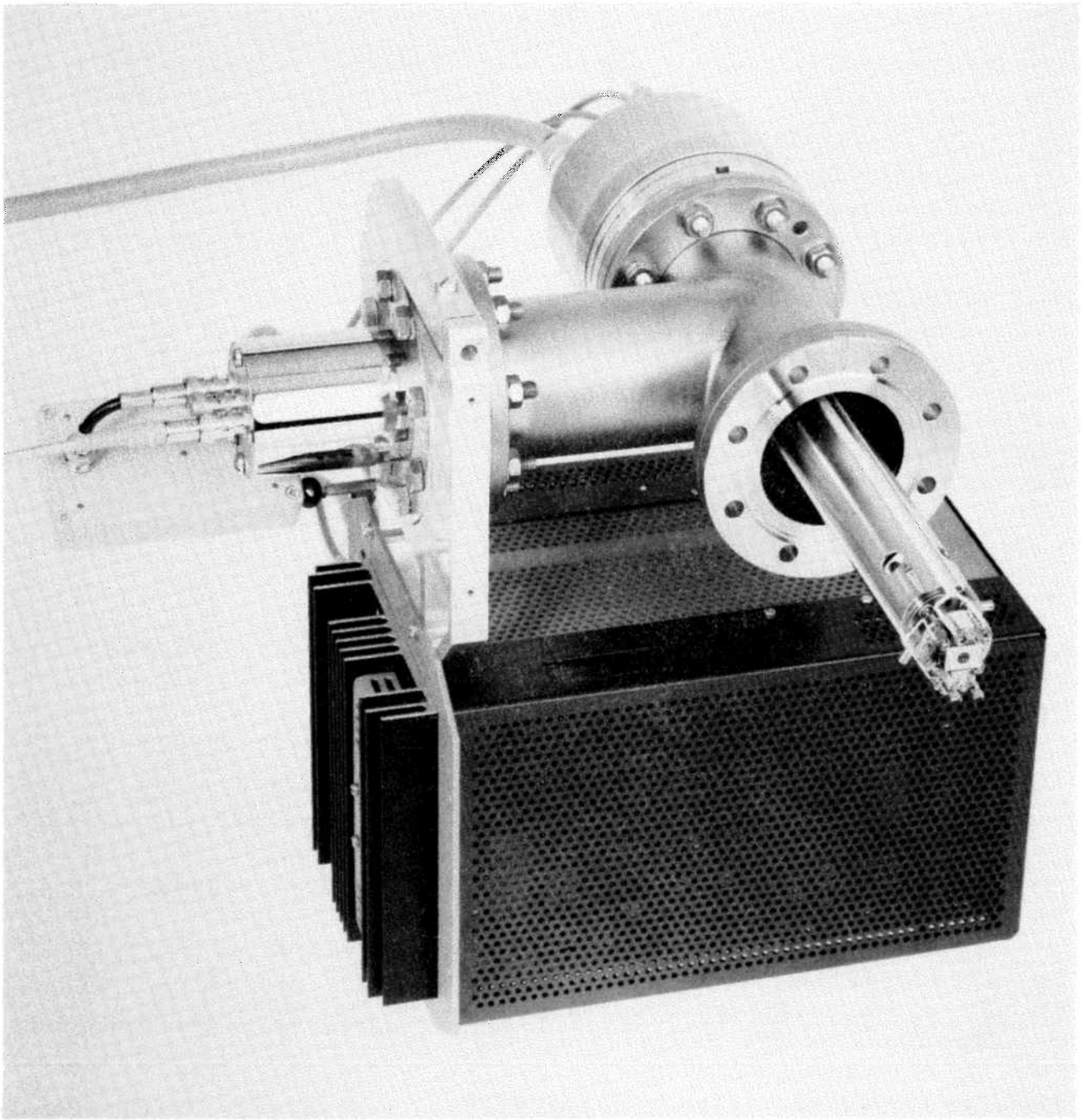
BALZERS

OPERATING INSTRUCTIONS

Quadrupole analyzer — QMA 400



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1. INTRODUCTION

The QMA 400 analyzer is the complete measurement sensor for the QMG 420 quadrupole mass spectrometer system. It consists of:

- One of the following ion sources:
  - Axial ion source
  - Gas tight ion source
  - Grid ion source
  - Crossbeam ion source
  - Crossbeam ion source with ion extraction optics
  - Crossbeam ion source with integrated molecular beam device
  - Ion extraction optics for focussing ions from external sources
- Mass filter with quadrupole rods, 8 x 200 mm (diam. x length)
- Ion detector with Faraday cup or 90° SEM and Faraday cup
- Connection head

2. TECHNICAL DATA

2.1 General data

Highest permissible total pressure	
– with Faraday cup (linearity limit)	$1 \cdot 10^{-4}$ mbar
– with SEM	$1 \cdot 10^{-5}$ mbar
Lowest detectable partial pressure	
– without SEM	$< 10^{-11}$ mbar
– with off-axis SEM and ion counting accessory	$< 10^{-15}$ mbar

Sensitivity for air, 1 mA emission current, uniform resolution (10% peak height), CB ion source, magnetic electron beam confinement accessory

– without SEM	$> 3 \cdot 10^{-4}$ A/mbar
– with SEM	> 200 A/mbar

2.2 Mass filter

Rod length	200 mm
Rod diameter	8 mm
Diameter of the grounded cylindrical housing	34.7 mm

2.3 SEM 217

Number of stages	17
Dynode width	20 mm
Entry opening	10 x 6 mm^2
Dynode material	Cu-Be
Insulation	Al_2O_3
Voltage divider	18 MΩ
High voltage	1 to 3.5 kV
Max. permissible output current	10^{-5} A
Maximum bakeout temperature	400 °C
Gain (for new SEM)	$> 10^8$ at 3.5 kV

2.4 Flanges

Flange size	DN 63 CF
Seal material	OFHC copper
(Viton O-rings on request)	

2.5 Bakeout

Without cable and connector plate	max. 400 °C
With cable and connector plate	max. 200 °C
With preamplifier or electrometer	max. 50 °C

2.6 Materials

Housing, flange	Stainless steel
Mass filter housing	
Ion deflection unit	Stainless steel
Rods	Molybdenum
Holder ring	Al_2O_3
SEM and housing	Stainless steel, Al_2O_3, Cu-Be, Ni
Feedthroughs	Stainless steel, ceramic

2.7 Protection tube

– without SEM	with Plexiglas protector
– with SEM	Stainless steel protector, evacuated

2.8 Dimensions

The measurements given for the total immersion depth apply to analyzers with axial beam ion sources. The deviations from this measurement for other ion sources can be taken from the footnote.

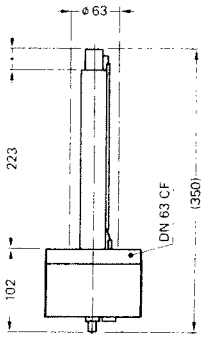


Fig. 2.1 QMA 400

* Axial beam ion source = 26 mm
Grid ion source = 27 mm
Crossbeam ion source with ion lens = 35.5 mm
Crossbeam ion source with ion optics = 43.5 mm
Crossbeam ion source to center of formation chamber = 23.5 mm

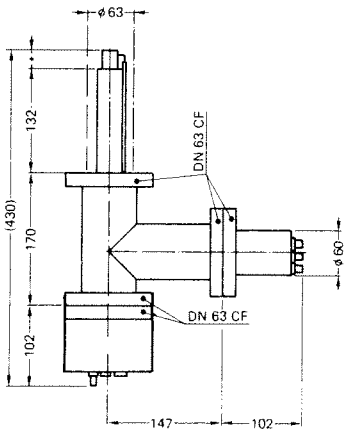


Fig. 2.2 QMA 400 with SEM 90° off-axis

3. DESCRIPTION

3.1 General

The QMA 400 analyzer used together with the standard version QMS 420 forms a mass spectrometer for specific masses (m/e) up to 511 and a resolution of over 1000 (FILTER OFF) at mass 500. For other mass ranges refer to the operating instructions for the QMS 420. Its excellent resolution and wide mass range make this instrument suited for solving analytical measuring problems. The open design and low degassing rate of the immersion system analyzer allow exact partial pressure analysis from the HV into the UHV range. The various combinations with Faraday cup or electrostatic ion deflection and off-axis SEM as well as a variety of different ion sources and ion optics allow optimum adaptation to individual measurement problems. The insulated holder for the SEM allows positive and negative ions to be detected in ion counting mode.

3.2 Design of the analyzer

3.2.1 Analyzer with Faraday cup

The analyzer and its Faraday cup are mounted on a DN 63 CF flange. The feedthroughs are welded into the flange. The Faraday cup is mounted on the middle feedthrough (13). The mass filter (1) is attached to the flange with a ring (20). The ion source or ion optics are mounted on the other end of the mass filter. The feedthroughs and the rods are connected by the wiring marked 10, and the connection to the ion source is made by the wiring marked 1 – 1.

The connection head with the connector plate is located on the outside of the flange. A fixation ring which clamps on the flange is supplied. Its function is to hold the electrometer amplifier and the RF generator.

The analyzer and the ion source ordered are tested at the factory and are supplied ready-for-installation.

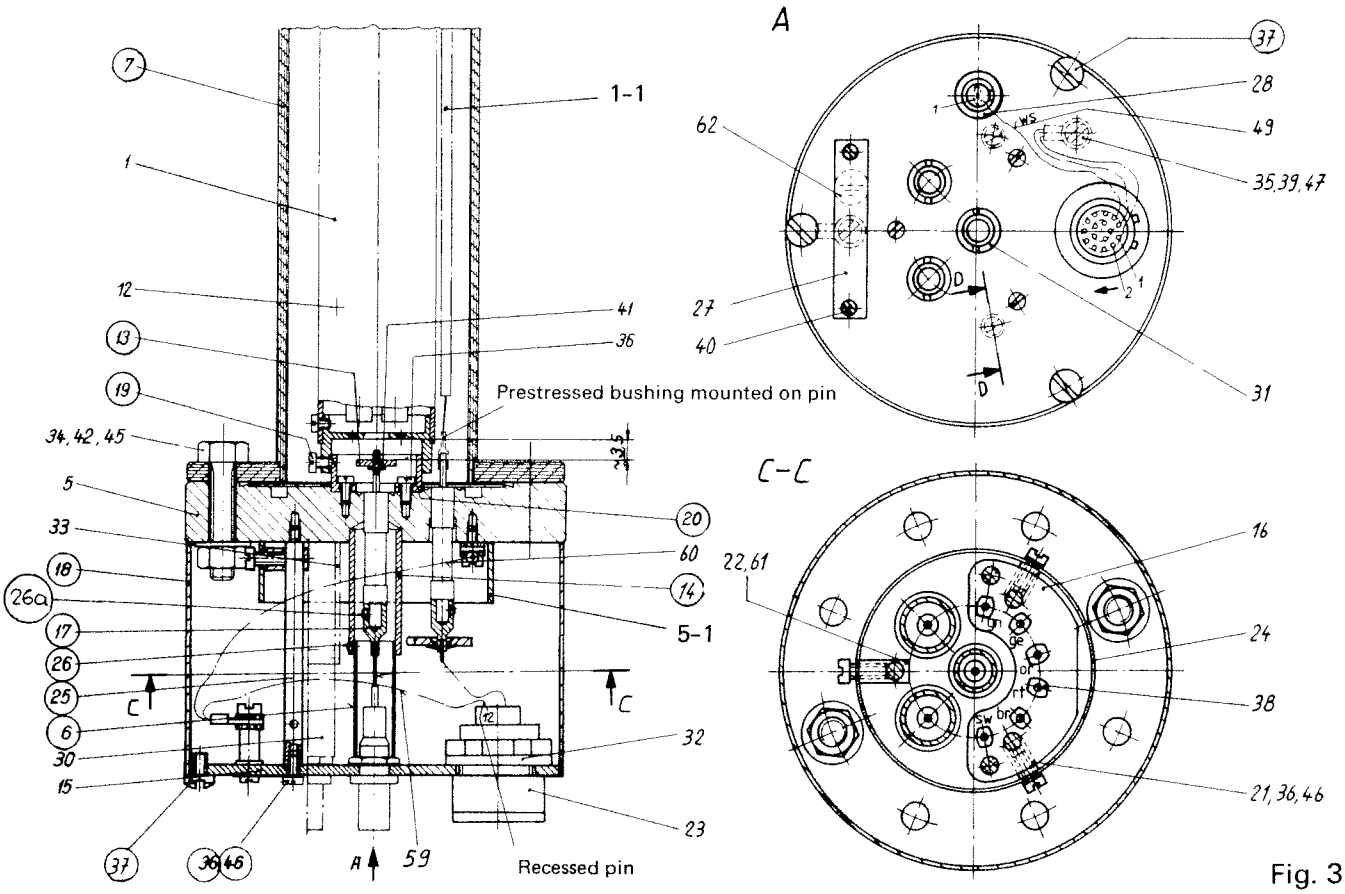


Fig. 3.1

3.2.2 Analyzer with 90° ion deflection and off-axis SEM

This analyzer consists of:

– T-shaped housing (1)

– Mass filter flange (2) with ion deflection unit (3), mass filter (6) and ion source (11)

– SEM flange (4) with insulated SEM already mounted (22)

– Connection heads on the outsides of the flanges (2 and 4)

– Protection tube (38) on the connection flange

The analyzer is evaucuated for shipping to protect the SEM. Remove the transportation protection before installing the analyzer.

