and fill with fresh oil (*see page 18*).

**Change of type of oil**

5 to 21 m<sup>3</sup>/h series pumps are tested in the factory with A120 oil or A119 for USA (A113 for C2 series pumps) unless specified otherwise in the order. When the pump is delivered, a certain quantity of oil remains in the functional block.

Thus, if you wish to use another type of oil, proceed as follows:

**Compatible oils**

Mineral oil can be replaced by another type of mineral oil. Simply flush the pump (*see above*) using the new oil and fill the pump (*see page 18*).

Mineral oils are also compatible with mineral-based synthetic oils (*see page 17*).

**Incompatible oils**

This is the case when, for example, a mineral oil is replaced by a synthetic oil (e.g. A120 by A113).

Synthetic oils are considered to be incompatible with each other for practical reasons: they are expensive. A mixture may cause slight cloudiness of the resulting mixture, which could be interpreted mistakenly as a sign of contamination or deterioration.

For the same reasons, clear synthetic and mineral oils (A300), which are also expensive, are treated as synthetic oils.

These remarks apply to ester or fluorocarbon type synthetic oils and the oils A111, A113 and A300 (*see page 17*).

Proceed as follows:

- Disassemble the pump completely and clean it (*see page 42*).
- Reassemble it.
- Connect an oil mist eliminator to the pump exhaust.
- Fill the pump with the new oil (*see page 18*).

NOTE: to replace a synthetic oil by a mineral oil, proceed as for compatible oils.

**In all cases, follow the recommendations of the pump integrators for the choice of the oil to be used.**



## 8.1.5 Oil mist filter exchange

## OME 25S

## II.5. MAINTENANCE

**⚠ DANGER**

During pump removal, draining or oil mist eliminator maintenance, the operator may come in contact with process residues which could cause severe injury or death. Ask your safety department for instructions according to the local regulations.

We recommend:

- Wearing gloves, safety glasses, respirator mask, or any appropriated safety equipment.
- Ventilating the premises well or working under an extracted hood.
- Not disposing of maintenance waste through standard disposal channels. Have it destroyed by a qualified company if necessary.
- Not disposing of the used cartridge through standard disposal channels; have it destroyed by a qualified company if necessary.
- Install the inlet and exhaust backing plates; these accessories are shipped with the pump.

**a) Cartridge saturation**

The following may be signs of a saturated cartridge:

- excessive smoke or droplets, or puffs of steam appear at the oil mist eliminator exhaust,
- a rapid or significant drop in the oil level,
- an increase in the pump oil case temperature.

The time taken to reach saturation point depends on the number of pumping operations, their frequency, the volume of pumped gas and the kind of the oil used. When the cartridge is saturated, replace as follows:

**b) Disassembly (Figure 2)**

- Remove eliminator from the pump and disassemble on a workbench.
- Unscrew the 4 nuts 15, while at the same time manually pressing each nipple of the eliminator (**to avoid sudden release of the spring**), and remove the 4 screws 13.
- Remove successively and in the following order, the upper nipple 2 (or elbow fitting A) and its O-ring seal 7, the spring 5, the valve 4 equipped with its flat ring 6, the cartridge 8 and the flat ring 6, then the lower body and its O-ring.

**c) Cleaning****⚠ WARNING**

Never clean the filter cartridge: always install a new one.

During disassembly, if the cartridge appears very clogged, filled with condensable products or gels, or is filled with very blackish, strong-smelling oil, it is then necessary to check the quality of the pump oil. It probably needs to be changed. In this case, drain the pump, replace the oil before installing an oil mist eliminator equipped with a new cartridge.

Elastomer seals 6 and 7 must always be replaced by new seals.

**After use in mineral or synthetic oil**, clean the components with a mineral-based solvent such as AXAREL<sup>(1)</sup>, CARECLEAN<sup>(2)</sup>, PREMACLEAN<sup>(3)</sup>, NAPHTESOL<sup>(4)</sup>.

Proceed as follows:

- Clean when cold or hot (max. 45°C) by dipping or using a cloth.
- Vacuum dry in a ventilated oven then,
- **The component must be cleaned a second time with alcohol.**

# OME 25S

**After use in (perfluorinate) synthetic oil**, clean the components in a solvent such as **GALDEN S 90™ (5)** and proceed as follows:

- Clean when cold by dipping or using a cloth.
- Dry the components in the open air or using compressed air.

**After use in (non-perfluorinate) synthetic or mineral oil**, clean the components with a solvent such as alcohol and proceed as follows:

- Clean when cold by dipping or using a cloth.
- Dry the components in the open air.
- Industrial washing solutions can also be used. The cleaning operation should be followed by vacuum drying.

## d) Reassembly

- Insert the flat ring 6 in the base of the body 1.
- Install the cartridge 8 so that it rests on the flat ring 6 in the body 1.
- Assemble the new O-ring 7 on the lower and upper nipples.
- Assemble the flat ring 6 on the valve 4 and install the unit on the cartridge, with the flat ring resting on the cartridge.
- Position the spring 5 on the valve 4.
- Position the body thus assembled 1 on the lower nipple: the latter can be identified by the direction of the arrow on the "Pump ↓" label (Pump port).
- Assemble the upper nipple on the spring 5 and assemble using the mounting screws 13, 14, 15. Apply 2 N-m of torque.
- Connect the eliminator to the pump exhaust port (see paragraph II.3.).

## II.6. APPLICATIONS NOT RECOMMENDED

### ⚠ CAUTION

Oil mist eliminators should not be used for the following applications: drying, freeze-drying, pumping condensable vapors, impregnation with polymerizable resins and debubbling monomers. Filter cartridges are flammable: do not use eliminators when pumping flammable products such as oxygen or silane. The standard oil mist eliminator must also not be used for pumping corrosive products or for microelectronic and chemical applications.

## I.7. REPLACEMENT PARTS

Parts which must be replaced each time the cartridge is changed:

| REFERENCE | NUMBER | PART NAME        | PART NUMBER |
|-----------|--------|------------------|-------------|
| 6         | 2      | Flat ring        | 052117      |
| 8         | 1      | Filter cartridge | 068304      |
| 7         | 2      | O-ring           | 111197      |

(1) ..... DUPONT DE NEMOURS registered trademark

(2) ..... CASTROL registered trademark

(3) ..... DOW registered trademark

(4) NIPPON OIL CORPORATION registered trademark

(5) MONTEDISON registered trademark

OME 25S

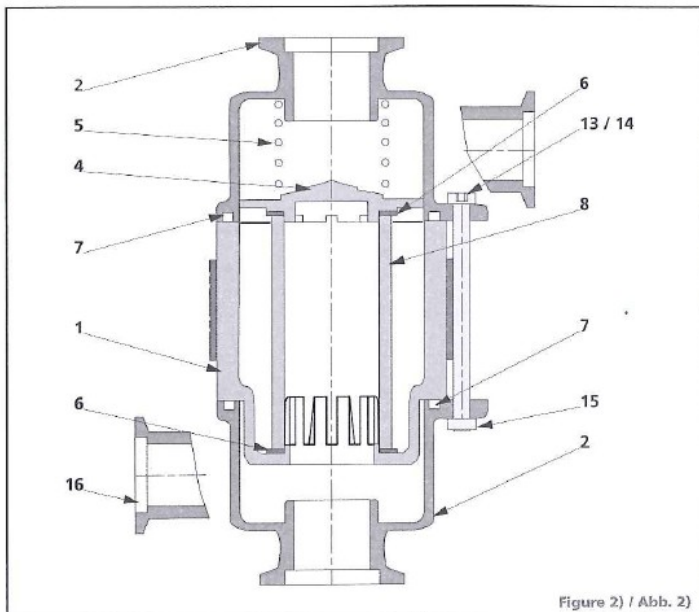


Figure 2) / Abb. 2)

|                                      |  |
|--------------------------------------|--|
| <p>Open oil mist filter</p>          |  |
| <p>Remove spring and press plate</p> |  |
| <p>Exchange filter insert</p>        |  |



# **Chapter 9**

# **Service Menu**

## **Version 1.0**

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# 9.1 Service Menu

## 9.1.1 Service menu

|   |   |  |
|---|---|--|
| <p>Press Settings on Main Screen<br/>To get into <b>Settings</b> screen.</p>            |   |  |
| <p>Press <b>Service</b> to get into Service mains screen</p>                            |   |  |
| <p>Enter the Password<br/><b>1170</b> and press <b>OK</b></p>                           |   |  |
| <p>Control boards<br/>IDversion</p>   | <p>Colibri ID: 00.14.2D.48.7B.92<br/>LV-Board ID: 00.00.47.56.C7.70<br/>HV-Board ID: 00.00.47.5E.96.70<br/>CT-Board ID: 00.00.5F.CE.C0.70</p> |  |
| <p>Enabled you can<br/>swap from the use<br/>menu direct in to the<br/>service menu</p> | <p><input checked="" type="checkbox"/> Remember service password</p>  |  |
| <p>Only for factory</p>   | <p><input type="checkbox"/> Debug On</p>  |  |
| <p>Set all settings to<br/>factory values</p>   | <p>Factory Reset: </p>  |  |
| <p>Enter the serial<br/>number</p>  | <p>ACE200<br/>Serial number: <b>597133</b></p>  |  |

