

# SIEMENS

## POLYMOBIL III

**SP**

### Service Instructions

from Serial no. 3000

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## Document revision level

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## Specially marked text

<b>⚠ WARNING</b>
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All texts marked with "Warning" contain information regarding potential hazards to health or life.

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<b>CAUTION</b>
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All texts marked "Caution!" contain information regarding potential hazards and steps to be taken to avoid hazards.

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<b>NOTE</b>
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All texts marked "Note:" contain additional information regarding the following procedure step. It is intended to clarify the step or to indicate ways to avoid predictable problems.

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## Documents required

- Wiring diagram X038I
- Description of functions RXB8-115.041.02...

## Tools and measuring instruments required

- Usual service tools
- Digital multimeter:  
Fluke 8060 A 97 02 101 Y4290
- 2 channel storage oscilloscope:  
Tektronik Type 2232 97 02 234 Y3155
- mAs meter 81 60 400 RE999
- Protective ground wire and leakage current  
tester: BENDER safety tester 97 06 979 Y0526
- Radiation detector 96 60 754 RE999  
See SPEED INFO 93/91

<b>CAUTION</b>
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During oscilloscope operation the protective ground wire connection in the power cable must not be interrupted under any circumstances.

For measurements where ground loops that may be present could impair the measuring result, use the TEK amplifier and the trigger attachment.

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## Safety notes and protective measures

**CAUTION**

- 
- When performing work and tests, the following must be observed:
    - the product-specific safety notes contained in the document,
    - the safety notes RA0-000.012.40... in Register 2 of the POLYMOBIL III file,
    - and the general safety notes contained in Register 2 of the TI binder.
  
  - After the system has been switched off, a dc voltage of approx. 300 V is applied for the main inverter.  
On D920 the yellow LED V35 lights up.  
Within approx. 1.5 minutes the voltage drops to approx. 12 V;  
LED V35 goes out.
  
  - Checks and adjustments that must be carried out with radiation switched on are marked with the symbol   
When performing work procedures which are marked with this symbol, radiation protective clothing must be worn.
- 
- Connect the POLYMOBIL III only to a power source (power outlet) meeting the standards of VDE 0107 or the usual local standards.
  - Before working on the open POLYMOBIL III switch **OFF** the unit with the power switch at the control panele and **unplug the power cable**.
  - Before removing or inserting PC boards, switch off the generator; in doing so, observe the ESD regulations.

## Replacing damaged or missing screws

- Damaged or missing screws must only be replaced by steel screws as specified in the installation drawings that conform to DIN 267 and have the specified tensile strength.

<b>CAUTION</b>
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**All Allen screws must have a tensile strength rating of 8.8.**

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## Cleaning

- The unit must always be switched off or disconnected before cleaning.
- Use only water or a luke warm mixture of a household cleaner diluted with water to clean the unit.
- Do not use an abrasive or organic solvents or cleaning agents containing solvents such as gasoline used for cleaning purposes, alcohol or stain remover. Do not spray water on the unit.
- For further information, refer to the Operating Instructions "Cleaning/Disinfecting".





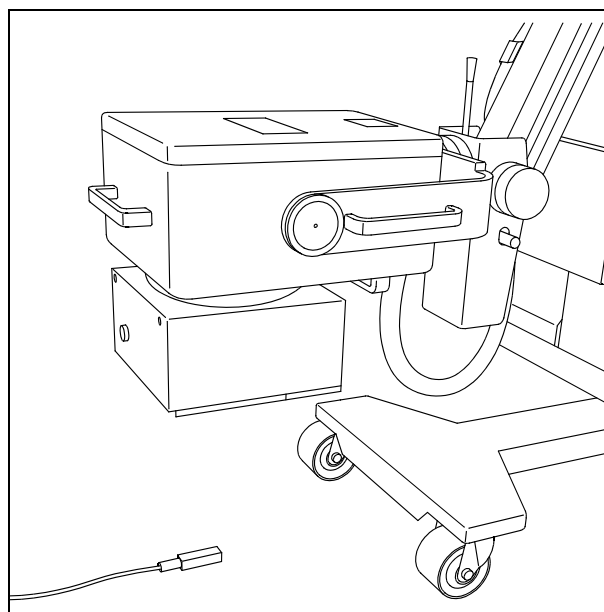


Fig. 1

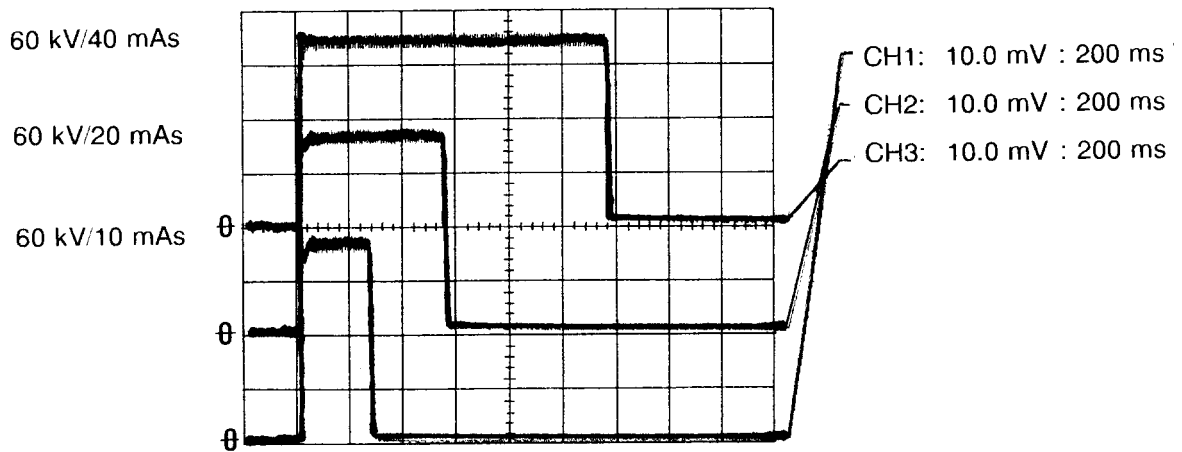
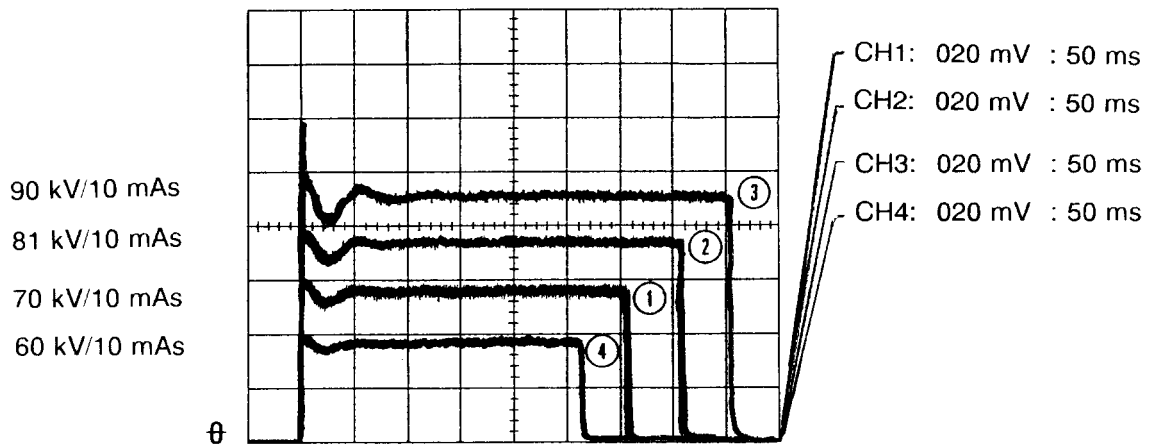
## High-voltage test with the radiation detector

### NOTICE

The amplitude can be different for each detector.

- POLYMOBIL ON
- Connect radiation detector to the oscilloscope and place it in the beam path of the POLYMOBIL III (see Fig. 1).
- Set the slide switch on the radiation detector to measuring range 1 (1 point visible).
- Set an SID of 40 cm and collimate onto the radiation detector with the light localizer (Fig.1).
- Trigger check exposures using the exposure data specified in the oscillograms (see Fig.2).





## There are three types of errors:

The following error codes are shown in the kV or mAs display on the control panel.

### Initialization error

- 90... EPROM check sum error
- 95...  $I_{H_{nom}}$  circuit error
- 96...  $mA_{nom}$  circuit error
- 97...  $kV_{nom}$  circuit error

### Stand-by error:

- 03...  $I_{H_{act}} < I_{H_{stby}}$
- 04...  $I_{H_{act}} > I_{H_{stby}}$
- 05...  $kV_{act} < > 0$
- 06...  $mA_{act} < > 0$
- 09... High pressure in the tank

### Exposure error:

- 11... Inverter short circuit
- 12...  $kV_{max}$
- 13...  $I_{max}$
- 14...  $kV_{act} < kV_{nom}$
- 15...  $mA_{act} < mA_{nom}$
- 16...  $mA_{act} > mA_{nom}$
- 17... maximum exposure time
- 18... exposure not completed

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In case of errors which impair radiography, perform the following checks.

## Checking the line voltage, fuses and LEDs

### a) Checking the line voltage

- Measure the supply voltage on site at the safety socket using the digital multimeter.

<b>NOTICE</b>
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**For voltages > 240 V AC see Startup Instructions  
RXB8-115.034.02... chapter 3.**

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- Plug the power plug of the POLYMOBIL into the safety socket.
- POLYMOBIL ON

<b>NOTICE</b>
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**If the POLYMOBIL cannot be switched on although the power plug  
and power voltage have been connected, the overcurrent circuit  
breaker F1 may have responded (automatic circuit breaker  
1/Fig. 1)**

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- POLYMOBIL OFF.