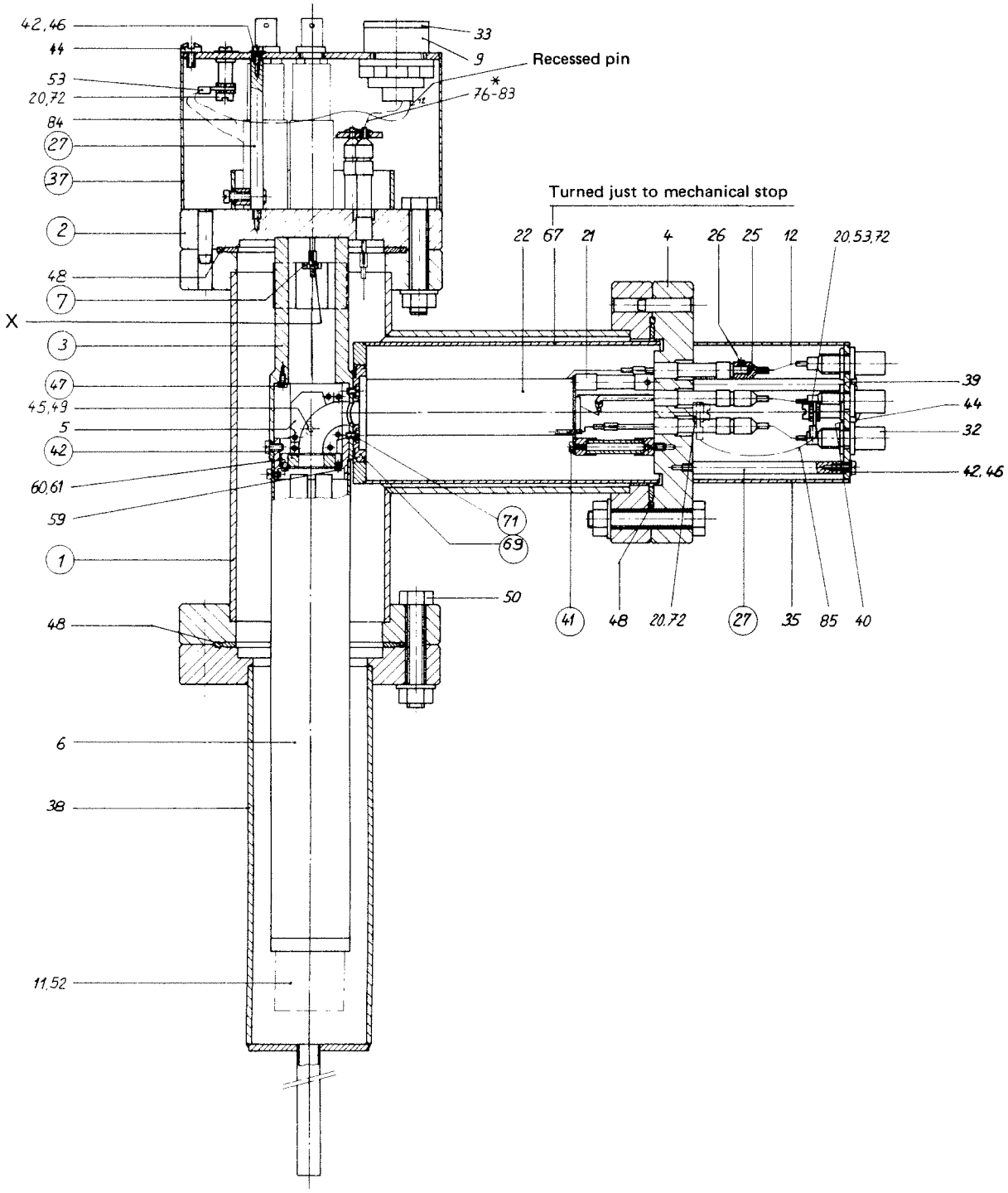


Fig. 3.2

3.3 Design of the mass filter

The mass filter consists of four cylindrical molybdenum rod electrodes arranged in parallel. They are held in place and insulated by two ceramic rings. The precision of the rod arrangement is decisive for proper functioning.

The rod system is located inside a cylindrical housing where it is held in place by a screw (13). The cylindrical housing provides the correct alignment of the rod system and the ion source. The ion source is mounted on a cover which is fitted to the end of the housing.

The inside of the rod system has been fitted with two shields so that there is no optical contact between the paths the ions travel and the open ceramic surfaces.

The operating voltages are conducted to the rods via four connection pins.

Opposite rod pairs are electrically connected via connection pieces located outside the housing.

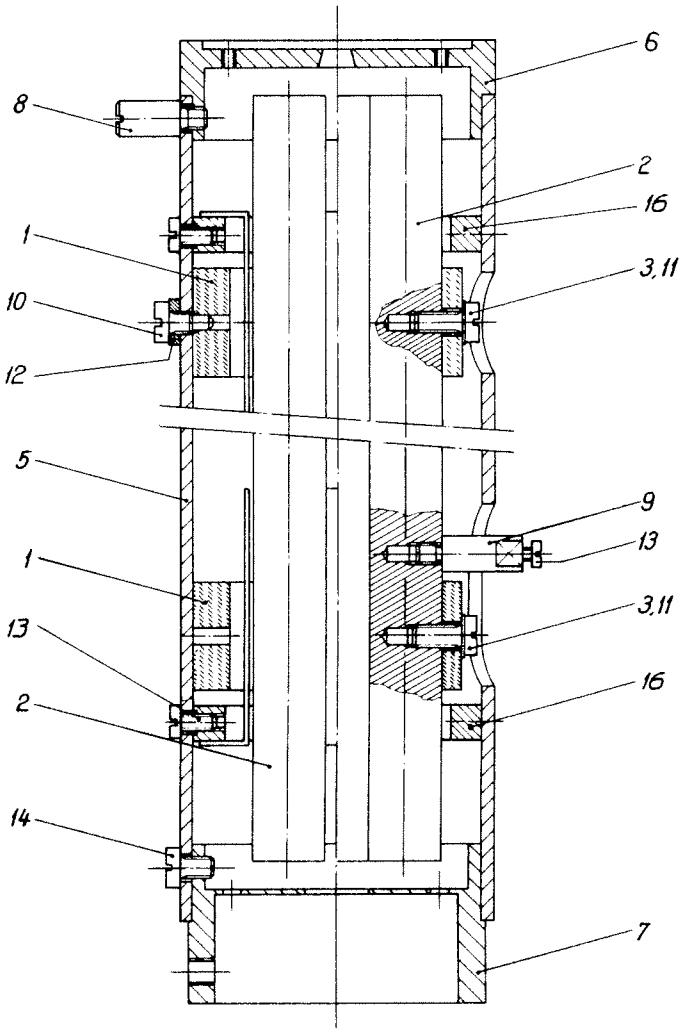


Fig. 3.3

3.4 Connection heads

The general design of the connection heads can be seen in Figs. 3.1 and 3.2.

Some feedthroughs are covered with two-part shielding tubes which are indispensible for proper functioning. Be sure to secure these shields in the closed position after undertaking any work on them.

The type of wiring made between the ion source connector and the feedthroughs depends chiefly on the type of ion source being used (Refer to drawings BG 546 ... -Z in the appendix). In addition to the ion source voltage, the field axis voltage is also conducted into the connection head via the ion source cable and is available at the 2-pole socket. It is supplied to the QMH from this socket via a cable.

To mount the QMA, the outer shell must first be removed to gain access to the flange screws. A special ring protects the ceramic feedthroughs from inadvertent damage. This protective ring should not be removed!

3.5 Ion source

Refer to the separate operating instructions for the particular ion source.

4. INSTALLATION

4.1 General information

The analyzer is supplied ready-for-operation with the specified ion source already mounted. A test report is included with each analyzer. It gives the most advantageous adjustment for the control unit. There is, however, one exception: The resolution values are no longer valid if the QMH has been changed.

The analyzer can be mounted at any angle.

4.2 Analyzer with Faraday cup (Fig. 3.1)

- Mount the holder supplied (clamping ring)
- Remove the cover (18) from the connection head
- Remove the protection tube (7)
- Carefully insert the analyzer through the connection flange (do not bend the wiring) and mount
- Secure the cover in place (18)

4.3 Analyzer with off-axis SEM (Fig. 3.2)

The SEM is supplied in an evacuated protection tube to prevent damage during shipping.

- Mount the holder supplied (clamping ring) and place the analyzer on the assembly frame.
- Do not remove the protection tube (38) until shortly before mounting the analyzer

  NOTE:
  Do not used the copper tube on the end of the protection tube as a connection port

- Carefully insert the analyzer through the connection flange (Do not bend the wiring) and mount.

4.4 Electrical connections

The following illustrations show the connections made between the analyzer and the electronics.

Connection	Purpose	Order Nr.	Cable length
1	Ion source supply	BG 548 082 -T	3 m
2	Ion source supply	BG 548 083 -T	10 m
3	SEM high voltage	BG 541 978 -T	3 m
4	SEM high voltage	BG 541 979 -T	10 m
5	Control cable	BG 541 964 -T	3 m
6	Extension cable	BG 541 680 -T	7 m
7	RF line	BG 541 960 -T	0.7 m
8	Field axis cable	BG 541 962 -T	0.7 m
9	Electrometer 1	BG 541 505 -T	0.8 m
10	EP input	BG 548 152 -T	0.1 m
11	EP input	BG 548 153 -T	0.5 m
12	Short circuit jumper	B 4728 891 B9	
13	QRM input	BG 524 317 -T	3 m
14	HV+ from the QPS	BG 519 123 -T	2.8 m
15	HV– from the QPS	BG 519 124 -T	2.8 m
16	QMA – QPS	BG 548 242 -T	3.0 m

Refer to the appendix for the detailed IS connector pin assignments

4.4.1 Analyzer with Faraday cup

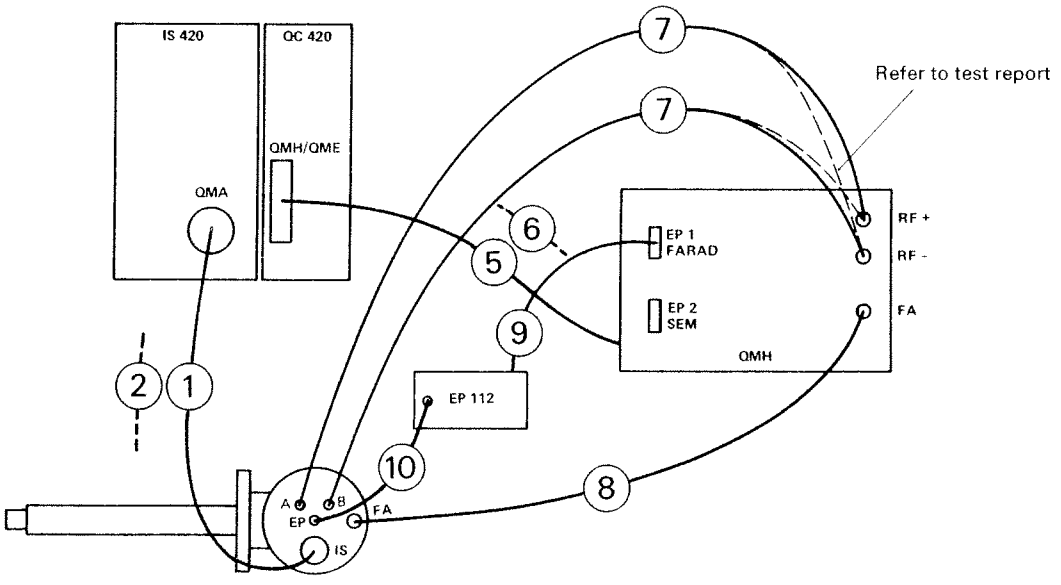
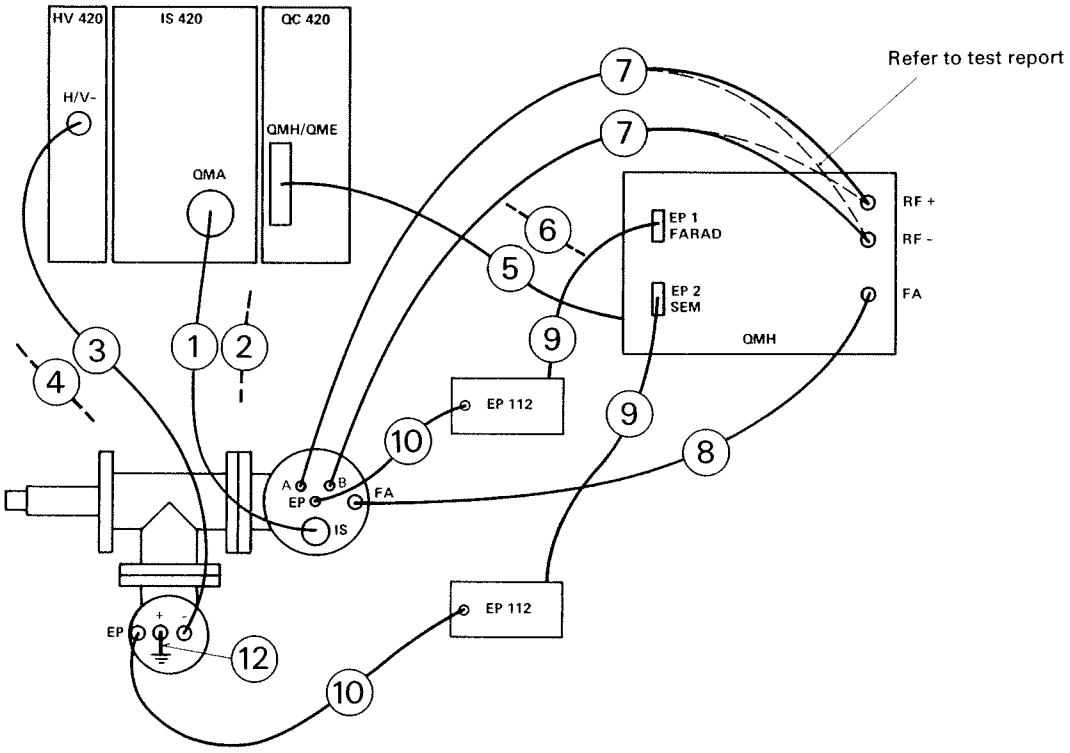


Fig. 4.1

4.4.2 Analyzer with 90° off-axis SEM

4.4.2.1 With EP 112 electrometer amplifier



If there is only one EP 112 connected to the SEM, the Faraday connection must be grounded using a shorting plug.

