BALZERS

OPERATING INSTRUCTIONS

Sputter Coater SCD 040

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1. APPLICATION

Specimens whose surfaces are to be examined in the scanning electron microscope must either be electrically conductive themselves or coated with an electrically conductive film. This is necessary to prevent image distorting electrical charges from building up on the specimen surface as well as to achieve better secondary electron emission which is important for the formation of an image.

The sputter coating method is also suited for this purpose in addition to the conventional high vacuum evaporation method. Sputtering is particularly suited for specimen surfaces which contain a variety of different structures. The SCD 040 allows the specimen surface to be sputter coated with a suitable metal as well as evaporation coated with a thin carbon film, using an appropriate accessory device, so that it is made electrically conductive.

2. DESCRIPTION OF FUNCTION

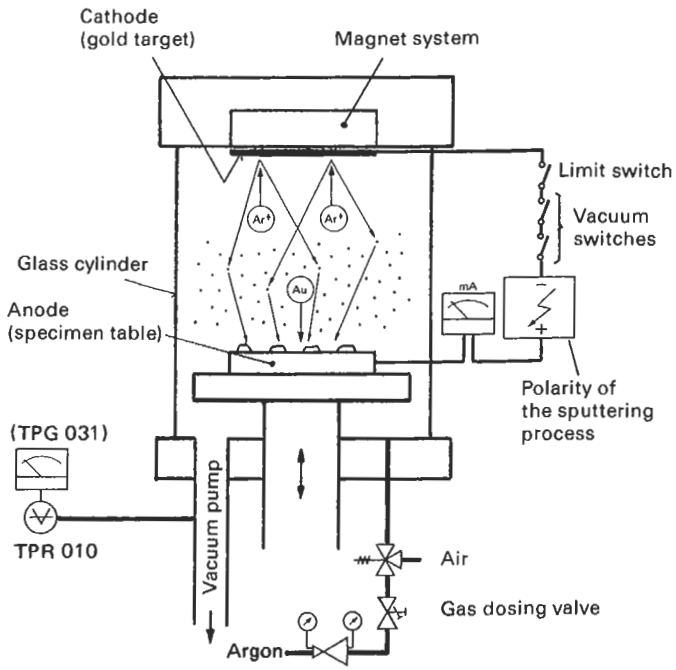


Fig. 1 Basic principle of the sputtering process

A pressure of approx. 0.05 mbar is established in an evacuated specimen chamber by admitting gas (preferably argon) through a dosing valve. Then a glow discharge is ignited between the specimen table (anode) and the sputtering target (cathode) when a high voltage is applied. The positively charged argon gas ions accelerated to the cathode as a result of this process knock metal atoms off the sputtering target when they hit it. The metal atoms thus released and the numerous gas molecules in the process chamber collide frequently, and the metal atoms are thus widely scattered. A diffuse "cloud" of metal atoms forms, from which atoms settle more or less uniformly onto the surrounding surfaces, including the surface of the specimen. This process forms a homogeneous, thin metal film even on very fissured surfaces that has sufficient electrically conductive properties for examination in the scanning electron micrsocope. The thickness of this metal film is dependent on the target material as well as on the working distance, the gas pressure, the glow discharge current and the duration of the process. In practical application, the selection of parameters also depend on the heat resistance of the specimen to be coated. Thus, as long a working distance as possible will be selected for temperature sensitive specimens together with a low glow discharge voltage and a longer sputtering time.

3. DESCRIPTION OF THE INSTRUMENT

3.1 Scope of the delivery

The following are included in the scope of the delivery for the SCD 040:

- Unit housing with operating and display panel:
  Specimen chamber base with built-in specimen table, motor-adjustable, water-cooled;
  Hinged, water cooled sputtering head with target holder and rotary-symmetrical magnet system;
  Electronics module with high voltage supply for sputtering and etching, as well as measurement, control and monitoring electronics for operating the unit;
  Manually operated gas dosing valve;
  Automatically controlled venting valve;
  Vacuum measurement equipment as well as a safety system with two vacuum switches and forcibly activated disconnect switch.
- Glass cylinder, inner diam. 108 mm, height 106 mm.
- Set of accessories and tools

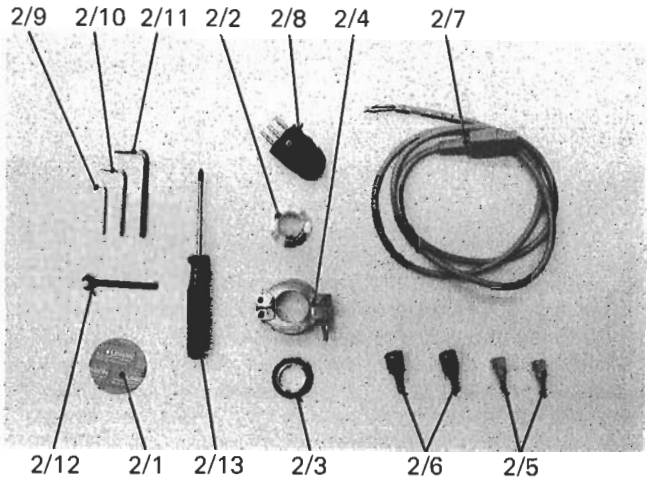


Fig. 2 Set of accessories

2/1 Gold target
2/2 Hose nipple DN 25 KF – 28
2/3 DN 25 KF seal
2/4 DN 25 KF clamping ring
2/5 Hose nipple ø 6 comp.
2/6 Hose nipple ø 8 comp.
2/7 Mains power cable
2/8 Recepticle 2 L + G
2/9 Hexagonal socket screw wrench 1/16"
2/10 Hexagonal socket screw wrench 3 mm
2/11 Hexagonal socket screw wrench 5 mm
2/12 Fork wrench SW 6
2/13 Philips screwdriver

3.2 Front view of unit

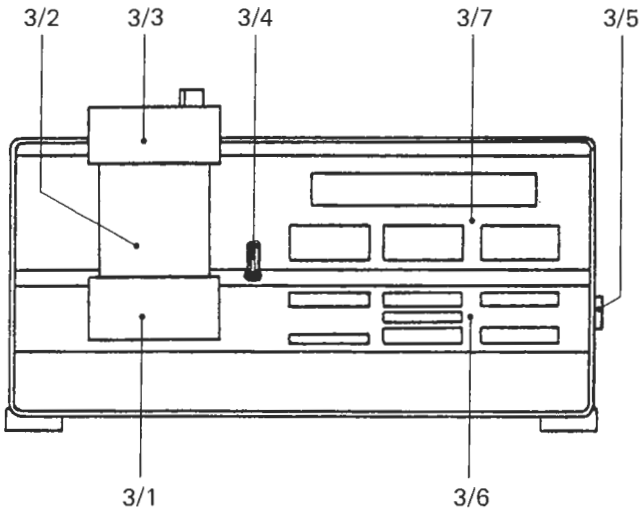


Fig. 3 Front view of unit

3/1 Specimen chamber base
3/2 Glass cylinder
3/3 Sputtering head
3/4 Gas dosing valve
3/5 Mains power switch
3/6 Operating panel
3/7 Display panel

3.3 Specimen chamber

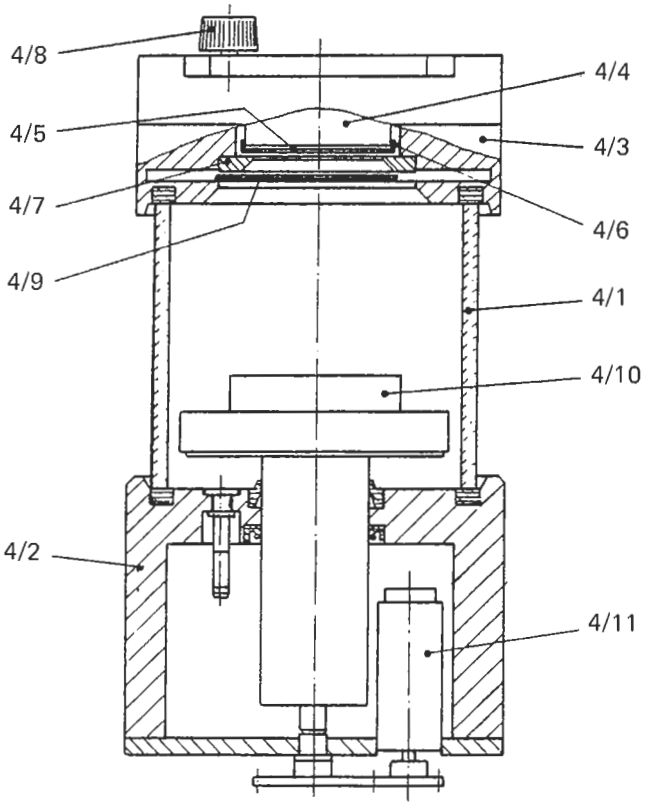


Fig. 4 Specimen chamber

4/1 Glass cylinder
4/2 Specimen chamber base
4/3 Sputtering head
4/4 Magnet system
4/5 Sputtering target
4/6 Target holder ring
4/7 Anode ring
4/8 Activation button for shutter
4/9 Shutter
4/10 Specimen table
4/11 Drive motor for table adjustment

3.4 Operating panel

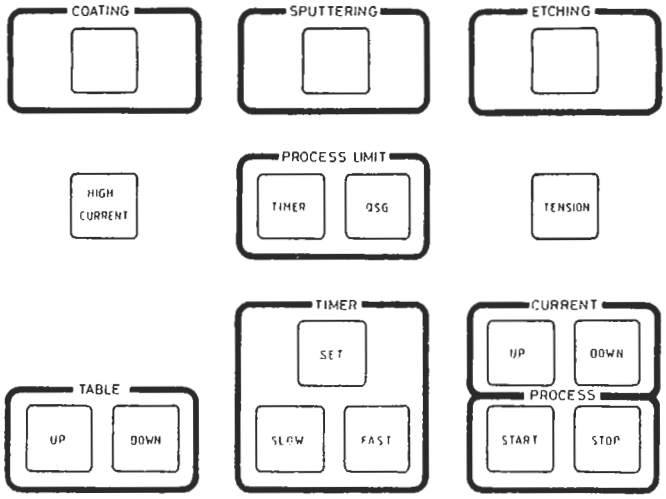


Fig. 5 View of the operating panel

The operating panel contains the following switches:

COATING		Process selection for evaporation (the evaporator is an accessory)
SPUTTERING		Process selection for sputtering
ETCHING		Process selection for etching
HIGH CURRENT		Pushbutton for full evaporator power (only for the COATING process)
PROCESS LIMIT	TIMER	Selection switch for ending the process after the preselected process duration has elapsed
	QSG	Selection switch for ending the process when the desired film thickness has been reached
TENSION		Switch from current to voltage display (only as long as the key remains down)
TABLE	UP	Table is moved up
	DOWN	Table is moved down
TIMER	SET	Button for process duration entry, operated simultaneously with either the SLOW or FAST button. Tapping the SET button for reversing the program direction e.g. from UP to DOWN (Display with illuminated arrow)
	SLOW	Modification of the time entry, approx. 1 second per second
	FAST	Modification of the time entry, approx. 1 minute per second
CURRENT	UP	Button for increasing the voltage or the value of the current displayed (only possible when the red STOP button is flashing!)
	DOWN	Button for decreasing the voltage or the value of the current displayed (only possible when the red STOP button is flashing!)

PROCESS	START	Button for activating the PROCESS LIMIT for automatically ending the process when the preprogramed time has elapsed or when the preprogrammed film thickness has been reached.
	STOP	When the unit is turned on the red STOP button lights: Current or voltage control is not yet possible. Once the STOP button has been pushed, it flashes: current or voltage can now be selected using the CURRENT button. Processes in progress can be stopped at any time by pushing the STOP button.

3.5 Display panel

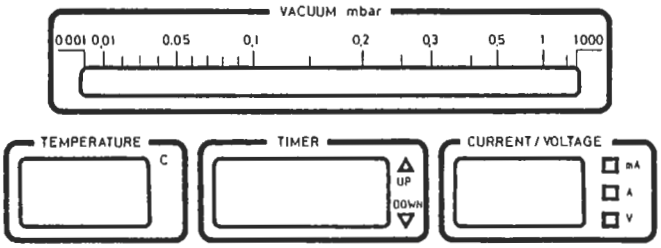


Fig. 6 View of the display panel

The display panel contains the following display instruments:

VACUUM	Displays the vacuum in the working chamber (the vacuum display must stop flashing before the process selection can be made).
TEMPERATURE	Displays the specimen table temperature: minimum value that can be displayed is –9.9 °C.
TIMER	Display of the process duration in minutes (1st and 2nd figure) and seconds (3rd and 4th figure); Maximum time that can be displayed: 59 minutes 59 seconds. When the TIMER process limit has been selected, the timer runs backwards from the time value entered. When the QSG process limit has been chosen, the timer counts forward from zero (stop-watch function). The TIMER display starts operating when the START button is pushed.
CURRENT/ VOLTAGE	for SPUTTERING process, display in mA/V; Maximum value 999 mA/ 999 V DC, full scale. for ETCHING process, display in mA/V; Maximum value 999 mA DC/999 V DC, full scale. for COATING process, display in A/V; Maximum value 99.9 A AC/99.9 V AC, full scale. EEE (error) is displayed when the maximum values are exceeded.