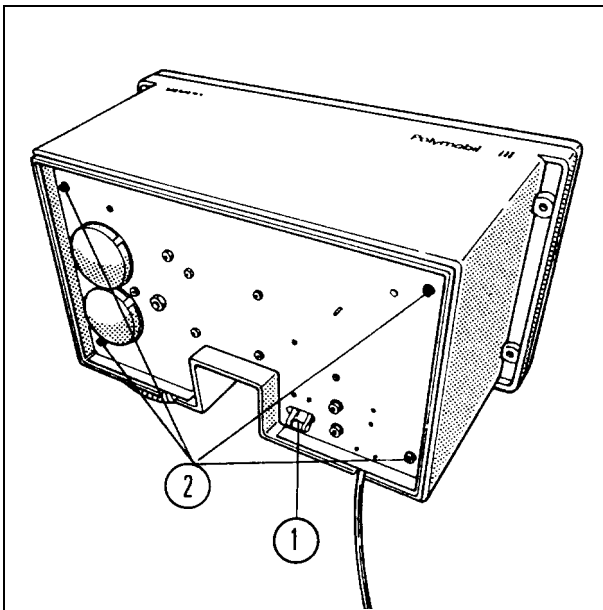
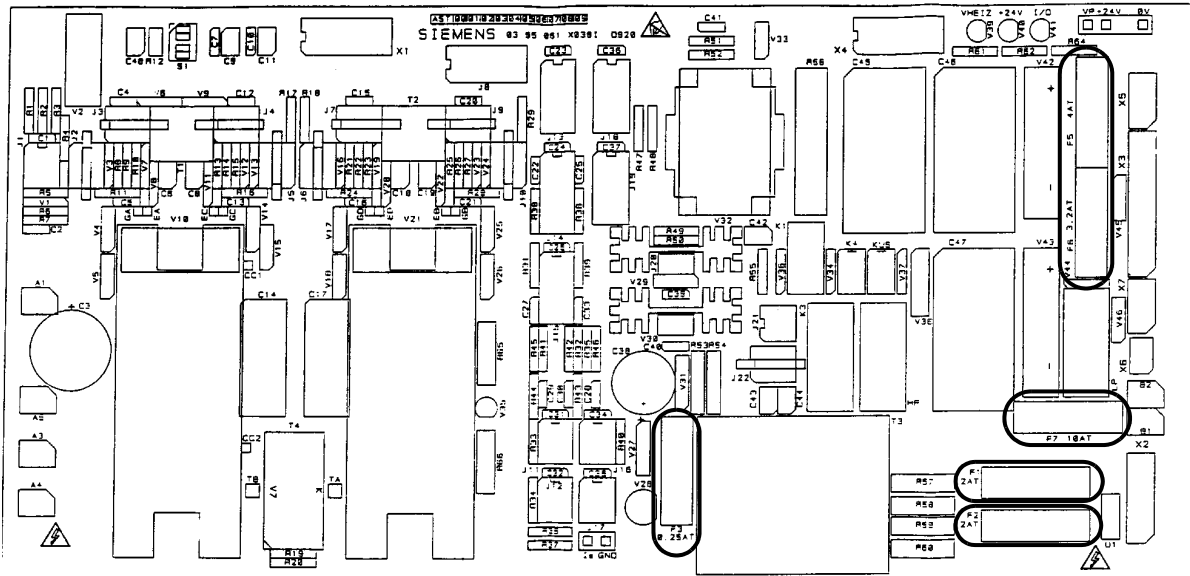


Fig. 1

#### b) Checking the fuses

- Checking the overcurrent circuit breaker:
  - Loosen the hand screw and the protective ground wire terminal and take the switch box off the cassette compartment.
  - Check if the overcurrent circuit breaker F1 (1/Fig. 1) has responded and, if so, unlock it.

Fuse value: 15 A



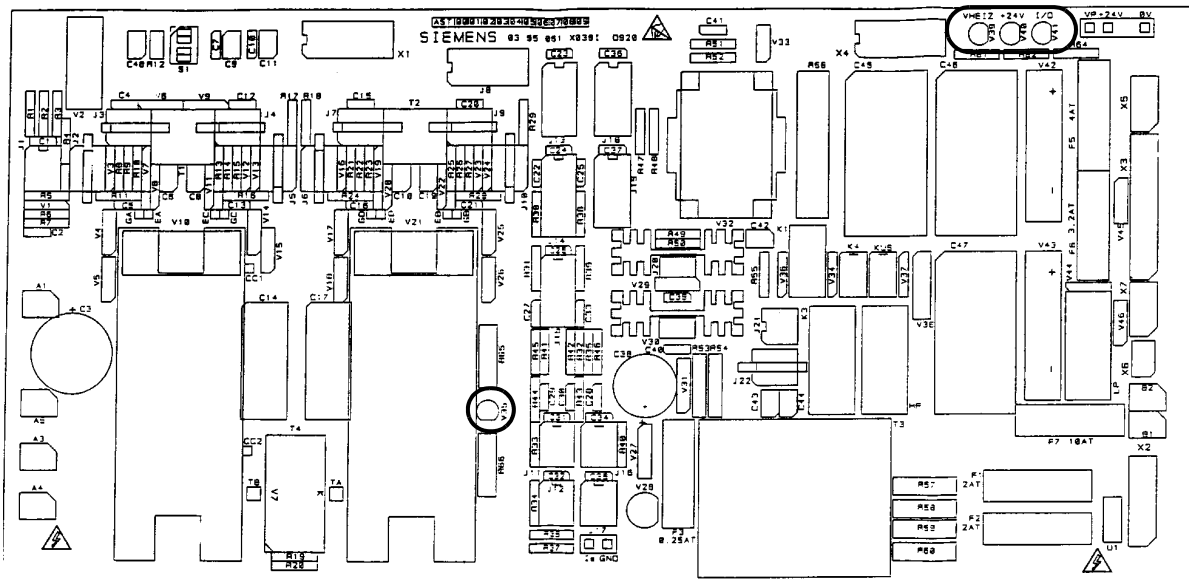
D920 (X038I-92D)

- Checking the fuses on D920

Loosen the 4 Allen screws (2/Fig.1, 4 mm key size) and remove the cover.

Check the following fuses:

F1	2 AT	Closing circuit
F2	2 AT	Closing circuit
F3	0.25 AT	T1 secondary
F5	4 AT	Filament circuit
F6	3.2 AT	24 V / Main inverter control
F7	10 AT	Light-beam localizerr



D920 (X0381-92D)

### c) Checking the LEDs on D910 and D920

- POLYMOBIL ON

After the initialization, the default data 60 kV and 10 mAs are displayed.

#### NOTICE

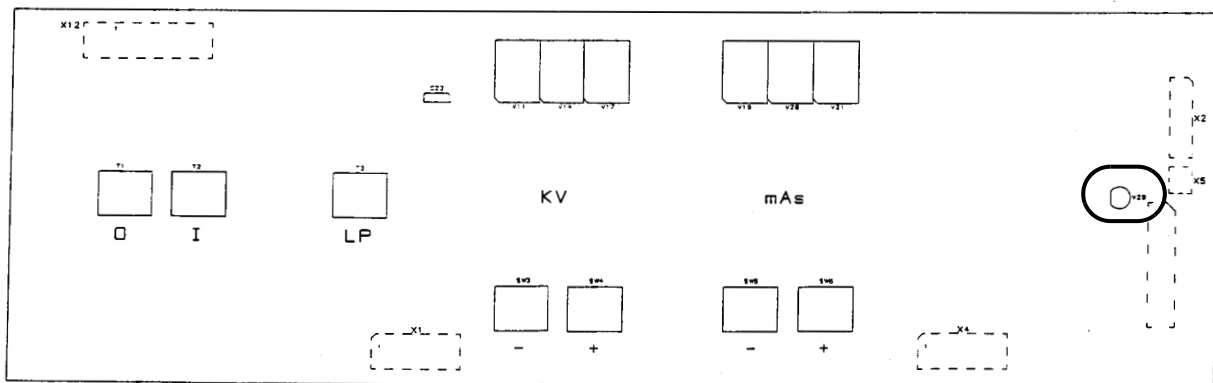
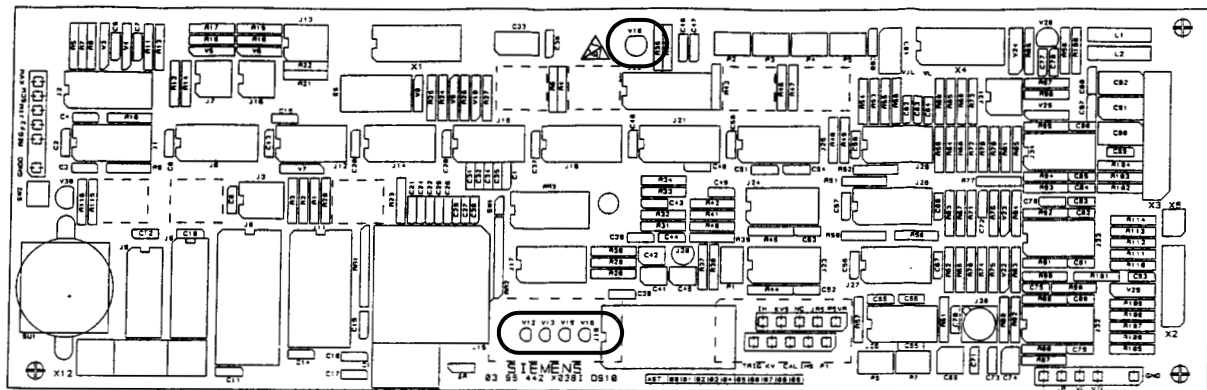
With a supply voltage of 110 V, LED V12 (green) is illuminated on D910.

### Stand-by operation

- On D920 the following LEDs are illuminated:

V40 (yellow)	+ 24 V
V39 (yellow)	$V_{\text{filament}}$
V41 (yellow)	I / O (ON/OFF)
V35 (yellow)	+ 300 V intermediate circuit voltage





D910 (X038I-91E)

**Preparation ON**

- In addition, V13 (green) lights up on D910.