Fig. 4.2

4.4.2.2 Connecting an oscilloscope directly to the SEM

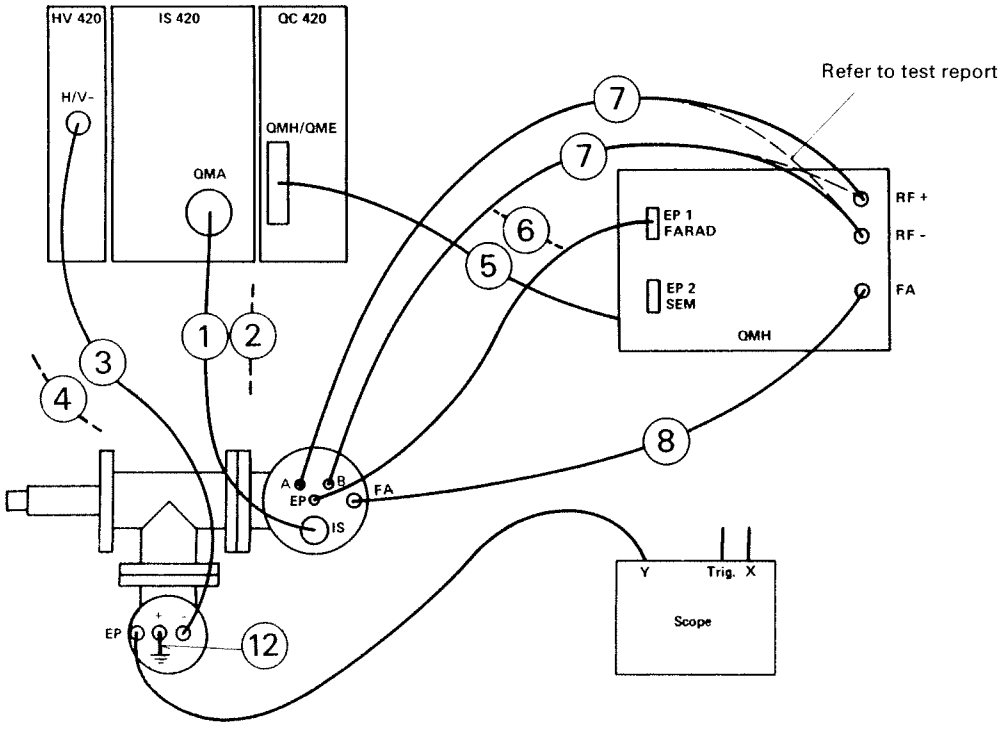


Fig. 4.3

4.4.2.3 Detecting positive ions with the QRM/QRV 102

For this measuring method the QRV preamplifier is connected directly to the SEM flange. The connection head with its connector plates must be removed first.

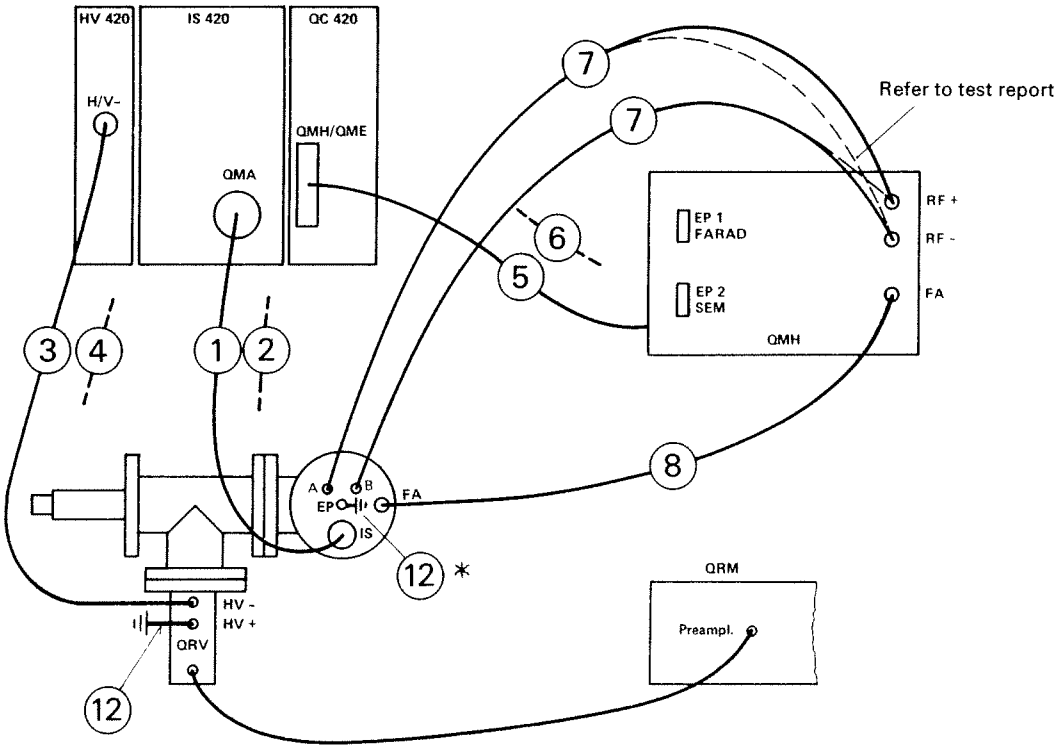


Fig. 4.4

4.4.2.4 Detection of positive and negative ions with ion optics, the QPS ion polarity control unit and the QRM/QRV ion counting electronics.

For this measuring method the QRV preamplifier is connected directly to the SEM flange. The connection head with its connector plates must be removed first.

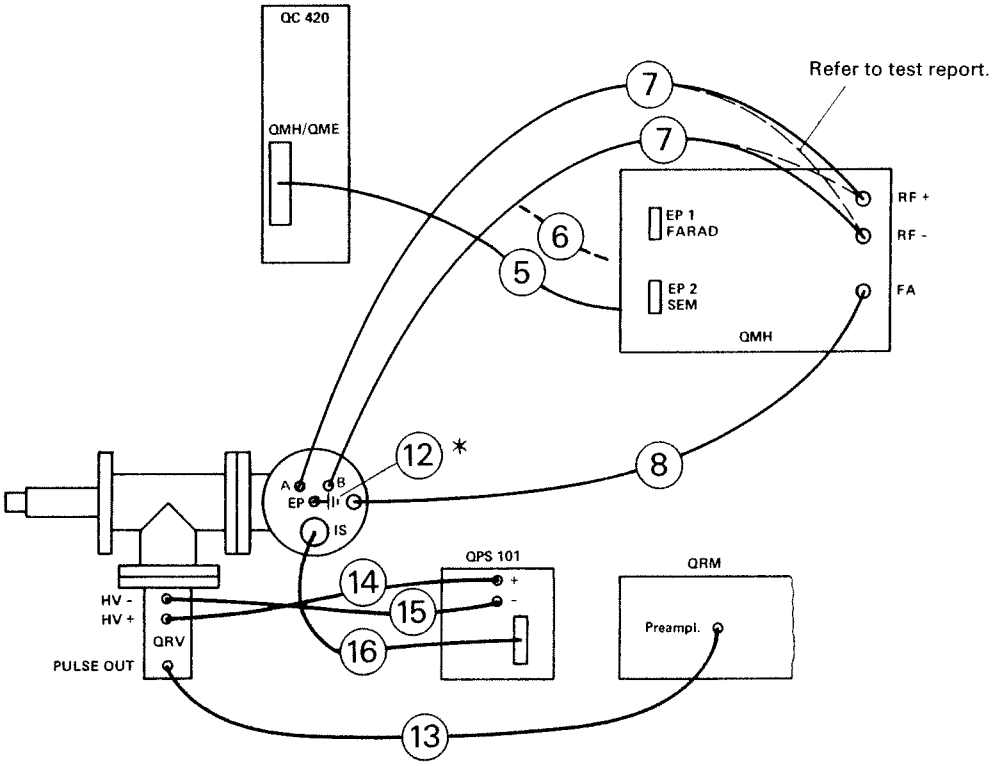


Fig. 4.5

* The EP1 can remain connected instead of short circuit jumper 12

5. OPERATION

5.1 Ion source potentials

Pertinent values can be taken from the test report. For information on setting the ion source voltages, refer to the separate operating instructions for the particular ion source being used.

5.2 Voltage for the deflection condenser ("DEFL")

The optimal value depends on the ion formation potential and also somewhat on the SEM voltage. The following settings can be used as guidelines:

IONREF	approx. 120 V	40 V
DEFL. I	300 V	200 V

DEFL I is fine tuned on the maximum signal. If the SEM voltage has been considerably modified, DEFL. I must be readjusted.

In the circuit described in 4.4.2.1 to 4.4.2.3, the large outside plate on the deflection condenser is grounded and the inner plate is on a negative voltage (DFEL. I). In the standard circuit (Fig. 3.2) the outside plate is connected to the axial feedthrough (x) to which the EP is connected for direct ion current measurement (Faraday mode).

In circuit 4.4.2.4 the deflection voltage can be applied as shown in Fig. 4.5. If the QPS adjustment range is not wide enough, the voltage divider must be resoldered to another point (refer to the operating instructions). For some applications it may be advantageous to apply accelerating voltages to both deflection plates. Both the QPS and QMS are designed for this (for the QMS 420: DEFL. I and DEFL. 0). The two potentials are conducted to the analyzer connector plate (Diagram 546 495 -Z). If necessary, a connection can be made between pin 16 in the IS connection head socket and the outside deflection plate. However, the EP cannot be connected in this latter case. If connection of the EP is nevertheless required, the jumper between the outer deflection plate and the separate collector must be opened and the deflection plate connected to the pin over an unassigned feedthrough. The separate collector can then continue to be used for direct ion current measurement (Faraday mode). As not all the ions reach this collector, the sensitivity is lower than when the outside deflection plate is a part of the Faraday cup.

When the deflection voltages come from the QMG 420, they are automatically short circuited.

The polarity of the two potentials is opposite to the ion polarity, which has the effect of accelerating the ions from the mass filter to the condenser.

5.3 Adjusting the protection setting

Refer to the QMS 420 operating instructions.

5.4 Operating at higher temperatures

The analyzer can be heated to a maximum of 200 °C during operation, but the temperature of the electrometer amplifier/preamplifier to the ion counting electronics must not exceed 50 °C. For this reason the electrometer amplifier and the RF generator are removed and placed outside the heating zone for bakeout. A 50 cm cable is supplied to make the connection to socket C of the SEM connector plate. If the bakeout temperature reaches or exceeds 150 °C, the SEM may only be operated at –1000 V.

The RF generator may not be heated to over 50 °C.

5.5 Baking the analyzer

The analyzer can be heated to 400 °C. The connector plate must be removed for temperatures over 200 °C. The QRV must always be removed for bakeout and may only be reinstalled when the flange has cooled to at least 50 °C.

5.6 Determining the SEM gain

5.6.1 From the ion currents measured with and without SEM

The interesting ranges of the mass spectrum are measured once directly and once indirectly with the SEM. The ratio of the currents for two corresponding peaks gives the gain for the specific operating conditions.

This method takes the effect of the ion deflection into account for analyzers with off-axis SEM.

5.6.2 From the amplitude of the individual pulses

The oscilloscope is connected to the SEM C collector via a cable with as low a capacitance as possible as shown in 4.4.2.2. The SEM gain can be calculated from the pulse amplitude as follows.

$$V = \frac{C_E \cdot U_O}{e}$$

where:

- C_E Capacitance of cable and scope input
- U_O Maximum pulse voltage
- e Unit charge

At a capacitance of 100 pF, 1.6 mV corresponds to a gain of 10^6. Time constant $C_E \cdot R_E$ must be high compared to the pulse duration (approx. 10^{-8} s). The pulse duration may not be so long that the pulses overlap. Choose a small enough peak in the interesting mass range and then reduce the emission. This reduces the number of background pulses which are usually lower than the ion-induced pulses (Prerequisite: Mass < 100, High voltage > 2 kV).

6. ASSEMBLY INSTRUCTIONS, MAINTENANCE

Sections 4.1 and 4.2 contain instructions for installing the analyzer in the vacuum system. Section 4.4 describes the connections to the electronics.

6.1 Removing and installing the mass filter in analyzers with Faraday cup (Fig. 3.1)

a) Disconnect the cable from the connector plate, remove the EP and QMH.

b) Remove the protective tube (18) from the connection head

c) Remove the analyzer from the vacuum chamber and set it on the assembly block with the holder

d) Disconnect the RF wiring on the mass filter

e) Loosen the fixation screws on the ion source

f) Wear lint free gloves or hold the ion source in a lint free paper towel. Carefully pull off the connector for the wiring vertically upwards using pliers. Place the ion source with its wiring on a clean surface taking care not to bend the wiring.

g) Remove the mass filter fixation screws (19).

h) Wear gloves or hold the mass filter in a paper towel and remove it by pulling straight up.

The mass filter can now be disassembled and cleaned according to Section 6.6.2

Installing the mass filter:

i) Place the mass filter straight up on the ring (12). Then first loosely insert the screws (19) and tighten them afterwards.

k) Place the ion source on the filter. If the wiring is already attached to the ion source, first plug the connector into the proper feedthrough and then screw down the ion source.
Consult the wiring diagram in the appendix or the operating instructions.

l) Check for proper connection and insulation of the ion source using an ohmmeter. If the insulation is poor, replace the ion source insulation sleeves (refer to the operating instructions for the ion source).

m) Attach the RF wiring with the screws and connect opposite rod pairs.

n) Check the positioning of the filament and the Wehnelt plates (refer to the operating instructions for the ion source).

o) Treat the flange and seal according to the separate applicable operating instructions (for flange connections) and mount the analyzer

p) Before tightening the flange screws, check the insulation of all the electrical contacts on the connector plate against one another and to ground and also check the continuity of the filament using an Ohmmeter.

q) Mount the protective tube (18)

6.2 Removing the mass filter and deflection unit from analyzers with off-axis SEM's (Fig. 3.2)

NOTE: Refer to Fig. 6.1

Flange connection F1 may under no circumstances be opened before F3 has been opened, the SEM pulled out, and the inner shielding tube (67) removed.

a) Open flange connection F3 and remove the SEM

b) Unscrew and remove the shielding (67)

c) Open flange connection F1, remove the mass filter together with the deflection unit from the vacuum chamber and the T-piece

d) Place the mass filter with holder on the assembly block

e) Remove the wiring connections (4/Fig. 6.2) on the ion source or the fixation screws for the ion source.

f) Carefully pull off the connector (2) for the wiring (15, 16) using pliers

g) Disconnect the RF supply (17) to the mass filter

h) Remove the screw (42) and pull the mass filter out of the tube (3)

i) Remove hex screw (7)

k) Carefully pull off the connector (1) and the axial connector (x / Fig. 3.2) using pliers and remove the complete deflection unit from the flange.