3.6 Back view of the unit

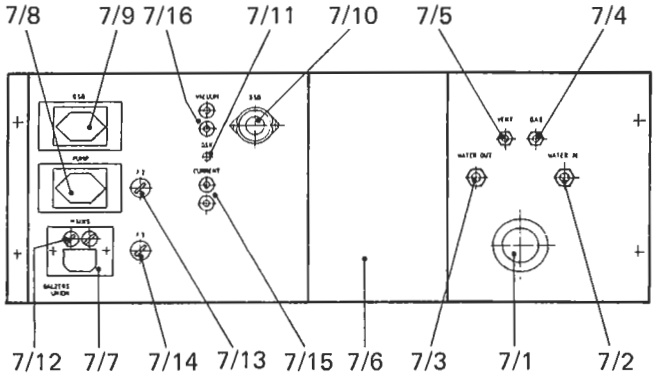


Fig. 7 Back view of the unit

7/1 DN 25 KF or ø 28 mm vacuum connection
7/2 WATER IN G1/4" or ø 8 mm cooling water inlet
7/3 WATER OUT G1/4" or ø 8 mm cooling water outlet
7/4 G1/8" or ø 6 mm GAS connection
7/5 G1/8" or ø 6 mm VENT connection
7/6 Space for a high current supply (accessory)

Electronics module:

7/7 Mains power connection
7/8 Vacuum pump recepticle
7/9 QSG 301 film thickness monitor recepticle
7/10 Connection for the QSG 301 report
7/11 Connection from the crystal holder to the QSG 301
7/12 Main fuse F1 (8 A slow blowing)
7/13 Fuse for vacuum pump, F2 (6.3 A slow blowing)
7/14 Fuse for the high voltage supply, F3
(1.25 A slow blowing for 220 V)
(2.5 A slow blowing for 115 V)
7/15 Recorder connection for current/voltage (0 – 10 V)
7/16 Recorder connection for vacuum (0 – 10 V)

3.7 Electronics module

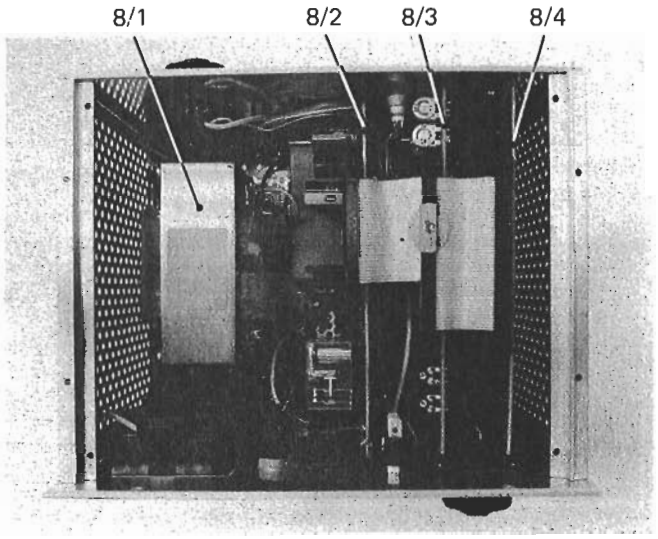


Fig. 8 Electronics module, view from the top with cover panel removed

8/1 High voltage transformer
8/2 Power pc board
8/3 Analog pc board
8/4 Logic pc board

The electronics module, mounted in the unit housing from the back, contains the high voltage supply (650 V AC) for both the sputtering and cathode etching processes as well as the electronics for the measurement, control and monitoring devices. These are on three plug-in pc boards as follows:

Power pc board as the power supply for the unit,

Analog pc board for the vacuum measurement, current and voltage measurement, specimen table adjustment and the switch-over to sputtering, etching and evaporation,

Logic pc board for monitoring the processes and for the safety system.

Caution: The electronics module may only be opened by properly trained specialists.

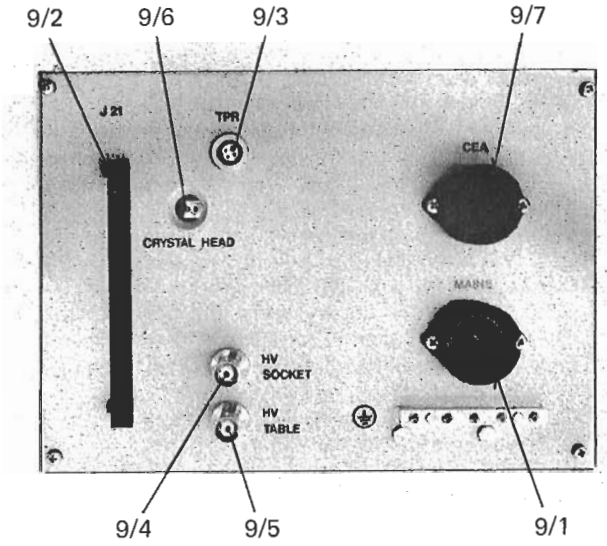


Fig. 9 Electronics module, back panel

9/1 Mains power connection
9/2 Recepticle for operation panel connection
9/3 Connection for the vacuum gauge head
9/4 High voltage connection for the sputtering head
9/5 High voltage connection for the specimen table
9/6 Plug connection for the crystal head
9/7 Recepticle for connection of the CEA 040 high current supply (accessory)

Refer to Fig. 7 for the arrangement of the connection elements and fuses on the front panel of the electronics module.

3.8 Safety and monitoring system

The high voltage parts in the unit are contact-protected by a safety circuit consisting of two mutually monitoring vacuum switches, a separation switch on the sputter head holder, and a TPR 010 medium vacuum gauge head. In addition, the unit is appropriately grounded according to technical regulations.

The SPUTTERING and ETCHING processes can only be carried out when the sputtering head is in the down position i.e. closed, and when the working chamber has been evacuated. In contrast, the COATING process can also be carried out when the sputtering head is up i.e. open.

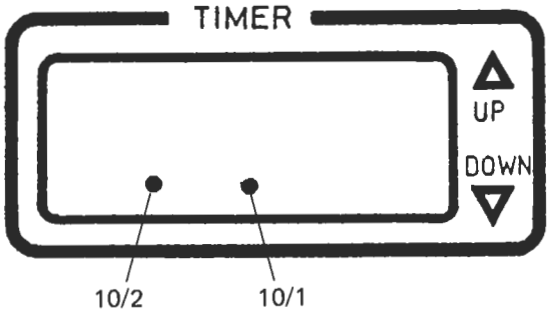


Fig. 10 Unit monitor

10/1 Flashing dot for the safety circuit
10/2 Flashing dot for the film thickness monitor

The appearance of the 10/1 flashing dot in the TIMER display indicates that the vacuum switches are not closed i.e. the working chamber is not evacuated, the sputtering head holder has not reached its open or closed position or that the safety disconnect switch for the sputtering head holder is defective, not closed, or its wiring defective.

The appearance of the 10/2 flashing dot in the TIMER display indicates that the report cable to the film thickness monitor is defective or not connected.

When the LED in the vacuum display flashes in the coarse vacuum range, it indicates that the vacuum necessary to allow the selection of a work process has not yet been reached (set at approx. 0.2 mbar).

When the vacuum display flashes at 0.001 mbar, a defect in the medium vacuum gauge head or a break in its connection cable is indicated.

4. TECHNICAL DATA

Dimensions

Unit:	
Width	490 mm
Depth	510 mm
Height	325 mm
Glass cylinder:	
Diameter	108 mm
Height	106 mm
Specimen table:	
Diameter	65 mm
Sputtering target:	
Diameter	54 mm
Working distance:	
minimum	40 mm
maximum	72 mm
Weight	30 kg

Connections

Electrical connection:	
Voltage (L+N+G)	220 V or 115 V
Frequency	50 Hz or 60 Hz
Power consumption	
without vacuum pump	170 VA
with DUO 004 B	600 VA
Main fuse	8 AT
Mains outlet	
for vacuum pump	220 V, 50 Hz or 115 V, 60 Hz
for film thickness measurement unit	220 V, 50 Hz or 115 V, 60 Hz
Recorder outputs	
for vacuum	0 – 10 V
for sputtering current/voltage	0 – 10 V
Cooling water connection:	
Pressure (above atmosphere)	1 – 4 bar
Input temperature	12 – 15 °C
Throughput	0.45 l/min
Connection, hose nipple	ø 8 mm
Operating gas (argon):	
Pressure (above atmosphere)	1 – 2 bar
Consumption	0.3 mbar l/s
Connection, hose nipple	ø 6 mm
Vacuum connection:	
Connection flange	DN 25 KF
or hose nipple	ø 28 mm
Venting connection:	
Hose nipple	ø 6 mm

Operational data

Sputtering power:	
maximum	650 V, 200 mA
Glow discharge current:	
maximum	200 mA
Sputtering rate:	
for gold, at a distance of 35 mm in an argon atmosphere	12 nm/min at 15 mA
Pumping time:	
to 5 x 10^{-2} mbar, with a two-stage rotary vane pump, 4 m^3/h pumping speed	approx. 2 min

5. INSTALLATION

5.1 Setting up

The SCD 040 sputter coater can be set up on an ordinary laboratory bench without any special fixation. Connections for the vacuum pump, cooling water, the operating gas (argon), and mains power are necessary for operating the unit.

5.2 Connecting the vacuum pump

A two-stage rotary vane pump with a pumping speed of at least 4 m^3/h is recommended as the vacuum pump (refer to Section 10 "ACCESSORIES"). To prevent vibrations from the pump being transferred to the sputtering unit, we recommend placing the vacuum pump on the floor. Take care nevertheless that the vacuum line is as short as possible to avoid longer pump-down times. The vacuum line is connected to the back of the unit with a small flange connection (7/1). This connection can also be fitted with a transition piece with hose nipple (ø 28) for the connection of a flexible line. The transition piece with hose nipple, seal and clamping ring are supplied as part of the accessories for the unit (2/2, 2/3, and 2/4). The exhaust line must be conducted either into an appropriate exhaust line or outdoors. If this is not possible, we recommend installing an oil mist filter (refer to Section 10 "ACESSORIES").

The power connection is made at the recepticle marked PUMP (7/8) on the back of the unit (protective ground on the middle pin). It is protected with a 6.3 A slow blowing fuse. If the vacuum pump used draws more current than this, we recommend using a switching unit with a contactor and connection cables (see Section 10 "ACCESSORIES").

5.3 Connecting the cooling water

The cooling water connection for the specimen table and the target holder is made with a flexible line to the ø 8 mm hose nipples to be mounted on the back of the unit. These nipples and the SERTO couplings necessary for the connection are included in the accessories (2/6). They are connected to the G1/4" pipe couplings WATER IN (7/2) and WATER OUT (7/3) connections.

5.4 Connecting the operating gas

The gas supply line is connected to the GAS coupling (Item 7/4) on the back panel of the unit. The hose nipple (2/5, ø 6 mm) included in the accessories must be mounted first. An appropriate pressure hose must be used for connection to the gas bottle. Argon is usually used as the operating gas, and it must be 99.5% pure. Argon gas in a pressure bottle must be purchased from a local supplier. The line from the gas bottle to the sputtering unit must run through a pressure reducing valve set to 1 to 1.5 bar above atmosphere.

Caution: To avoid accidents, the operating gas bottle must be properly secured so that it cannot tip over

5.5 Venting connection

We recommend venting the process chamber with dry air or an appropriate inert gas (such as nitrogen) to prevent long pumpdown times the next time the chamber is evacuated. The hose nipple (2/5, ø 6 mm) must be mounted on the VENT screw coupling (7/5) on the back of the unit. A flexible hose is attached to the hose nipple.

5.6 Power connection

The accessory set contains a 1.5 m cable (2/7) with an appropriate apparatus plug. This cable is for the mains power connection. The connectorless end of this cable must be fitted with a mains power connector (L+N+G) appropriate for local sockets.

Wire colors:

brown	Live
blue	Neutral
green/yellow	Protective ground

The apparatus end of the cable is connected to the connection (7/7) on the back of the unit.