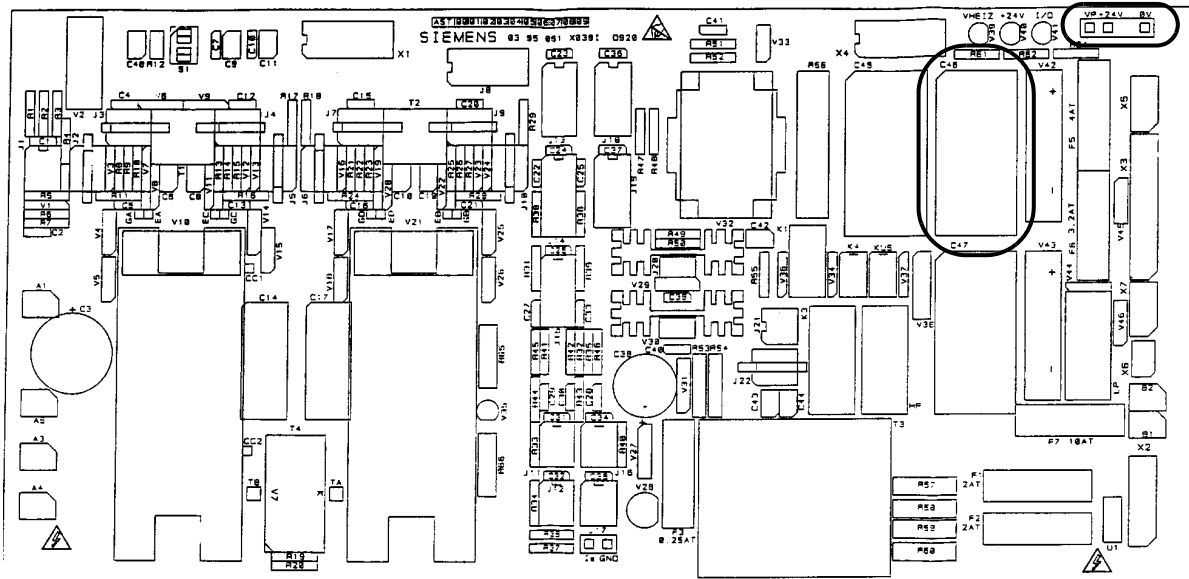
**Trigger an exposure**

- In addition, the following LEDs light up on D910:

- V15 (green) exposure
- V18 (green) SS
- V28 (yellow) radiation display

**Error message**

- V16 (red) lights up on D910.



D920 (X0381-92D)

### Checking the supply voltages

- When the system is switched on, relays HR and K1 on D920 pull in and supply transformer T1, power supply M6 and the intermediate circuit with line voltage.
- Measure the 24 V supply voltage with the digital multimeter on D920 at MP "+ 24 V" and "0V"..

Measured voltage approx. 28.2 V

Tolerance  $\pm 5$  V

- Measure the filament circuit voltage supply on the electrolyte capacitor C46 at +/- on D920.

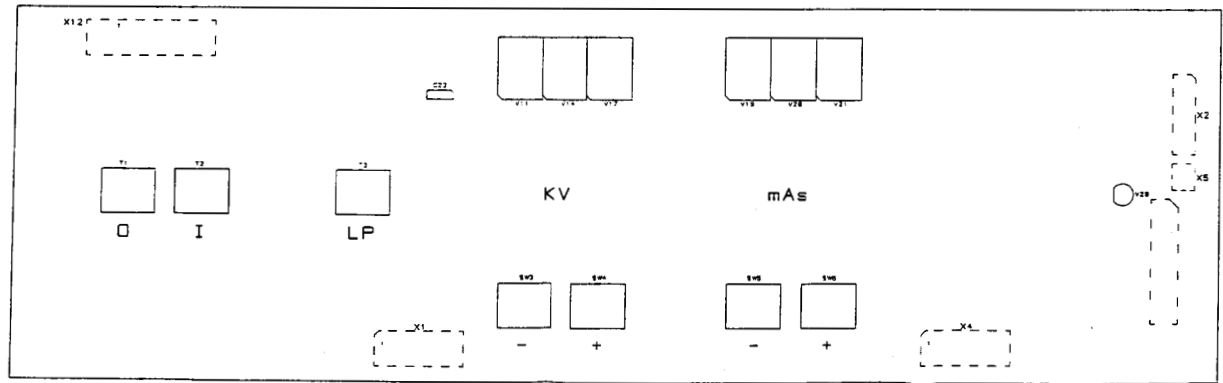
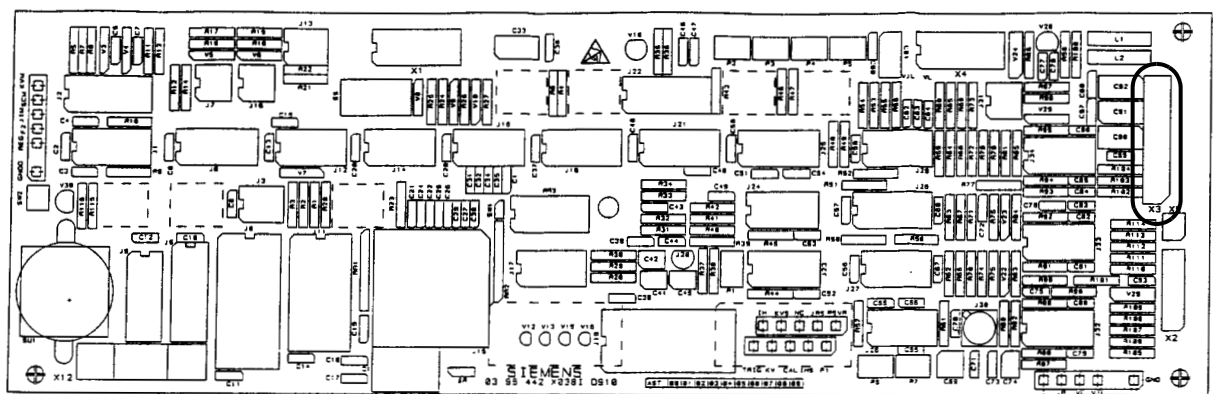
Measured voltage

in stand-by mode approx. 18.5 V

Tolerance  $\pm 4$  V

with preparation approx. 16.4 V

Tolerance  $\pm 3$  V



D910 (X038I-91E)

- Measure the supply voltages on D910.X3.
 

+ 5 V at X3.4 and X3.1 (0 V)	Tolerance $\pm 0.5$ V
+15 V at X3.5 and X3.6 (0 V)	Tolerance $\pm 1$ V
- 15 V at X3.7 and X3.6 (0 V)	Tolerance $\pm 1$ V

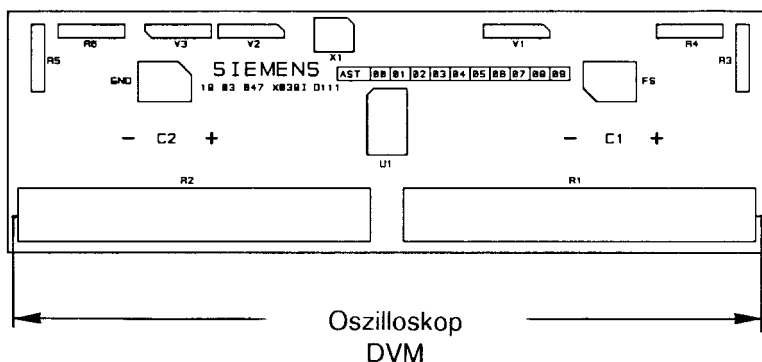
Checking the intermediate circuit voltage

**CAUTION**

On D111 an intermediate circuit voltage of ... up to 350 V is applied!

During oscilloscope operation the protective ground wire connection in the power cable must not be interrupted under any circumstances.  
 For measurements where ground loops that may be present could impair the measuring result, use the TEK amplifier and the trigger attachment.

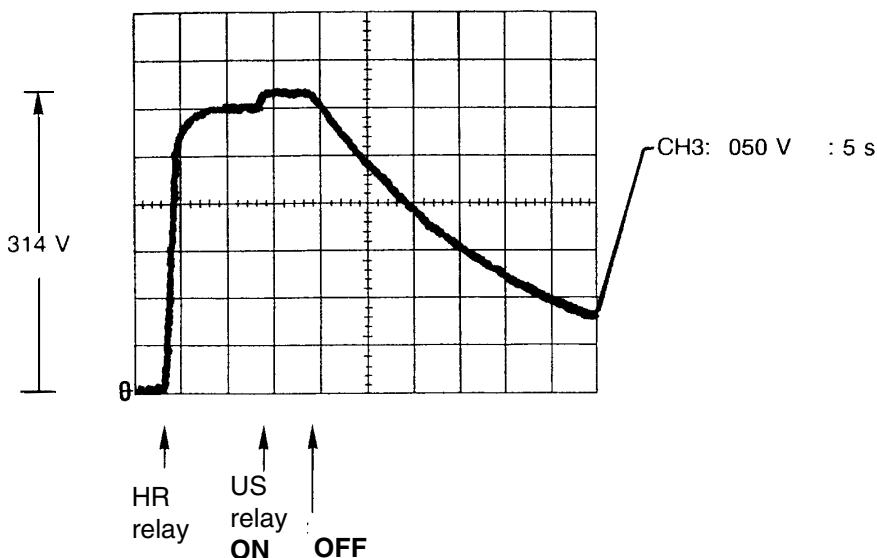
- Connect oscilloscope or digital multimeter to D111.R1 and R2.



D111 (X038I-111B)

- Depending on the supply voltage, a value between 250... 350 V DC must be measured with the digital multimeter.

Charging and discharging procedure

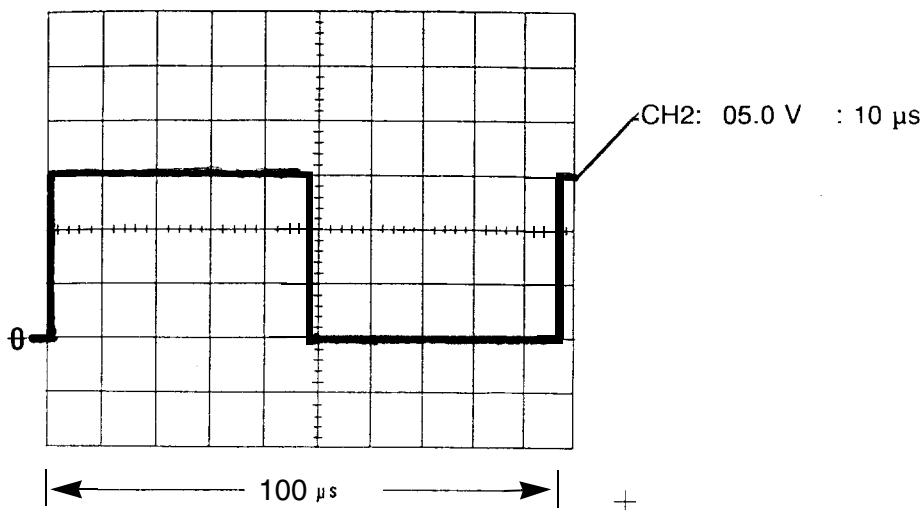


## Checking the maximum main inverter frequency

- POLYMOBIL OFF
- Open bridge "S1" on D920 (solder).
- Connect oscilloscope on D910 to MP "REG" and "GND".
- POLYMOBIL ON
- Trigger exposure.