### 9.1.2 Vacuum Screen function description

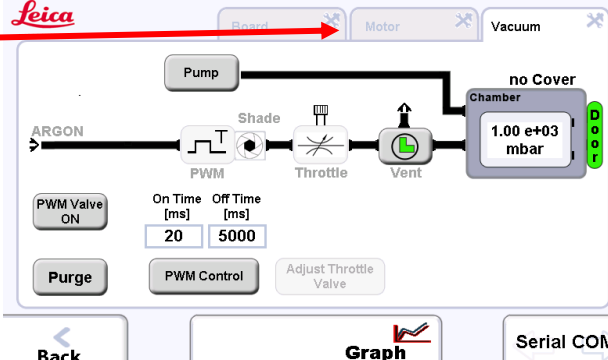
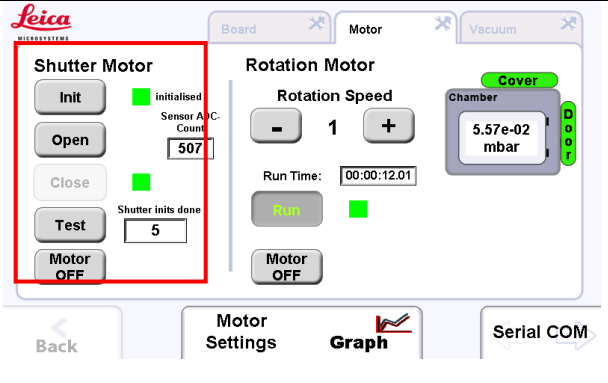

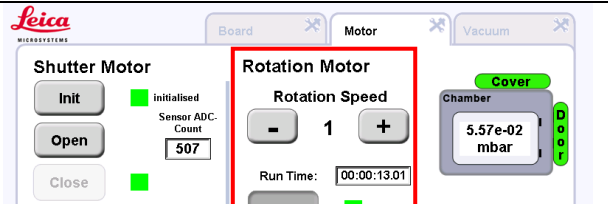
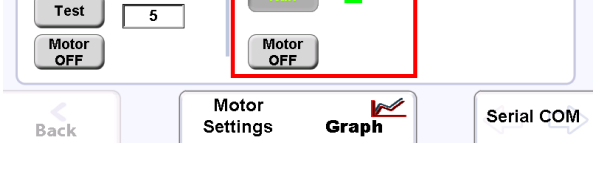
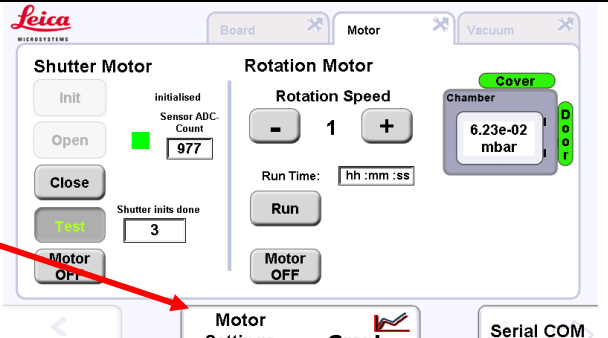
|  |  |
|--|--|
| <p>Tab on <b>Vacuum &amp; Motion</b> to enter in the Vacuum screen</p> |  |
|--|--|

|  |   |  |
|--|---|--|
| Rotary Pump ON / OFF   | <b>Pump</b>   |  |
| Purge function activating  | <b>Purge</b>  |  |
| Press "PWM Control" button to set On – and Off Time of the argon regulation valve. | On Time [ms] 20    Off Time [ms] 5000<br><b>PWM Control</b> |  |
| Gas regulation ON  | <b>PWM Valve ON</b>   |  |
| Actual chamber vacuum Indication   | Chamber<br>1.00 e+03 mbar                                   |  |
| Safety switch indications  | <b>Cover</b>  |  |
| Opens screen for throttle valve adjustment ,see 9.1.3                              | Adjust Throttle Valve                                       |  |
| Actual valve status indication   |   |  |

### 9.1.3 Throttle valve adjustment screen

|  |  |
|--|--|
| <p>Follow to the instructions in the yellow box. After the adjustment fix the adjustment screw with the counter nut.</p> |  |
| <p>When the adjustment has finished, don't forget to connect the tubing again!</p>                                       |  |

9.1.4 Motor screen function description


|   |  |
|---|--|
| <p>Tab on <b>Motor</b> to enter in the Motor control screen</p>   |    |
| <p>Shutter motor Init</p> <p>Open Shutter and show motor counts</p> <p>Close shutter</p> <p>Starts continuous open /close cycle</p> |    |
| <p>No power on the stepper motor</p>  |   |
| <p>Stage rotation speed select able from 1 - 5</p>  |  |
| <p>No power on the stepper motor</p>  |  |
| <p><b>Motor setting <u>only</u></b> for factory</p>   |  |

### 9.1.5 Low Vacuum control board

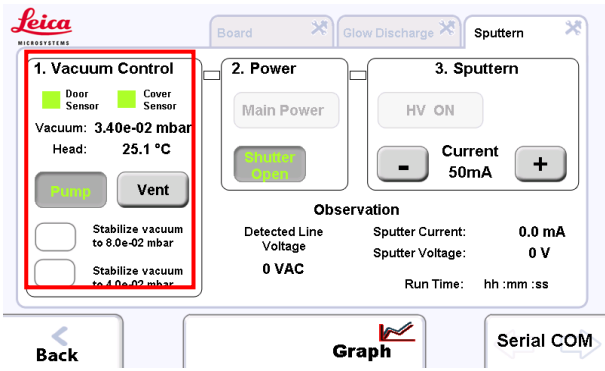
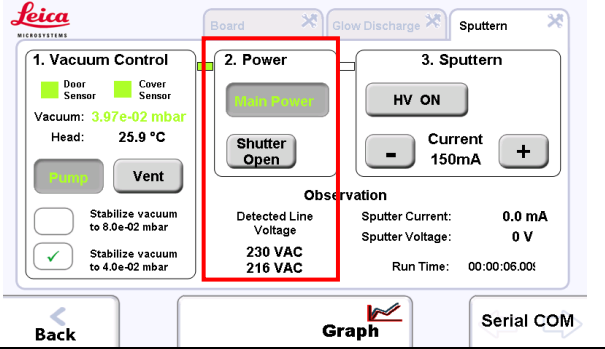
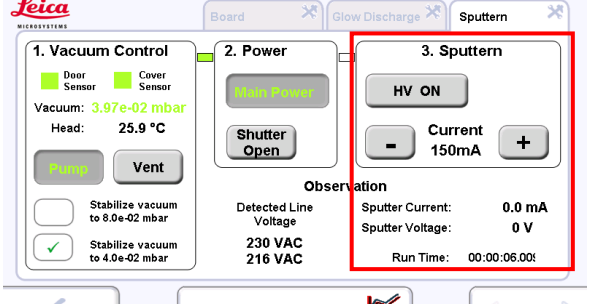

|   |  |
|---|--|
| <p>Tab on Board</p>   |  |
| <p>Low Vacuum Control Board<br/>You can find all connection on the board.</p> |  |


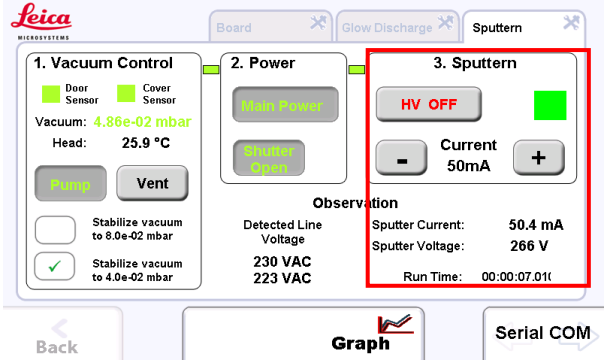
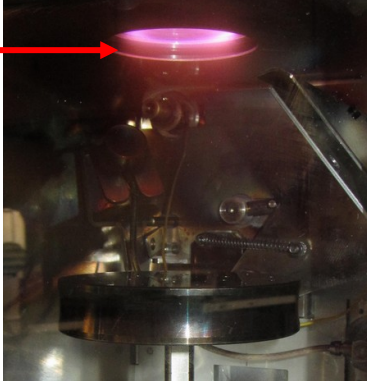
### 9.1.6 Low Vacuum graph

|  |   |
|--|---|
| <p>Tab on Graph</p>  |   |
| <p>It shows the characteristics of the Vacuum.</p>   |   |
| <p>Show the actual Vacuum, the time in seconds to reach the Vacuum <math>P &lt; 2e-02mbar</math> and the time in seconds to reach Vacuum <math>P &lt; 9.9e-03mbar</math></p> | <p>P: 2.54e-02 mbar, P&lt; 2e-02mbar in: 517s, P&lt; 9.9e-03mbar in: 517s</p> |
| <p>With the arrow left and right you can follow the graph from begin till to the end.</p>  |   |
| <p>Clear the screen.</p>   |   |

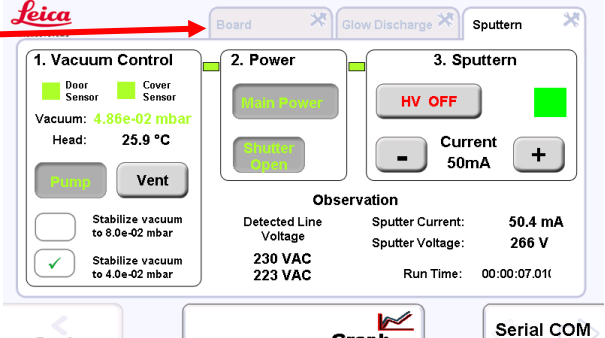
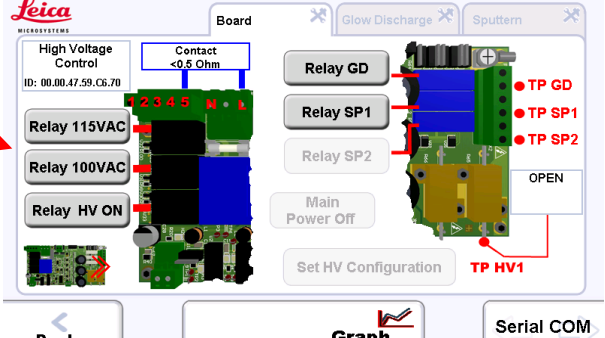
|  |  |
|--|--|
| <p><b>Stop</b> and <b>Start</b> the record of the graph</p>                                  |  |
| <p>Make screen shoots on a USB stick.<br/>If no USB stick is connected it gives a signal</p> |   |

