

# **Service Instructions**

# **SLK Laboratory Hot Plates**

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## Service: to SLK Laboratory Hot Plates

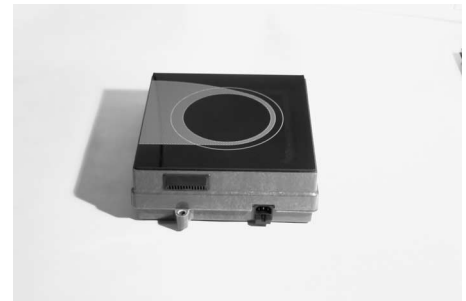
### General way of proceeding

- The following applies in principle: Outside SCHOTT Geräte only complete modules (PCBs, driving units etc.) will be replaced. Repair of PCBs is not admissible and will result in the loss of any warranty claims.
- For this reason no wiring documents of the PCBs equipped in SMD technology will be made available.
- For replacement purposes, authorized service providers should always have spare boards and spare modules on stock.
- Defective PCBs should be sent by the service agencies to SCHOTT Geräte for repair to safeguard warranty claims.

### View of the devices



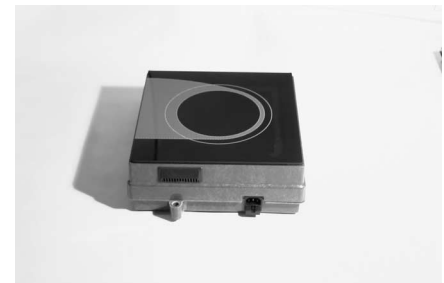
SLK 1/ 2 front view



SLK 1/ 2 rear view



SLK 3/ 4 front view



SLK 3/ 4 rear view



SLK 5/ 6 front view



SLK 5/ 6 rear view

## 1 Safety information

The SLK Laboratory Hot Plates correspond to protection class I. They have been built and tested according to DIN EN 61 010, Part 1, Protective Arrangements for electronic measurement instruments and have left our plant in perfect condition concerning safety regulations. To maintain this condition and to ensure safe operation the user has to observe the instructions and warning notes which are included in this Service Instructions. Development and protection is done within a system which meets the requirements laid down in the DIN EN ISO 9001 standard.

For reasons of safety, the SLK Laboratory Hot Plates must only be opened by authorised persons; this means, for instance, that work on electrical equipment must only be performed by qualified specialists.

**⚠ In the case of non-observance of these provisions the SLK Laboratory Hot Plates may constitute a danger: electrical accidents or fire hazard. Moreover, in the case of unauthorised intervention in the SLK Laboratory Hot Plates as well as in the case of negligently or deliberately caused damage, the warranty will become void. ⚠**

Prior to plugging the mains plug on, it has to be ensured that the operating voltage of the SLK Laboratory Hot Plates matches that of the mains voltage. The operating voltage is indicated on the specification plate. Non-observance of this provision may result in damage to the SLK Laboratory Hot Plates in personal injury or damage to property.

Any change of the operating voltage by service agencies is neither possible, nor admitted!

If it has to be assumed that safe operation is impossible, the SLK Laboratory Hot Plates concerned have to be put out of operation and secured against inadvertent operation. In this case please switch off the laboratory Hot Plates, pull the plug of the mains cable out of the mains socket, and remove the Laboratory Hot Plates from the place of work.

Examples for the assumption that a safe operation is no longer possible include:

- ➡ the package is damaged
- ➡ the Laboratory Hot Plates show visible damage
- ➡ the Laboratory Hot Plates do not function properly
- ➡ liquid has penetrated into the casing

The SLK Laboratory Hot Plates must not be stored or operated in humid rooms.

For safety reasons, the Laboratory Hot Plates must only be used for the range of application described in the present operating instructions. No experience is available with regard to the use of the Laboratory Hot Plates for other purposes, so that it is impossible to predict any specific hazards for this kind of non-conforming use. In the case of deviations from the intended proper use of the device, it is up to the user to evaluate the possible risks.

**⚠ The relevant regulations regarding the handling of the substances used have to be observed:** the decree of hazardous matters, the chemicals act, and the rules and information of the chemicals trade. It has to be ensured on the side of the user that the persons entrusted with the use of the Laboratory Hot Plates are experts in the handling of the substances used in the environment of the Laboratory Stirrer, or that they are supervised by expert persons, respectively.