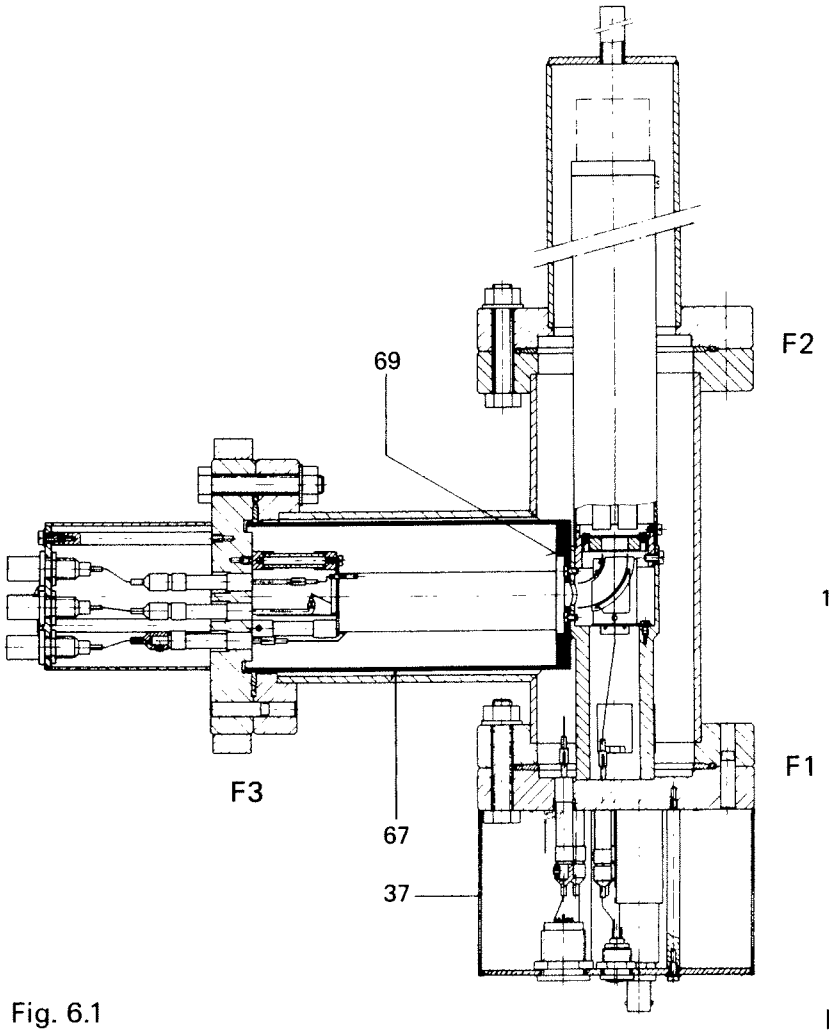


Fig. 6.1

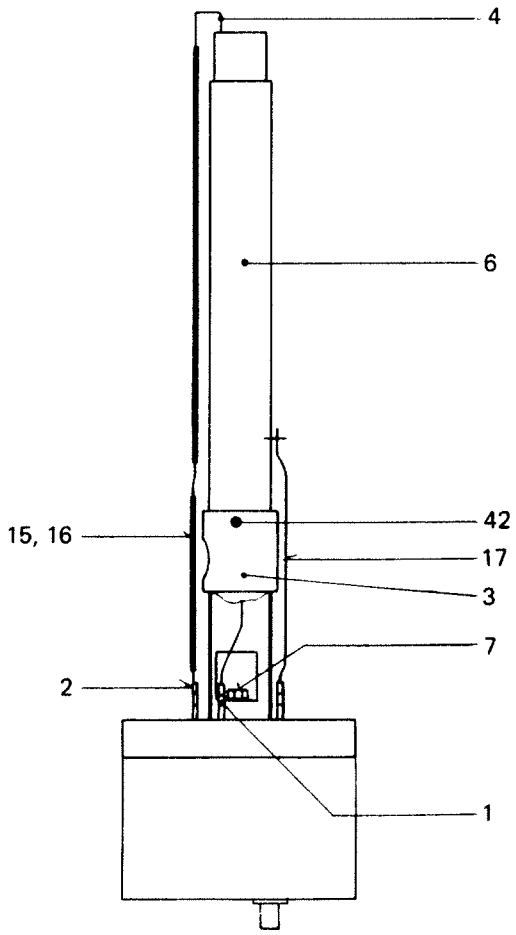


Fig. 6.2

6.3 Removing the deflection condenser

a) Remove the mass filter as described in 6.2 a) – h).

b) Loosen the lateral clamping screws (45, 49 / Fig. 3.2)

c) Remove screws (47 / Fig. 3.2)

d) Pull the connector(s) (1 / Fig. 6.2) for the deflection plates off the feedthroughs.

e) Using an appropriate pair of pliers, carefully pull the axial connector off the feedthroughs without using excessive force and pull the condenser out of the tube. To do this, the shield clamp over the access opening must first be removed.

6.4 Installing the deflection plates, the deflection unit and the mass filter

a) Reassemble in reverse order of the descriptions in 6.3 or 6.4.

b) Don't forget the shielding clamp
The lateral clamping screws must be tightened so that the outside cover to the deflection unit is squeezed together somewhat. If this is not done, microphonic noise can occur in Faraday mode.

c) Plug the wiring connector onto the feedthrough (Fig. 3.2)

d) Check the insulation resistors, the connections to all the electrodes and the continuity of the filament using an ohmmeter.

e) Place the mass filter in the T-piece before installing the SEM. A pin guarantees correct positioning. Tighten the connections for Flange F1 (Fig. 6.1).

f) Screw in the SEM shielding tube slightly. If the threads don't catch i.e if the friction of the shielding against the wall is too great, the fixation screws for the thread piece (71) can be loosened somewhat and then retightened after the shield has been screwed in.

g) Install the SEM as described in 6.5.

6.5 Replacing the SEM

a) Open the SEM flange (F3 / Fig. 6.1) and place it on the assembly block.

b) Remove screws (41)

c) Carefully pull the connector off the pins and remove the SEM – pay attention to the number and placement of the washers

d) Put the new SEM in place and put any washers back in their proper place. Plug the connector onto the appropriate pins (Fig. 6.3 / Fig. 6.4)

e) Affix the SEM with screws (41)

f) Check the insulation and the resistor chain (18 MΩ) using an ohmmeter

g) Mount the flange. The pin provides correct positioning.

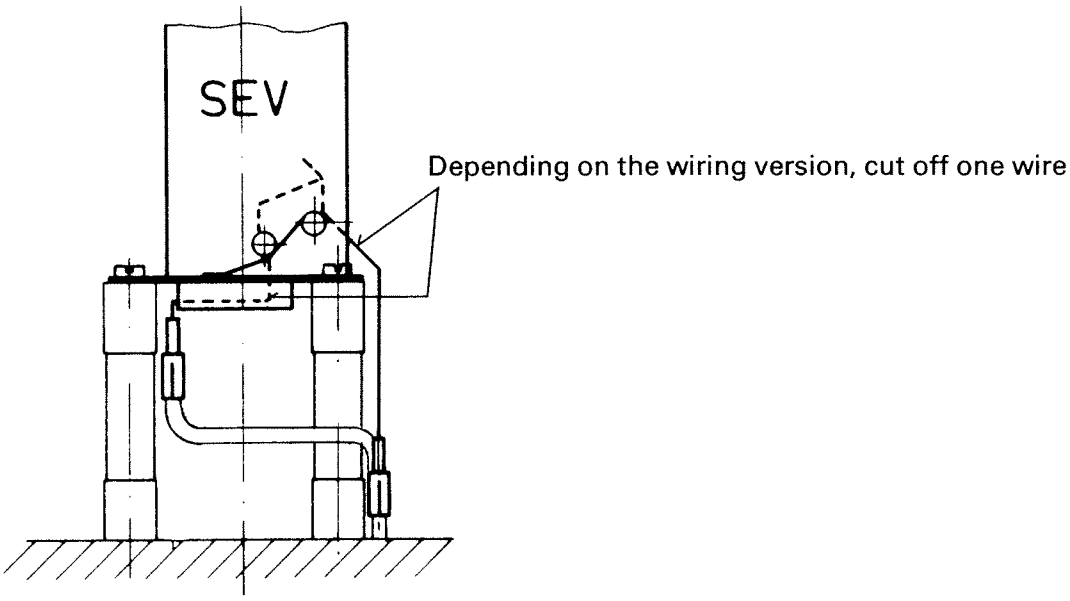


Fig. 6.3

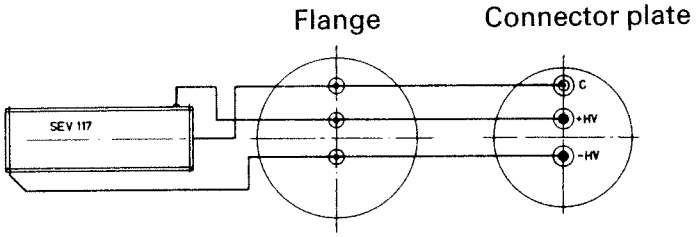


Fig. 6.4

6.6 Cleaning the mass filter and the ion source

The mass filter requires no cleaning as long as it is functioning properly. Certain operating conditions can, however, lead to contamination of the ion source and the rod system which cause poor resolution and stability and low sensitivity. In many of these cases cleaning the ion source as described in the operating instructions for the source is all that is needed to restore proper functioning.

6.6.1 Cleaning the ion source

Refer to the separate operating instructions for the source.

a) Remove the analyzer as described in 6.1 a) – c) or 6.2 a) – d)

b) Loosen the ion source wiring

c) Take the ion source apart, removing the baseplate last, and clean.

d) Attach the ion source baseplate to the mass filter

e) Reassemble the ion source

f) Connect the wiring to the ion source

g) Install the analyzer

6.6.2 Cleaning the mass filter (Fig. 3.3)

If the mass filter needs to be cleaned, the ion source will usually also require cleaning

a) Remove the ion source according to 6.6.1 a) – c).

b) Remove the screws (13) from the RF connections and remove the RF wiring.

c) Carefully remove the RF connection pin (9) with the 3.2 mm open-jawed wrench.

d) Remove the spacer pin (8) and take off the cover (6)

e) Remove the shields (16)

f) Remove the mass filter fixation screws (14), take the mass filter off the end piece (7) and place horizontally on a clean surface (paper towel, aluminum foil).

g) Remove the screws (10) from the mass filter while it is lying horizontally! Put the screws in a safe place!
While wearing lint free gloves, push the rod system out of the tube and place it on a clean surface.

h) Clean the ion source end of the rods with a fiberglass brush or Q-tip and Al_2O_3 powder and distilled water. Most contamination occurs at this end of the rod system. However, the entire length of the rods can be cleaned the same way if necessary.

Do not dismantle the rod system any further. Precise adjustment of the rod system is only possible at the Balzers factory. The mechanical accuracy of the mass filter is of decisive importance for proper functioning. Balzers assumes no guarantee for proper functioning of the mass filter if a rod has been removed from the rings.

i) Clean the rods and shields of all residues using Freon or alcohol. Take care not to get solvent on the ceramic parts.

k) Remove lint and dust with a jet of clean gas (not compressed air!)

l) Wearing lint-free gloves (surgical gloves) slide the rod system into the tube so that the taps for the connection screws (9) can be seen in the longitudinal slits.

m) Align the hole in the ceramic piece with the tap in the tube and screw in the fixation screw (10)! Only this special screw with lathed end may be used!

n) Install the shield (16)

o) Place the mass filter on the end piece (7) and secure with the screws (14)

p) Secure the cover (6) with the screws (8)

q) Mount the ion source and install the analyzer

6.7 Removing the connector plate(s) (Fig. 3.1)

The procedure described is for analyzers with Faraday cups, but it does not differ greatly for other types of analyzers.

a) Remove the EP, QMH and cable from the connector plate

b) Remove screws (37) and take off the cover for the connection head (18)

c) Loosen the socket head cap screws (26) for the screening sleeve(s) (14), push the sleeves up to the connector plates and secure with screws (26).

d) Loosen all the socket head cap screws (26, 26a) on all the connectors (17) mounted on feed-throughs.

e) Remove the fixation screws and washers (36, 46) and take off the connector plate. Do not bend the wires with connectors (17). The threaded pins (25) and the protective ring (5–1) for the feedthrough can remain in the flange for bakeout.