**9.1.7 Sputter screen function description (High Voltage)**

|  |   |  |
|--|---|--|
| <p>Safety sensor indication</p>  | <p><input checked="" type="checkbox"/> Door Sensor <input checked="" type="checkbox"/> Cover Sensor</p> |    |
| <p>Actual chamber vacuum</p>   | <p>Vacuum: <b>3.40e-02 mbar</b></p>   |  |
| <p>Actual Sputter head temp. Note: switch off when temp. <b>65°C</b> reach</p> | <p>Head: <b>25.1 °C</b></p>   |  |
| <p>Activates Pump and Vent</p>   | <p><input type="button" value="Pump"/> <input type="button" value="Vent"/></p>                          |  |
| <p>Regulates Argon to <math>8.0 \times 10^{-2}</math> mbar</p>                 | <p><input type="checkbox"/> Stabilize vacuum to <math>8.0 \times 10^{-2}</math> mbar</p>                |  |
| <p>Regulates Argon to <math>4.0 \times 10^{-2}</math> mbar</p>                 | <p><input type="checkbox"/> Stabilize vacuum to <math>4.0 \times 10^{-2}</math> mbar</p>                |  |
| <p>To activate the <b>Main Power</b> enter a check mark in the box.</p>        | <p><input checked="" type="checkbox"/> Stabilize vacuum to <math>4.0 \times 10^{-2}</math> mbar</p>     |  |
| <p>Reached vacuum indication change from <b>red</b> to <b>green</b></p>        | <p><input checked="" type="checkbox"/> Stabilize vacuum to <math>4.0 \times 10^{-2}</math> mbar</p>     |  |
| <p>Connects mains voltage to the HV power supply</p>                           | <p><input type="button" value="Main Power"/></p>  |  |
| <p>Shutter Open / Close function</p>   | <p><input type="button" value="Shutter Open"/></p>  |  |
| <p>Indicates actual mains voltage to HV power supply</p>                       | <p>Detected Line Voltage<br/><b>230 VAC</b><br/><b>216 VAC</b></p>                                      |  |
| <p>High Voltage ON for sputtering</p>  | <p><input type="button" value="HV ON"/></p>   |  |
| <p>Sputter Current adjustment<br/>5 – 150 mA</p>                               | <p><input type="button" value="-"/> <b>Current 150mA</b> <input type="button" value="+"/></p>           |  |
| <p>Actual Sputter – Voltage and Current</p>                                    | <p>Sputter Current: <b>0.0 mA</b><br/>Sputter Voltage: <b>0 V</b></p>                                   |  |

|  |   |  |
|--|---|--|
| <p><b>HV OFF</b> show activated</p> <p>Current adjustable</p> <p>Show actual Current, Voltage and Time</p> |  <p><b>Current</b> 50mA</p> <p>Sputter Current: <b>50.4 mA</b></p> <p>Sputter Voltage: <b>266 V</b></p> <p>Run Time: 00:00:07.01</p> |  |
|  | <p>Sputter plasma</p>   |  |

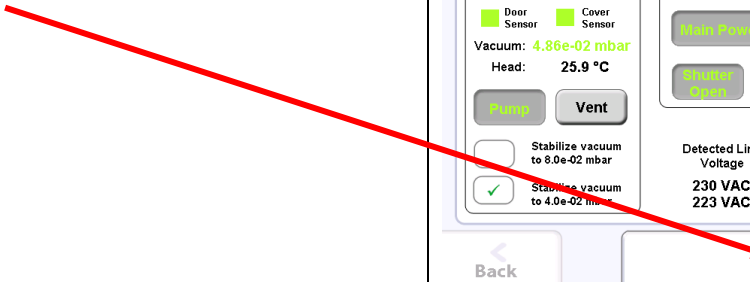
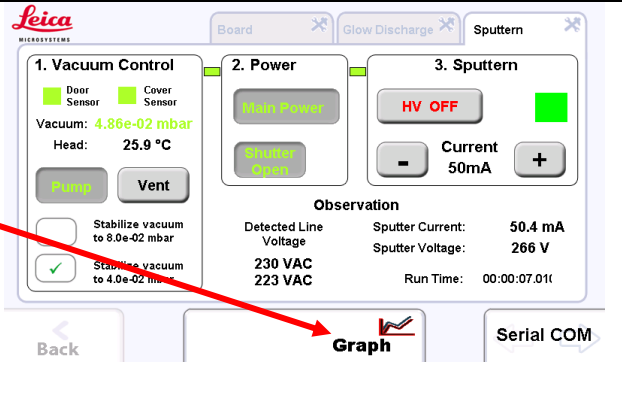
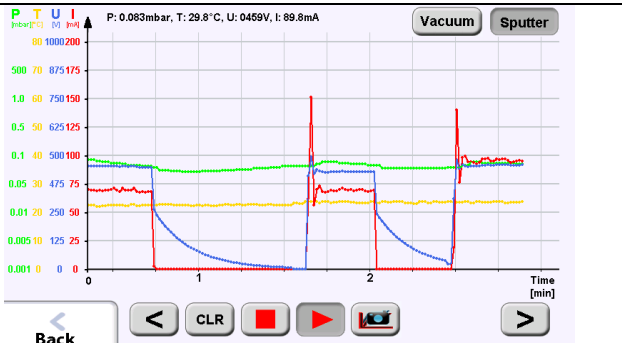
### 9.1.8 High Voltage board

|                                   |  |
|-----------------------------------|--|
| <p>Tab on <b>Board</b></p>        |  |
| <p>You can activate the Relay</p> |  |

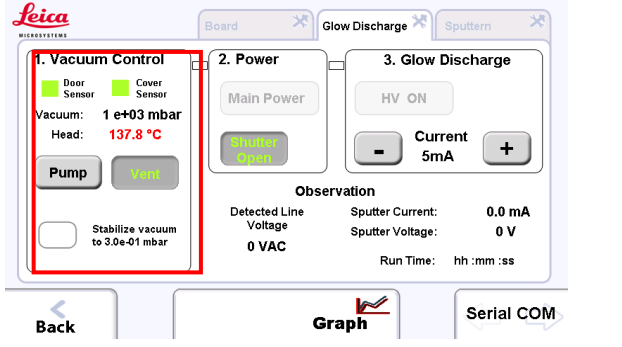
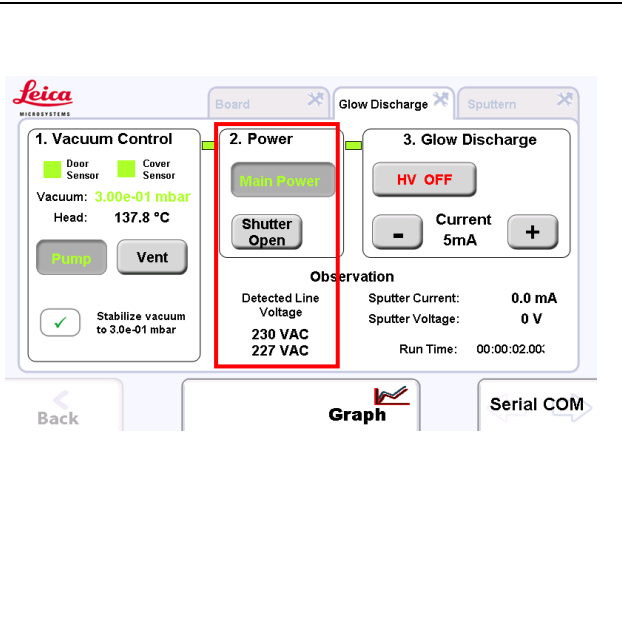



|   |  |
|---|--|
| <p>Activated <b>Relay115VAC</b> <span style="color: green;">■</span><br/>Show the point of measurement.</p> | <p>High Voltage Control<br/>ID: 00.00.47.69.07.70</p> <p>Contact &lt;0.5 Ohm</p> <p>1 2 3 4 5 N L</p> <p>Relay 115VAC</p> <p>Relay 100VAC</p> <p>Relay HV ON</p> |
| <p>Activated <b>Relay100VAC</b> <span style="color: green;">■</span><br/>Show the point of measurement</p>  | <p>High Voltage Control<br/>ID: 00.00.47.69.07.70</p> <p>Contact &lt;0.5 Ohm</p> <p>1 2 3 4 5 N L</p> <p>Relay 115VAC</p> <p>Relay 100VAC</p> <p>Relay HV ON</p> |
| <p>Activated <b>Relay HV ON</b> <span style="color: green;">■</span><br/>Show the point of measurement</p>  | <p>High Voltage Control<br/>ID: 00.00.47.69.07.70</p> <p>Contact &lt;0.5 Ohm</p> <p>1 2 3 4 5 N L</p> <p>Relay 115VAC</p> <p>Relay 100VAC</p> <p>Relay HV ON</p> |
| <p>Activated <b>Relay SP 1</b> <span style="color: green;">■</span><br/>Show the point of measurement</p>   | <p>Relay GD</p> <p>Relay SP1</p> <p>Relay SP2</p> <p>Main Power Off</p> <p>Set HV Configuration</p> <p>TP SP1</p> <p>Resistance ~56 Ohm</p> <p>TP HV1</p>        |