During all work with the SLK Laboratory Hot Plates: **⚠ Please wear protective glasses! ⚠**

## 2 Introduction

### 2.1 Required tools

- Crosstip screwdriver Philips no. 1
- Crosstip screwdriver Philips no. 2
- 8 mm fork wrench

### 2.2 Required measuring and testing means

- ⇒ Digital multi-meter
- ⇒ Pt 1000 simulator for checking and aligning the SLK 2T, SLK 6 Laboratory Hot Plates (temperature range)

### 2.3 Setting values

n/a

## 3 Materials used

The following materials are used to manufacture the Laboratory Hot Plates:

- Hot plate:  
Glass ceramics
- Casing:  
Casing made (top and bottom section) SMC plastic

## 4 Description of the exchangeable modules

### 4.1 Logic main board

Printed board equipped in SMD technology. This board accommodates the processor microchip, EEPROM module (memory for device parameters), the LED display, and the infrared touch sensors. Since these touch sensors have to be in close contact with the glass ceramics, they are spring loaded.

The contact with the power-pack is made using a 7-channel connector.

A stirrer, if used, is contacted using via soldered connections.

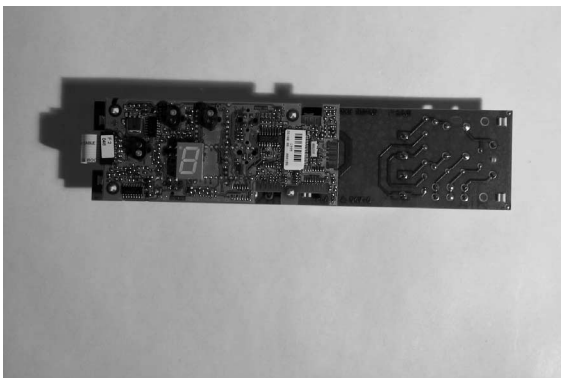
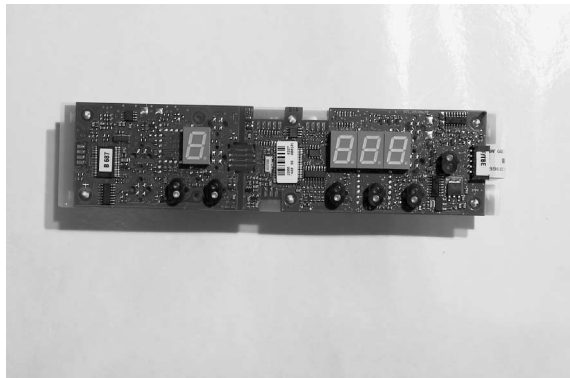


Illustration: SLK 1/ 2 main board



SLK 5/ 6 main board

## 4.2 Power-pack board

Conventionally equipped printed circuit board. This board carries the transformer, relays for controlling the heaters (number varies with the device type), the mains unit for generating the secondary voltages (5 Volt and 12 Volt), and 2 fuses. The power-pack board is connected to the logics board via plastic spacers (6 pieces) providing spring-loaded support. The connection between the power-pack board and the bottom section of the casing is also made using plastic spacers (6 screws).

The heater element(s) is/are contacted via plug-in connectors.

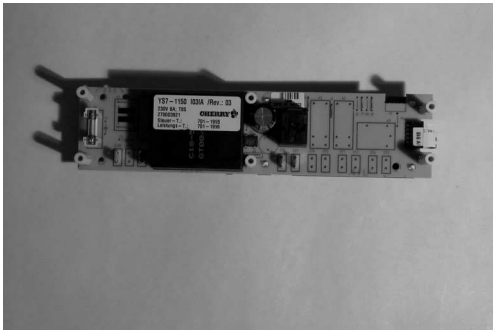
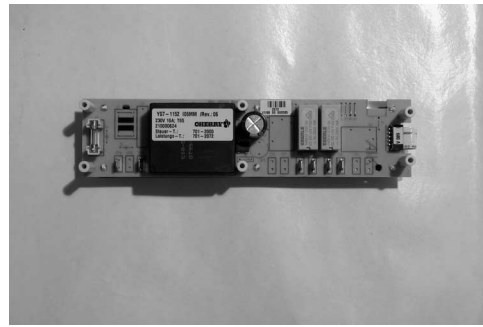


Illustration: SLK 1/ 2 power-pack board



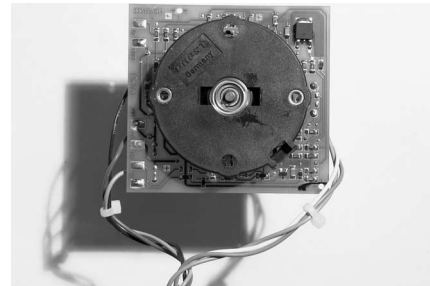
SLK 4/ 5 power-pack board

## 4.3 Driving unit, low-voltage

Consists of motor, motor support plate, magnetic holder with yoke plate and 2 magnets.