**NOTICE**

- Err 15 is displayed.
- No radiation.



$F_{max} = 10 \text{ kHz}$   
 $T_{min} = 100 \mu\text{s}$  Tolerance: + 0 μs / - 5 μs

- Adjust the maximum main inverter frequency with potentiometer P2 to D910 (X028I-91E).
- POLYMOBIL OFF
- Connect jumper "S1" on D920 (solder).

**Oscillating current measurement**

- POLYMOBIL OFF
- Connect oscilloscope on D920 to MP "I<sub>s</sub>" and "GND".

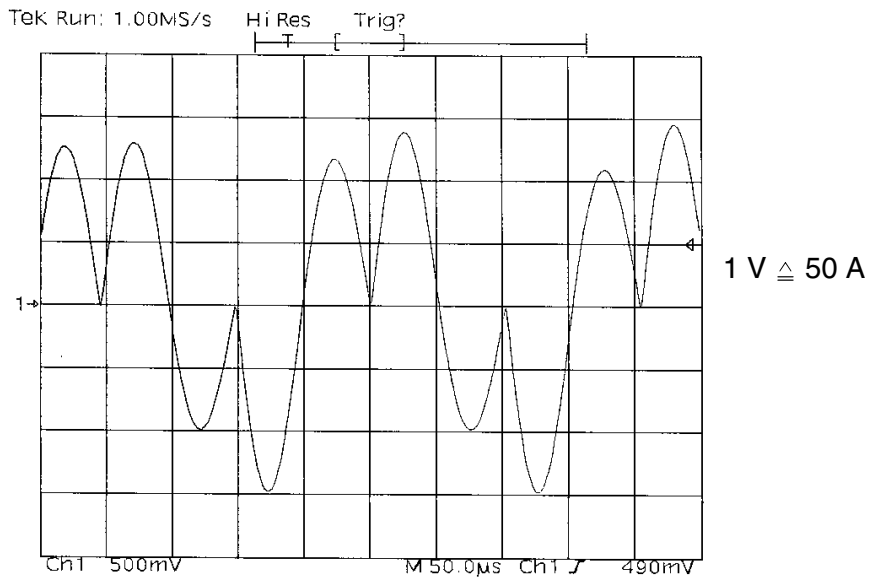
<b>NOTICE</b>	<b>Integrated current transformer.</b> <b>1V <math>\triangleq</math> 50 A</b>
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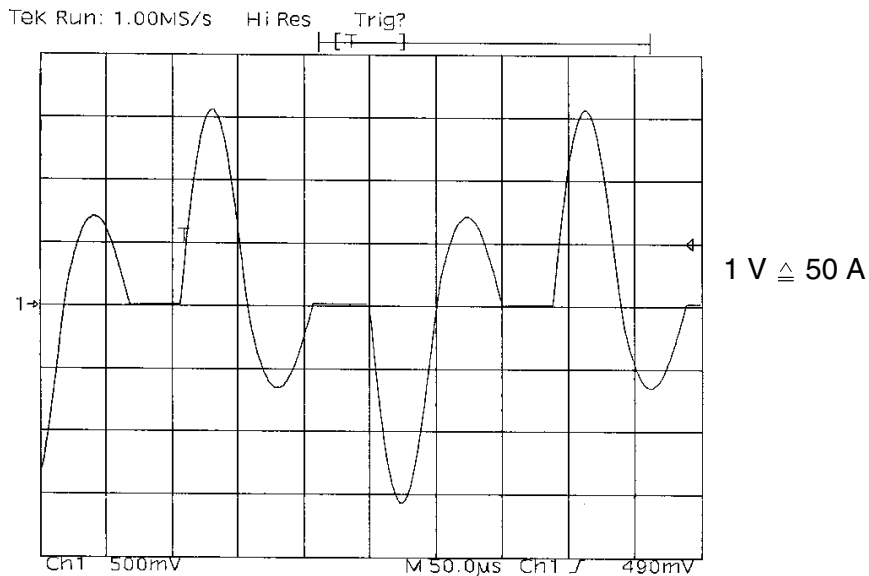
- POLYMOBIL ON
- Trigger exposure with default values 60 kV, 10 mAs.

**Main inverter ok**

- During the kV rise



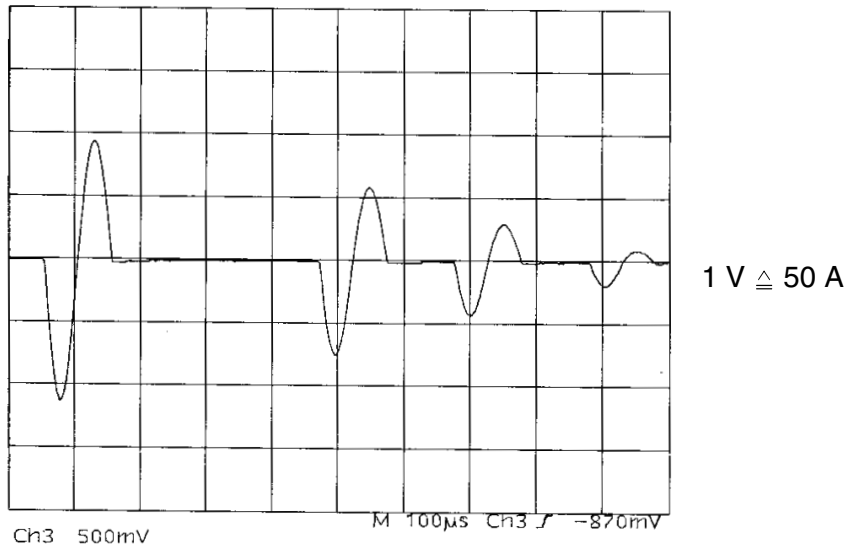
- After the kV rise



## Error case

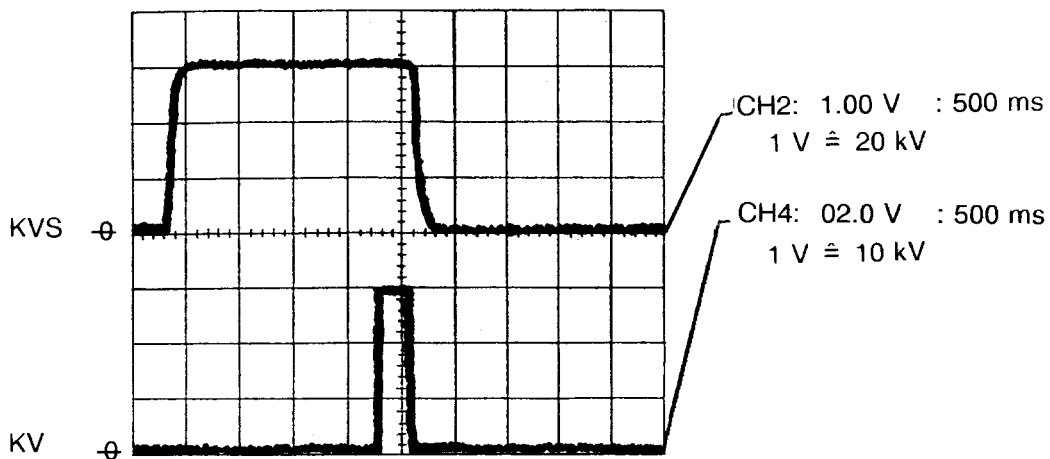
Only one diagonal is fired.

Tek Stop: Single Seq 500KS/s



**Checking the high-voltage  $kV_{NOM}$  and  $kV_{ACT}$** 

- Connect oscilloscope on D910 to MP "kVS" (1 V  $\hat{=}$  20 kV nominal value) and "kV" (1 V  $\hat{=}$  10 kV actual value) and "GND" (X038I-6).
- POLYMOBIL ON
- Trigger an exposure with the default values 60 kV; 10 mAs.