6.8 Mounting the connector plate(s) (Fig. 3.1)

a) Check that the threaded pins (25) are screwed into the flange. Mount the protective ring (6) for the feedthroughs.

b) Carefully mount the connector plate so that the connector (17) fits on the appropriate feedthrough.

c) Secure the connector plate with screws (36) and washers (46) and only afterwards carefully tighten the socket head cap screws (26, 26a) on all the connectors (17) without using excessive force on the feedthroughs.

d) Slide the sleeve(s) (14) over the feedthroughs and secure with the screws(s) (26)

e) Put the cover for the connection head (18) back in place and secure with the screws (37)

6.9 Removing and mounting the QRV 102 preamplifier

a) Turn off the HV and QRM

b) Remove the cable from the QRV

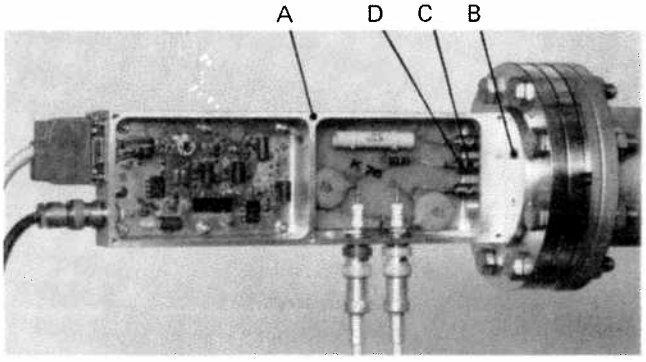
c) Loosen screw A and remove the cover from the QRV

d) Loosen screw C using the hexagonal wrench. Do not use unnecessary force on the feedthroughs because the ceramic parts could break

e) Remove screw B and carefully take out the amplifier.

f) When mounting the amplifier, carefully plug connector D into the feedthroughs and tighten screw B. Only after this has been done proceed to carefully tighten the C screws.

g) Put the cover in place and tighten the A screws



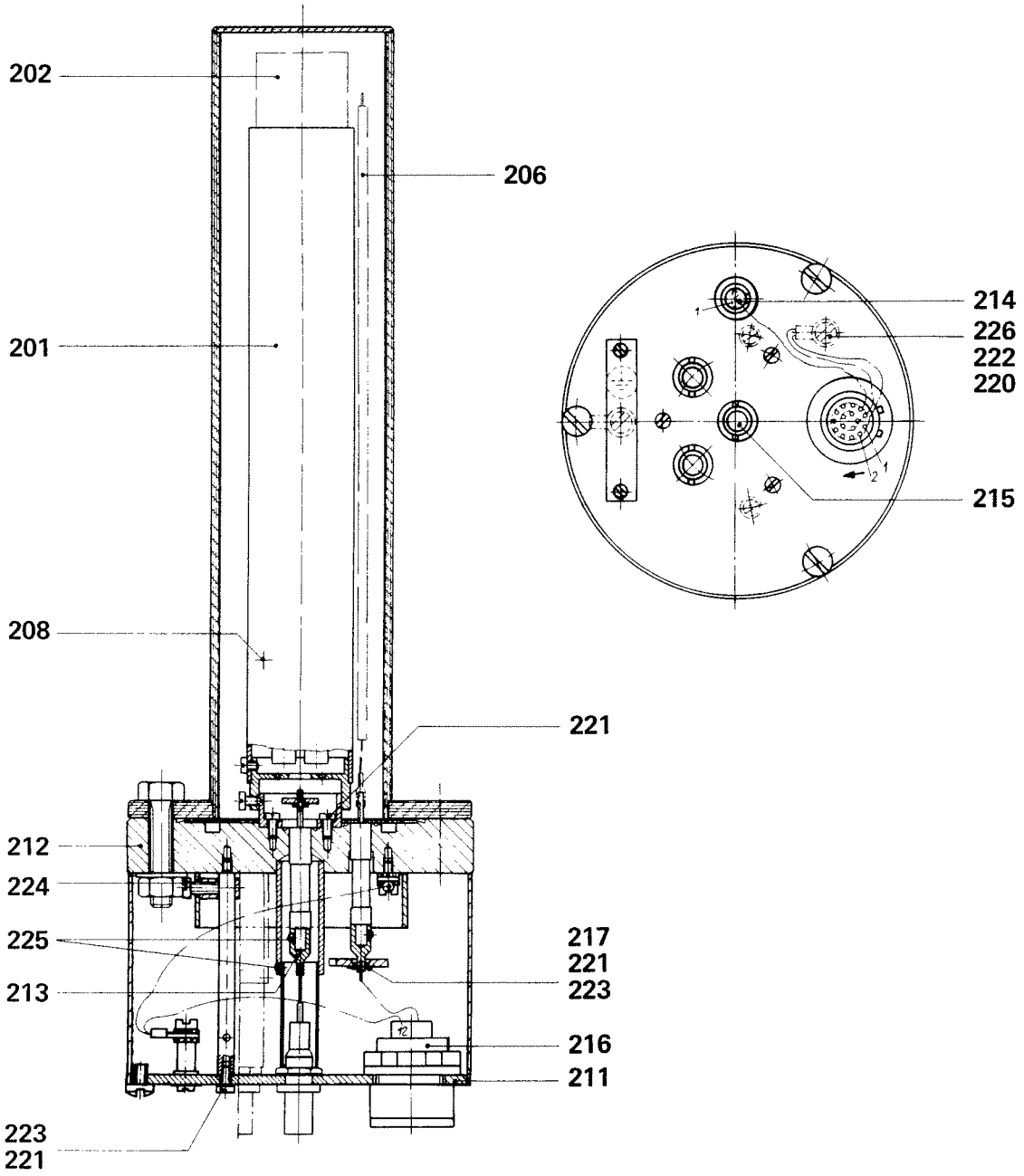
7. SPARE PARTS

Order spare parts according to the enclosed spare parts list.

When ordering, be sure to state the **model designation** and the **serial number** as given on the nameplate.

Ordering example:

10 pc Cu seals, DN 63 CF, Order Nr. BP 414 607 -T, as per spare parts list BK 800 127 E, Item 209



Quadrupole analyzer/Quadrupol-Analysator **BK 800 127 E/1**

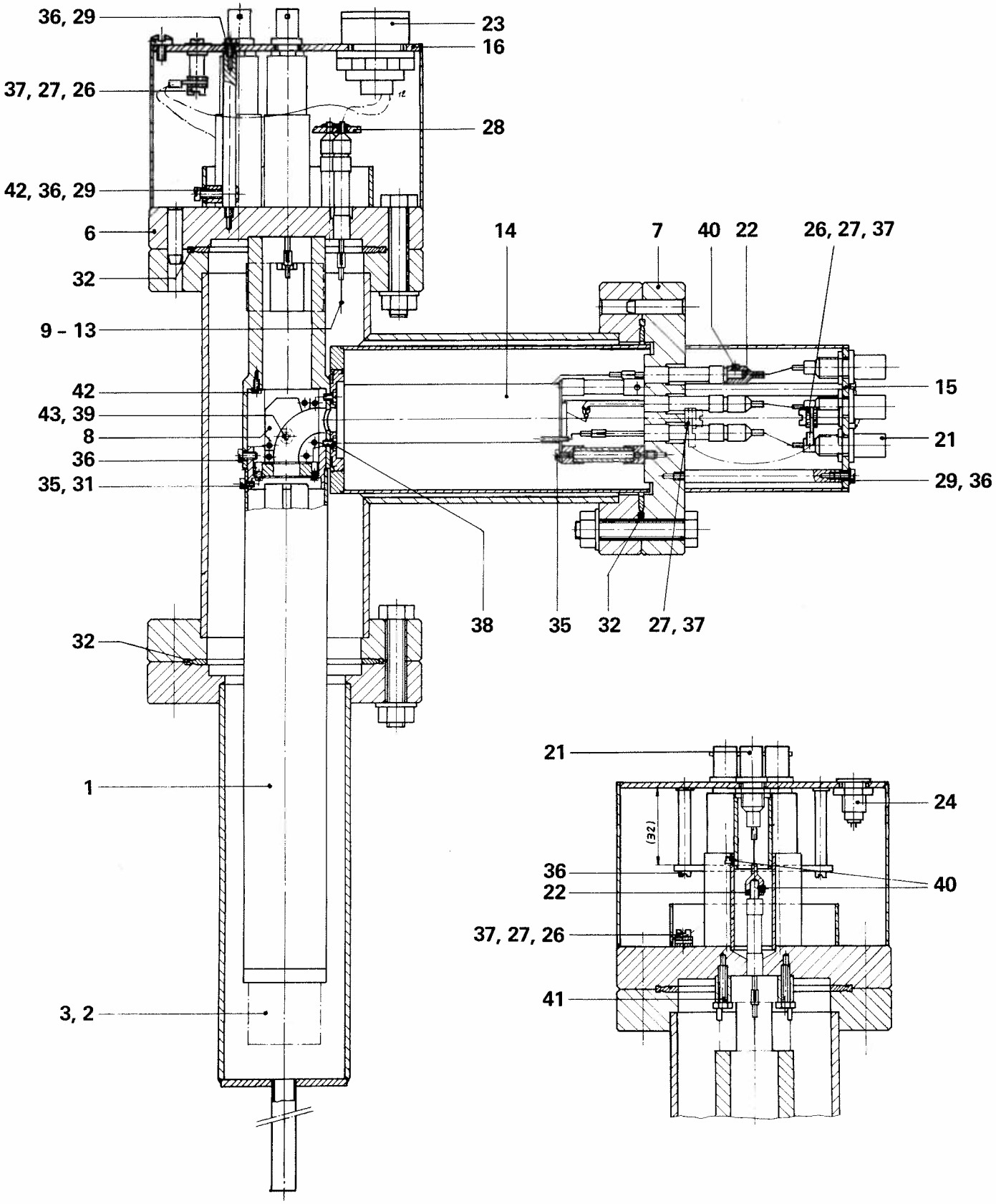
	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Quadrupole mass filter/Quadrupol-Massenfilter	201			BK 800 127 E/5
1	Standard ion source/Ionenquelle, Standard	202			BK 800 127 E/8
		203			
		204			
		205			
1	Wiring heater/Verdrahtung, Heizung	206	BG 521 650 -T		
1	Wiring ion source/Verdrahtung, Ionenquelle	207	BG 521 651 -T		
1	Wiring RF connection/Verdrahtung, HF-Verbindung	208	BG 521 123 -T		
1	Copper seal/Cu-Dichtung, DN 63 CF	209	BP 414 607 -T		
		210			
1	Cover/Deckplatte	211	BG 546 032 -X		
1	Flange comp./Flansch, DN 63 CF	212	BK 371 880 -X		
9	Plug/Stecker	213	BG 516 698		
1	Socket/Gerätedose, 2 P, D103A051	214	B 4722 180 FC		
3	Socket/Chassisbuchse, 22SHV-50-0-2	215	B 4722 652 B9		
1	Socket/Anschlussdose, 16ST, EGJ.4B.316...› Z	216	B 4722 823 LU		
6	DUO-Klips, FD-ST, SXN-10, ∅ 2	217	B 3833 261		
		218			
		219			
3	Screw/Zylinderschraube, INOX, M4 x 6 mm	220	N 3052 249 X		
9	Screw/Zylinderschraube, INOX, M3 x 6 mm	221	N 3052 189 X		
6	Disc/Fächerscheibe, CU-SN 6, A4,3	222	N 3537 246 B		
5	Safet washer/Sicherungsscheibe, INOX, ∅ 3,2/5,5 x 0,45 mm	223	B 3547 137 X		
1	Screw/Zylinderschraube, INOX, M3 x 10 mm	224	N 3052 193 X		
12	Threaded pin/Gewindestift	225	BN 801 661		
3	Cable shoe/Kabelschuh	226	B 4644 426 FA		

Spare Parts for / Ersatzteile zu

Quadrupole analyzer/Quadrupol-Analysator BK M07 500

BALZERS

BK 800 127 E/2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37, 27, 26
41
3, 2

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Quadrupole mass filter/Quadrupol-Massenfilter	1			BK 800 127 E/5
1	Cross-Beam/Ionenquelle	2			BK 800 127 E/6
1	Ion lens/Ionenlinse	3			BK 800 127 E/7
		4			
		5			
1	Flange comp./Flansch kpl., DN 63 CF	6	BG 543 873 -X		
1	CF-Flange comp./CF-Flansch, DN 63 CF	7	BG 517 350 -X		
1	Deviating unit/Umlenkeinheit	8	BG 543 877 -X		
1	Wiring heater I, CB/Verdrahtung Heizung I, CB	9	BK 371 896 -T		
1	Wiring heater II, CB/Verdrahtung Heizung II, BC	10	BK 371 897 -T		
1	Wiring ion source/Verdrahtung Ionenquelle, CB	11	BK 371 898 -T		
1	Wiring RF connection/Verdrahtung HF-Verbindung	12	BG 543 868 -T		
1	Wiring ion lens, CB/Verdrahtung Ionenlinse, CB	13	BK 371 899 -T		
1	SEV 217	14	BG 521 611 -X		
1	Cover/Deckplatte	15	BG 546 521 -X		
1	Cover/Deckplatte	16	BG 546 033 -X		
		17			
2	Short-ciruit plug/Kurzschlussstecker, 64 SHV 0-0-1	18	B 4728 891 B9		
		19			
		20			
6	Socket/Chassisbuchse, 22 SHV 50-0-2	21	B 4728 652 B9		
14	Plug/Stecker	22	BG 516 698		
1	Socket/A-Dose, 16 ST, EGJ. 4B. 316 ...>Z	23	B 4722 823 LU		
1	Socket/G-Dose, 2P, D103A051	24	B 4722 180 FC		
		25			
5	Cable shoe/Kabelschuh	26	B 4644 426 FA		
10	Disc/Fächerscheibe, CU-SN 6, A4, 3	27	N 3537 246 B		
8	DUO-Klips, FD-ST, SXN-10, ⌀ 2 mm	28	B 3833 261		
8	Safet panel/Sicherungsblech, INOX, ⌀ 3,2/5,5 x 0,45 mm	29	B 3547 137 X		
		20			
3	Clamp/Halteklammer	31	BG 516 662		
3	Copper seal/CU-Dichtung, DN 63 CF	32	BP 414 607 -T		
		33			
		34			
6	Screw/Zylinderschraube, INOX, M2 x 4 mm	35	N 3052 111 X		
15	Screw/Zylinderschraube, INOX, M3 x 6 mm	36	N 3052 189 X		
5	Screw/Zylinderschraube, INOX, M4 x 6 mm	37	N 3052 249 X		
2	Screw/Zylinderschraube, INOX, M2,5 x 4 mm	38	N 3052 158 X		
2	Threaded pin/Gewindestift	39	BG 543 894		
17	Threaded pin/Gewindestift	40	BN 801 661		
2	Screw/6kt-Schraube, INOX, M4 x 16 mm	41	N 3015 259 X		
4	Screw/Zylinderschraube, INOX, M3 x 4 mm	42	N 3052 186 X		
2	Nut/6kt-Mutter, INOX, M3	43	N 3415 037 X		