Illustration: Driving unit, complete, top view



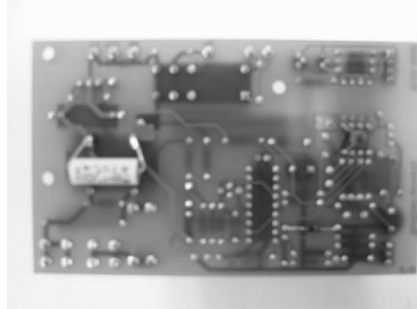
Driving unit, complete, bottom view

## 4.4 Driving unit, split-pole motor

Consists of motor, motor support plate, magnetic holder with yoke plate and 2 magnets.



Illustration: Split-pole motor



Control PVC, rear side



Components side

#### 4.5 Flat heater

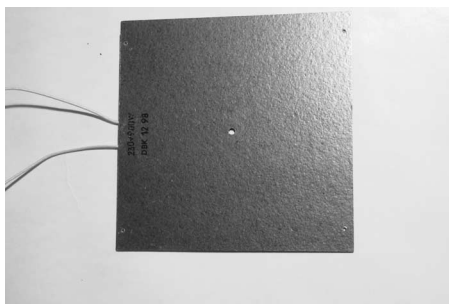


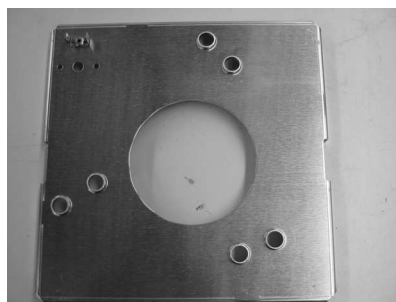
Illustration: Flat heater with connection leads

The flat heater design is used to ensure good magnetic coupling properties. The flat heater consists of a coiled heating cable inserted between two Mikanit discs.

#### 4.6 Support plate and insulation – flat heater



Illustration: Insulating plate



Support plate with bore hole for the magnetic stirrer and catch punchings for spring locking

#### 4.7 Capillary tube sensor

The capillary tube sensor is provided to avoid overheating of the heating element.

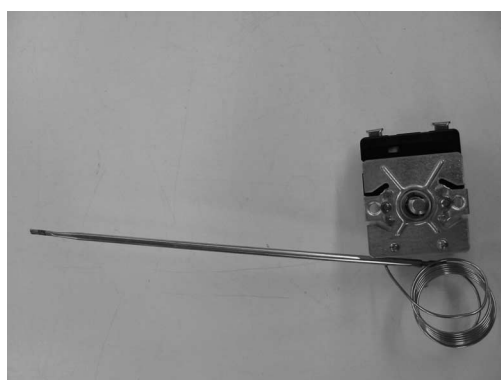


Illustration: Capillary tube sensor



Placement of the capillary tube sensor on the heating element

## 4.8 Radiation heater

Radiation heater with „short-rod limiter“ for over-temperature protection and non-twist feature installed.

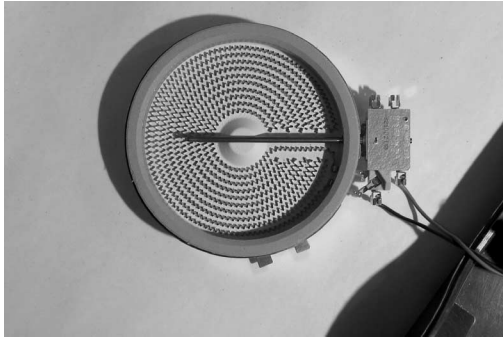


Illustration: Radiation heater, top and bottom view

and below

## 5 Dismantling the individual modules

To be able to work on the devices, please separate the device from mains by unplugging the mains plug.

### 5.1 Opening the casing

- **Caution: Prior to opening the device, please unplug the mains plug!!**
- Place the device (cold) on a soft surface with the glass ceramics down.
- Remove the self-adhesive rubber feet at the four corners.
- Loosen the five Philips screws at the bottom of the device using a Philips screwdriver (Philips no. 2).
- Subsequently, take the hot plates in both hands in such a manner that you can hold the top and bottom parts together, then turn the hot plates around again.