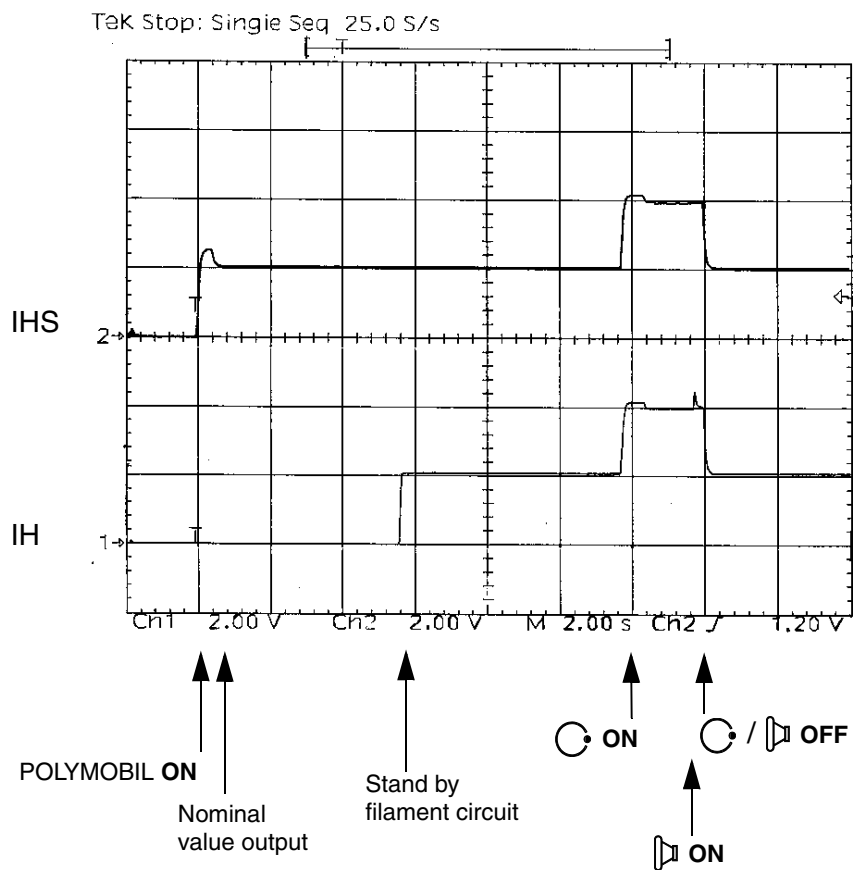


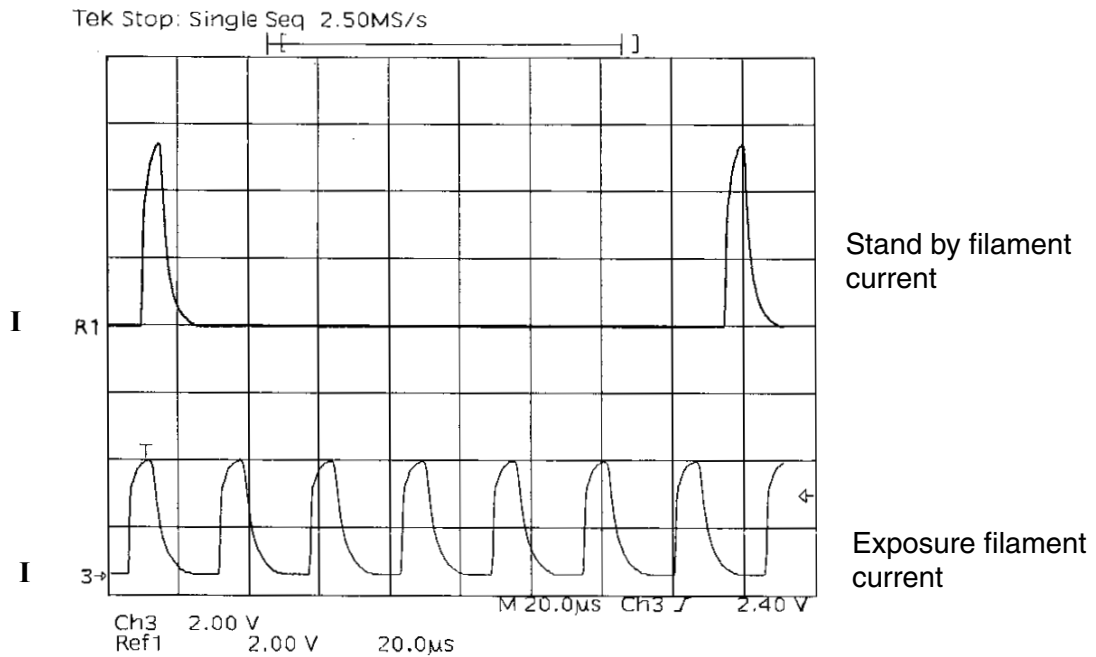
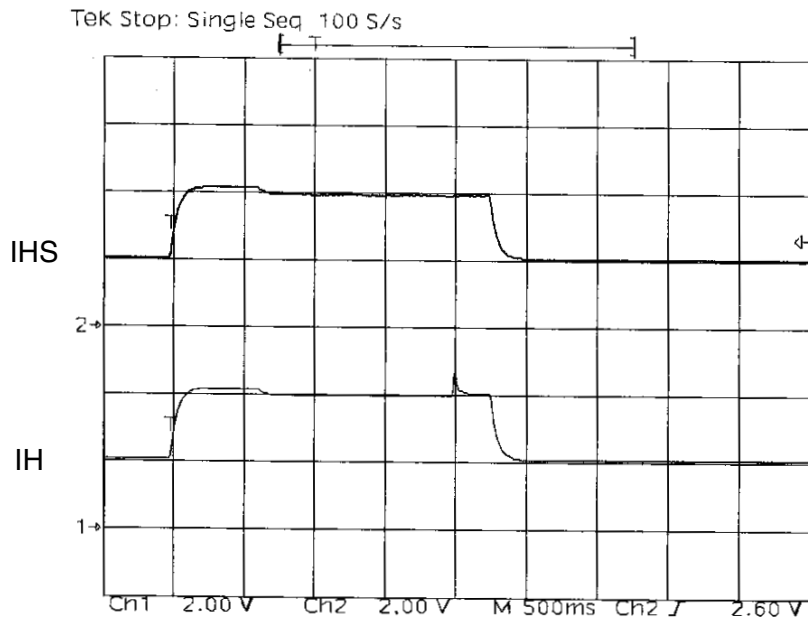


## Checking the filament and tube current

### Filament current

- Connect oscilloscope on D910 to MP "IHS" (NOMINAL), "IH" (ACTUAL), "I" (ACTUAL) And "GND".
- **POLYMOBIL ON**  
After approx. 7 seconds the stand-by filament current comes on.
- Trigger an exposure with the default values 60 kV, 10 mAs.





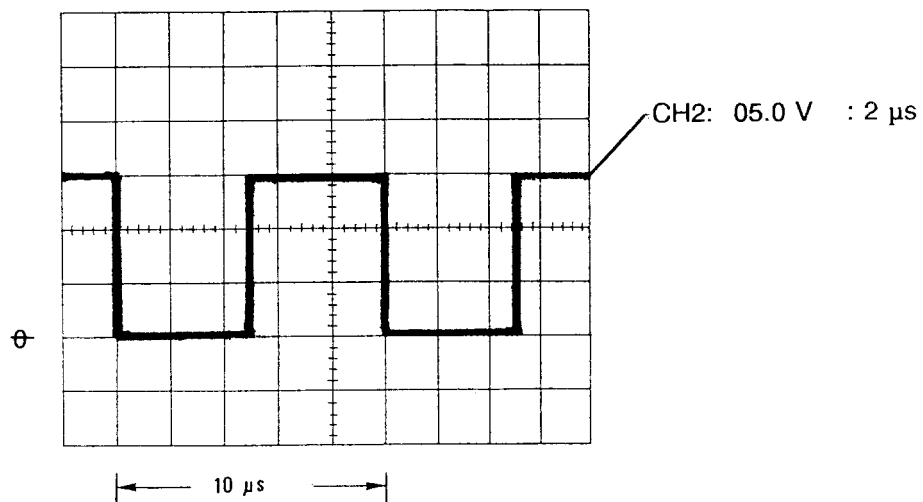
## Setting the maximum filament frequency

- POLYMOBIL OFF
- Remove fuse F5 on D920.
- Connect oscilloscope on D910 to MP "CAL" and "GND".
- POLYMOBIL ON

**NOTICE**

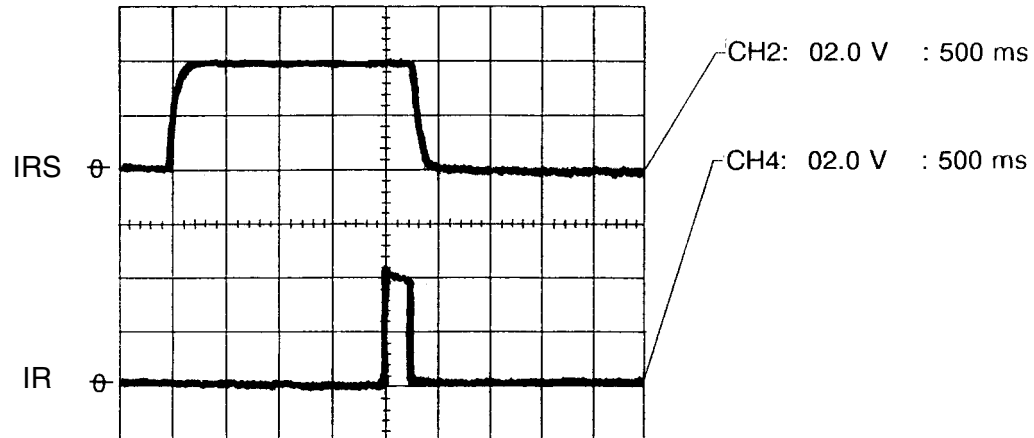
Err 3 is displayed.

- Using P3, set the maximum filament frequency on D910 ( $100 \text{ kHz} \pm 10 \mu\text{s}$ )



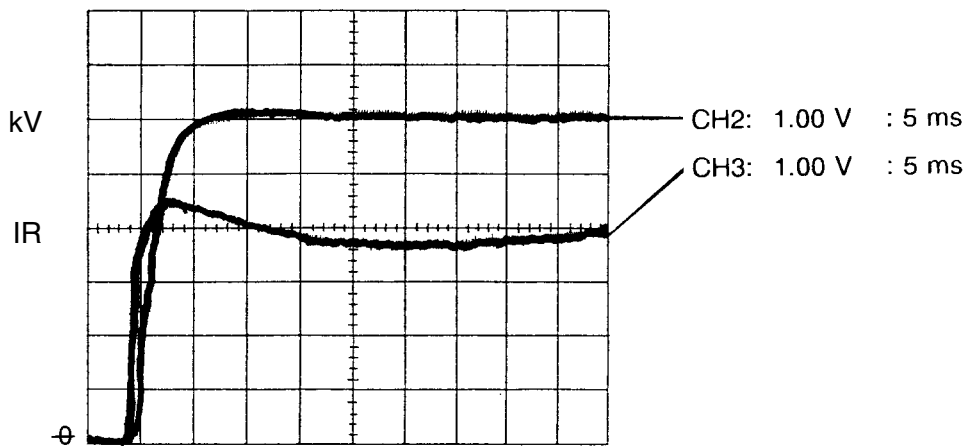
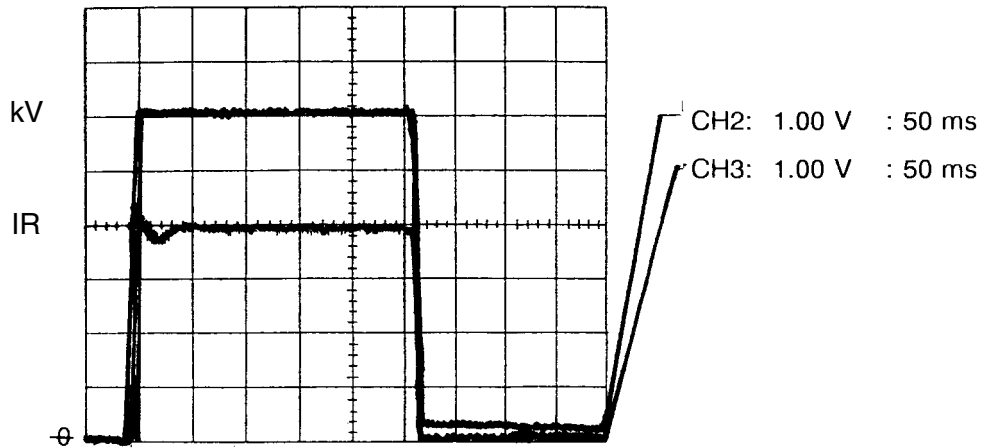
### Checking the tube current

- Connect oscilloscope on D910 to MP "IRS" (NOMINAL), "IR" (ACTUAL) and "GND".
- POLYMOBIL ON
- Trigger an exposure with the default values 60 kV, 10 mAs.