### 9.1.9 Sputter Vacuum – Current – Voltage graph

|   |  |
|---|--|
| <p>Tab on <b>Graph</b></p>      |  |
| <p>The Graph show the characteristics of <b>Vacuum</b>, <b>Temperature</b>, <b>Voltage</b> and <b>Current</b></p> |  |

### 9.1.10 Glow Discharge screen function description

|  |   |  |
|--|---|--|
| <p>Safety sensor indication</p>  | <p><input checked="" type="checkbox"/> Door Sensor <input checked="" type="checkbox"/> Cover Sensor</p>   |  |
| <p>Actual chamber vacuum</p>   | <p>Vacuum: <b>1 e+03 mbar</b></p>   |  |
| <p>Actual Sputter head temp.</p>   | <p>Head: <b>29.7 °C</b></p>   |  |
| <p>Activates Pump and Vent</p>   | <p><input type="button" value="Pump"/> <input type="button" value="Vent"/></p>  |  |
| <p>Regulates air flow to 5.0x10<sup>-1</sup>mbar</p>                             | <p><input type="checkbox"/> Stabilize vacuum to 3.0e-01 mbar</p>  |  |
| <p>Note: only with a stabilize vacuum you can activate the <b>Main Power</b></p> | <p><br/><input checked="" type="checkbox"/> Stabilize vacuum to 3.0e-01 mbar</p> |  |
| <p>Connects mains voltage to the HV power supply</p>                             | <p><input type="button" value="Main Power"/></p>  |  |
| <p>Indicates actual mains voltage to HV power supply</p>                         | <p>Detected Line Voltage<br/><b>230 VAC</b><br/><b>227 VAC</b></p>  |  |
| <p>Shutter Open / Close function</p>   | <p><input type="button" value="Shutter Open"/></p>  |  |

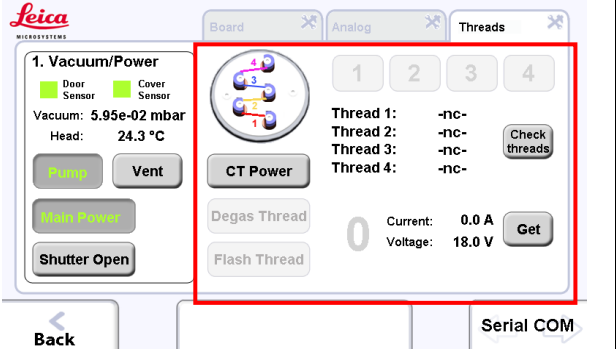
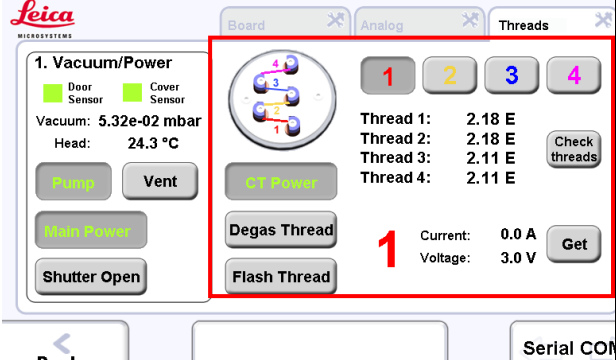
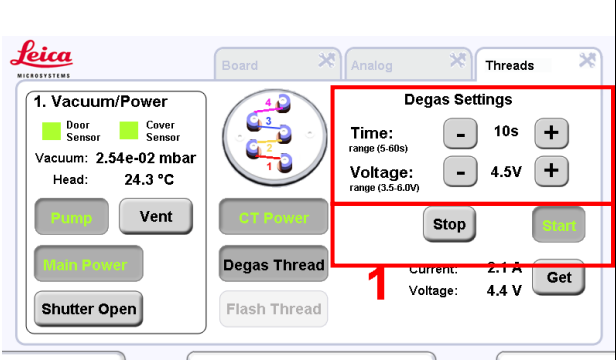
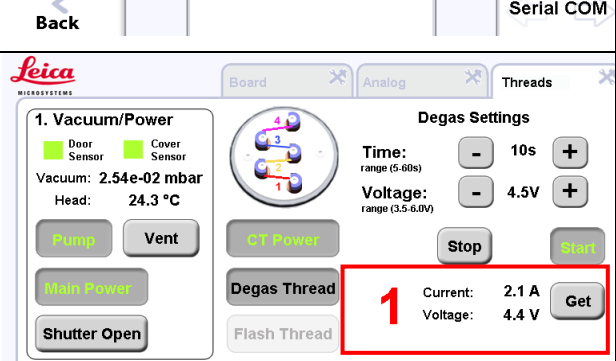
|   |   |  |
|---|---|--|
| High Voltage ON for glow discharge          | HV ON   |  |
| Glow discharge current adjustment 5 - 15 mA | Current 15mA                                    |  |
| Actual Current Indication                   | Sputter Current: 0.0 mA<br>Sputter Voltage: 0 V |  |
| High Voltage ON - Time                      | Run Time: 00:00:02.00                           |  |

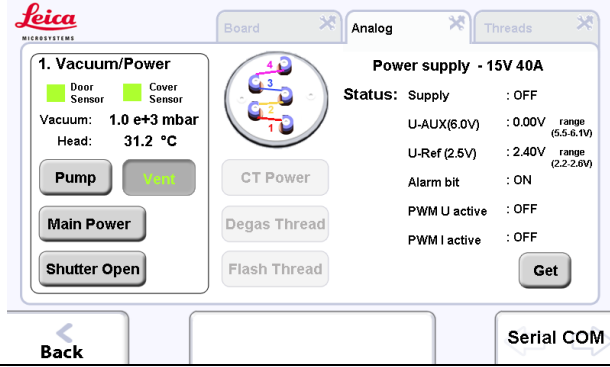

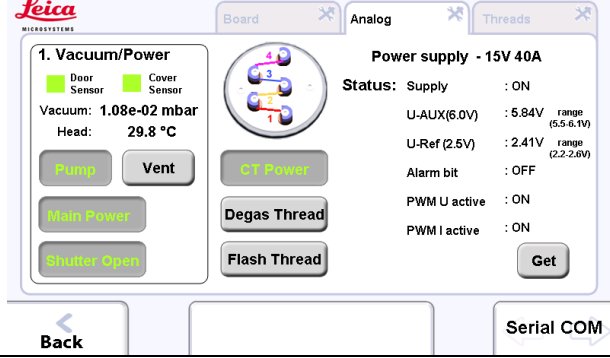

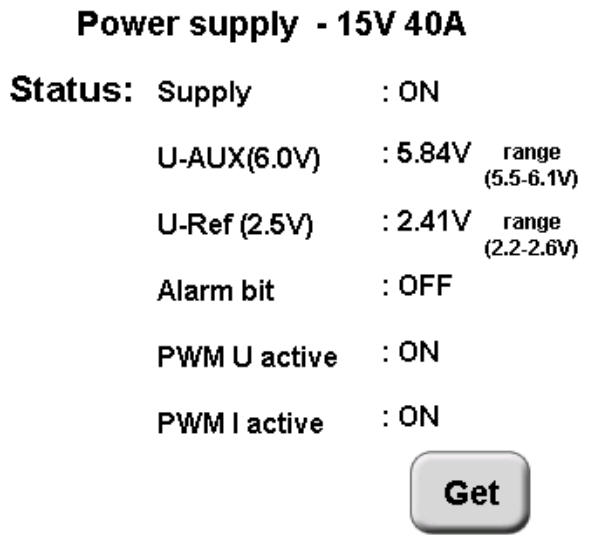
### 9.1.11 Glow Discharge Vacuum – Voltage - Current graph

|   |  |
|---|--|
| Tab on Graph  |  |
| The Graph show the characteristics of Vacuum, Voltage and Current |  |

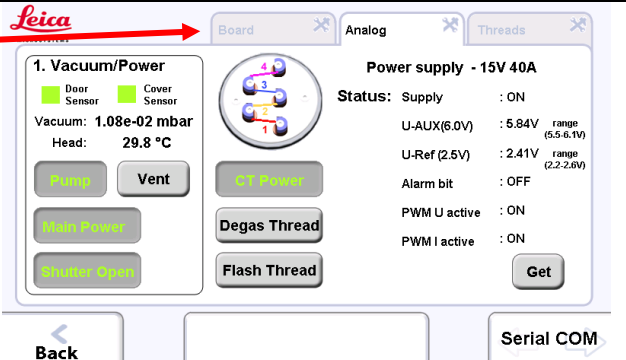
### 9.1.12 Carbon Thread screen function description

|  |  |
|--|--|
| Before you start with thread test activate the Main Power and the CT Power |  |
|--|--|

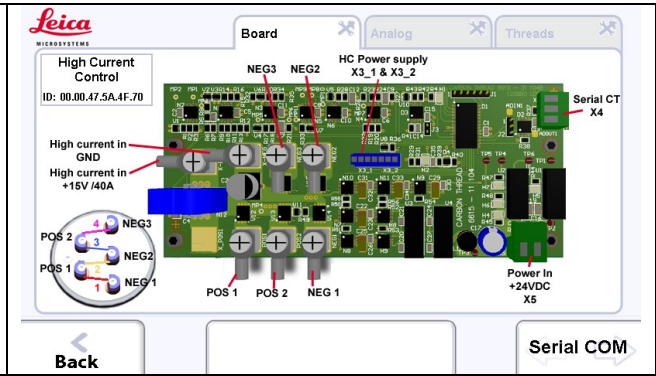
|   |   |  |
|---|---|--|
| Control Power ON / OFF                    | <b>CT Power</b>   |    |
| Measures resistance of the Thread         | <b>Check threads</b>  |  |
| Indicates Actual resistance               | <b>Thread 1: -nc-</b>                                       |  |
| Choose thread 1 to 4                      | <b>1</b>  |    |
| Activates Degas Settings                  | <b>Degas Thread</b>   |  |
| Activates Flash Settings                  | <b>Flash Thread</b>   |  |
| Degas ON time                             | <b>Time: - 10s +</b><br><small>range (5-60s)</small>        |   |
| Degas Voltage                             | <b>Voltage: - 4.5V +</b><br><small>range (3.5-6.0V)</small> |  |
| <b>Starts</b> thread degas                | <b>Start</b>  |  |
| <b>Stop</b> degas                         | <b>Stop</b>   |  |
| Refreshing for actual Current and Voltage | <b>Get</b>  |  |
| Current and Voltage indication            | <b>Current: 2.1 A</b><br><b>Voltage: 4.4 V</b>              |  |
|   |   |  |

|   |  |   |
|---|--|---|
| <p>Power supply value screen show the actual status of the power supply</p> |  |   |
| <p>Tab on <b>Main Power</b><br/>Tab on <b>CT Power</b></p>                  |   |   |
| <p>Tab on <b>Get</b><br/>Show the actual values.</p>                        |  |  |