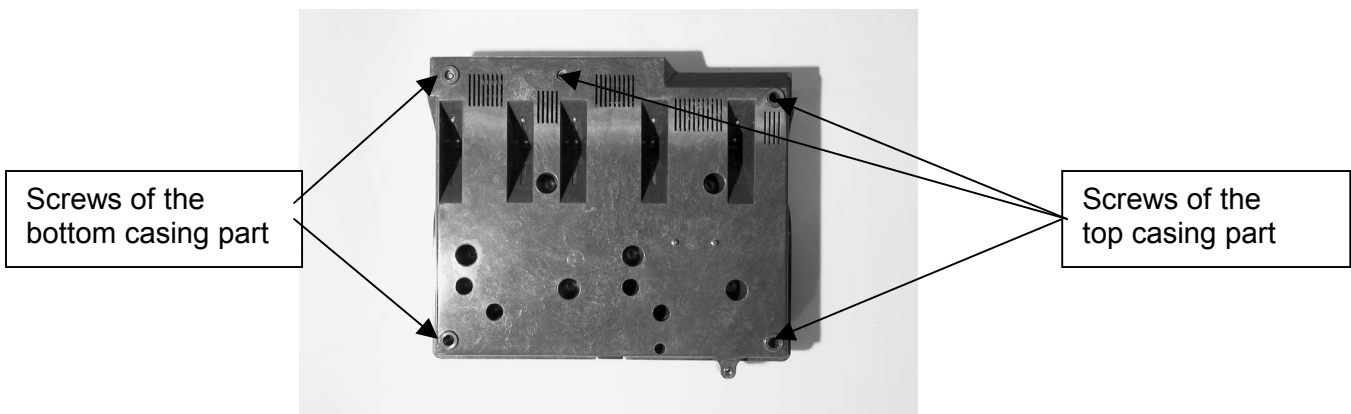


Illustration: Bottom side of the SLK 5/ 6 hot plates



## 5.2 Replacing the main socket

- Normally, the replacement of a mains socket alone is not intended, since the logics board and the power-pack board are only available in pairs. Yet, it is theoretically possible for a service to replace just one of these parts. In this case the logics board which is left over can be used at a later time.
- Open the device as described in section 5.1.
- Remove the mains socket by pulling it upwards out of the casing, then carefully separate all flat-blade connectors from the connection contacts.
- To lock the mains socket in place, the adapter bit has to be used.
- The mains socket can only be replaced as a whole.
- Considering that the insulation of the cable is made of a particularly highly heat-resistant material, please do not use any cable other than the genuine spare cable. Similarly, the flat-blade connectors, especially the heater flat-blade connectors, are in highly heat-resistant design.
- To re-assemble the unit, please proceed in reverse order.

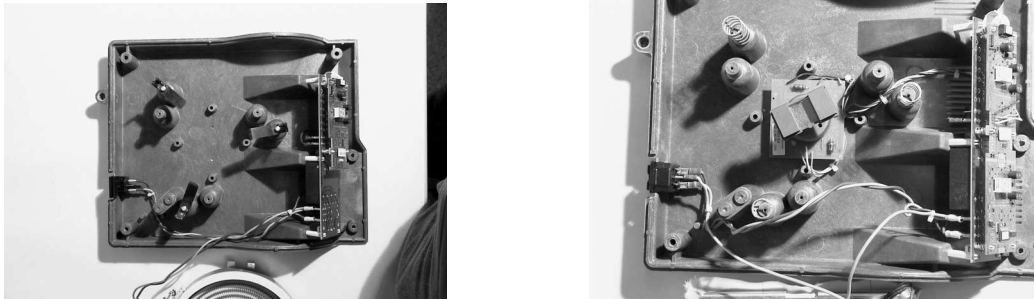


Illustration: Laying of the mains cable inside the device

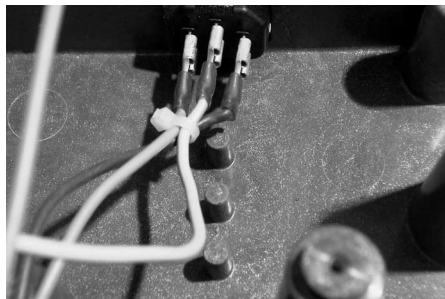


Illustration: Detail, securing the mains cable inside the casing

## 5.3 Disassembly of the stirrer motor

Two different stirrer-drive versions are available. The first one uses a 230 Volt split-pole motor, the other one a low-voltage motor in compact design. Since these two drives are not compatible with each other, the same motor type has to be installed in case of a repair.

Here below, the description how to exchange the low-voltage drive:

- Open the device as described in section 5.1.
- The motor has to be replaced as a whole together with its holding bracket.
- Detach the electrical connection between the motor and the connection board by unsoldering the connectors.
- Loosen the two fastener screws of the holding bracket.
- Remove the motor from the casing.
- To re-install a new motor incl. holding bracket, please proceed in reverse order.