## Checking the kV and tube current (IR)

- Connect oscilloscope on D910 to MP "kV", "IR" and "GND".
- POLYMOBIL ON
- Trigger exposure with the default values 60 kV, 10 mAs.



Prolonged transient response

**NOTICE**

The transient response of the tube current can be set with P1 on D910.

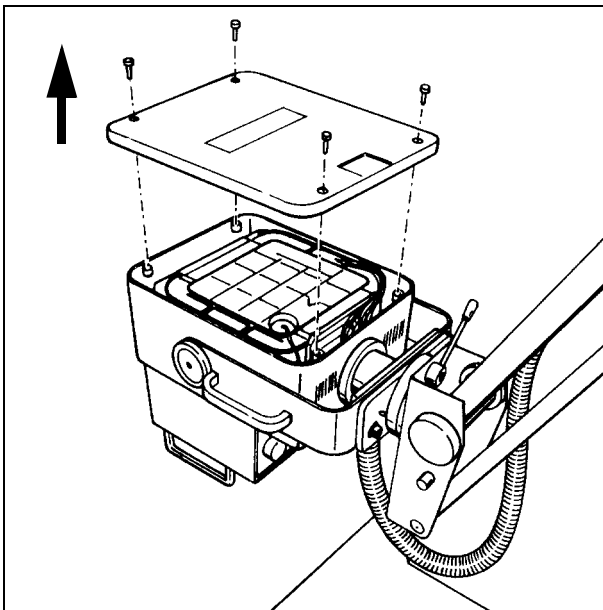


Fig. 2

### Checking the mAs values

- Remove the 4 Allen screws ( 3 mm key size) from the lid of the single tank and take off the lid (Fig. 2).
- Remove jumper "mA+ / mA -" in the single tank.
- Connect the mAs meter to the "mA + / mA -" sockets (X038I-5/5).
- Trigger the following exposures:



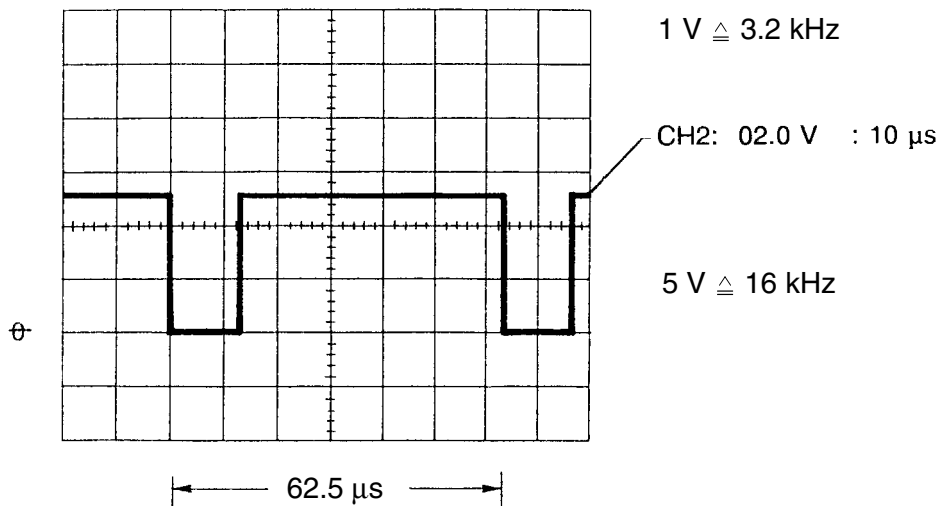
Setting at control panel	valid mAs values
40 kV, 200 mAs	195 ... 205 mAs
66 kV, 100 mAs	97 ... 103 mAs
90 kV, 1 mAs	1,0 ... 1,3 mAs

- Remove the mAs meter and reinsert the jumper in the single tank at "mA+ / mA -" .
- Reinstall the lid of the single tank.

## Adjusting the mAs

- Unplug plug X2 on D910.
- Establish connection (jumper) from plug contact X2.5 (side of the board) to MP "P5 VR" on D910 .
- Establish connection (jumper) from plug contact X2.6 (side of the board) to MP "GND" on D910.
- Connect oscilloscope on D910 to MP "F1" and "GND" (1 V  $\triangleq$  3,2 kHz).
- POLYMOBIL ON

<b>NOTICE</b>	<b>Err 6 is displayed.</b>
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- Adjustment with potentiometer P7 on D910 (adjust to 16 kHz)

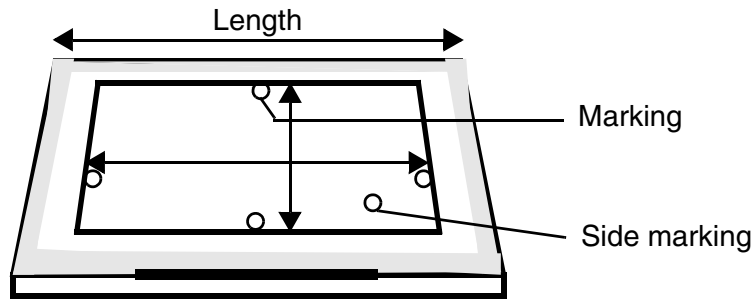


Fig. 3

### Aligning the light field to the radiation field

Operating sequence:

- Load a 24 cm x 30 cm or 10" x 12" cassette with film and place it on a table or a similar base.
- Using a tape measure, set a vertical SID of 100 cm or 40" to the upper edge of the cassette.
- Using the control buttons, set a format of 18 cm x 24 cm or 8" x 10.
- Switch on the light localizer and align the cassette.
- Attach radiopaque markings (e.g. washers, coins) to the cassette as shown in Fig. 3. Attach a washer as lateral marking.
- Trigger an exposure (60 kV, 10mAs) and develop the film.
- Using a waterproof felt pen, write the following data on the developed film.
  - Set SID
  - Film size
  - Radiation field size





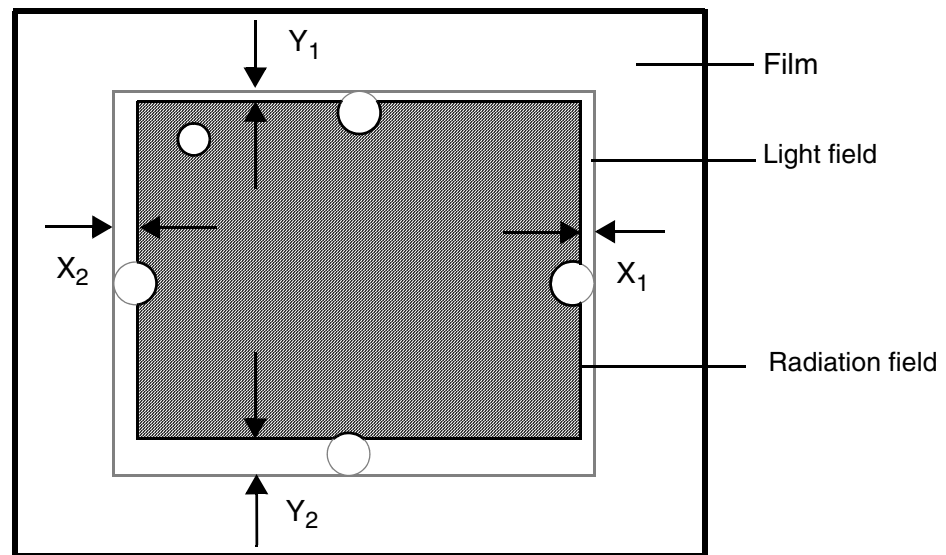


Fig. 4

## Evaluation:

- Measure the deviations between light field edges and radiation field edges on all four sides (X<sub>1</sub>, X<sub>2</sub>, Y<sub>1</sub>, Y<sub>2</sub>) as shown in Fig. 4.
- Determine the total deviations in the X and Y direction (ignore the +/- signs).
- Both the length deviation ( $\Sigma Y$ ) and the width deviation ( $\Sigma X$ ) must be less than 1.6 cm.

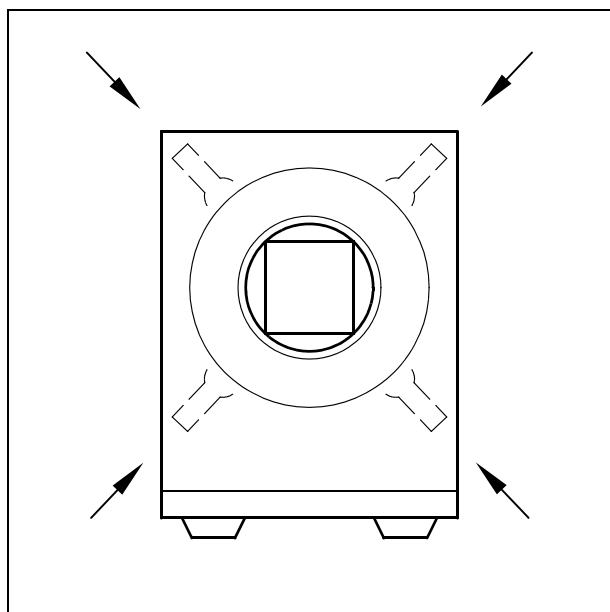


Fig. 5

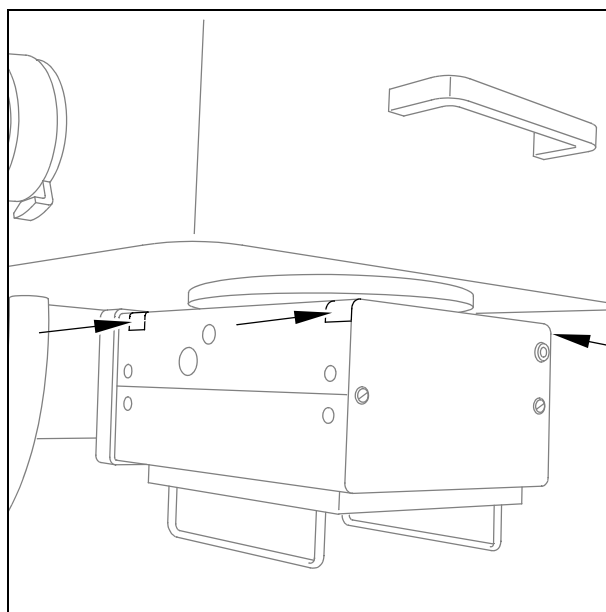


Fig. 6

- If the deviation is higher, loosen the 4 Allen screws slightly (arrows/Fig. 5/Fig. 6) and move the collimator accordingly.  
Then, tighten the screws at the collimator (arrows/Fig. 5/Fig.6) again.
- Repeat the check and, if necessary, adjust the collimator again until the deviation between the light field and the radiation field is within the admissible tolerance (< 1,6 cm).