5.7 Connecting the QSG 301 film thickness monitor

The cable integrated in the QSG 301 quartz crystal film thickness measurement device (accessory) is connected to the CRYSTAL HEAD (9/6) connection on the back of the electronics module. To make this connection, the electronics module must be removed after the upper and lower fixation screws have been unscrewed. The cable from the QSG 301 is plugged into the QSK recepticle (7/11) on the back of the SCD 040. An oscillator must be integrated in this cable. The cable for the switch-off command from the QSG 301 to the SCD 040 is connected to the QSG recepticle (7/10) on the SCD 040.

6. START-UP

Before beginning actual use of this unit, we recommend running through all its functions both to test them and to gain practical experience in their operation.

6.1 Mounting the sputtering target

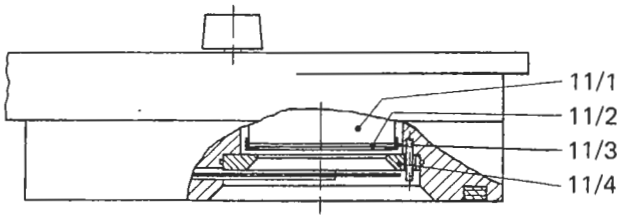


Fig. 11 Sputtering head

11/1 Ring magnet
11/2 Sputtering target
11/3 Target holder ring
11/4 Anode ring

Open the sputtering head. Remove the anode ring (11/4) held in position with a ball catch and pull the target holder ring (11/3) off the ring magnet (11/1).

Place the sputtering target (11/2) into the holder ring (11/3) and put the ring back on the ring magnet.

Put the anode ring (11/4) back in its initial position (note guide pin).

6.2 Adjusting the working distance

The working distance is primarily chosen according to the heat resistance of the specimen to be coated. The distance is farther for heat sensitive specimens, and the sputtering time is correspondingly longer. The sputtering source can be closer to heat insensitive specimens and the sputtering time is correspondingly shorter (refer to sputtering time diagram in Section 7.1).

The specimen table is positioned using the TABLE UP and DOWN button on the operating panel. To protect the drive motor, the table should only be adjusted when the specimen chamber is not evacuated i.e. in vented condition. Because the TABLE buttons are only enabled when the unit is on, and the vacuum pump begins to run as soon as the unit is turned on, the pump must be allowed to pump at atmospheric pressure for a short time, or its connection cable must be disconnected from the socket (7/8) while the table is being adjusted.

6.3 Mounting the specimen

The specimens should first be affixed to the appropriate SEM specimen carrier with silver print or some other appropriate solid or liquid adhesive. Then place the carrier in the bores provided for it in the specimen table. We recommend using the special tweezers listed in Section 10 "ACCESSORIES" for making this transfer.

Larger specimens can be placed directly on the specimen table for coating. With this method, however, lighter specimens may be in danger of being blown off the table when the specimen chamber is vented. To prevent this, a hose pinched with a hose clamp can be attached to the venting connection (Item 7/5). This can then be used to dose the air vented into the chamber after the unit has been turned off.

6.4 Mounting the glass cylinder

Before mounting the glass cylinder, check the specimen chamber base seal for contamination, and clean with a lint-free cloth drenched in alcohol if necessary. The glass cylinder itself must be absolutely clean, particularly its sealing surfaces and must therefore also be checked and cleaned if necessary.

Contaminants on the sealing surface lengthen the evacuation time or in certain cases make it impossible to achieve the required working vacuum.

6.5 Evacuating the specimen chamber

After the glass cylinder has been mounted, the specimen chamber is closed by lowering the sputtering head. Check that the sputtering head is well seated on the sealing surface of the glass cylinder.

Turn the unit on from power switch (3/5). The vacuum pump will start to run. The specimen chamber is evacuated to < 0.05 mbar; the pressure display is located on the display panel. The working pressure necessary for the process is adjusted from the gas dosing valve (3/4) (the gas dosing valve is located to the right of the specimen chamber base in the units with serial numbers 718 to 818).

6.6 Venting the specimen chamber

The specimen chamber is vented automatically when the unit is turned off from the power switch (3/5).

7. OPERATING THE UNIT

7.1 Sputtering with the sputtering time control

How to calculate the achievable film thickness of the sputter coated metal film as a function of the working distance (see Section 6.2), the sputtering time, and the sputtering current see sputtering time diagram in Figs. 12 to 20:

- Prepare the unit as described in Sections 6.1 to 6.4.
- Turn on the water cooling.
- Open the cut-off valve for the operating gas bottle (also refer to Section 5.4).
- Turn the unit on from power switch (3/5):
  The vacuum pump will start to run,
  The solenoid venting valve closes,
  The PROCESS LIMIT switches to TIMER, and the TIMER button lights,
  PROCESS switches to STOP-Mode I, and the STOP button lights,
  The VACUUM mbar display appears.
  The TEMPERATURE for the table is displayed.

  TIMER display goes to zero
  The arrow for the DOWN programming direction lights,
  The CURRENT/VOLTAGE current display goes to zero (slight deviations from zero are possible).
- Press the SPUTTERING process selector:
  The SPUTTERING button flashes, a "beep" is sounded (the vacuum display must stop flashing before the process selection is enabled).
- The process selected by pressing the SPUTTERING button is acknowledged. The SPUTTERING button lights, the beeping stops.
- Change the programming direction for the TIMER to UP by pushing the SET button.
- Enter the desired sputtering time by simultaneously pushing the SET and either the FAST or SLOW buttons.
- Evacuate the process chamber to < 0.05 mbar.
- Establish the working pressure at approx. 0.05 mbar by admitting the operating gas (argon) through the gas dosing valve.
- Close the shutter on the sputtering head:
  Set activation button (4/8) at the red mark (if there are difficulties with ignition, open the shutter briefly).
- Push the STOP button:
  The PROCESS switches to STOP-mode II,
  STOP button flashes,
  Voltage or current selection CURRENT (TENSION) is enabled (when the TENSION button is pushed, an idle voltage of 130 — 140 V is displayed).
- Set the sputtering current at the desired value by pushing the CURRENT UP/DOWN buttons (refer to sputtering diagram):
  The current display starts changing approx. 10 seconds after the CURRENT UP button has been pushed, because it takes that long to reach the voltage level necessary for the ignition. The current display changes in jumps of 2 to 3 mA.
- Open the shutter (green mark) after the sputtering current has been adjusted and then push the START button:
  The START button flashes, PROCESS LIMIT is switched on which means that the TIMER sputtering time control is activated. The STOP button goes out. The time display starts running backwards to zero, beginning with the process duration entered on the TIMER.
- The sputtering process is stopped automatically when the preselected sputtering time has elapsed:
  START button goes out,
  The STOP button lights (STOP-mode I),
  The CURRENT/VOLTAGE display goes to zero,
  The TIMER display is on zero because the process has run through.
- Close gas dosing valve.
- Turn the unit off from the power switch:
  Vacuum pump stops,
  Solenoid venting valve opens to vent the specimen chamber, all displays go out.
- Turn off the cooling water to prevent condensation on the specimen table and sputtering target.
- Close the cut-off valve on the operating gas bottle.

Important: The values given in the sputtering diagrams in the following section are very much dependent on the working pressure and particularly on the working distance to the sputtering target. They are only applicable for argon gas.

The working distance is understood as the distance between the sputtering target and the surface of the specimen to be coated.

In calculating this, the distance from the target to the surface of the seal in the sputtering head is 17 mm. If the working distance is to be set at 50 mm, the surface of the specimen to be coated must thus be 33 mm from the edge of the glass cylinder.

When the above-mentioned operating conditions are held to, the required film thickness (as a function of the sputtering current and sputtering time) is largely reproducible.

However, for exact measurement of the sputtered-on film, we recommend the use of a quartz crystal film thickness monitor (refer to Section 10 "ACCESSORIES").

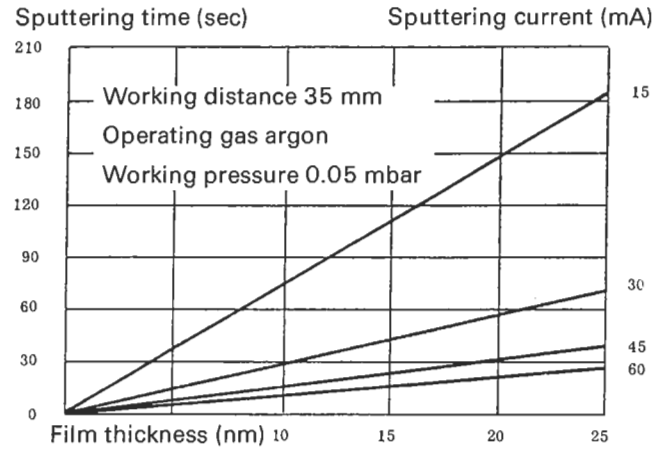
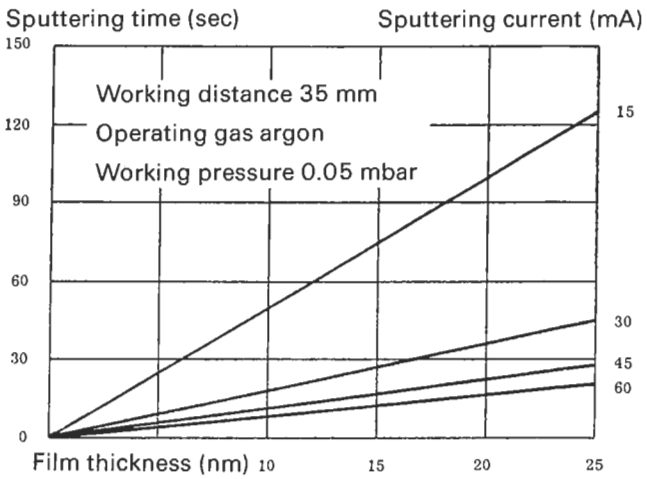


Fig. 12 Sputtering time diagram for silver



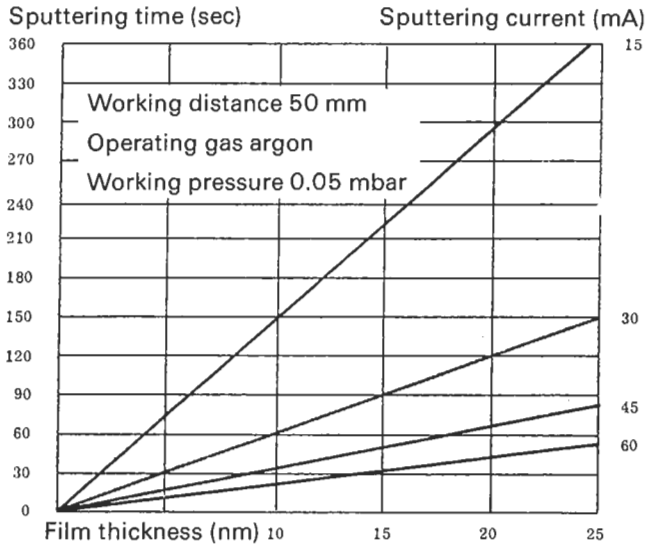
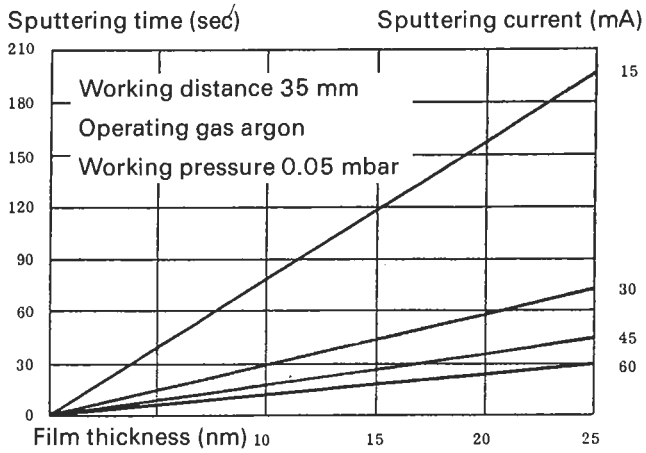
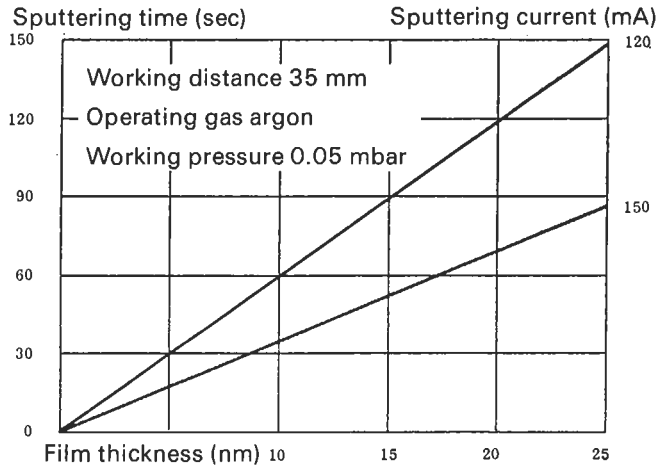
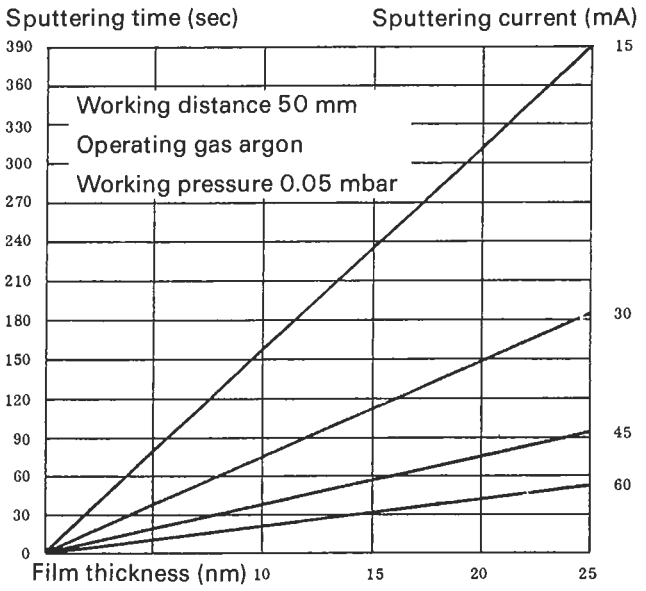