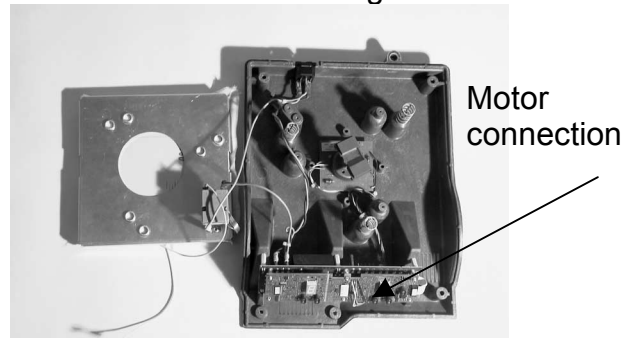
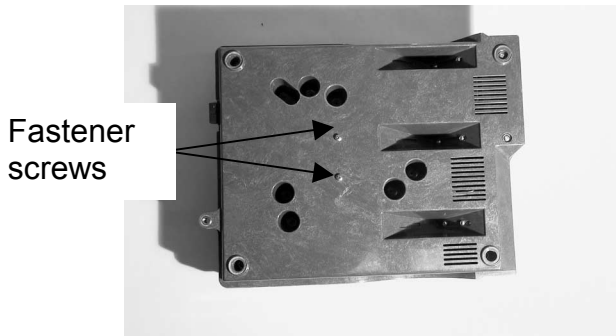


Illustration: Bottom view of the motor fastening bracket

SLK 3/ 4 stirrer drive

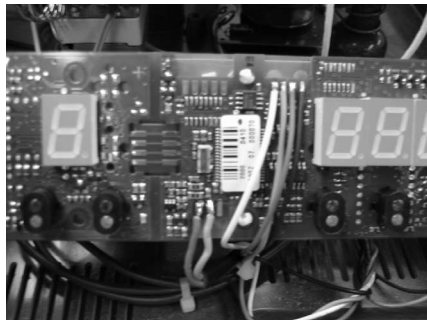


Illustration: Detail, motor connection on the logics board

#### 5.4 Replacing a radiation heater

- Open the device as described in section 5.1.
- Carefully lift the upper casing port.
- Remove the two flat-type plugs from the connectors.
- If the flat-type plugs show traces of excessive over-heating or oxidation, the cable harness has to be replaced as well.
- Now you can remove the radiation heater.
- To install a new radiation heater, please proceed in reverse order.
- **Caution:** The proper fit of the non-twist feature and the electrical connection elements is to be verified.
- Please observe the colours of the connection elements.

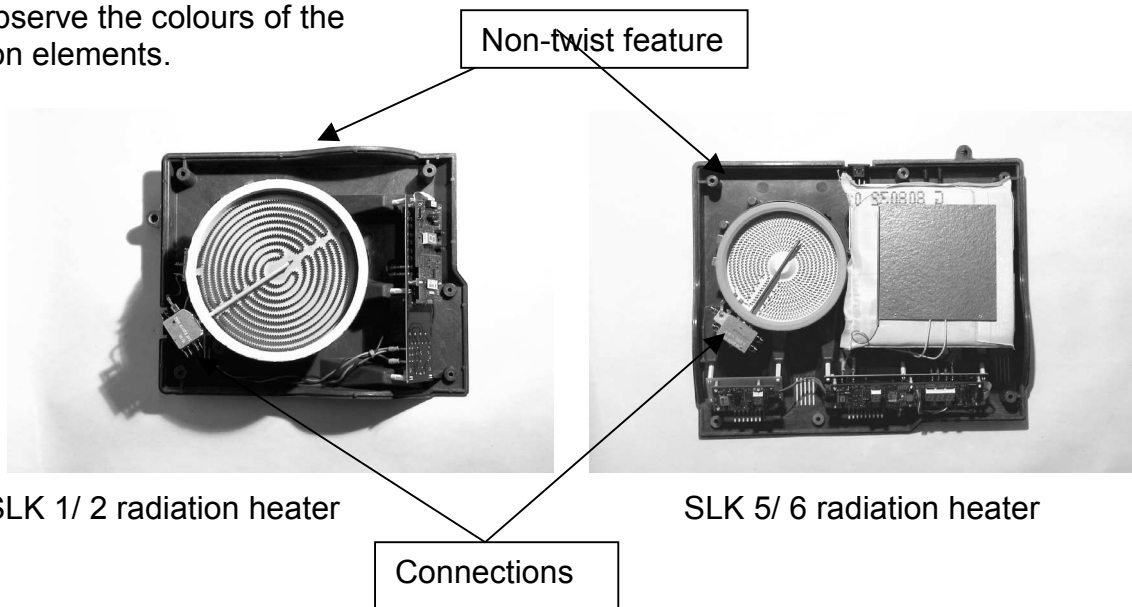


Illustration: SLK 1/ 2 radiation heater

SLK 5/ 6 radiation heater

## 5.5 Dismantling the flat-type heating element

Two different installation styles of flat-type heating elements are in use. Starting with the serial numbers below, the flat-type heating elements are installed with a spring load in the bottom part:

SLK 3/ 230 Volt no.: 950363

SLK 3/ 115 Volt no.: 905049

SLK 4/ 230 Volt no.: 960452

SLK 4/ 115 Volt no.: 907541

SLK 5/ 230 Volt no.: 965218

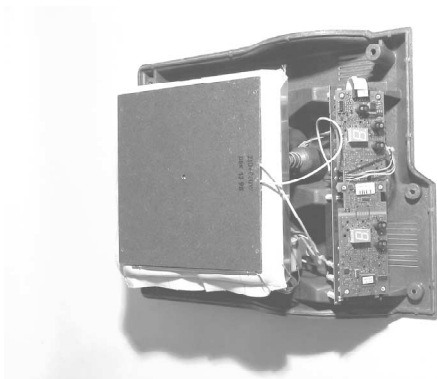
SLK 5/ 115 Volt no.: 910001

SLK 6/ 230 Volt no.: 967843

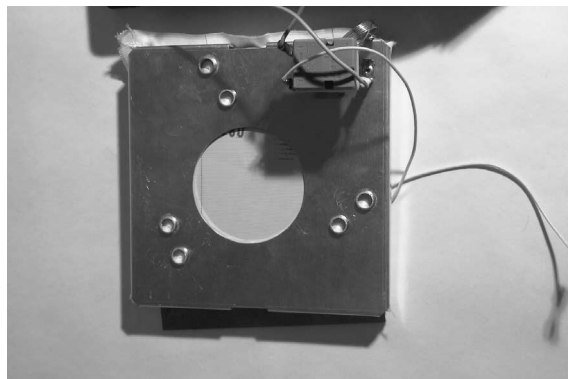
SLK 6/ 115 Volt no.: 912543

In the case of older serial numbers, the flat-type heating elements were installed in the top part. When ordering spare parts, you have to state the installation type being used. A subsequent modification would cause major problems since in this case the drives, too, would have to be replaced. When installing the flat-type heating elements, please make sure that the capillary tube sensor is installed in parallel with the flat-type heating element.

Use four nails in each corner to prevent the flat-type heating element from shifting.



Heating element, fully installed



Support plate with capillary tube sensor installed

## 5.6 Dismantling the logic board

- Open the device as described under section 5.1.
- First remove all cable connections to the logics and the power-pack board: voltage supply, sensor line, and the flat-type cable.

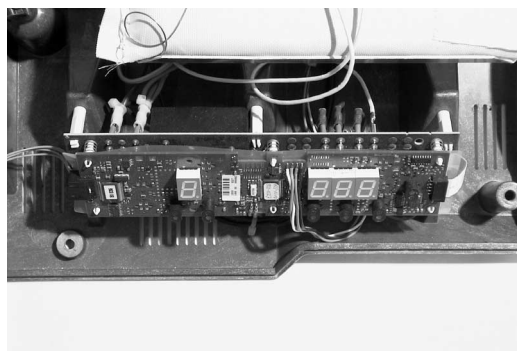
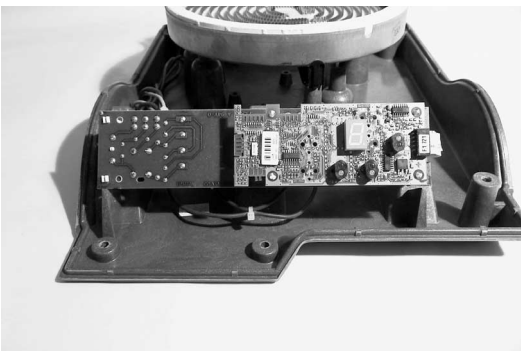


Illustration: Plan view of the bottom side of the board

- Loosen the fastener screws located at the bottom of the device using a Philips no. 2 driver.
- Carefully remove the board from the casing.
- To install a new logics board, please proceed in reverse order.

## 5.7 Dismantling the power-pack board

- Open the device as described in section 5.1.
- First loosen all electrical connections (logics-board connector, flat-blade plugs).
- Loosen the 6 cross-recessed screws at the bottom of the hot plates holding logics and the power-pack board.
- Carefully pull the power-pack board upwards to remove it from the device.
- Separate the logics and the power-pack board.
- To install a new power-pack board, please proceed in reverse order.