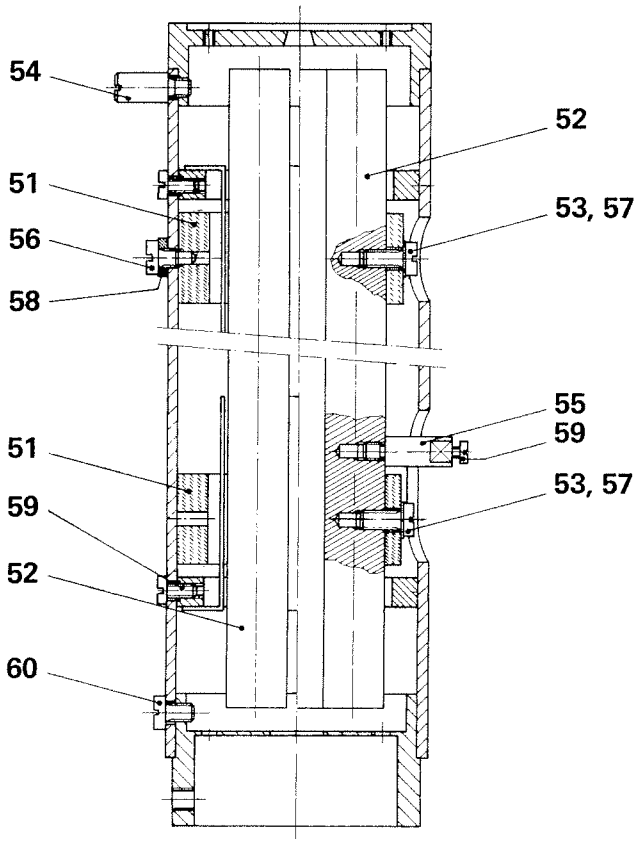
Spare Parts for / Ersatzteile zu

Quadrupole analyzer/Quadrupol-Analysator BK M07 509

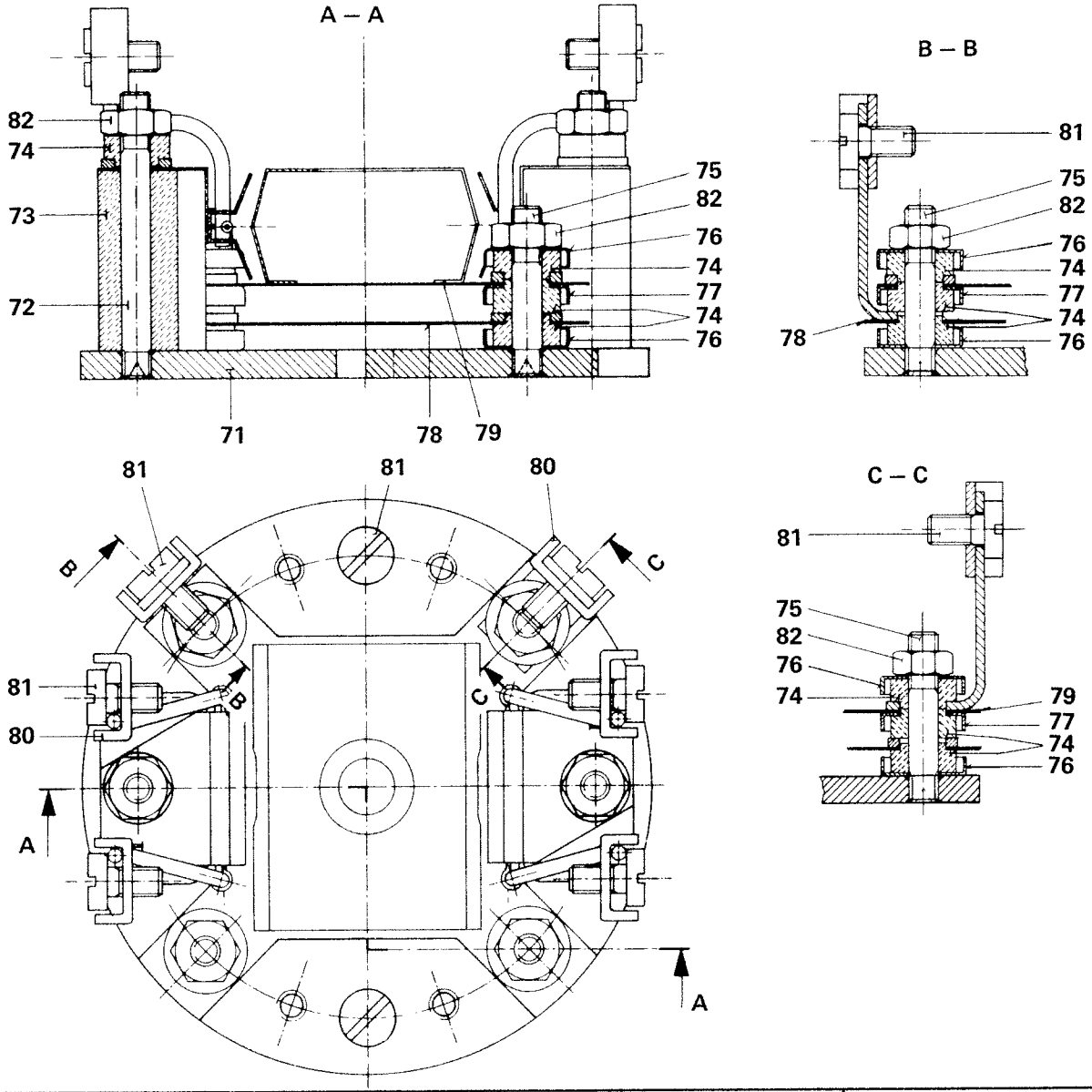
BALZERS

BK 800 127 E/4

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
2	Ring	51	BG 521 142		
4	Rod/Stab	52	BG 521 143		
8	Screw/Zylinderschraube	53	BG 521 145		
3	Screw/Gewindebolzen	54	BG 521 148		
4	Bolt/Bolzen	55	BG 521 149		
1	Screw/Schraube, INOX, M2,5 x 6 mm	56	BG 521 159		
8	Disc/Scheibe	57	BG 521 158		
1	Ring nut/Ringmutter	58	BG 521 577		
10	Screw/Zylinderschraube, INOX, M2 x 4 mm	59	N 3052 111 X		
3	Screw/Zylinderschraube, INOX, M2,5 x 4 mm	60	N 3052 158 X		



	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Base plate/Grundplatte	71	BG 521 101		
2	Threaded pin/Gewindebolzen	72	BG 521 116		
		73			
14	Insulating bushing/Isoliertülle	74	BN 809 801		
4	Threaded pin/Gewindebolzen	75	BP 218 078		
8	Cap/Haube (boring/Bohrung ⌀ 1,7 mm)	76	BG 516 474		
4	Cap/Haube (boring/Bohrung ⌀ 2,4 mm)	77	BK 370 025		
1	Orifice/Blende	78	BG 521 114 -X		
1	Lense/Formationsraum	79	BG 521 111 -X		
6	Clip/Anschlussbügel	80	BG 511 289		
8	Screw/Schraube, INOX, M1,6 x 3 mm	81	N 3052 067 -X		
6	Nut/Mutter, INOX, M1,6	82	N 3415 023 -X		
		83			
2	Cathode filament, Re/Re-Kathode	84	BN 845 052 -T		*
2	Cathode filament, W/W-Kathode	85	BN 845 088 -T		*



Spare Parts for / Ersatzteile zu

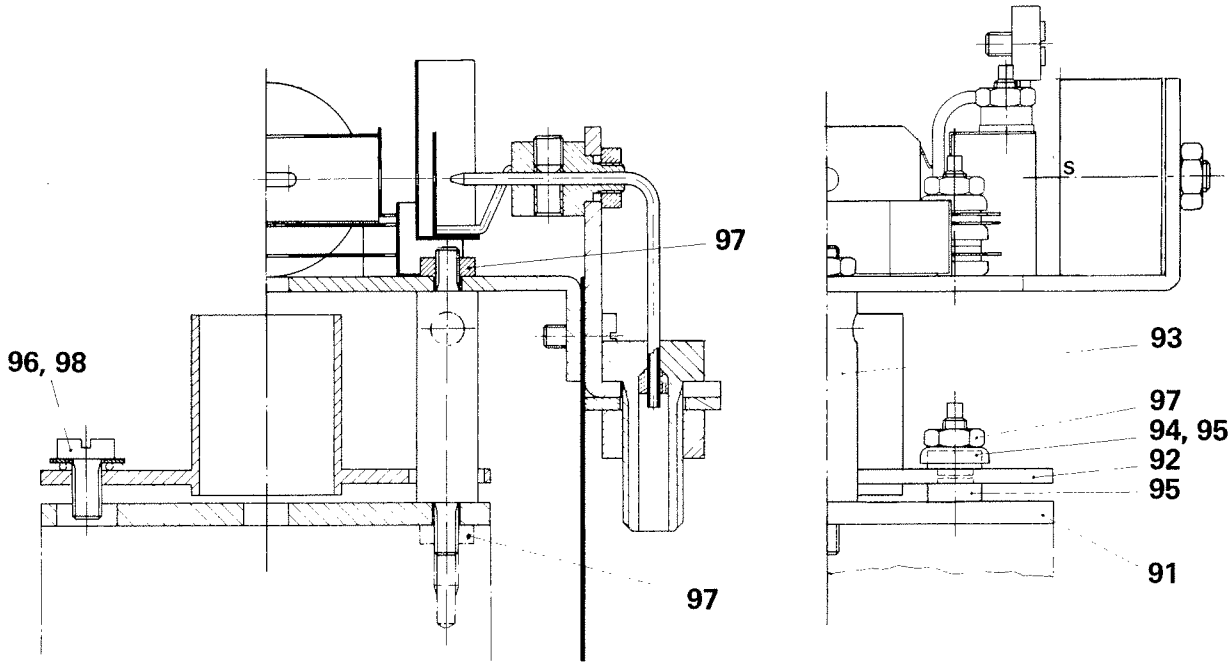
Cross-Beam/Ionenquelle BG 521 100 -U

BALZERS

BK 800 127 E/6

* on ceramic bloc/auf Keramikblock

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Plate comp./Grundplatte, kpl.	91	BK 371 856 -X		
1	Ionisation chamber/Formationsraum	92	BK 371 858		
2	Bolt/Bolzen	93	BK 371 859		
1	Hood/Haube	94	BG 516 474		
8	Insulating bushes/Isoliertülle	95	BN 809 801		
1	Screw/Zylinderschraube, INOX, M2 x 4 mm	96	N 3052 111 X		
6	Nut/6kt-Mutter, INOX, M1,6	97	N 3415 023 X		
1	Disc/U-Scheibe, ⌀ 2,2/5 x 0,3 mm	98	N 3502 406 X		



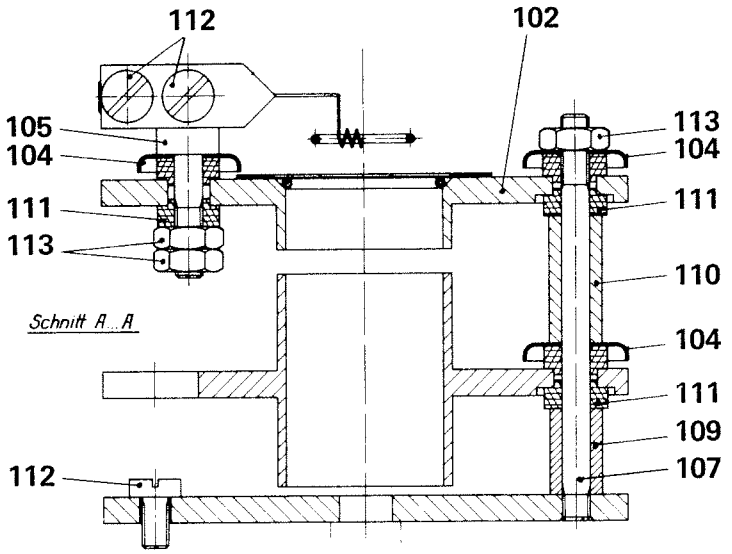
Spare Parts for/ Ersatzteile zu

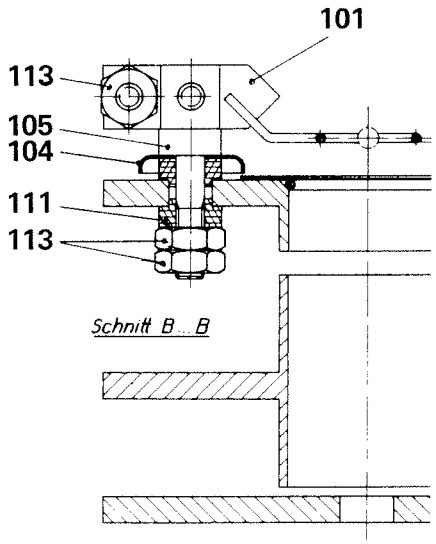
Ion lens/Ionenlinse BK 371 890 -T

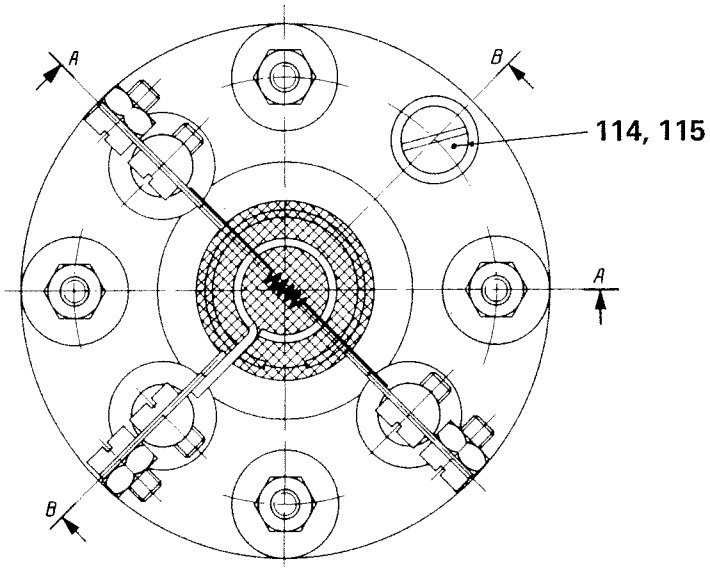
BALZERS

BK 800 127 E/7

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Wehnelt cylinder/Wehnelt-Zylinder	101	BG 516 677 -X		
1	Grid comp./Gitter kompl.	102	BG 516 789 -X		
		103			
11	Cap/Haube	104	BG 516 474		
3	Threaded pin/Gewindebolzen	105	BN 801 654		
		106			
4	Threaded pin/Gewindebolzen	107	BG 521 016		
		108			
4	Distance hose/Distanzrohr, ∅ 3 x 10,8 mm	109	BN 803 906 -4		
4	Distance hose/Distanzrohr, ∅ 3 x 13,2 mm	110	BN 803 906 -3		
22	Insulating bushing/Isoliertülle	111	BN 809 801		
8	Screw/Schraube, INOX, M 1,6 x 3 mm	112	N 3052 067 X		
13	Nut/Mutter, INOX, M 1,6	113	N 3415 023 X		
2	Washer/Unterlagscheibe, ∅ 2,2/5 x 0,3 mm	114	N 3502 406 X		
2	Screw/Schraube, INOX, M 2 x 4 mm	115	N 3052 111 X		