Fig. 13 Sputtering time diagram for gold







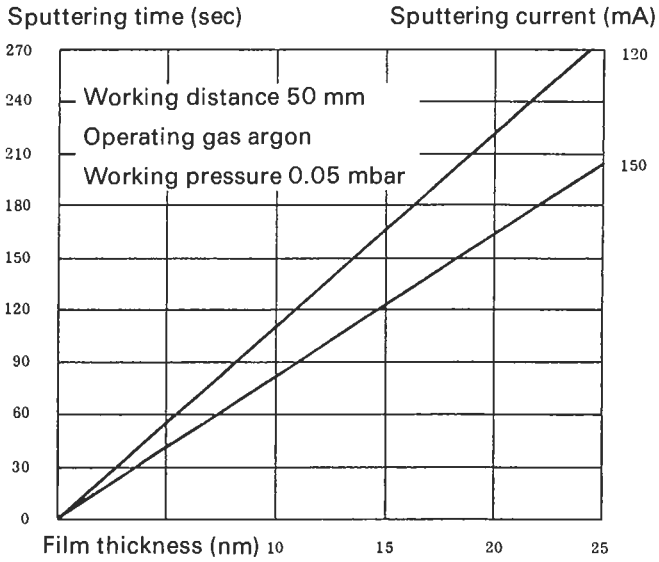
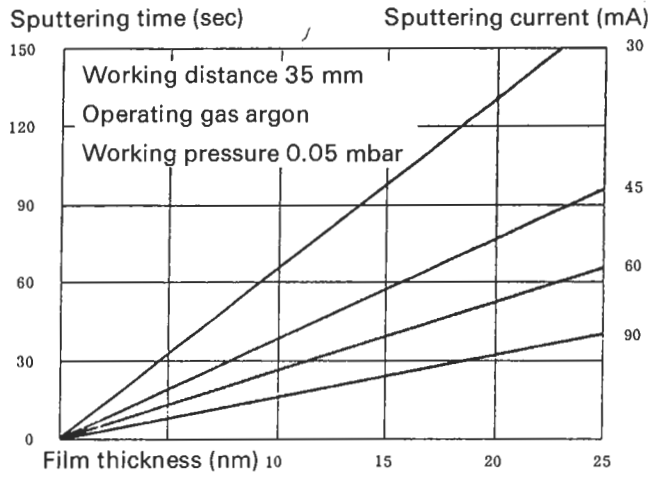
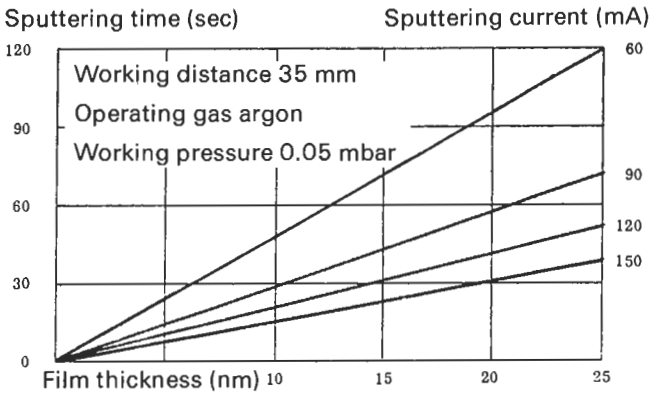


Fig. 14 Sputtering time diagram for gold/palladium (80/20)

Fig. 15 Sputtering time diagram for chrome





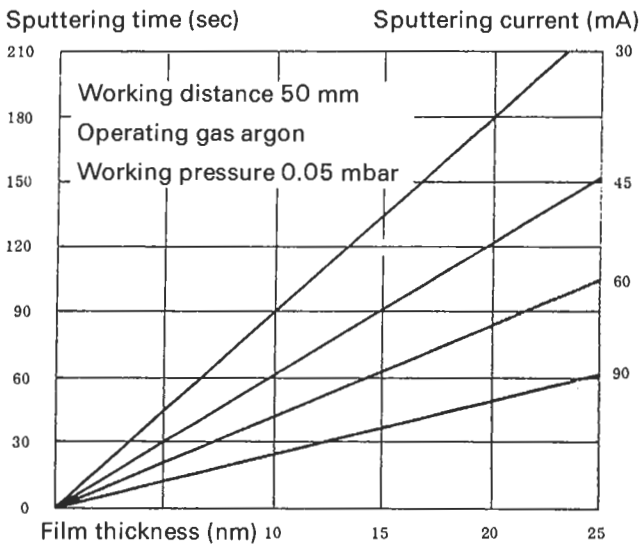


Fig. 16 Sputtering time diagram for copper

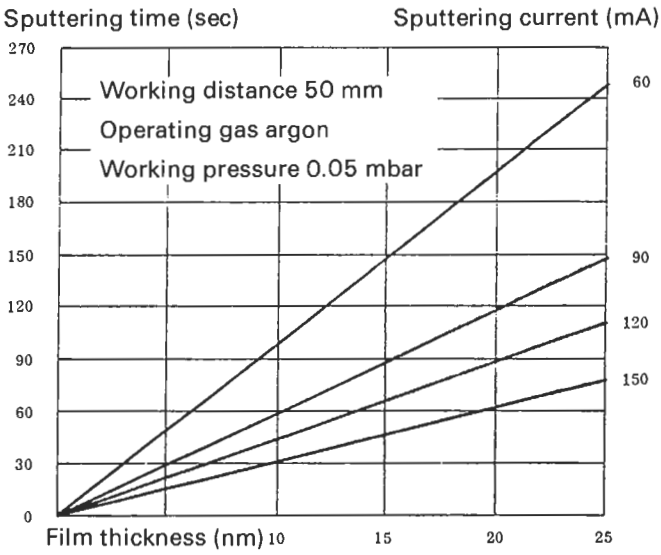


Fig. 17 Sputtering time diagram for nickel

7.2 Sputtering with the film thickness monitor

Connect the QSG 301 film thickness monitor (accessory) as described in Section 5.7 to the sputtering unit and make the preparations for film thickness measurement as follows:

Enter the DENSITY of the material to be measured e.g. 19.3 for gold (pay attention to the decimal point!). Select an appropriate scale range on the RANGE selector knob such as "RANGE x 1 red" for a film thickness of 15 nm.
In this case the red scale in the display applies, the full scale deflection is 30 x 1 = 30 nm. To determine the switch-off point, the film thickness monitor is turned on from the POWER switch (signal lamp lights). Push the SET button and, for a film thickness of 15 nm, set the needle in the display to 15 scale divisions using the potentiometer to the right of the SET button. For that use a small screwdriver. After this adjustment the measurement unit remains programmed for a 15 nm gold layer.

- Prepare the sputtering unit according to Sections 5.7 and 6.1 through 6.4.
- Turn on the water cooling.
- Open the cut-off valve on the operating gas bottle (also refer to Section 5.4).
- Turn the unit on at the power switch (3/5):
  The vacuum pump starts running.
  The solenoid venting valve closes.
  PROCESS LIMIT, switches to TIMER, the TIMER button lights.
  PROCESS switches to STOP-mode I, STOP button lights.
  The VACUUM mbar display appears.
  The TEMPERATURE table temperature is displayed.
  The TIMER display goes to zero.
  The arrow for the programming display DOWN lights.
  The current display CURRENT/VOLTAGE goes to zero (slight deviations from zero are possible).
- Turn on the QSG 301 film thickness measurement unit from the POWER switch.
- Push the SPUTTERING process selector.:
  The SPUTTERING button flashes, a "beep" is sounded.
  (The vacuum display must stop flashing before process selection is possible).
- Acknowledge the process selected by pushing the SPUTTERING button:
  The SPUTTERING button lights, the "beep" stops.

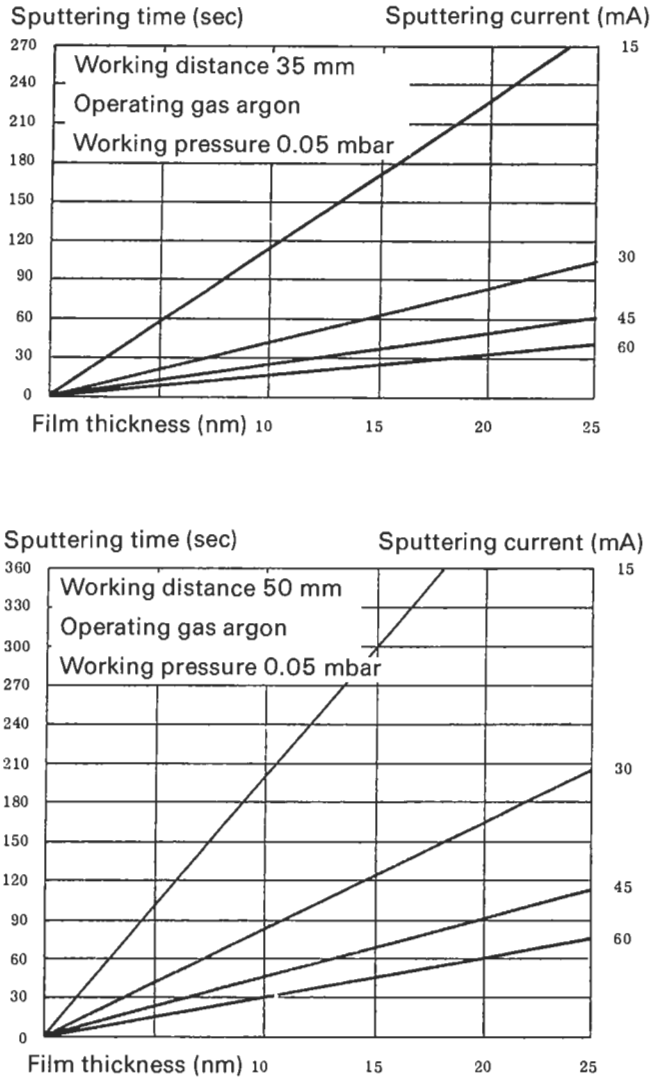


Fig. 18 Sputtering time diagram for platinum

- Push the STOP button:
  PROCESS switches to STOP-mode II,
  STOP button flashes,
  The film thickness equipment is driven,
  voltage or current selection CURRENT (TENSION) is enabled (when the TENSION button is pushed an idle voltage of 130 – 140 V is displayed).
- Press the QSG button on PROCESS LIMIT:
  The QSG button flashes, which means that the film thickness control will be made by the quartz crystal measurement equipment.
- On the QSG 301 film thickness monitor: Turn on the audio signal by turning the speaker knob (top left) cw, set the display needle to zero with the ZERO potentiometer, and set the START switch to OPEN: the signal lamp will light.
- Evacuate the specimen chamber to < 0.05 mbar.
- Establish the working pressure at approx. 0.05 mbar by admitting operating gas (argon) through the gas dosing valve.
- Close the shutter on the sputtering head:
  Set the activation button (4/8) to the red mark (in the event of ignition difficulties, open the shutter briefly).
- Set the sputtering current to the desired value using the CURRENT UP/DOWN buttons (average value for gold 30 to 40 mA):
  The current display starts changing approx. 10 seconds after the CURRENT UP button has been pushed because it takes that long to reach the ignition voltage necessary for the discharge. The current display changes in jumps of 2 to 3 mA.
- Open the shutter after the necessary sputtering current has been reached (green mark) and press the START button on the sputtering unit:
  The START button flashes, the PROCESS LIMIT is turned on which means that the film thickness monitor is activated. In addition, the TIMER starts running forward from zero in a stop-watch-like function.
- When the desired film thickness and thus the preselected cut-off point for the sputtering process has been reached, the process is stopped automatically:
  START button on the sputtering unit goes out.
  STOP button lights (STOP-mode I).
  CURRENT/VOLTAGE display goes to zero.
  TIMER display shows the elapsed sputtering time.
  Display on the film thickness monitor goes to zero.
  START (OPEN) lamp on the film thickness monitor goes out.
- Close the gas dosing valve.
- Turn off the sputtering unit from the power switch:
  The vacuum pump stops.
  The solenoid venting valve opens to vent the specimen chamber,
  all the displays go out.
- Turn off the film thickness monitor from the POWER switch.
- Turn off the water cooling to prevent condensation on the specimen table and sputtering target.
- Close the cut-off valve on the operating gas bottle.