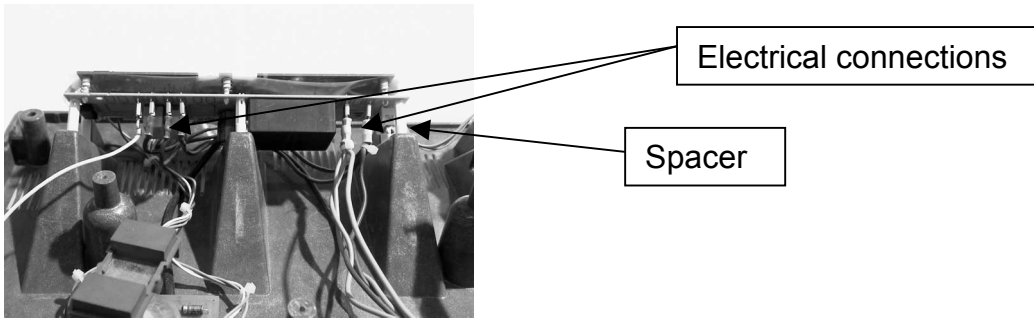
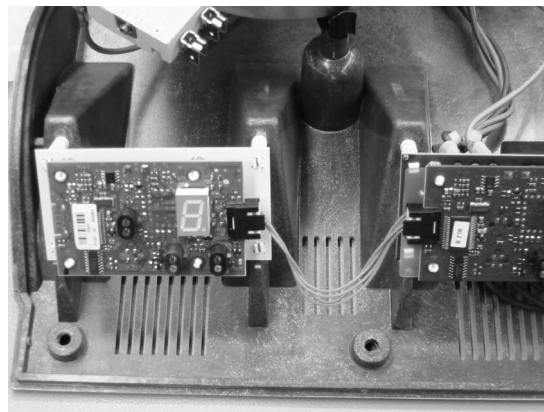


Illustration: Power-pack board in the SLK 5/ 6

## 5.8 Dismantling the SLK 5/ 6 touch control radiation heater

- Open the device as described under section 5.1.
- Carefully first loosen all electrical connections to the logics board.
- Loosen the 4 screws at the bottom of the device.
- To re-install the heater, please proceed in reverse order.



## 5.9 Glass-ceramics cover

- If the glass-ceramics pane is broken, the entire upper part has to be replaced as well. Simply removing the defective glass-ceramics pane and simply gluing on a new one is not recommended, since the gluing process may lead to problems.

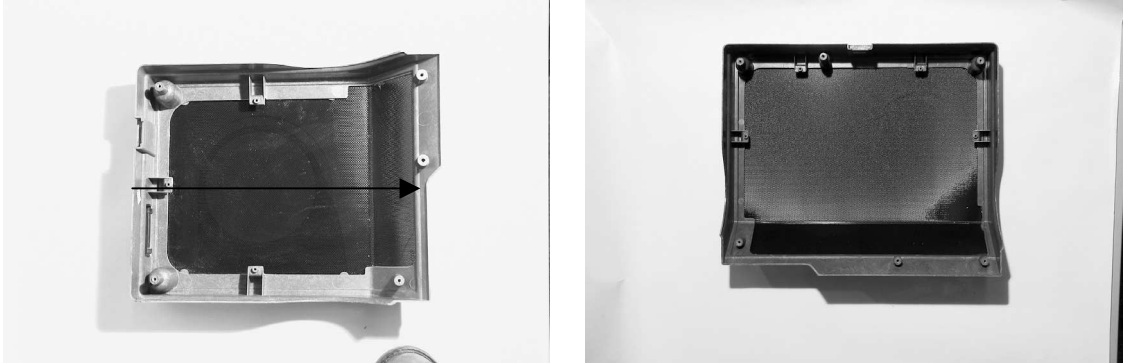


Illustration: Casing with glass-ceramics pane

## 5.10 Upper casing section with glass-ceramics pane

- Open the device as described under section 5.1.
- If a flat-type heater is installed in the upper part, please remove it.
- To re-assemble the unit, please proceed in reverse order.

## 5.11 Cable harness of the temperature sensor with 4 mm banana sockets

- Remove the electrical connections (de-solder) on the control board.
- To install a new cable harness, please proceed in reverse order. For reasons of electromagnetic interference, the wires have to be twisted inside the device.

## 5.12 Closing the casing

- Place the top part on the bottom part.
- Make sure not to pinch any loose cables when fastening the screwed connections.
- Seize the two parts with both hands, then turn them around.  
PLEASE NOTE: The upper part with the glass-ceramics pane should be put on a clean, plane surface to avoid scratches to the pane.
- Use the 5 screws to screw the two parts together. PLEASE NOTE: If the screw is over-tightened, the thread domes may be damaged.
- To conclude, glue the rubber feet into the frames provided. If the old rubber feet cannot be bonded on properly, new feet have to be used.