9.1.13 Carbon Thread Control board

|                            |  |
|----------------------------|--|
| <p>Tab on <b>Board</b></p> |  |
|----------------------------|--|

Connections overview screen



# Chapter 10

# Adjustments & SW Update

## Version 1.0



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|                               |          |
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| <b>10.1 Adjustments</b> ..... | <b>3</b> |
| <b>10.2 SW-Update</b> .....   | <b>3</b> |
| 10.2.1 SW update .....        | 3        |

## 10.1 Adjustments

n.a.

## 10.2 SW-Update

### 10.2.1 SW update

The software update can be done in the user menu. In the menu "settings" you will find the update button. The new software should be on a USB data stick, and this data stick should be connected to the ACE USB port.



**Only the latest software version can be updated.**

If a zip file is sent via e.g. email, extract the file 'Leica.zip' on a stick to the root directory. Now the following folder structure should be seen:

<Drive>:\Leica\ACExxx update ...

Connect the stick to the USB connector on the front side of the unit

|                        |  |
|------------------------|--|
| <p>Tab on Settings</p> |  |
| <p>Tab on Update</p>   |  |

Connect the USB stick.  
You can see in grey screen the current version

Icon for the USB stick indicate if connected or disconnected

| Software          | Part ID     | Current Version | New Version | Select updates |
|-------------------|-------------|-----------------|-------------|----------------|
| Operating System  | xxxx xx-xxx | 01.01.01        | -           | No             |
| User Interface    | 6615 31-911 | 01.02.02        | -           | No             |
| Controller LO-Vac | 6615 31-906 | 01.02.02        | -           | No             |
| Controller        | n/a         | n/a             | -           | No             |
| Controller        | 6615 31-902 | 02.01.01        | n/a         | No             |

Connect service data stick to USB port.

0.0%

Back

New software is available it light up in black column new software.

Tab on yes to start the update.

| Software          | Part ID     | Current Version | New Version | Select updates |
|-------------------|-------------|-----------------|-------------|----------------|
| Operating System  | xxxx xx-xxx | 01.01.01        | n/a         | No             |
| User Interface    | 6615 31-911 | 01.02.02        | 01.02.03    | Yes            |
| Controller LO-Vac | 6615 31-906 | 01.02.02        | 01.02.02    | Yes            |
| Controller        | n/a         | n/a             | -           | No             |
| Controller        | 6615 31-902 | 02.01.01        | 02.01.01    | Yes            |

Choose Software and click "Update".

0.0%

Back

When a update is started this arrow show you the selected Part ID

You can track the update .The red bar moving from left to the right side

| Software          | Part ID     | Current Version | New Version | Select updates |
|-------------------|-------------|-----------------|-------------|----------------|
| Operating System  | xxxx xx-xxx | 01.01.01        | n/a         | No             |
| User Interface    | 6615 31-911 | 01.02.02        | 01.02.03    | Yes            |
| Controller LO-Vac | 6615 31-906 | 01.02.02        | 01.02.02    | Yes            |
| Controller        | n/a         | n/a             | -           | No             |
| Controller        | 6615 31-902 | 02.01.01        | 02.01.01    | Yes            |

Updating Controller 6615 31-906 ...

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Back
STOP Update

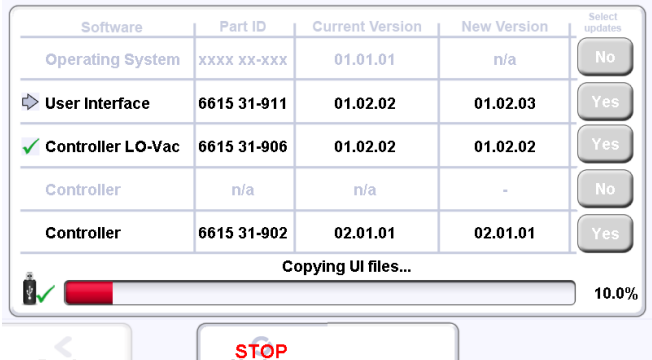
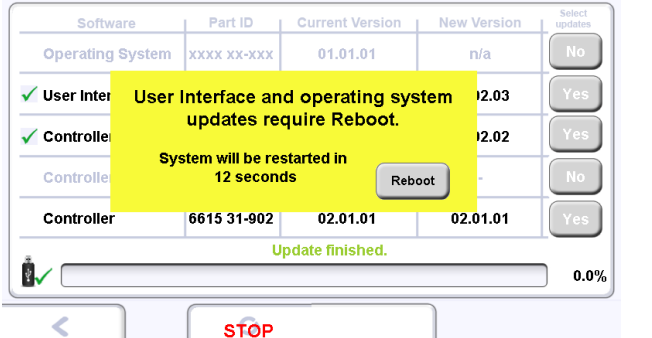
A green check mark and the hint update is finished show you a successful update

| Software          | Part ID     | Current Version | New Version | Select updates |
|-------------------|-------------|-----------------|-------------|----------------|
| Operating System  | xxxx xx-xxx | 01.01.01        | n/a         | No             |
| User Interface    | 6615 31-911 | 01.02.02        | 01.02.03    | Yes            |
| Controller LO-Vac | 6615 31-906 | 01.02.02        | 01.02.02    | Yes            |
| Controller        | n/a         | n/a             | -           | No             |
| Controller        | 6615 31-902 | 02.01.01        | 02.01.01    | Yes            |

Update finished.

0.0%

Back

| <p>If more updates are available the <b>User Interface</b> must be done as last step .</p>   |  <table border="1"> <thead> <tr> <th>Software</th> <th>Part ID</th> <th>Current Version</th> <th>New Version</th> <th>Select updates</th> </tr> </thead> <tbody> <tr> <td>Operating System</td> <td>xxxx xx-xxx</td> <td>01.01.01</td> <td>n/a</td> <td>No</td> </tr> <tr> <td>User Interface</td> <td>6615 31-911</td> <td>01.02.02</td> <td>01.02.03</td> <td>Yes</td> </tr> <tr> <td>Controller LO-Vac</td> <td>6615 31-906</td> <td>01.02.02</td> <td>01.02.02</td> <td>Yes</td> </tr> <tr> <td>Controller</td> <td>n/a</td> <td>n/a</td> <td>-</td> <td>No</td> </tr> <tr> <td>Controller</td> <td>6615 31-902</td> <td>02.01.01</td> <td>02.01.01</td> <td>Yes</td> </tr> </tbody> </table> <p>Copying UI files... 10.0%</p> <p>Back STOP Update</p> | Software        | Part ID     | Current Version | New Version | Select updates | Operating System | xxxx xx-xxx | 01.01.01 | n/a | No | User Interface | 6615 31-911 | 01.02.02 | 01.02.03 | Yes | Controller LO-Vac | 6615 31-906 | 01.02.02 | 01.02.02 | Yes | Controller | n/a | n/a | - | No | Controller | 6615 31-902 | 02.01.01 | 02.01.01 | Yes |
|--|--|-----------------|-------------|-----------------|-------------|----------------|------------------|-------------|----------|-----|----|----------------|-------------|----------|----------|-----|-------------------|-------------|----------|----------|-----|------------|-----|-----|---|----|------------|-------------|----------|----------|-----|
| Software   | Part ID  | Current Version | New Version | Select updates  |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Operating System   | xxxx xx-xxx  | 01.01.01        | n/a         | No              |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| User Interface   | 6615 31-911  | 01.02.02        | 01.02.03    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller LO-Vac  | 6615 31-906  | 01.02.02        | 01.02.02    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller   | n/a  | n/a             | -           | No              |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller   | 6615 31-902  | 02.01.01        | 02.01.01    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| <p>After finishing the User Interface need a reboot.</p> <p>The instrument will do a restart automatically.</p> <p>If the instrument not restart by himself please switch OFF and ON</p> |  <table border="1"> <thead> <tr> <th>Software</th> <th>Part ID</th> <th>Current Version</th> <th>New Version</th> <th>Select updates</th> </tr> </thead> <tbody> <tr> <td>Operating System</td> <td>xxxx xx-xxx</td> <td>01.01.01</td> <td>n/a</td> <td>No</td> </tr> <tr> <td>User Interface</td> <td>6615 31-911</td> <td>01.02.02</td> <td>01.02.03</td> <td>Yes</td> </tr> <tr> <td>Controller LO-Vac</td> <td>6615 31-906</td> <td>01.02.02</td> <td>01.02.02</td> <td>Yes</td> </tr> <tr> <td>Controller</td> <td>n/a</td> <td>n/a</td> <td>-</td> <td>No</td> </tr> <tr> <td>Controller</td> <td>6615 31-902</td> <td>02.01.01</td> <td>02.01.01</td> <td>Yes</td> </tr> </tbody> </table> <p>Update finished. 0.0%</p> <p>Back STOP Update</p>     | Software        | Part ID     | Current Version | New Version | Select updates | Operating System | xxxx xx-xxx | 01.01.01 | n/a | No | User Interface | 6615 31-911 | 01.02.02 | 01.02.03 | Yes | Controller LO-Vac | 6615 31-906 | 01.02.02 | 01.02.02 | Yes | Controller | n/a | n/a | - | No | Controller | 6615 31-902 | 02.01.01 | 02.01.01 | Yes |
| Software   | Part ID  | Current Version | New Version | Select updates  |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Operating System   | xxxx xx-xxx  | 01.01.01        | n/a         | No              |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| User Interface   | 6615 31-911  | 01.02.02        | 01.02.03    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller LO-Vac  | 6615 31-906  | 01.02.02        | 01.02.02    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller   | n/a  | n/a             | -           | No              |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |
| Controller   | 6615 31-902  | 02.01.01        | 02.01.01    | Yes             |             |                |                  |             |          |     |    |                |             |          |          |     |                   |             |          |          |     |            |     |     |   |    |            |             |          |          |     |

After the last software update change back to user screen.