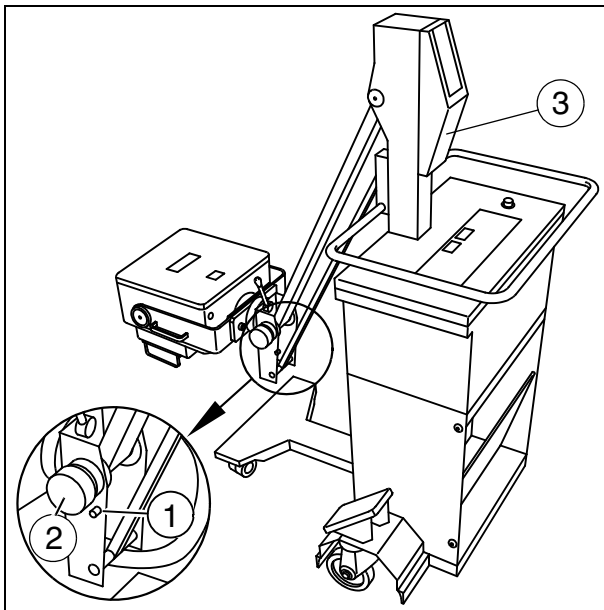


Fig. 7

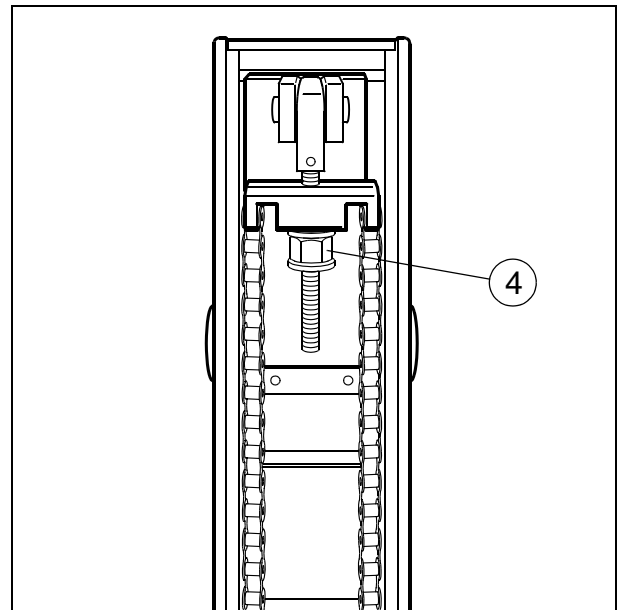


Fig. 8

### Checking and readjusting the counterweight

- Unlock the support arm (1/Fig. 7) and release the turning knob (2/Fig. 7).  
Without any accessories attached, the support arm should be easy to move across the entire movement range and stop in any position.

### Readjusting the counterweight with accessories attached

If the support arm does not stop in any position with accessories attached, readjust the spring tension for the counterweight.

- Take the cover (3/Fig. 7) off the stand.
- Completely release the additional brake on the support arm (2/Fig. 7).
- Move the support arm into the horizontal position.
- Tighten the screw by means of a 17mm fork wrench (4/Fig. 8).  
Adjust the spring tension so that the support arm is balanced in the horizontal position, i.e. the forces needed for lifting and lowering the tube unit are equal.

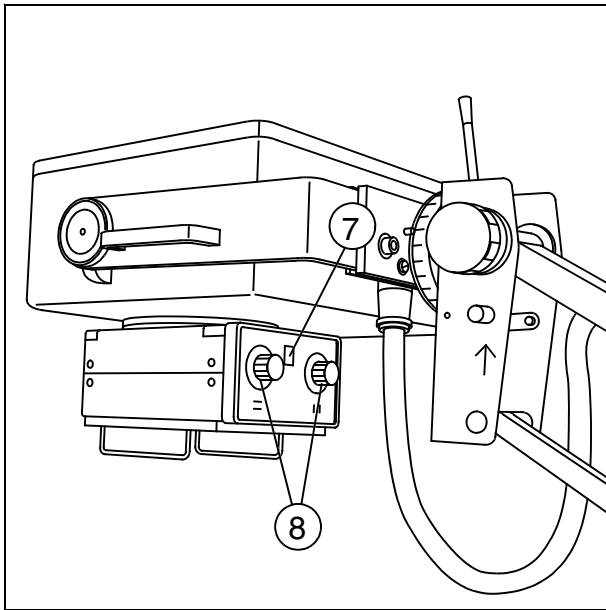


Fig. 9

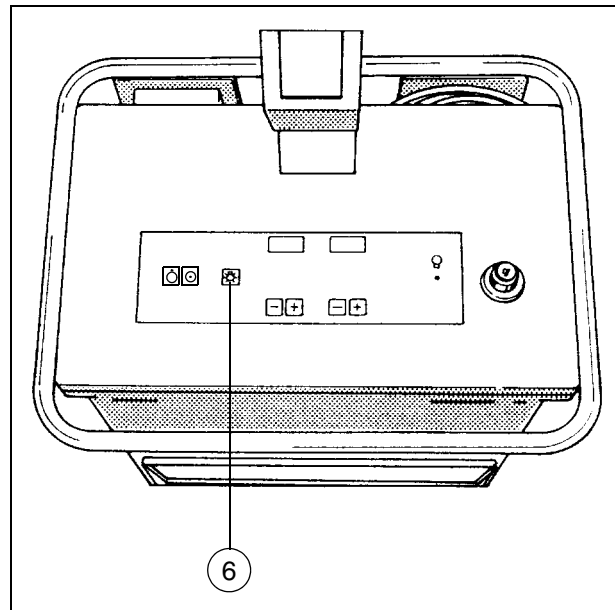



Fig. 10

### Checking the control elements on the collimator

- Check the light-beam localizer operated both at the control panel and at the collimator. To do so, press the  button (6/Fig. 10 or 7/Fig. 9), the light-beam localizer lamp lights up for  $20\text{ s} \pm 1\text{ s}$ .
- Check if the double-slot diaphragm can be rotated  $\pm 45^\circ$ .
- Check that format adjustment (blades) is easy and smooth by turning the collimator adjustment knobs (8/Fig. 9).

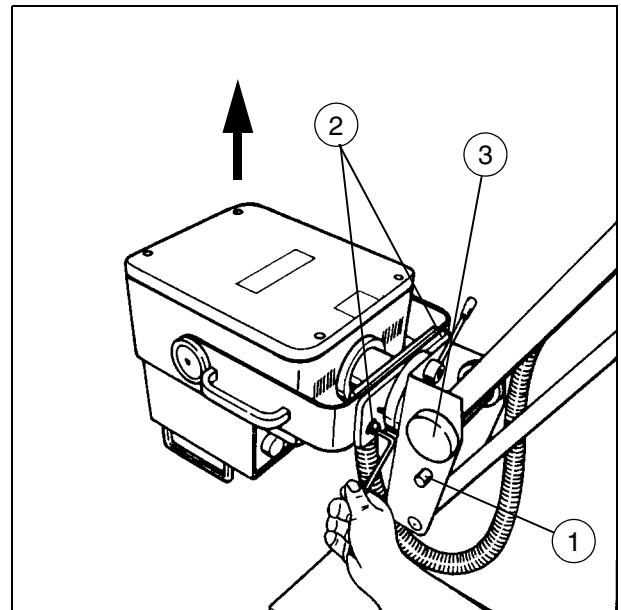


Fig. 1

## Replacing the single tank

To replace the single tank, remove it from the mobile stand as follows:

- Move the arm system in the lowest position and check if the safety locking (pin 1/Fig. 1) has engaged.

**The stand cannot be moved upwards any longer.**

- Tighten the turning knob(3/Fig. 1).
- Loosen the threaded ring and pull out the connector of the single tank.
- Using an 8 mm Allen key, loosen the two screws on the bracket (2/Fig. 1) approx. two turns.
- Lift the single tank off vertically and place it on a soft base.
- Detach the collimator (see chapter 5, page 2).
- Install the new single tank in the reverse order.
- Check alignment of light field to radiation field and adjust if necessary. (see "Aligning the light field to the radiation field").

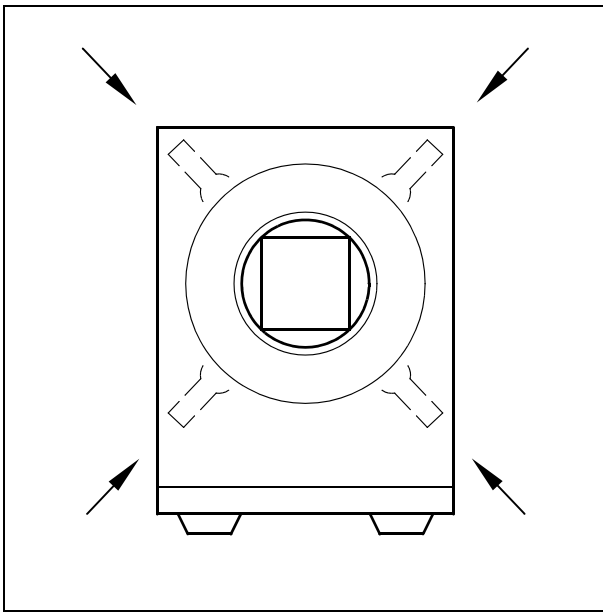


Fig. 2

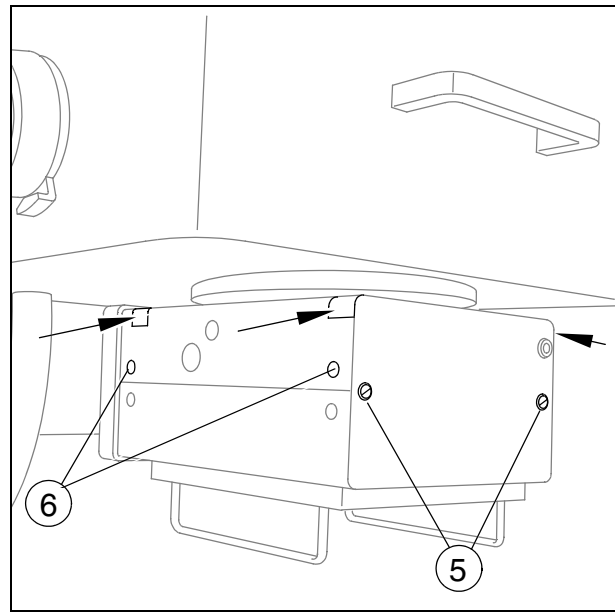


Fig. 3

### Replacing the collimator

In the case of damage, the collimator has to be replaced completely.