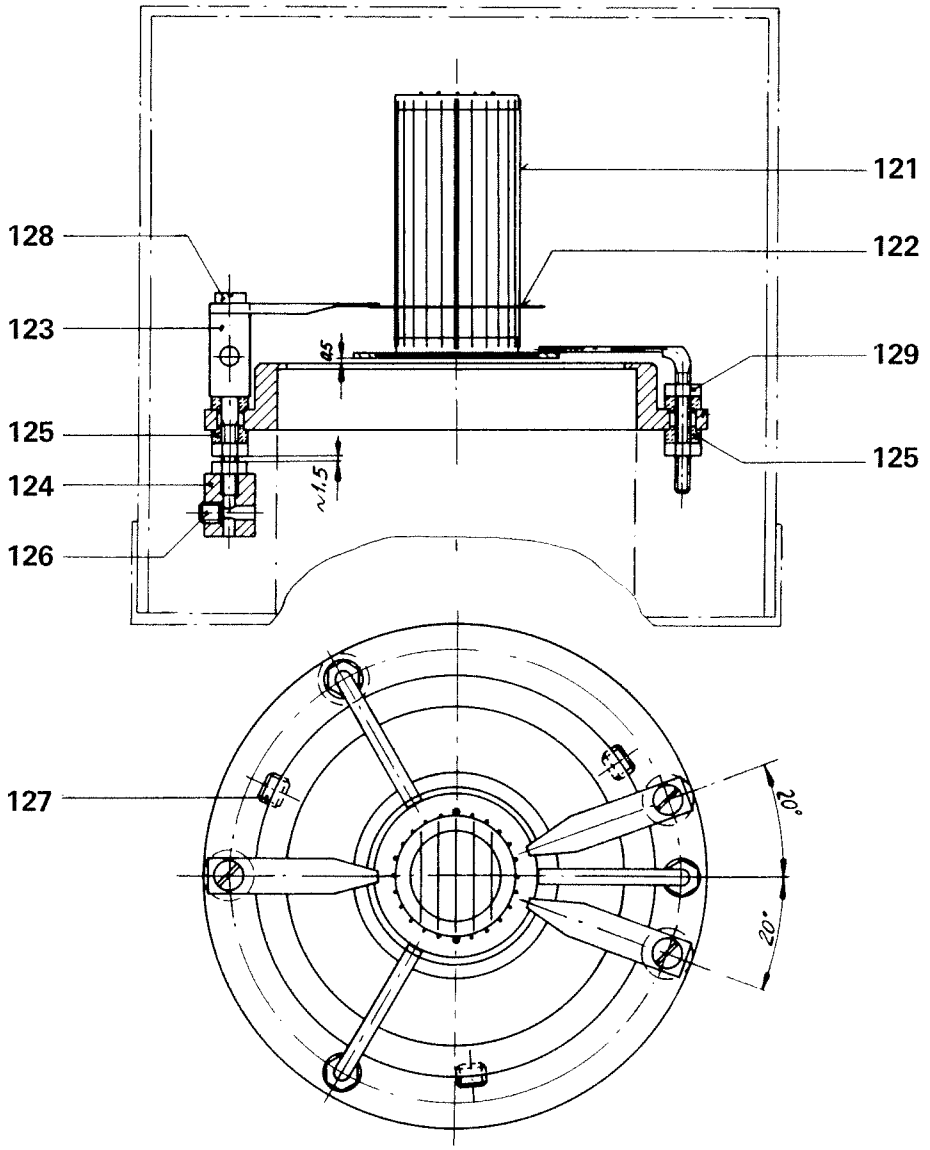
Spare Parts for / Ersatzteile zu

Standard ion source/Ionenquelle, Standard BG 520 180 AT

BALZERS

BK 800 127 E/8

	Description Teil	Item Pos.	Order No. Bestell-Nr.	S	Reference Bemerkungen
1	Grid/Gitter	121	BG 516 972 -X		
1	Filament/Katode	122	BG 516 977 -X		
3	Filament holder/Katodenhalter	123	BG 516 969		
4	Connecting block/Klemmteil	124	BG 516 988		
12	Insulating bushing/Isoliertülle	125	BG 516 966		
4	Threaded pin/Gewindestift	126	BN 801 663		
3	Threaded pin/Gewindestift	127	BN 801 661		
3	Screw/Zylinderschraube, M 1,6 x 3 mm	128	N 3052 067 BB		
12	Nut/6kt-Mutter, 0,8 D, INOX, M 1,6	129	N 3415 023 X		
		130			
		131			
		132			

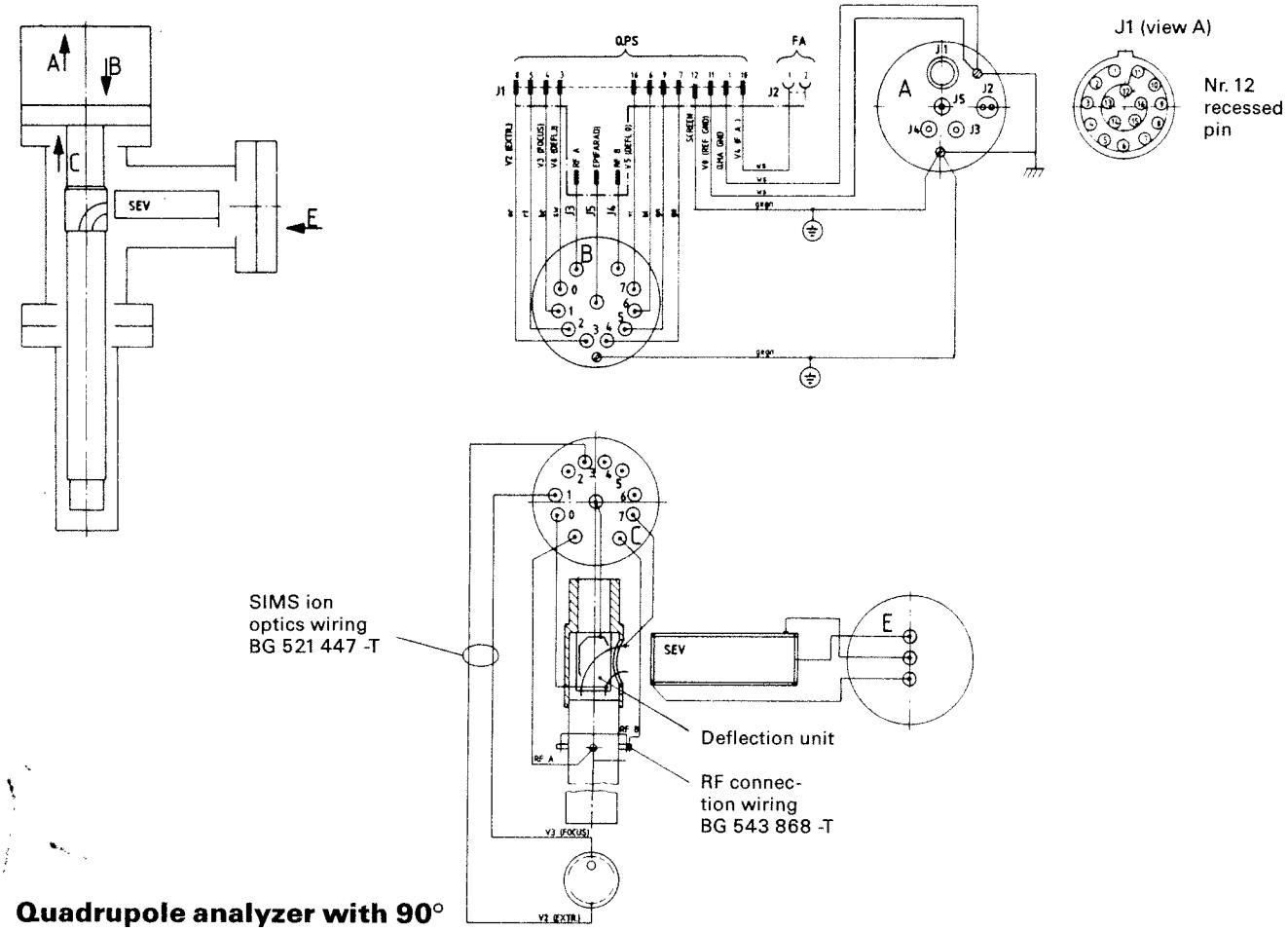


Spare Parts for / Ersatzteile zu

Grid ion source/Gitter-Ionenquelle BG 516 971 -U

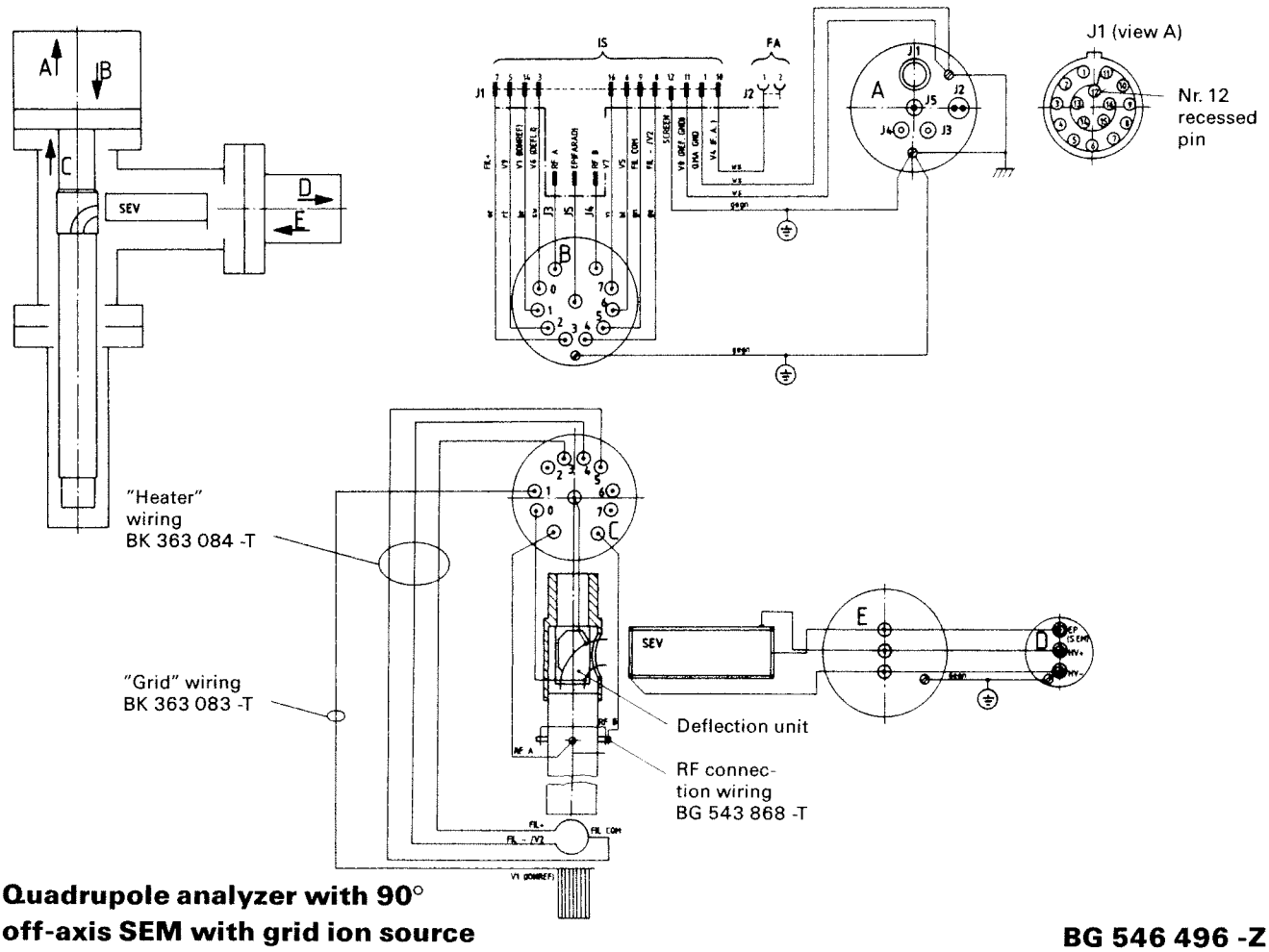
BALZERS

BK 800 127 E/9



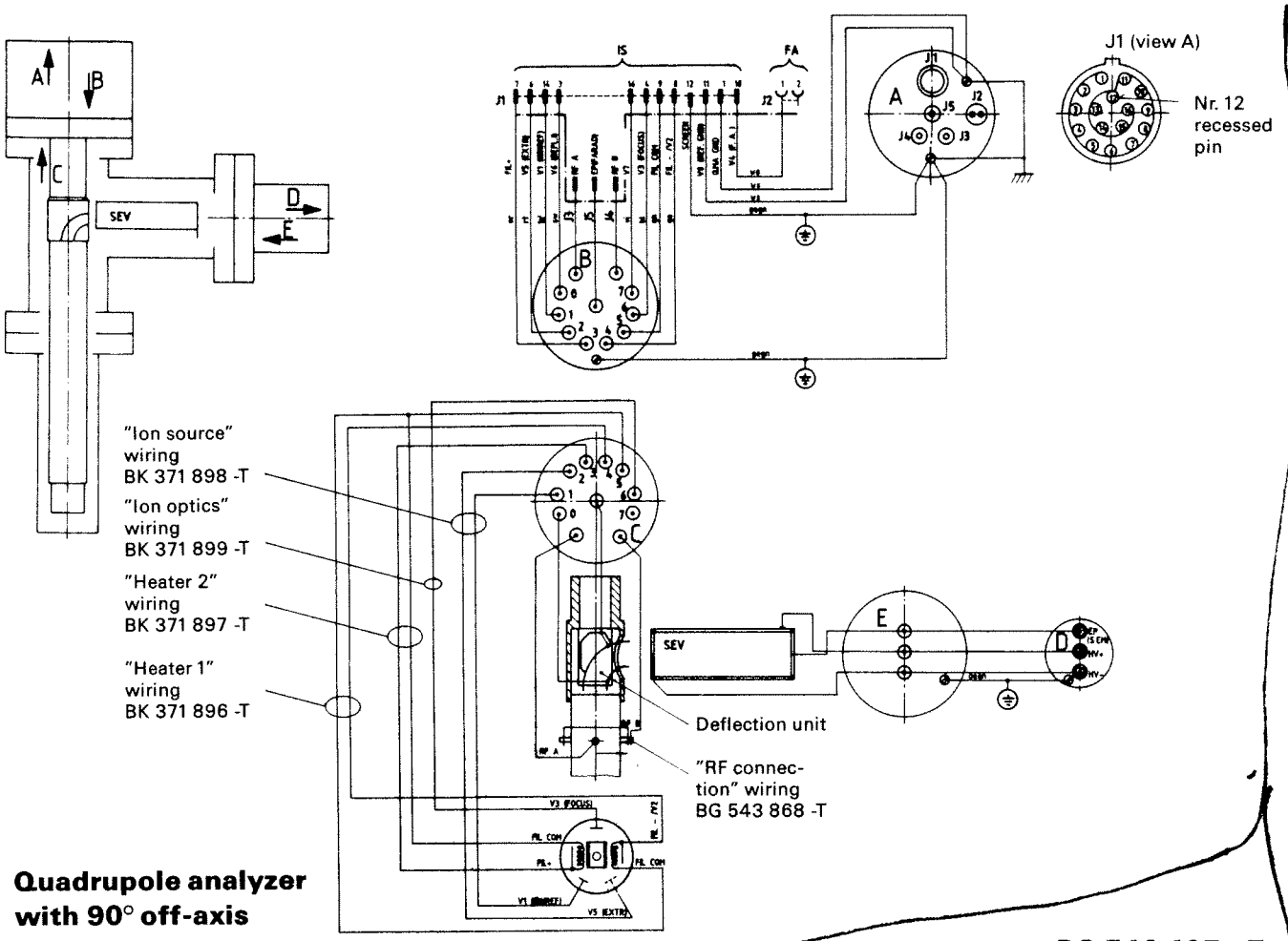
Quadrupole analyzer with 90°
off-axis SEM with SIMS ion optics