# Chapter 11

# Spare parts & Tools

## Version 1.0

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## 11.1 Spare parts

### 11.1.1 ACE 200 CARBON THREAD Coater (16771580)

|     | Title                                      | Order number              |
|-----|--|---------------------------|
| 00  | Protection frame                           | 16771531811               |
| 01  | Glass for chamber door                     | 16771531809               |
| 02  | O-ring for chamber door                    | 16771531806               |
| 03  | Shutter shield + Shutter spring            | 16771531880 + 16771531408 |
| 04  | Touch screen panel                         | 16661561119               |
| 04a | USB Port (PSB)                             | 16661561102               |
| 05  | Carbon Thread evaporation flange complete  | 16771511111               |
| 06  | O-ring for evaporation flange chamber side | 16771531277               |
| 07  | Low Vacuum (PCB)                           | 16661561106               |
| 08  | Shaft seal for shutter                     | 16771531337               |
| 09  | Safety Sensor (door)                       | 16661561137               |
| 10  | Shutter Motor                              | 16302831106               |
| 11  | Power Supply HWS100/24                     | 16250040                  |
| 12  | Mains Voltage Outlet (for rotary pump)     | 16242014                  |
| 13  | Mains Voltage Inlet (Coater)               | 16241601                  |
| 13* | Mains Voltage Inlet (for rotary pump)      |                           |
| 14  | Safety Sensor (cover)                      | 16661561138               |
| 15  | Low Vacuum Gauge                           | 16771531815               |
| 16  | Mains Switch ON/OFF                        | 16250278                  |
| 17  | LAN Adapter (PCB)                          | 16661561110               |
| 18  | Mains Power Relay                          | 16250088                  |
| 18* | Mains Power Relay (for rotary pump)        |                           |
| 19  | Carbon Thread (PCB)                        | 16661561104               |
| 20  | Power Supply SWS600L-15 (Carbon Thread)    | 16250271                  |
| 21  | Venting Valve                              | 16771531832               |
| 22  | Shutter Sensor                             | 16661561134               |
| 23  | Over Current Protective Switch 10A         | 16250173                  |
|     | <b>Only for Version CT&amp;GD</b>          |                           |
|     | High Voltage Transformer CT & GD           | 16661531001               |
|     | High Voltage Control (PCB) for CT & GD     | 16661561301               |

### 11.1.2 ACE 200 SPUTTER Coater (16771582)

|    | Title                                  | Order number              |
|----|--|---------------------------|
| 00 | Protection frame                       | 16771531811               |
| 01 | Glass for chamber door                 | 16771531809               |
| 02 | O-ring for chamber door                | 16771531806               |
| 03 | Shutter shield + Shutter spring        | 16771531880 + 16771531408 |
| 04 | Touch screen panel                     | 16661561119               |
| 05 | Sputter flange complete                | 16771511110               |
| 06 | O-ring for flange chamber side         | 16771531277               |
| 07 | Low Vacuum (PCB)                       | 16661561106               |
| 08 | Shaft seal for shutter                 | 16771531337               |
| 09 | Safety Sensor (door)                   | 16661561137               |
| 10 | Shutter Motor                          | 16302831106               |
| 11 | Power Supply HWS100/24                 | 16250040                  |
| 12 | Mains Voltage Outlet (for rotary pump) | 16242014                  |



|     |   |             |
|-----|---|-------------|
| 13  | Mains Voltage Inlet (Coater)                            | 16241601    |
| 13* | Mains Voltage Inlet (for rotary pump)                   |             |
| 14  | Safety Sensor (cover)                                   | 16661561138 |
| 15  | Low Vacuum Gauge  | 16771531815 |
| 16  | Mains Switch ON/OFF                                     | 16250278    |
| 17  | LAN Adapter (PCB)                                       | 16661561110 |
| 18  | Mains Power Relay (Coater)                              | 16250088    |
| 18* | Mains Power Relay (for rotary pump)                     |             |
| 19  | High Voltage Control (PCB)<br>for SP / SP & GD / GD     | 16661561301 |
| 20  | Venting Valve   | 16771531832 |
| 21  | Control Valve (only for GD or SP)                       | 16771561813 |
| 21* | <b>additional:</b><br>Control Valve (only for GD or SP) | 16771561813 |
| 22  | Shutter Sensor  | 16661561134 |
| 23  | Throttle Value (only for GD or SP)                      | 16771531835 |
| 24  | High Voltage Transformer<br>SP / SP & GD / GD           | 16661531001 |
| 25  | Over Current Protective Switch 10A                      | 16250173    |

### 11.1.3 ACE 200 SPUTTER and CARBON THREAD Coater (16771584)

|     | Title   | Order number              |
|-----|---|---------------------------|
| 00  | Protection frame  | 16771531811               |
| 01  | Glass for chamber door  | 16771531809               |
| 02  | O-ring for chamber door                                       | 16771531806               |
| 03  | Shutter shield + Shutter spring                               | 16771531880 + 16771531408 |
| 04  | Touch screen panel  | 16661561119               |
| 05* | Carbon Thread evaporation flange complete                     | 16771511111               |
| 05* | Sputter flange complete                                       | 16771511110               |
| 06  | O-ring for flange chamber side                                | 16771531277               |
| 07  | Low Vacuum (PCB)  | 16661561106               |
| 08  | Shaft seal for shutter  | 16771531337               |
| 09  | Safety Sensor (door)  | 16661561137               |
| 10  | Shutter Motor   | 16302831106               |
| 11  | Power Supply HWS100/24  | 16250040                  |
| 12  | Mains Voltage Outlet (for rotary pump)                        | 16242014                  |
| 13  | Mains Voltage Inlet (Coater)                                  | 16241601                  |
| 13* | Mains Voltage Inlet (for rotary pump)                         |                           |
| 14  | Safety Sensor cover   | 16661561138               |
| 15  | Low Vacuum Gauge  | 16771531815               |
| 16  | Mains Switch ON/OFF   | 16250278                  |
| 17  | LAN Adapter (PCB)   | 16661561110               |
| 18  | Mains Power Relay (Coater)                                    | 16250088                  |
| 18* | Mains Power Relay (for rotary pump)                           |                           |
| 19  | High Voltage Control (PCB)<br>for SP / SP & GD / CT & GD / GD | 16661561301               |
| 20  | Venting Valve   | 16771531832               |
| 21  | Control Valve (only for GD or SP)                             | 16771511813               |
| 22  | Shutter Sensor  | 16661561134               |
| 23  | Throttle Value (only for GD or SP)                            | 16771531835               |
| 24  | High Voltage Transformer<br>for SP / SP & GD / CT & GD / GD   | 16661531001               |

|    |   |             |
|----|---|-------------|
| 25 | Over Current Protective Switch 10A      | 16250173    |
| 26 | Carbon Thread (PCB)                     | 16661561104 |
| 27 | Power Supply SWS600L-15 (Carbon Thread) | 16250271    |

### 11.1.4 Glow Discharge

|   | Title                 | Order number |
|---|-----------------------|--------------|
| 1 | GD connector complete | 16771561327  |
| 2 | connector spring      | 16771531884  |
| 3 | Electrode plate       | 16771531882  |

### 11.1.5 Carbon Thread Head

|   | Title                           | Order number |
|---|---------------------------------|--------------|
| a | Isolation shield (incl. screws) | 16771561002  |
| c | Feed through                    | 16771561001  |
|   |                                 |              |

### 11.1.6 Rotary Pump

|  | Title           | Order number |
|--|-----------------|--------------|
|  | Oil filter kit  | 16B801007153 |
|  | Rotary pump oil | 16ACE61002SP |

## 11.2 Tools

### 11.2.1 Tools

|  | Title                        | Order number |
|--|------------------------------|--------------|
|  | Scotch brite (red)           | 16LZ04790KN  |
|  | Wenol Metal Polishers P=100g | 16LZ02086KN  |
|  | Nylon Gloves "S"             | 16779931130  |
|  | Nylon Gloves "M"             | 16779931131  |
|  | Nylon Gloves "L"             | 16779931132  |
|  | Nylon Gloves "XL"            | 16779931133  |

# **Chapter 12**

# **Preventative Maintenance**

# **(PM)**

# **Version 1.0**

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Combination and SPUTTER Coater ..... 3  
(Order number PM Kit: 16ACE200CARBONM12)..... 3  
(Order number PM Kit: 16ACE200COMBIPM12)..... 3  
(Order number PM Kit: 16ACE200SPUTERM12)..... 3

## 12.1 Preventative Maintenance

### 12.1.1 Checklist Preventative Maintenance- EM ACE 200 CARBON Thread, Combination and SPUTTER Coater

(Order number PM Kit: 16ACE200CARBONM12)