## 6 The following modules are available as rebuilt or spare parts, resp.

1. Radiation heater
2. Set of flat-type heating elements for low-voltage motor.
3. Set of flat-type heating elements for split-pole motor.
4. Mains supply cable harness, specific to individual devices.
5. Control PCB including power pack for SLK 1 and 2 with processor and LED display.
6. Control PCB including power pack for SLK 2T with processor and LED display.
7. Control PCB including power pack for SLK 3 and 4 with processor and LED display for low-voltage motor.
8. Control PCB including power pack for SLK 3 and 4 with processor and LED display for split-pole motor.

9. Control PCB including power pack for SLK 5 with processor and LED display for low-voltage motor.
10. Control PCB including power pack for SLK 5 with processor and LED display for split-pole motor.
11. Control PCB including power pack for SLK 6 with processor and LED display for low-voltage motor
12. Control PCB including power pack for SLK 6 with processor and LED display for split-pole motor.
13. Touch Control for radiation heater, left hot plate SLK 5/6.
14. Control system for split-pole motor.
15. Split-pole motor with magnetic disc.
16. Low-voltage motor with support bracket, magnetic holder, yoke plate, magnets.
17. Upper casing part with glass-ceramics for SLK 1/2, SLK 2T, SLK 3/4, SLK 5, SLK 6.
18. Lower casing part.
19. Cable harness temperature sensor with 4 mm banana sockets.

## 7 Error diagnose on the SLK Laboratory Hot Plates type

### 7.1 No LED indication visible

- Is the house mains supply functioning properly? Yes → 7.2

7.2 Mains connection cable ok? Yes → 7.3

- No: Replace cable with genuine spare part only.

7.3 Fuses (two on the power-pack board) ok? Yes → 7.4

- No: Replace fuses (all!) or entire power-pack board (please refer to Chapter 5.6, Dismantling the power-pack board)

7.4 Is the operational voltage of the power pack present on the secondary side (5 V and approx. 12 V)?

- yes: Replace entire logics board (please refer to Chapter 5.6, Dismantling the logics board)

### 7.5 Device is not heating:

7.6 Display visible?

- no → Please check items 7.1 to 7.4

7.7 Display is present:

- Does the relay click when the highest temperature (stage) is set from the cold condition?

- yes → Check the radiation heater, flat-type heating element, using an ohmmeter (< 100 ohm), similarly, check cable harness to the radiation heater.

- Check fuses on the power-pack board.

- no → Relay or logics board with processor and LED defective.

### 7.8 Device is not stirring

7.9 Display visible?

- no → Please check items 7.1 to 7.4

7.10 Display visible:

- yes → Replace motor, if necessary, replace control board with processor and LCD.

## 8 Required service work / maintenance intervals

### 8.1 Maintenance intervals

Normal operation:

- The laboratory hot plate do not contain any parts requiring regular service.
- Prior to connecting the device to mains, please check to see that the mains cable is not damaged.

**PLEASE NOTE:** If Hot Plates with significant traces of corrosion inside the device are sent in for repair, it is urgently recommended to suggest the use of a compressed-air connector to the customer. Experience has shown that the lifetime of Hot Plates which are exposed to attacks of this kind is greatly reduced. The compressed-air connector involving an over-pressure inside the device can reduce this corrosion tendency considerably.

### 8.2 Cleaning

- Clean the laboratory Hot Plates using a damp cloth and a normal household detergent.
- The bottom and rear side of the device have to be dry-treated. In no case must any liquid penetrate into the laboratory Hot Plates.

## 9 Ex-works gauging – SLK Laboratory Hot Plates

### 9.1 General

The calibration process of the temperature display of the laboratory hot plate as described here will eliminate any component-related errors in the temperature measurement.

This work is not required for various PT 1000 sensors, but only with regard to the electric components.

The internal resolution of the AD transducer is 8 bits (256 counts/values).

Calibration is done using a PT 1000 simulator.

### 9.2 Temperature-calibration procedure

- To calibrate the device, the following three temperatures have to be applied (software version 1.2 and higher): 0°C, 90°C, and 175°C.
- To set the device to the calibration mode, the two PT 1000 input have to be short-circuited prior to applying the supply voltage.
- After switching the device on using the main sensor, the display of the main module will show “E\_1”; the device is ready for calibration.
- Detach the connection between the PT 1000 input sockets.
- Use a PT 1000 simulator to successively apply the three temperature values. Confirm each of the values by operating the XX sensor.
- If an incorrect temperature value is applied, the device will briefly display the “E\_F” message, and work has to be resumed with 0 degrees.

## 10 Error messages

The error messages are shown in the right part of the display (on the main display)

Errors: S 1 to 9, with Pt 100 Sensor connected: interruption of the sensor line  
E1 after switching on: short of the PT 1000 (sensor)

**Service: to SLK Laboratory Hot Plates**

**SCHOTT**

of ideas

glass made

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