#### Proceed as described in the following:

- Loosen two screws (5/Fig. 3) and remove the rear panel.
- Mark the 5 connecting cables of the collimator and disconnect them.
- Remove the two screws on both sides (6/Fig. 3) of the upper cover.
- Turn the two knobs (8/Fig. 4) in their final position and remove them.
- Remove the front panel after having loosened the two screws (7/Fig. 4).  
**Caution:** Front panel is connected to collimator via cables (9/Fig. 5).
- Remove the collimator after loosening the four Allen screws (arrows /Fig. 2/ Fig. 3).

#### CAUTION:

**Hold the collimator.**

**Lift upper cover and pull out connecting cable through the case.**

- Attach the new collimator, fasten it with the four screws (arrows /Fig. 2/ Fig. 3) and center it.
- Connect the connecting cables and screw down the rear panel.
- Check agreement of light and radiation field and make adjustment if required (see "Agreement of light and radiation field").

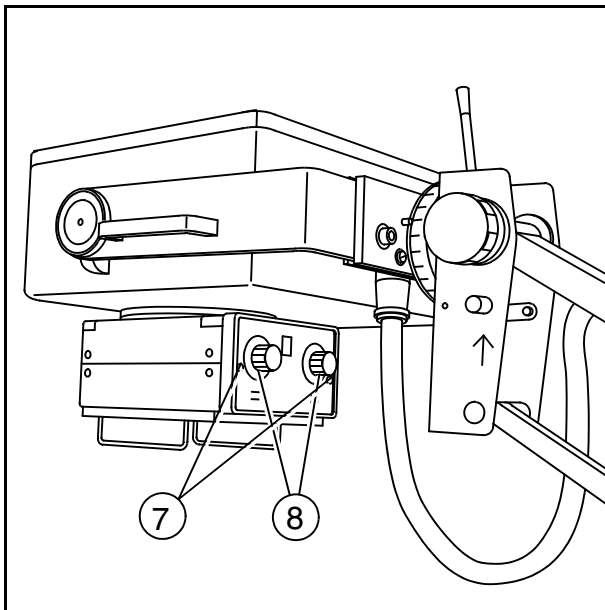


Fig. 4

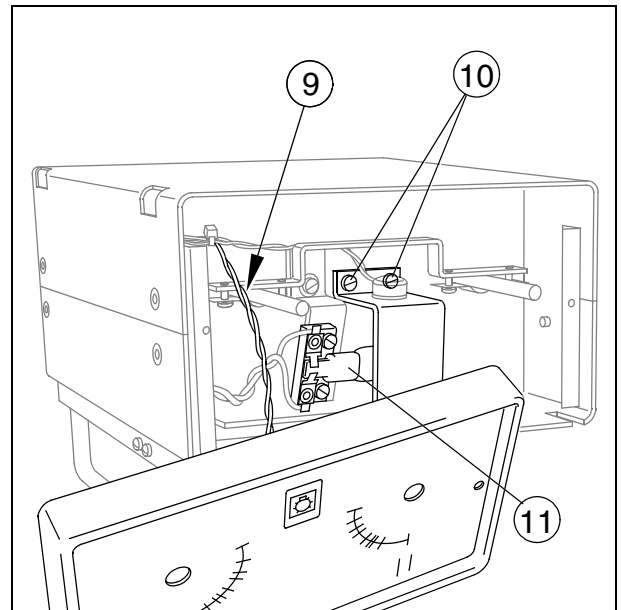


Fig. 5

## Replacing the light-beam localizer lamp

- The replacement light-beam localizer lamp is located below the cassette tray.
- Turn both knobs (8/Fig. 4) to an end position and remove them.
- Remove front panel after loosening both screws (7/Fig. 4) .  
**Caution:** The frontpanel is connected to the collimator via cables (9/Fig. 5).
- Loosen both screws (10/Fig. 5) and unscrew the bracket carrier of the temperature switch).
- Take out the defective lamp (11/Fig. 5) and replace it by a new lamp.

### **CAUTION:**

**Do not touch the glass envelope with your bare fingers.**

- Screw down the bracket and the front panel.
- Adjust both knobs and fasten them.

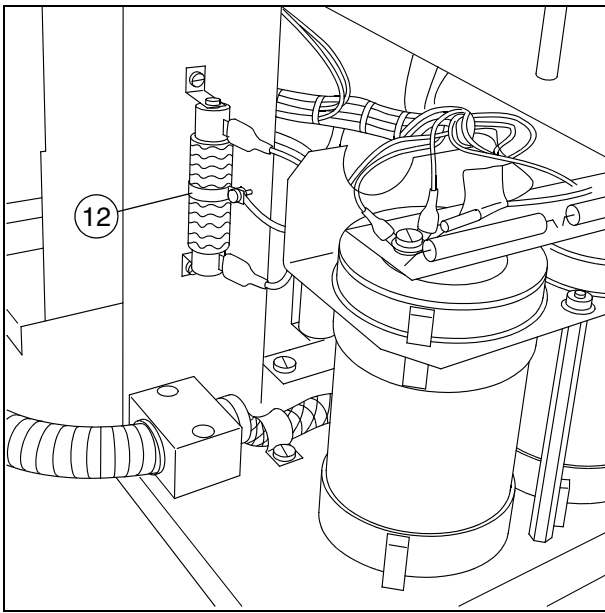


Fig. 6

**NOTICE**

The light-beam localizer lamp voltage can be adjusted at resistance R6 (12/Fig. 6).  
The voltage at the lamp should be  $11.5 \text{ V} \pm 0.2 \text{ V}$ .

- Check function of the light-beam localizer lamp.



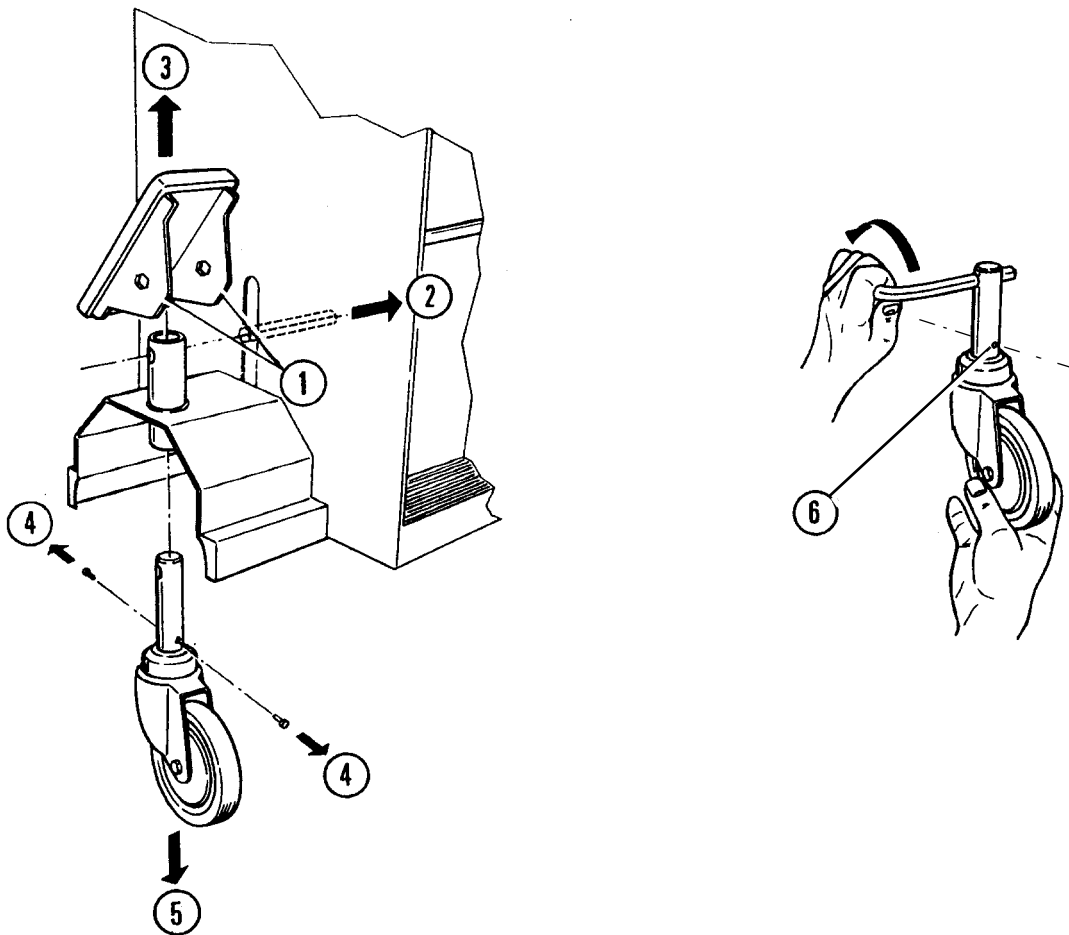


Fig. 7

## Replacing the castor

Herefore:

- 1 **Only loosen** the Allen screws at the **right and left** (key width 2.5 mm)!
  - 2 **Move** hexagonal shaft **backwards**
  - 3 Remove pedal
  - 4 Remove allen screws (key size 6 mm)
  - 5 Remove castor.
  - 6 Bring the threaded holes of the new castor into position
- Install the new castor in the reverse order.
  - Check pedal positions (see operating instructions)

TD RX 6/ Friedrich  
 TD RX 1 / Kern R.  
 TDU 3 / Hay