(Order number PM Kit: 16ACE200COMBIPM12)

(Order number PM Kit: 16ACE200SPUTERM12)



#### Security Measures during Maintenance and Cleaning

Maintenance work on this instrument should only be carried out by a qualified Leica trained engineer!

| Customer                      |   |             |           |   |         | Date         |
|-------------------------------|---|-------------|-----------|---|---------|--------------|
| Engineer                      |   |             |           |   |         |              |
| Instrument Type (catalog no.) |   |             |           |   |         |              |
| Serial Number                 |   |             |           |   |         |              |
| Job Sheet or ETR no.          |   |             |           |   |         |              |
| Item                          | Task  | See Chapter | All Month | Wear / Spare Parts Required / Information   | Reading | FSE Comments |
| 1                             | Test ran of the instrument to get overview of the unit condition before starting the service work | 4           | 12        | <ul style="list-style-type: none"> <li>- Check pumping time until <math>2 \times 10^{-2}</math> mbar</li> <li>- Activate stepwise all available process like sputtering, glow discharge and carbon thread evap. as a function test. As soon as each process goes on, it can be switched off again.</li> </ul> |         |              |

|    |  |   |    |   |  |  |
|----|--|---|----|---|--|--|
| 2  | Clean Chamber door glass   | 6 | 12 | <i>Use Wenzol Metal Polishers or equal</i>                  |  |  |
| 3  | Clean Sample stage   | 6 | 12 | <i>Use Sand paper or sand blasting unit</i>                 |  |  |
| 4  | Clean protection frame   | 6 | 12 | Use scotch brite  |  |  |
| 5  | Clean quartz crystal head  | 6 | 12 | Use scotch brite 16LZ04790KN                                |  |  |
| 6  | Clean shutter  | 6 | 12 | <i>Use Sand paper or sand blasting unit</i>                 |  |  |
| 7  | Exchange O-ring for chamber door   | 6 | 12 | 16771531806   |  |  |
| 8  | Exchange O-ring for flange chamber side  | 6 | 12 | 2 x 16771531277   |  |  |
| 9  | Exchange carbon thread <sup>1</sup> evap. Flange Isolation shield and the 5 screws from the Feed troughs | 6 | 12 | Isolation shield (incl. screws)<br>16771561002              |  |  |
| 10 | Clean sputter flange <sup>2</sup>  | 6 | 12 | Use scotch brite  |  |  |
| 11 | Exchange vacuum oil and the oil filter of the Rotary pump  | 8 | 12 | Rotary pump oil 16ACE61002SP<br>oil filter kit 16B801007153 |  |  |
| 12 | Pre testing of the Pump down time  | 4 | 12 |   |  |  |
| 13 | Final Function Test after PM   | 4 | 12 |   |  |  |

**Comments**

Total expenditure of working time: ca. 3-4 hours, depending on system status.

<sup>1</sup> only by CARBON Thread or "Combi" configuration

<sup>2</sup> only by SPUTTER configuration

# Chapter 13

# Trouble shooting

## Version 1.0



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## 13.1 Error Codes List

### 13.1.1 Main Board Controller

|       |   |                                |
|-------|---|--------------------------------|
| E1001 | Shutter motor not connected                 | Check connections              |
| E1003 | Shutter motor end switch not found          | See 13.2.1                     |
| E1004 | Shutter motor blocked                       | See 13.2.2                     |
| E1006 | Shutter motor sensor blocked in ON position | See 13.2.1                     |
| E1011 | COM connection to display missing           | See 7.1.1 to check connections |
| E1012 | Safety switch not closed                    | See 13.2.2                     |
| E1013 | Safety switch not closed                    | See 13.2.2                     |
| E1014 | Safety switch not closed                    | See 13.2.2                     |
| E1015 | Pump Timeout                                | See 13.2.3                     |
| E1016 | Process terminated                          | See 13.2.4                     |
| E1018 | Process terminated                          | See 13.2.4                     |
| E1019 | Process terminated                          | See 13.2.4                     |

### 13.1.2 Sputter / Glow discharge Controller

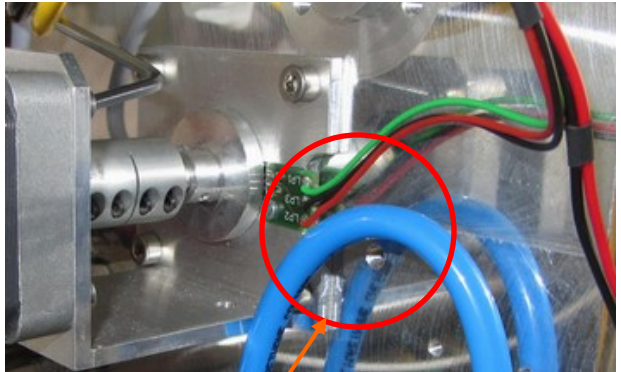
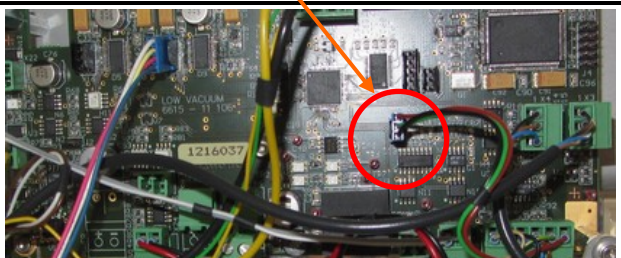
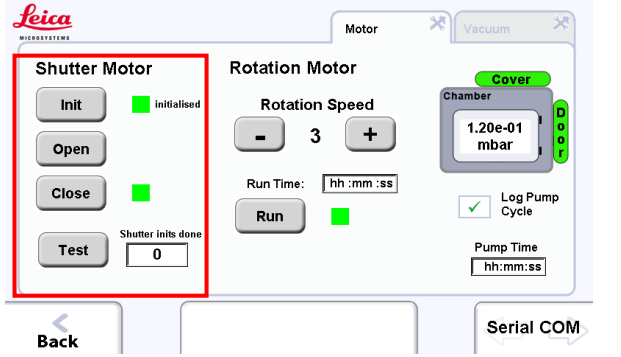
|       |  |                       |
|-------|--|-----------------------|
| E2001 | Mains voltage to HV-power supply missing   | Check door switch     |
| E2002 | Mains voltage to HV-power supply < 85 VAC  | See 13.2.4            |
| E2003 | Mains voltage to HV-power supply < 210 VAC | See 13.2.4            |
| E2004 | Mains voltage to HV-power supply > 250 VAC | See 13.2.4            |
| E2005 | HV connection to sputter head missing      | See 13.2.5            |
| E2007 | Mains voltage unstable                     | See 13.2.6            |
| E2009 | Sputter head short circuit                 | See 6.1.4.2           |
| E2010 | No plasma                                  | See 13.2.7            |
| E2011 | Plasma unstable                            | See 13.2.7            |
| E2012 | High Voltage fault                         | Change power supply   |
| E2015 | Sputter head not connected                 | See 13.2.8            |
| E2016 | Head over temperature > 65°C               |                       |
| E2017 | No deposition during sputtering            | Check QSG and shutter |

### 13.1.3 Carbon thread evap. Controller

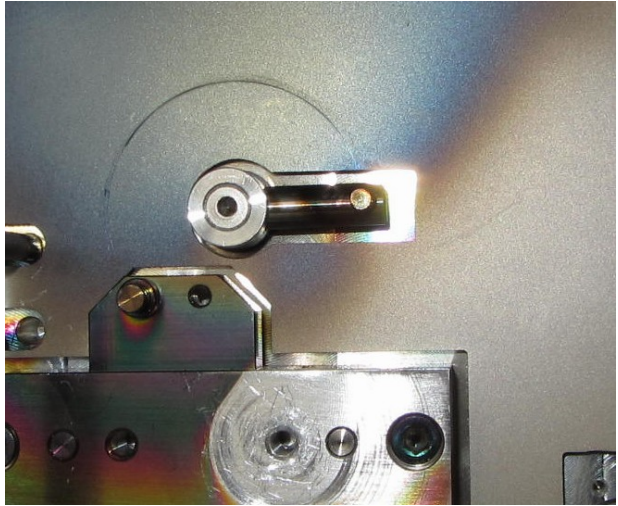
|       |                                |  |
|-------|--------------------------------|--|
| E4001 | No threads available           |  |
| E4002 | All threads exhausted          |  |
| E4003 | Number of flashes not possible | Reduce flash number or install new threads |
| E4009 | Head over temperature > 65°C   |  |
| E4011 | Mains voltage missing          | Check door switch                          |
| E4012 | Mains relay not on             | Check door switch                          |
| E4015 | Evaporation head not connected | Detected by temp. sensor                   |

## 13.2 Trouble shooting

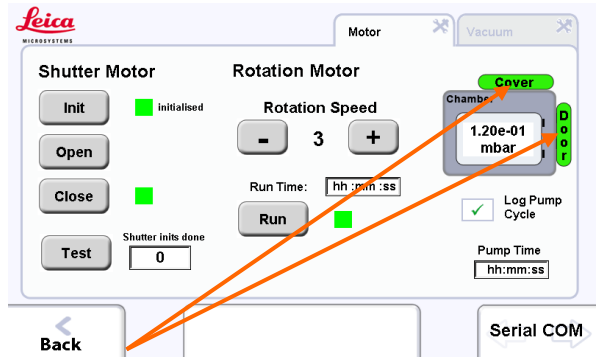
### 13.2.1 E1003 , E1006 Shutter motor

|  |  |
|--|--|
| <p><b>E1003</b> Shutter motor end switch not found</p> <p><b>E1006</b> Shutter motor sensor blocked in ON position</p> |  |
| <p style="text-align: center;"><b>Cause</b></p>  | <p style="text-align: center;"><b>Elimination</b></p>  |
| <p>Sensor wire disconnected</p>  | <div style="text-align: center;">  <p>Check sensor wire connections</p>  </div> |
| <p style="text-align: center;">Sensor defect</p>   | <p style="text-align: center;">Exchange sensor with cable</p>  |
| <p>For shutter motor test use service page "Motor"</p>   |    |