7.3 Sputtering with pre-sputtering

Target materials that are not noble metals must be pre-sputtered with closed shutter before the specimen is coated. This is necessary primarily to remove the oxide layer as target preparation before sputter coating the specimens. The pre-sputtering time for the metals used (such as chrome, copper or nickel) is between 5 and 10 minutes.

- Prepare the unit as described in Section 7.1 and turn it on.
- Set the pre-sputtering time by simultaneously pushing the SET and either the FAST or SLOW button.
- Evacuate the specimen chamber to < 0.05 mbar.
- Establish the working pressure of 0.1 mbar by admitting operating gas (argon) through the gas dosing valve.
- Close the shutter on the sputtering head:
  Set the activation knob, (4/8) to the red mark.
- Push the STOP button:
  PROCESS switches to STOP-mode II.
  STOP button flashes.
  Voltage or current selection CURRENT (TENSION) is enabled.
- Set the sputtering current initially to approx. 100 mA from the CURRENT UP/DOWN button. After the first degassing, increase to approx. 150 mA. In the event of ignition difficulties check the voltage by pressing the

TENSION button, and after approx. 250 V have been reached, open the shutter for 1 to 2 seconds (repeat this shutter open procedure if necessary).

- If necessary, re-establish the vacuum at 0.1 mbar.
- Push the START button:
  The START button flashes,
  PROCESS LIMIT is turned on i.e. the TIMER sputtering time control activated. The STOP button goes out. The time display starts running backwards to zero, starting with the time entered for the process duration.
- After the pre-sputtering time has elapsed, the process is stopped automatically:
  The START button goes out.
  The STOP button lights (STOP-mode I).
  The CURRENT/VOLTAGE display goes to zero.
  The TIMER display is on zero because the process time has elapsed.

When the pre-sputtering process has ended, the actual sputtering process to coat the specimen as given in Section 7.1 or 7.2 follows. The sputtering current to be entered for chrome is 120 to 150 mA, for nickel 90 to 150 mA and for copper 30 to 90 mA (refer to the sputtering time diagrams in Figs. 12 to 18).

7.4 Cathodic etching

When the poles of the sputtering configuration are reversed, the specimen table is on high voltage and the sputtering head on ground. This allows material to be removed from the surface of the specimen by cathode sputtering, cleaning it i.e. "etching" it.

- Prepare the unit as described in Section 7.1 and turn it on.
- Press the PROCESS selection ETCHING:
  ETCHING button flashes, a "beep" sounds (the vacuum display must stop flashing before process selection is possible).
- Acknowledge the process selected by pressing the ETCHING button:
  The ETCHING button lights and the "beep" stops.
- Change the programming direction for the TIMER to UP by pushing the SET button.
- Set the desired etching time by simultaneously pushing the SET button and either the FAST or SLOW button.
- Evacuate the specimen chamber to < 0.05 mbar.
- Establish the working pressure of approx. 0.1 mbar by admitting operating gas (argon) through the gas dosing valve.
- Close the shutter on the sputtering head:
  Set the activation knob (4/8) to the red mark.
- Push the STOP button:
  PROCESS switches to STOP-mode II.
  STOP button flashes.
  TENSION voltage selection is enabled.
- Adjust the voltage to approx. 400 V (approx. 4 – 5 mA) by simultaneously pushing the CURRENT UP/DOWN button and the TENSION button.
- If necessary, readjust the vacuum to 0.1 mbar.
- Push the START button:
  The START button flashes, PROCESS LIMIT is turned on i.e. the TIMER etching time control is activated. The STOP button goes out. The time display starts running backwards to zero, starting with the process duration entered in the TIMER.
- After the preselected etching time has elapsed, the etching process is stopped automatically:
  The START button goes out.
  The STOP button lights (STOP-mode I).
  The CURRENT/VOLTAGE display goes to zero.
  The TIMER display is on zero because the process time has elapsed.
- Shutting down the unit, including the facilities, is described in Section 7.1.

To protect the sputtering target from contamination, the shutter remains closed during the etching process.

To prevent the specimen table from being etched, it can be covered with aluminum foil. The specimen to be etched can then be placed on top of the foil.

As the film thickness monitor is not required for the etching process, we recommend removing the crystal holder to protect it. If this is not possible, the crystal measurement head must be moved to the outermost edge of the specimen table (Teflon).

8. MAINTENANCE

The SCD 040 sputtering device is for the most part maintenance-free. However, special care must be taken to keep the specimen chamber with glass cylinder, the specimen table, the sputtering head, and the specimen chamber seal clean. We recomend a Scotch-Brite cloth and/or the metal cleaning argent "Wenol plus K" for cleaning metal parts; an appropriate substrate cleaner (refer to Section 10 "ACCESSORIES") for cleaning the glass cylinder; and alcohol for cleaning the silicone rubber seal.

The vacuum pump must be maintained according to the applicable maintenance rules, which can be taken from the corresponding operating instructions (PK 800 086 BN for the DUO 004 B). The same holds for the TPR 010 vacuum gauge head (operating instructions A 51-9853 e).

9. TROUBLESHOOTING

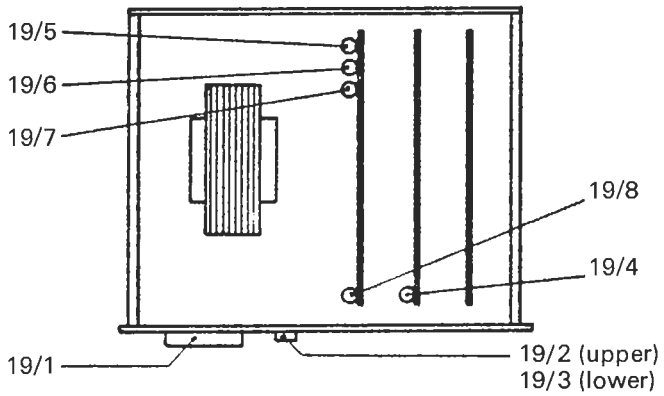


Fig. 19 Electronics module Fuse arrangement

19/1 F1	Main fuse 8 A slow blowing
19/2 F2	Fuse for vacuum pump 6.3 A slow blowing
19/3 F3	Fuse for high voltage, primary 2.5 A slow blowing for 115 V, 1.25 A slow blowing for 220 V
19/4 F4	Fuse for high voltage, secondary 315 mA slow blowing. This fuse is located either on the analog pc board or on the front panel in some units, and has not been included at all in units from serial number FN 819 onwards.
19/5 F14	Fuse for the digital part (+5 V DC) 500 mA slow blowing
19/6 F13	Fuse for the analog part (±15 V DC) 500 mA slow blowing
19/7 F12	Fuse for the relay (+ 24 V DC) 500 mA slow blowing
19/8 F11	Fuse for the transformer control, primary 400 mA slow blowing for 115 V 200 mA slow blowing for 220 V

The vacuum pump does not start running when the unit is turned on from the power switch (3/5) and no display appears on the display panel.
Mains cable not connected or fuse F1 (19/1) defective.

The vacuum pump does not start running when the unit is turned on from the power switch (3/5).
The cable to the pump is not connected (recepticle 7/8) or fuse F2 (19/2) is defective.

No display appears on the display panel when the unit is turned on from the power switch (3/5).
Fuse F14 (19/5) is defective.

No vacuum display appears on the display panel.
Fuse F12 (19/7) is defective.

Caution: The electronics module may only be opened by properly trained specialists

Vacuum display flashes at 0.001 mbar although the chamber is at atmospheric pressure (at $< 10^{-4}$ on units from serial number 718 to 818).
Vacuum gauge head is defective or the connection cable to the electronics module or the gauge head is not connected.

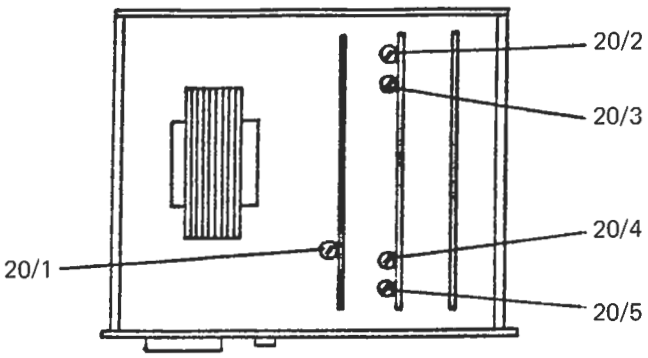


Fig. 20 Electronics module
Arrangement of the trimmer potentiometers

20/1 Trimmer potentiometer VR 1, for idle voltage
20/2 Trimmer potentiometer VR 1 for vacuum display, zero point
20/3 Trimmer potentiometer VR 2 for vacuum display, full scale and analog output
20/4 Trimmer potentiometer VR 5 for flashing vacuum display
20/5 Trimmer potentiometer VR 4 for current limitation (200 mA)

The vacuum display does not go to 1000 mbar when the specimen chamber is vented. The cause can be incorrect adjustment of the vacuum measurement system or the vacuum display.
Check at the VACUUM recorder output (7/16):
The voltage must be exactly 10 V at 1000 mbar. If this is not the case, adjust the value at the trimmer potentiometer (20/3) (Caution: Only minimum adjustment will be necessary). The voltage at 0.02 mbar must be exactly 1 V. Adjust the value at the trimmer potentiometer (20/2).

If the checks at the recorder outputs show correct values, the vacuum display must be adjusted to 1000 mbar from the potentiometer (21/2) when the specimen chamber is at atmospheric pressure. This potentiometer is accessible when the display panel has been removed. To remove this panel, remove the left hand side panel, and push the display panel out of the spring clamps from behind.

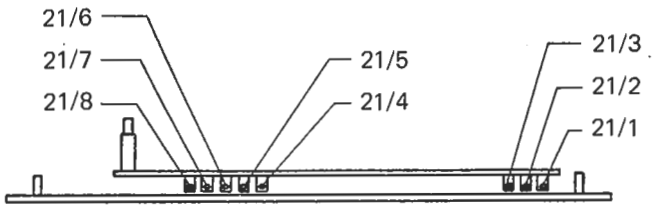


Fig. 21 Display panel, view from above
Arrangement of the trimmer potentiometers

21/1 Zero point adjustment for the current display
21/2 1000 mbar adjustment for the vacuum display
21/3 Full scale adjustment for current (DVM)
21/4 Timer density value adaptation
21/5 Full-scale adjustment for the specimen table temperature (DVM)
21/6 Specimen table zero point adjustment (DVM)
21/7 Offset temperature measurement circuit
21/8 Specimen table temperature measurement current adjustment

Flashing vacuum display at under 0.15 mbar or constant vacuum display at over 0.15 mbar (the process selection is disabled in the range defined by the flashing display).
Adjustment of the switching point with the trimmer potentiometer (20/4) on the analog pc board.

The second flashing dot (between the 2nd and 3rd digits) on the timer display appears when the pressure in the specimen chamber is < 200 mbar.
This indicates a break in the safety circuit: Vacuum relay is not closed, vacuum gauge head defective or not connected, safety separation switch on the sputtering head holder is defective or out of adjustment and thus not closed (also refer to Section 3.8). The process selection is disabled when the safety circuit is not closed.