BG 546 495 AZ



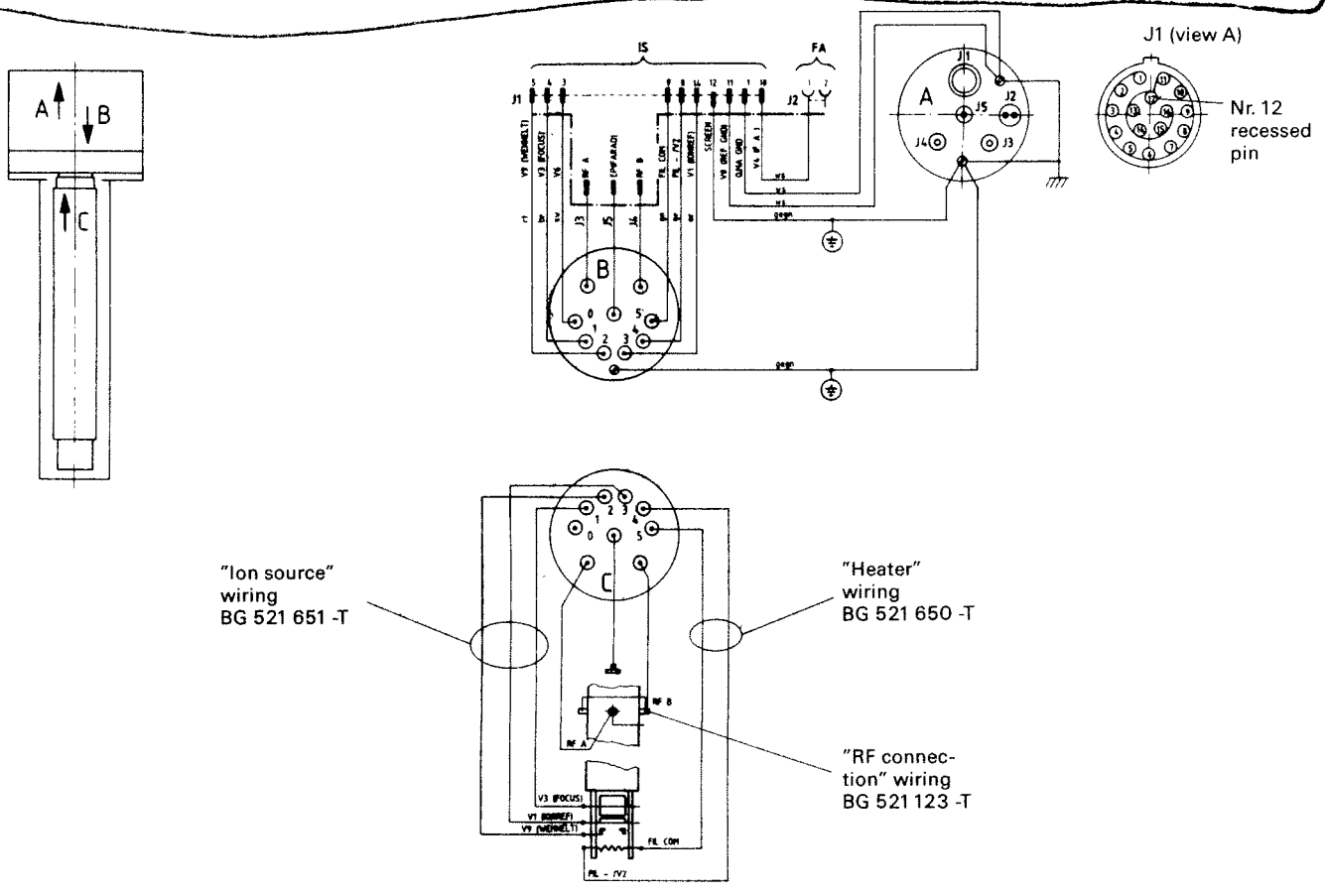
Quadrupole analyzer with 90°
off-axis SEM with grid ion source

BG 546 496 -Z



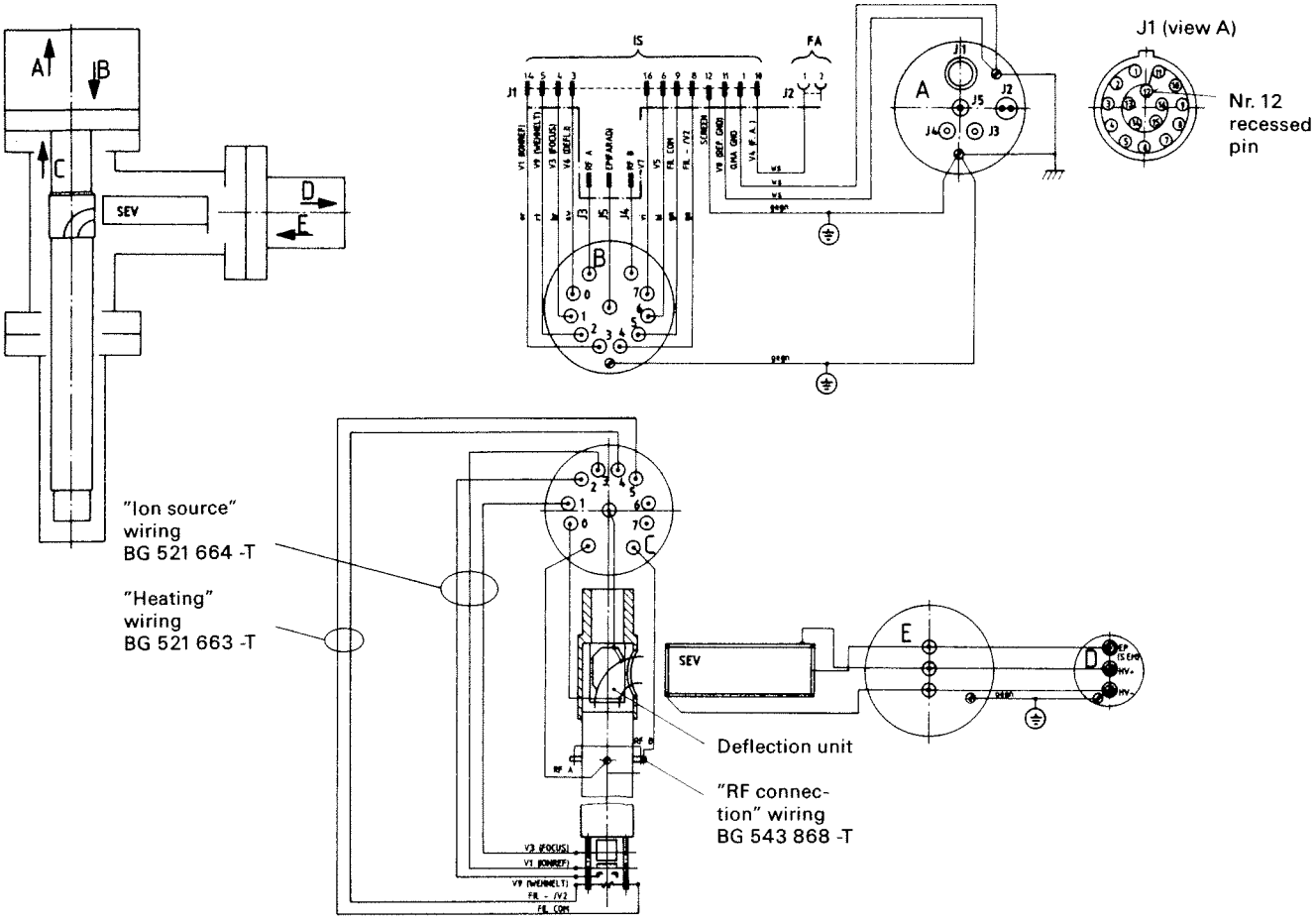
Quadrupole analyzer with 90° off-axis SEM with crossbeam ion source

BG 546 497 - Z

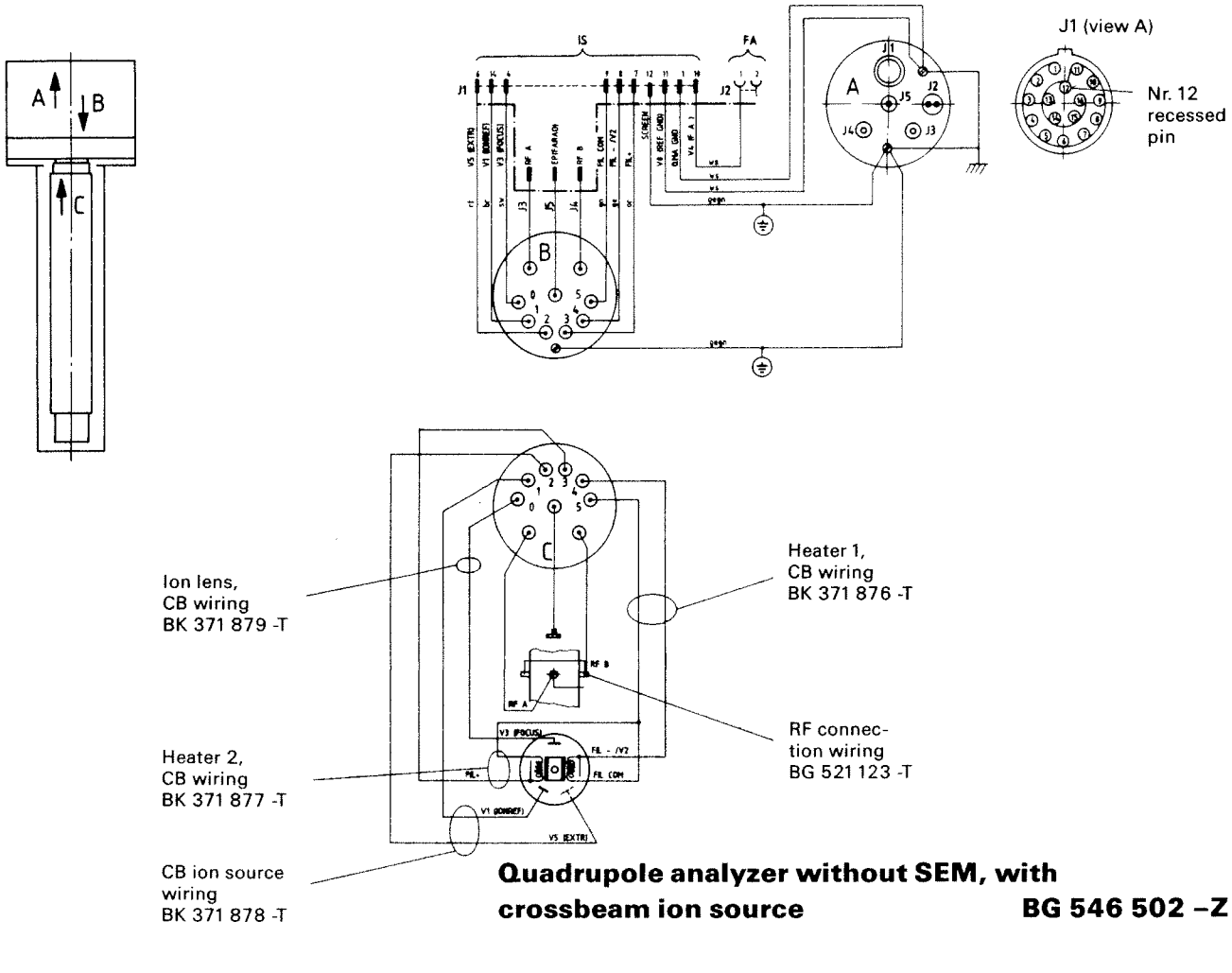


Quadrupole analyzer without SEM, with axial ion source

BG 546 500 -Z



Quadrupole analyzer with 90° off-axis SEM with axial ion source **BG 546 501 -Z**



Quadrupole analyzer without SEM, with crossbeam ion source **BG 546 502 –Z**

Appendix: PIN-assignment of the 16 pole LEMO connector

PIN-Nr.	Potential
1	QMA GND
2	SPEC-SRC RET
3	V6 (DEFL. I)
4	V3 (FOCUS)
5	V9 (WEHNELT)
6	V5 (EXTR)
7	FIL+
8	FIL– (V2) (CATHODE)
9	FIL COM
10	V4 (F.A.)
11	V0 (REF. GND)
12	SCREEN
13	V8 Spare
14	V1 (IONREF) (ANODE)
15	SPEC-SRC ON (+24 V)
16	V7 (DEFL. 0)

PIN-assignment of the 2 pole LEMO connector

1	V4 (F.A.)