13.2.2 Error1004 Shutter motor

| Trouble                                |  |
|--|--|
| <b>Error1004 Shutter motor blocked</b> |  |
| Cause                                  | Elimination  |
| Motor shaft mechanically blocked       |  <p>Remove motor shaft to find the blockage<br/>See also instruction 6.1.2.3</p> |
| Stepper motor blocked                  | <p>Remove stepper motor. See 6.1.2.3<br/>Correct working stepper motor shaft can be smoothly rotated by hand .If not, exchange motor.</p>                          |

13.2.2 Safety switch Error

| Trouble   |  |
|---|--|
| <b>E1012 Safety switch not closed</b><br><b>E1013 Safety switch not closed</b><br><b>E1014 Safety switch not closed</b> |  |
| Cause   | Elimination  |
| One of the safety switches not closed or defect.  |  <p>Green colour indicates “closed”<br/>Go into service to check indication<br/>If needed ,exchange switch</p> |
| Safety switch not connected   | See diagram at 7.1.1 to check connections  |

13.2.3 E1015 Pump Timeout

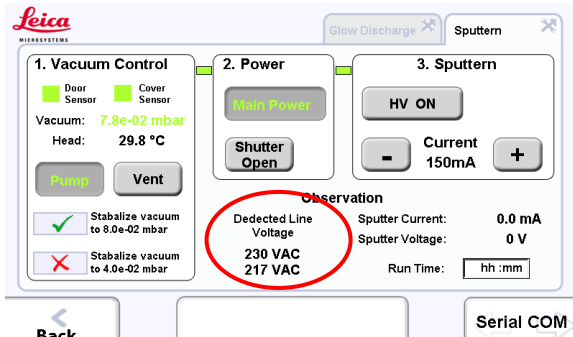
| Trouble   |   |
|---|---|
| <b>E1015 Pump Timeout</b>                       |   |
| Cause   | Elimination   |
| Pump not connected                              | Connect pump mains cable to ACE200 backplane  |
| Mains switch on rotary pump is switched off     | Switch on the mains switch  |
| Fuse at ACE200 backplane for rotary pump is off |  <p>Push in the fuse and check pumping again</p> |
| Pump motor defect                               | Exchange pump   |
| Pump creates no vacuum                          | Send pump for repair or exchange it   |
| Vacuum leak                                     | Find leak   |

13.2.4 E1016 , E1018 , E1019 Process terminated

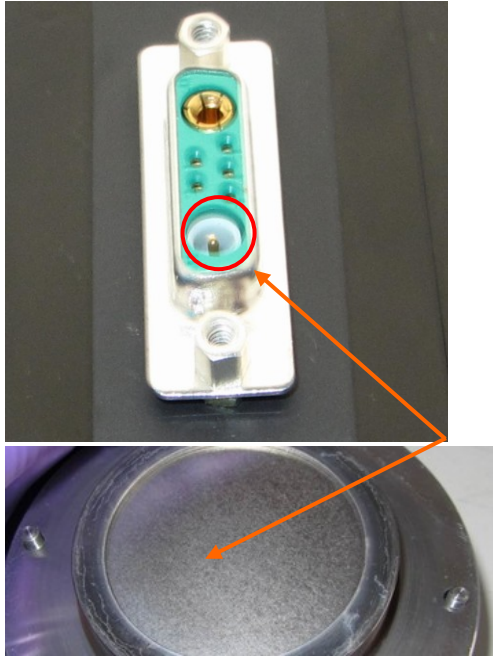
| Trouble  |   |
|--|---|
| <b>E1016</b>   |   |
| Cause  | Elimination   |
| Could not regulate argon flow to correct process value within 7 minutes. | <ul style="list-style-type: none"> <li>- Check Argon cylinder pressure (0,5 bar)</li> <li>- Check argon regulation valve (see 7.1.8 and 9.1.3)</li> </ul> |
| Trouble  |   |
| <b>E1018</b>   |   |
| Cause  | Elimination   |

| Evaporation flange cover was opened during process      | Close cover and restart         |
|---|---------------------------------|
| Trouble   |                                 |
| <b>E1019</b>  |                                 |
| Cause   | Elimination                     |
| Chamber door locking handle was unlocked during process | Lock handle and restart process |

13.2.5 E2002 , E2003 , E2004 Mains Voltage

| Trouble  |   |
|--|---|
| <p><b>E2002</b> Mains voltage to HV-power supply &lt; 85 VAC<br/> <b>E2003</b> Mains voltage to HV-power supply &lt; 210 VAC<br/> <b>E2004</b> Mains voltage to HV-power supply &gt; 250 VAC</p> |   |
| Cause  | Elimination   |
| Missing mains contact  | Check all mains contacts following to the mains wiring diagram on 7.1.2   |
| Safety switch not closed   | See 13.2.2  |
| Test   |  <p>To test the mains voltage:</p> <ol style="list-style-type: none"> <li>1.) Pump chamber to <math>5 \times 10^{-2}</math> mbar</li> <li>2.) Press <b>Main Power</b></li> <li>3.) Check Detected Line Voltage</li> </ol> |

13.2.6 E2005 Sputter head

| Trouble   |  |
|---|--|
| E2005 HV connection to sputter head missing         |  |
| Cause   | Elimination  |
| Missing wire contact to sputter head                | Check High voltage cable using wiring diagram 7.1.6  |
| Missing high voltage contact on sputter head inside |  <p>Check connection between HV pin<br/>And magnet housing of the sputter head using<br/>an Ohmmeter, correct resistance :&lt; 0,5 Ohm<br/>When resistance higher ,disassemble sputter<br/>head 6.1.4.2</p> |

13.2.7 E2007 Mains voltage unstable

| Trouble                            |   |
|------------------------------------|---|
| E2007 Mains voltage unstable       |   |
| Cause                              | Elimination   |
| Voltage from unit outside unstable | Check voltage with a Voltmeter                              |
| Bad mains connection unit inside   | See diagram at 7.1.2 to check and measure mains connections |



## 13.2.8 E2010 , E2011 Sputter plasma error

| Trouble                                  |  |
|--|--|
| E2010 No Plasma<br>E2011 Plasma unstable |  |
| Cause                                    | Elimination  |
| Low purity of the argon gas              | Purge argon line to the unit                       |
| Sputter head magnetron damaged by heat   | See <b>6.1.4.2</b> for exchanging of the magnetron |

## 13.2.9 E2015, Sputter head not connected

| Trouble  |   |
|--|---|
| E2015 Sputter head not connected                               |   |
| Cause  | Elimination   |
| Missing wire contact for sputter head<br>Temp.sensor detection | Check wire contacts to pin1 and pin 2 ,see diagram <b>7.1.6</b>           |
| PT 1000 temperature sensor defect                              | Exchange sensor ,see <b>6.1.4.2</b> for disassembling of the sputter head |

## Decontamination Certificate

Dear Customer,

Any product that is to be returned to Leica Microsystems or serviced on site, must be cleaned and decontaminated in the appropriate manner. Since it is not possible to decontaminate for prion diseases, such as CJD, BSE, CWD etc., equipment exposed to specimens containing prion diseases cannot be returned to Leica Microsystems for repair. On-site repair of prion-contaminated equipment will only be conducted after the Field Service Engineer has been educated in the risks, instructed in the policies and procedures of the institution and provided with personal protective equipment.

This certificate, when completed, must be placed in the instrument box and attached to the outside of the shipping crate or handed directly to the service engineer. Packages will not be opened nor servicing commenced until the company or service engineer have received a completed certificate. Should returned goods be considered a hazard by the Company, they will be returned immediately to the customer at his/her expense.

Name/Model

Serial. No.

Quantity

Yes

No

This equipment has been exposed internally or externally to hazardous materials.

If **no**, please sign and ship.

If **yes**, please answer questions from 1-2 as indicated below.

1

Yes

No

This equipment has been in contact with:  
Unfixed biological samples such as blood, body fluids etc.

If **yes**, please provide further details:

---

Yes

No

Pathological samples

If **yes**, please provide further details:

---

Yes

No

Other biohazards

If **yes**, please provide further details:

---

Yes

No

Chemicals/substances hazardous to health

If **yes**, please provide further details:

---

# Living up to Life



**Yes**  **No**

Other hazards

**If yes, please provide further details:**

---

**Yes**  **No**

Radioactive materials

**If yes, please provide further details:**

---

**2**

**Yes**  **No**

This equipment has been cleaned and decontaminated:

**If yes, please give details of the method:** \_\_\_\_\_

**If no\*, please indicate why not::** \_\_\_\_\_

(\* Such equipment must not be returned without the written agreement of Leica Microsystems)

## Important - to avoid refusal of shipment:

Place one copy in the instrument box prior to packing or hand it over to the service engineer. Customer assumes all responsibility for the immediate return shipment of articles sent to Leica without proper decontamination documentation. If you have any further questions, please call your local Leica organization.

**Leica Internal Use:** If applicable, note corresponding Job and RAN-/RGA-Number:

Job Sheet No.: \_\_\_\_\_ BU Return Authorization Number: \_\_\_\_\_ SU Return Goods Authorization: \_\_\_\_\_

**Signature/Date**

**Name**

**Position**

**eMail**

**Institute**

**Department**

**Address**

**Phone**

**Facsimile**