The first flashing dot (between the 1st and 2nd digits) on the timer display appears.
When a quartz crystal film thickness monitor is being used, this indicates that the report cable to the film thickness monitor is not connected or defective. If no film thickness monitor is being used, the flashing point has no significance.

The timer display cannot be adjusted and remains on zero.
Using the SET UP/DOWN button, check whether the switchover in the timer is working:
If the switchover cannot be made, the SET button is defective and must be replaced.
If the switchover works, but the TIMER display does not run after SPUTTERING has been selected and the QSG and START buttons pushed, IC 4060 on the display panel is defective. Replace the display panel.

The motor used for the specimen table adjustment does not run when the TABLE UP/DOWN button is pushed.
Fuse F13 (19/6) and/or F12 (19/7) is defective.

The CURRENT/VOLTAGE current display does not go to zero when the sputtering process has been stopped.
Adjust the zero point from the trimmer potentiometer (21/1) on the display panel. This potentiometer is acessible after the display panel has been removed. To remove this panel, remove the left hand side panel, and push the display panel out of the spring clamp from behind.

The voltage cannot be increased after SPUTTERING or ETCHING has been selected and the STOP button pushed (button flashes). The CURRENT/VOLTAGE display remains on zero; there is no discharge.
Fuse F3 (19/3) or F4 (19/4) is defective.

The voltage cannot be increased after SPUTTERING or ETCHING has been selected and the STOP button pushed (button flashes). The CURRENT/VOLTAGE display remains on zero; the high voltage transformer hums.

Fuse F4 (19/4) is defective.

After the process has been selected and the STOP button pushed (button flashes) a current is displayed without the current having been increased, but the idle voltage (check by pushing the TENSION button) remains on zero.

Short circuit in the sputtering head. The target holder ring is touching the anode ring.

The sputtering current cannot be increased to 200 mA. The process is turned off early by the overcurrent limitation.

Readjust the cut-off point from trimmer potentiometer VR 4 (20/5) in the electronics module accordingly.

The discharge does not ignite when the shutter is closed after the sputtering process has been selected and the voltage increased.

Increase the voltage under controlled conditions to between 250 and 300 V by pushing the TENSION button, and open the shutter briefly until the ignition takes place. Then close the shutter, and adjust the sputtering current to the desired value. A somewhat higher working pressure until the discharge is ignited can also be used as an ignition aid.

10. ACCESSORIES

DUO 004 B two-stage rotary vane pump

Pumping speed 4 m^3/h

for 220 V, 50 Hz	Order Nr. BU 007 150 -T
for 220 V, 60 Hz	Order Nr. BU 007 151 -T
for 240 V, 50 Hz	Order Nr. BU 007 155 -T

DUO 016 B two-stage rotary vane pump

Pumping speed 16 m^3/h

for 220 V, 50 Hz	Order Nr. BU 007 146 -T
for 220 V, 60 Hz	Order Nr. BU 007 147 -T
for 240 V, 50 Hz	Order Nr. BU 007 148 -T

Vacuum connection hose, 1.5 m

with connection parts — Order Nr. BU 007 152 -T

Oil mist filter

for connection to the exhaust port of the vacuum pump, with connection parts — Order Nr. BU 007 153 -T

Switching unit

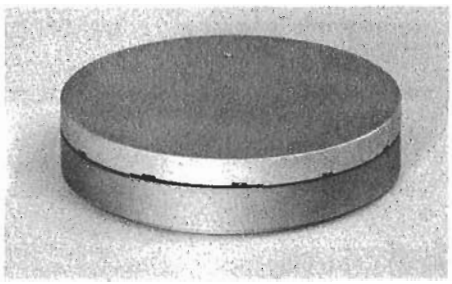
with contactor and connection cables, for driving a vacuum pump with a starting or nominal current of > 6.3 A.
Order Nr. BU 005 003 -T

Foil targets, ⌀ 54 mm, 0.2 mm thick

Chrome	Order Nr. BU 007 223
Gold	Order Nr. B 8010 072 21
Gold-palladium 80/20	Order Nr. B 8010 072 29
Copper	Order Nr. BU 007 224
Nickel	Order Nr. BU 007 222
Platinum	Order Nr. B 8010 072 28
Silver	Order Nr. B 8010 072 26

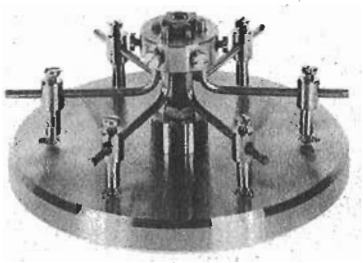
Sputter shadowing device, Order Nr. BU 007 163

For the simultaneous shadowing of 12 TEM specimens with a sputtered Au/Pd or a Pt film according to a technique developed by W. Colquhoun, State University of New York.



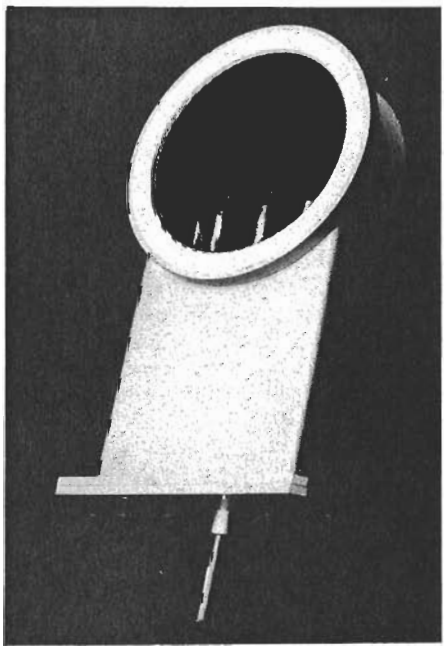
Sputter shadowing device, Order Nr. BU 007 164 -T

For the simultaneous rotary shadowing of 6 TEM specimens with a sputtered Au/Pd or a Pt film according to a technique developed by W. Colquhoun. The shadowing angle can be varied through a simple adjustment of the device.



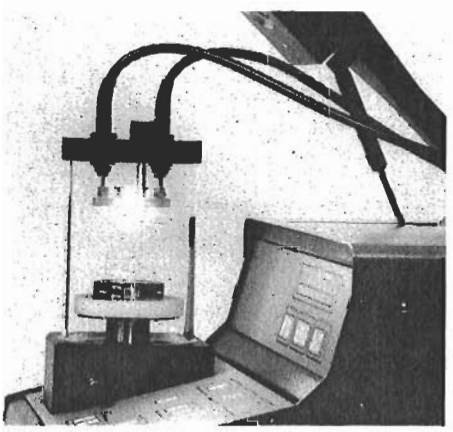
CGC 010 carbon-gold-carbon accessory,
Order Nr. BU 007 177 -T

For applying a carbon-gold-carbon film combination to SEM specimens without breaking the vacuum, according to a technique developed by Prof. R. Blaschke, Universität Münster. (The CEA 040 high current supply, Order Nr. BU 007 181 -T, is required for operating this device).

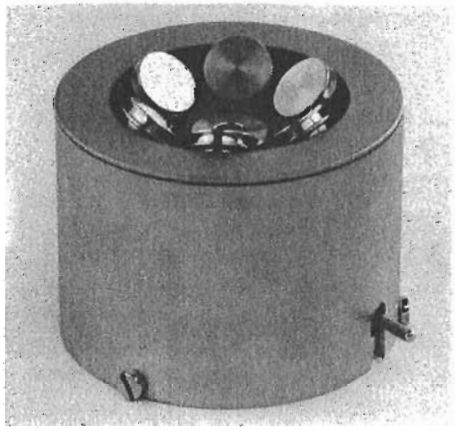


CEA 040 high current supply,
Order Nr. BU 007 181 -T
with high current transformer, 160 VA, U_{sec} 16 V; for installation in the sputtering unit

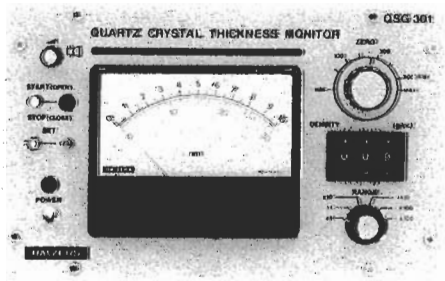
Carbon thread evaporation device,
Order Nr. BU 007 180 -T
For the production of conductive carbon films on SEM specimens to be analyzed with the microprobe. Consists of the CEA 040 high current supply, the carbon evaporator flange, glass chamber, high current cables and evaporation material.



Planetary drive, Order Nr. BU 007 162 -T
holds 6 SEM specimen disks for Cambridge, Etec, Philips or ZEISS scanning electron microscopes.

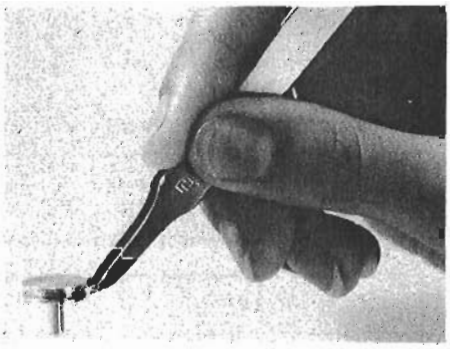


Film thickness measurement device,
Order Nr. BU 007 055 -T
For measuring the thickness of the film being applied to the specimen during the evaporation or sputtering process. Consists of the QSG 301 measuring instrument, QSK 301 crystal holder, oscillator, various cables and a set of crystals (10 pieces).



Wafer coating accessory, Order Nr. BU 007 185 -T
with ⌀ 207 Pyrex glass chamber, 64 mm high, to be set on the base of the sputtering unit. A rotary table for a 5" round or square wafer, or a 6" round wafer is mounted in the baseplate of the chamber. The cover plate to the chamber has been provided with an opening for mounting a sputtering head or a carbon thread evaporator.

Special tweezers, Order Nr. B 8010 030 11
For picking up SEM specimen carriers for Cambridge, Etec, Philips and ZEISS scanning electron microscopes.

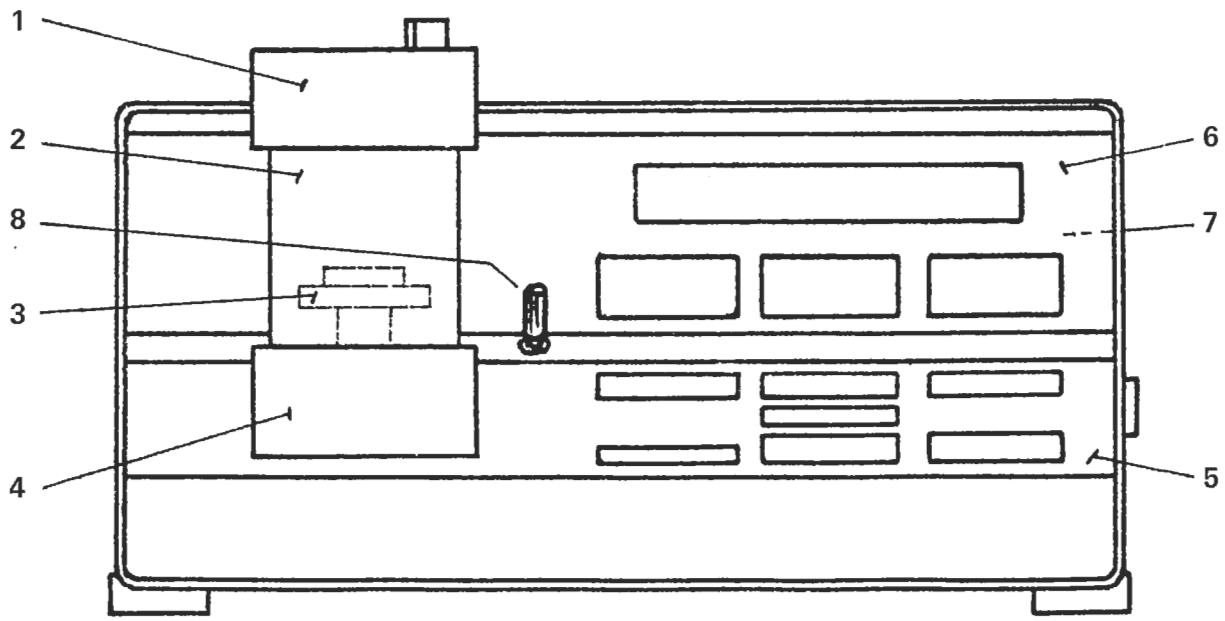


Metal cleaning agent, Order Nr. B 8010 170 15
"Wenol plus K" for nonabrasive cleaning of metal surfaces. 100 g tube.

Substrate cleaners (Types 1 and 2), 500 ml bottles
Order Nr. BD 481 900 -T
for precleaning glass and metal surfaces,
Order Nr. BD 481 901 -T
for final cleaning of glass, metal and plastic surfaces.

Scotch-Brite cloth, Order Nr. BU 017 029 -T
for mechanical cleaning of metal and glass surfaces. Package of 5, size 224 x 158 mm.

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Sputtering head comp. / Sputterkopf kpl.	1			BU 800 166 E/2
1	Glass cylinder / Glaszylinder	2	BU 007 510 -T		
1	Specimen table comp. / Objekttisch kpl.	3			BU 800 116 E/3
1	Specimen chamber base / Probenkammer-Sockel	4			BU 800 116 E/4
1	Operating panel / Bedienungs-Panel	5	BU 014 569 -T		
1	Display panel / Anzeige-Panel	6	BU 014 570 -T		
1	Elektronics module / Elektronik-Einschub	7			BU 800 116 E/5
1	Gas dosing valve / Gasdosierventil	8a	B 8010 074 80		to / bis FN 818
1	Gas dosing valve / Gasdosierventil	8b	B 8010 074 83		from / ab FN 819
1	Gauge head / Vakuum-Messröhre, TPR 010	9	BG G02 250		to / bis FN 818 *
1	Gauge head / Vakuum-Messröhre, TPR 010	10	BG G02 251		from / ab FN 819 *
1	Centering ring / Zentrierring, DN 10 KF	11	BP 213 314 -T		for / für TPR 010
2	Vacuum switch / Vakuumschalter, Typ 6051	12	B 8010 079 38		
1	Solenoid valve / Magnetventil, 6 V	13	B 8010 145 07		



Spare Parts for / Ersatzteile zu

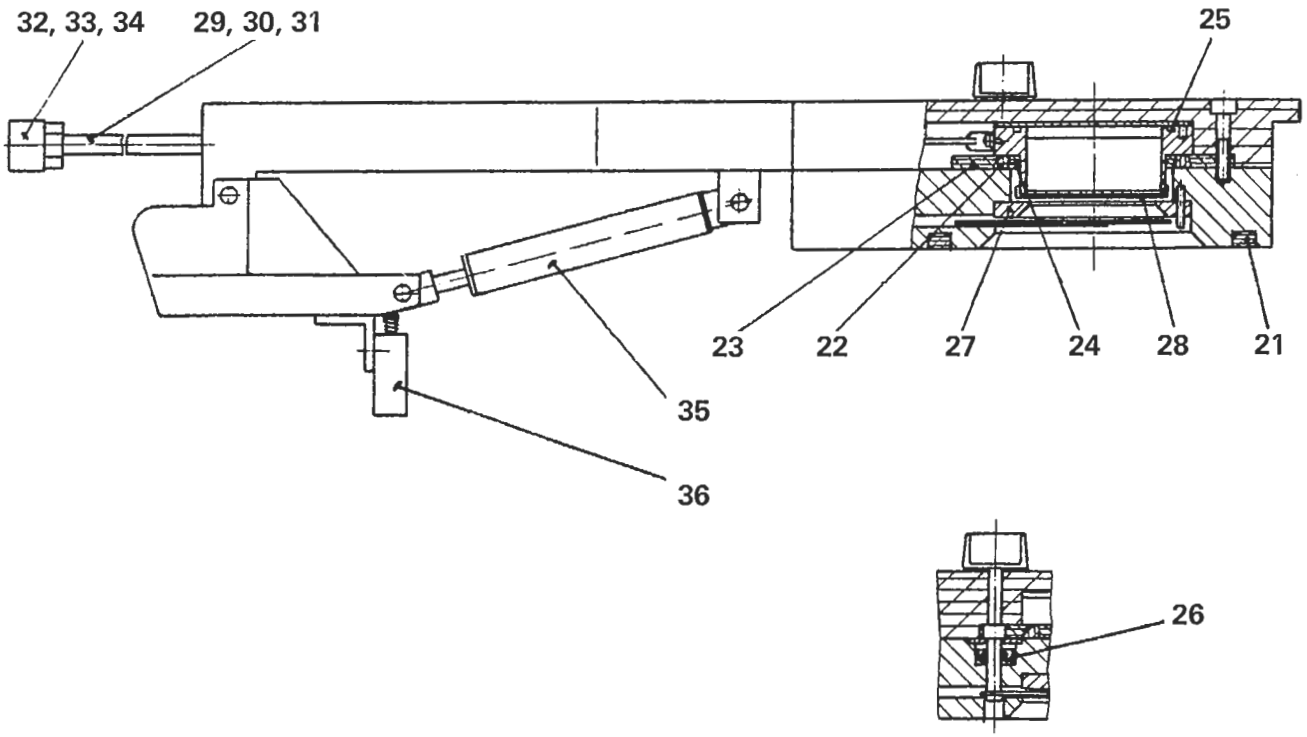
Sputtering unit / Sputtergerät SCD 040 BU G01 000

BALZERS

BU 800 116 E/1

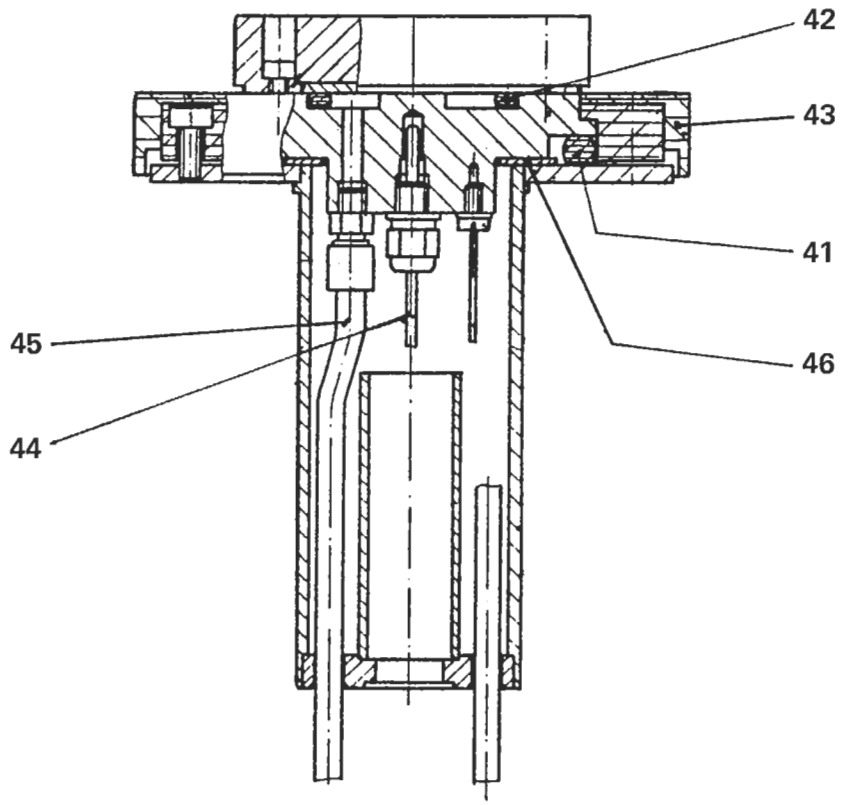
* Separate Operating Instructions / Separate Betriebsanweisung

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Silicon seal / Silikondichtung	21	BU 007 471		
1	O-Ring	22	BU 007 453		
1	Ring	23	BU 007 744		
1	Support ring / Stützring	24	BU 007 745		
1	O-Ring, ϕ 53,65 x 2,62 mm	25	B 8010 077 70		
1	Shaft seal / Wellendichtung	26	N 4083 011 PD		
1	Anode ring / Anodenring	27	BU 007 977 -U		
1	Target holder / Target-Haltering	28	BU 077 767		
1	PTFE-hose / PTFE-Schlauch	29	B 8010 074 77		Length / Länge = 850 mm
1	PTFE-hose / PTFE-Schlauch	30	B 8010 074 77		Length / Länge = 650 mm
2	Hose clamp / Schlauchklemme	31	B 4163 244 Z		
2	Nut / Anschlussmutter, G 1/4"	32	B 4117 563 GM		
2	Clamp ring / Klemmring	33	B 4119 363 -M		
2	Sleeve / Stützhülse	34	B 4119 413 -M		
1	Dampfer / Dämpfer	35	BU 007 936 -X		
1	Push button / Drucktaster	36	B 8010 146 33		



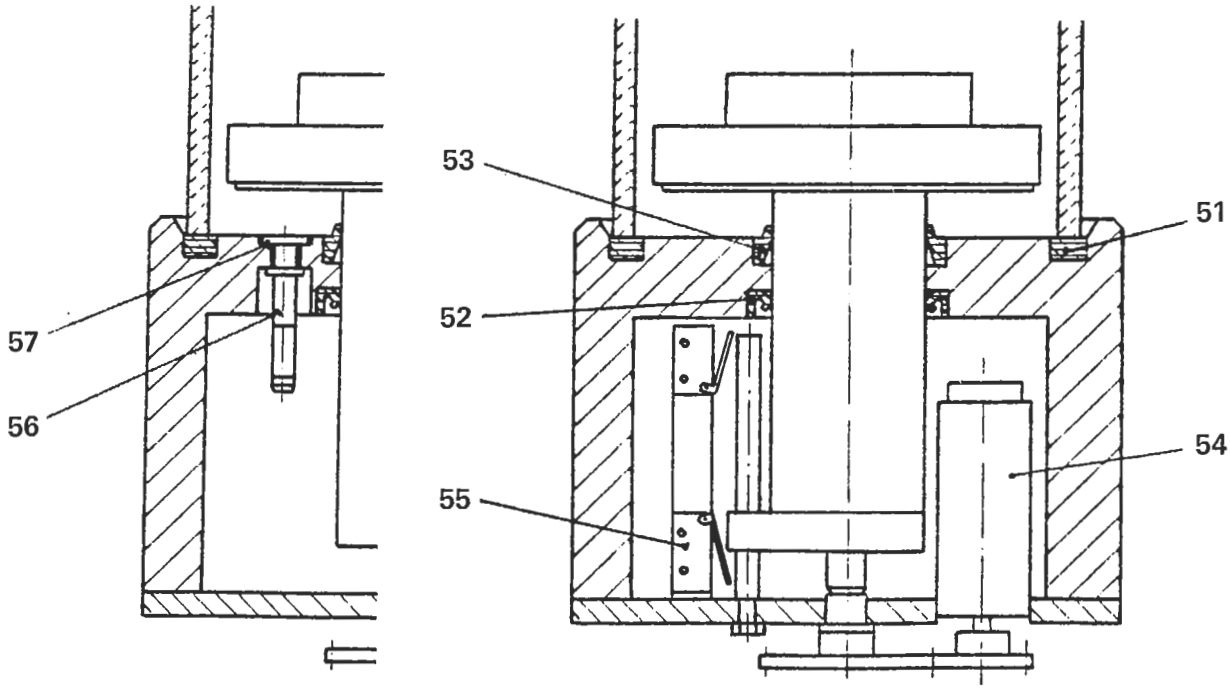
Spare Parts for / Ersatzteile zu		BALZERS
Sputtering head comp. / Sputterkopf kpl.	BU 014 572 -T	BU 800 116 E/2

		Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	O-Ring		41	BU 007 453		
1	O-Ring, ϕ 30 x 4 mm		42	B 4070 516 PV		
1	Ring		43	BU 007 884		
1	Sensor / Fühler, PT 100		44	B 8010 115 63		
2	Plastic tubing / Kunststoffrohr		45	B 8010 075 77		Length / Länge = 550 mm
1	Insulation / Isolation		46	BU 014 554		



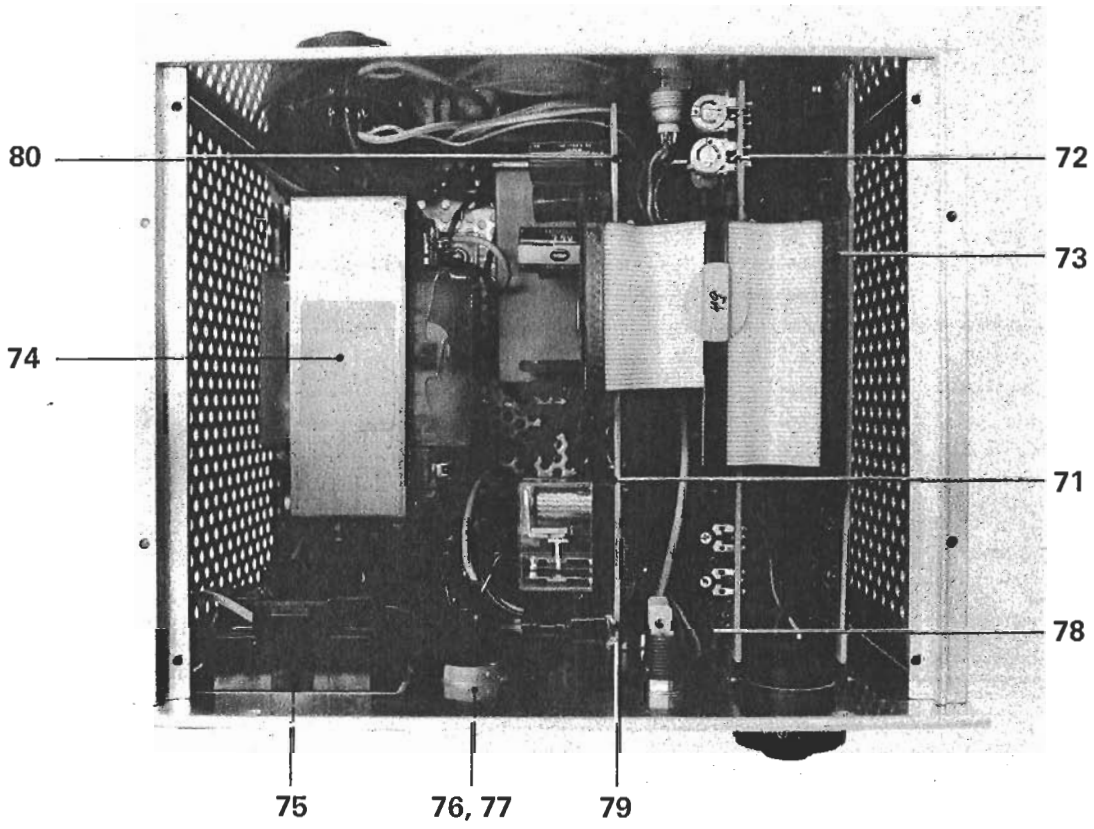
Spare Parts for / Ersatzteile zu	BALZERS
Specimen table comp. / Objekttisch kpl. BU 014 565 -T	BU 800 116 E/3

				Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1				Silicon seal / Silikondichtung	51	BU 007 471		
1				Shaft seal / Wellendichtung	52	B 8010 077 34		
1				Skimmer / Abstreifer	53	B 8010 077 39		
1				Gear motor / Getriebemotor	54	B 8010 145 34		
2				Micro switch / Mikroschalter	55	B 8010 145 33		
1				Apparate socket / Apparate-Dose RADV	56	B 8010 079 78		
1				O-Ring, ϕ 7 x 1,5 mm	57	B 8010 148 66		
2				Plastic tubing / Kunststoffrohr	58	B 8010 075 77		Length/Länge = 120 mm
1				Plastic tubing / Kunststoffrohr	59	B 8010 075 77		Length/Länge = 480 mm
2				Plastic tubing / Kunststoffrohr	60	B 8010 075 77		Length/Länge = 650 mm



Spare Parts for / Ersatzteile zu	BALZERS
Specimen chamber base / Probenkammer-Sockel BU 014 566 -T	BU 800 116 E/4

		Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1		Power pc board / Power-Print	71	BU 014 647 -T		
1		Analog pc board / Analog-Print	72	BU 014 646 -T		
1		Logic pc board / Logik-Print	73	BU 014 645 -T		
1		High voltage transformer / Hochspannung-Transformer	74	BU 005 005		
2		Fuse / Feinsicherung, 8 AT	75	B 4666 454		
1		Fuse / Feinsicherung, 6,3 AT	76	B 4666 452		
1		Fuse / Feinsicherung, 1,25 AT	77	B 4666 438		for / für 220 V
1		Fuse / Feinsicherung, 2,5 AT	77	B 4666 444		for / für 115 V
1		Fuse / Feinsicherung, 315 mAT	78	B 4666 592 DL		to / bis FN 818
1		Fuse / Feinsicherung, 200 mAT	79	B 4666 422		for / für 220 V
1		Fuse / Feinsicherung, 400 mAT	79	B 4666 428		for / für 115 V
3		Fuse / Feinsicherung, 500 mAT	80	B 4666 430		



Spare Parts for / Ersatzteile zu		BALZERS
Electronics module / Elektronik-Einschub	BU 014 560 -T (220 V) BU 014 561 -T (115 V)	BU 800 116 E/5

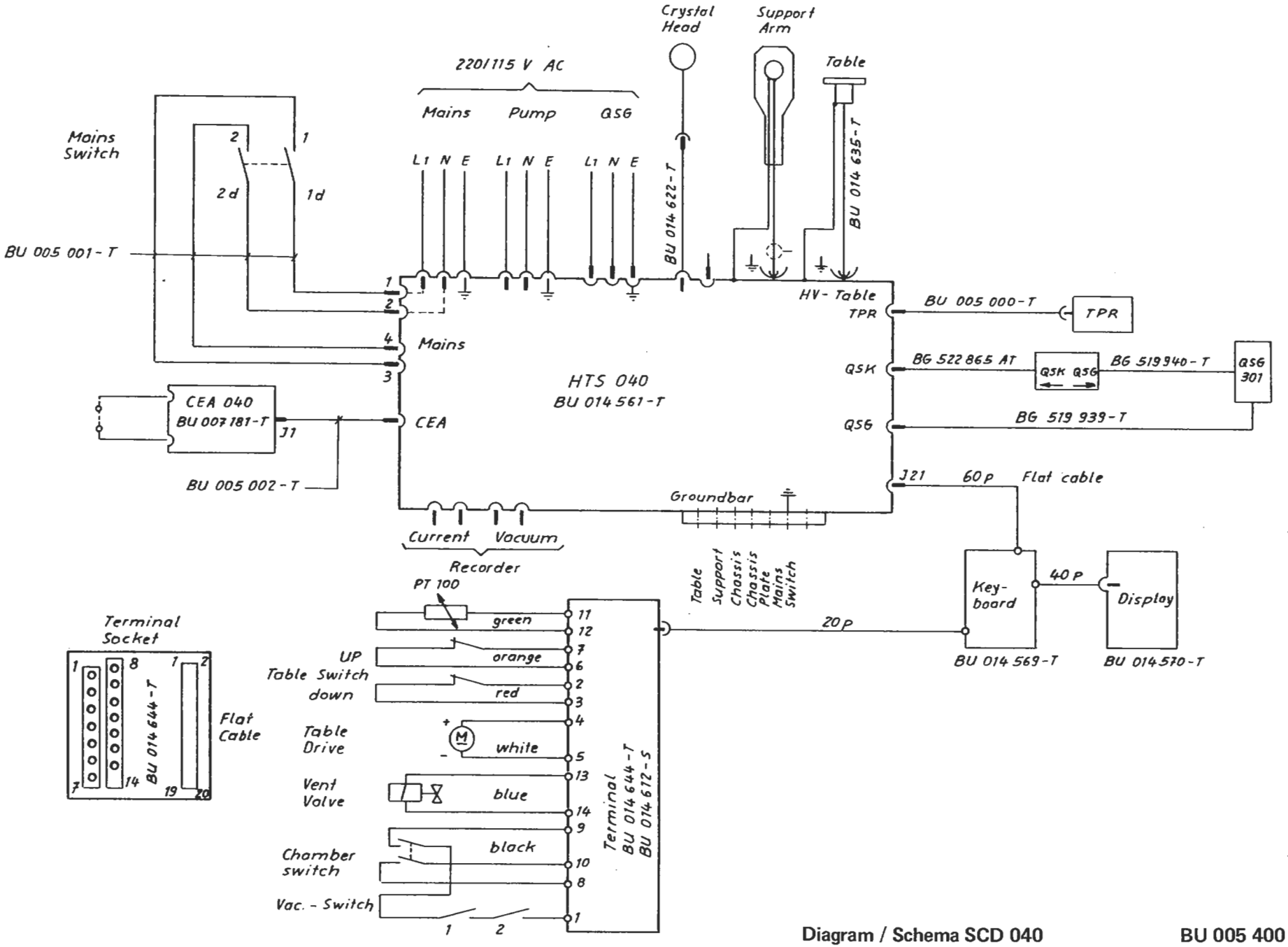
	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Hose nipple / Schlauchwelle, DN 25 KF-28	91	BP 217 027		
1	Seal / Dichtung, DN 25 KF	92	BP 213 328 -T		
1	Clamping ring / Spannring, DN 25 KF	93	BP 217 427 -T		
2	Hose nipple / Schlauchwelle, SO 40503-6-4	94	B 8010 074 59		
2	Nut / Anschlussmutter, SO 20-6-G 1/8	95	B 4117 556 GM		
2	Clamping ring / Klemmring, SO 1-6	96	B 4119 359 -M		
2	Hose nozzle / Schlauchtülle, SO 40502-8-6	97	B 8010 074 69		
2	Nut / Anschlussmutter, SO 20-8-G 1/4	98	B 4117 563 GM		
2	Clamping ring / Klemmring, SO 1-8	99	B 4119 363 -M		
3	Sealing ring / Dichtring, CU SO 7-G 1/8	100	B 4119 531 -K		
1	Sealing ring / Dichtring, CU, SO 5-G 1/4	101	B 4119 502 -K		
1	Hex wrench / 6kt-Stiftschlüssel, 1/16"	102	N 5701 144		
1	Hex wrench / 6kt-Stiftschlüssel, 3 mm	103	N 5701 007 BC		
1	Hex wrench / 6kt-Stiftschlüssel, 5 mm	104	N 5701 011 BC		
1	Fork wrench / Gabelschlüssel, SW6	105	B 5702 113 CD		
1	Philips screwdriver / Kreuzschlitz-Schraubenzieher	106	N 5719 203		

Spare Parts for / Ersatzteile zu

Set of accessories for the SCD 040 / Zubehörsatz zu SCD 040

BALZERS

BU 800 116 E/6


Crystal Head
Support Arm
Table
220/115 V AC
Mains
Pump
QSG
L1 N E L1 N E L1 N E
BU 014 622-T
BU 014 635-T
Mains Switch
2
1
2d
1d
BU 005 001-T
1
2
4
3
Mains
HTS 040
BU 014 561-T
HV-Table
TPR
BU 005 000-T
TPR
QSK
BG 522 865 AT
QSK QSG
BG 519 940-T
QSG 301
QSG
BG 519 939-T
CEA 040
BU 007 181-T
J1
CEA
BU 005 002-T
J21
60p
Flat cable
Groundbar
Current
Vacuum
Recorder
PT 100
Table Support Chassis Plate Mains Switch
Terminal Socket
1 8 1 2
7 14 19 20
BU 014 644-T
Flat Cable
UP
Table Switch
down
green
orange
red
Table Drive
white
Vent Valve
blue
Chamber switch
black
Vac. - Switch
11
12
7
6
2
3
4
5
13
14
9
10
8
1
1 2
Terminal
BU 014 644-T
BU 014 612-S
20p
Key-board
40p
Display
BU 014 569-T
BU 014 570-T

The following electrical diagrams are available on request:

SCD 040 overview diagram	BU 005 400 -S
SCD grounding diagram	BU 005 409 -S
HTS 050 electronics module (block diagram)	BU 005 410 -S
Power pc board	BU 005 401 -S
Power pc board lay-out plan	BU 005 413 -S
Analog pc board	BU 005 402 AS
Analog pc board lay-out plan	BU 005 416 -S
Logic pc board	BU 005 403 -S
Logic pc board lay-out plan	BU 005 415 -U
Operating pc board	BU 005 404 -S
Operating pc board	BU 005 412 -U
Display pc board	BU 005 405 -S
Display pc board lay-out plan	BU 005 414 -U
Terminal	BU 014 612 -S

When requesting any of the above diagrams, please include the serial number of your SCD 040 sputter coater or your HTS 040/HTS 050 electronics module.

13. ADDITIONAL OPERATING INSTRUCTIONS

Depending on the tooling of a particular sputtering unit, additional operating instructions may be needed for maintenance or operation.

DUO 004 B vacuum pump	PK 800 086 BN
DUO 016 B vacuum pump	PK 800 086 BN
ONF 025 oil mist filter	PK 800 079 BN
TPR 010 vacuum gauge head	A 51-9853 e
QSG 301 quartz crystal film thickness monitor	BG 800 110 BE
QSK 301 crystal head	BB 800 210 BE
CEA 040 carbon thread evaporation accessory	BU 800 124 BE
Sputter shadowing device	BU 800 134 BE
Planetary drive	BU 800 135 BE
CGC 010 carbon-gold-carbon accessory	BU 800 126 BE
Wafer coating accessory	BU 800 125 BE