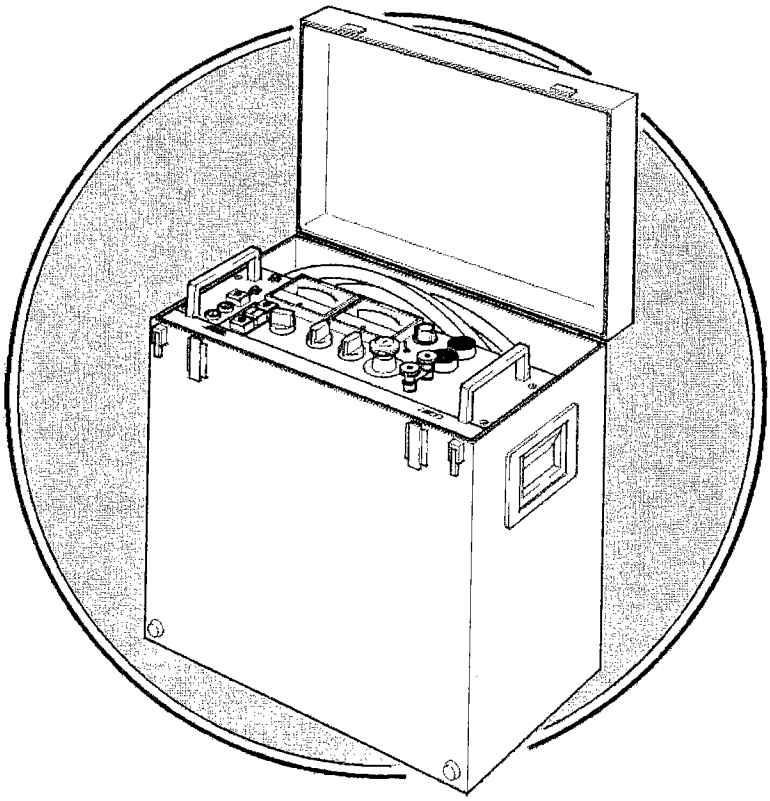
User manual

High Voltage Testing Sets
PGK 50 and PGK 80



For High Voltage Tests up to:
50 kV DC (= PGK50) and 80 kV DC (= PGK80)

Ident. Nr. 822-006
04/2005
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Guide to this Operating Instruction

For fast finding of important information the corresponding text passages are marked with symbols (symbols not stated here are self-explanatory).

More and special information concerning the respective subject are available from BAUR.

Important information about the instrument!
In any case, read carefully!

Important information text.

Copyright

In the interest of our customers we reserve the right for modifications due to technical progress. Illustrations, descriptions and delivery content are therefore not binding.

Preface

This manual contains all information necessary for the correct handling and use of the High Voltage Testing Sets PGK 50 and PGK 80 Before using the PGK, please read carefully these User Manual. If you have any questions please contact directly:

BAUR Prüf- und Messtechnik GmbH, Raiffeisenstrasse 8
A-6832 Sulz / Austria

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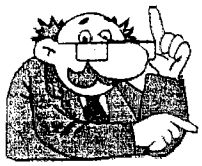
or refer to your nearest BAUR representative.

Baur Test Equipment Ltd.
Faraday House, 10 Lind Rd
Sutton, Surrey
SM1 4PJ, UK
Tel:020 8661 0957
Fax:020 8642 4801

Safety precautions



- The High Voltage Testing Sets PGK 50 and PGK 80 are built in accordance with today's state of engineering and is safe to operate. Individual components and the finished unit are inspected continually by our qualified staff within the framework of our Quality Assurance Provisions. Each unit is subjected to thorough testing prior to shipment.

- It is imperative to every person who is involved with the installation, start-up, operation and maintenance to have read and understood the complete Operating Instruction.

- It is the responsibility of the customer to ensure that only authorized persons may be allowed to use the PGK.

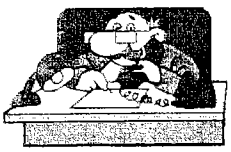
The user
- is qualified and properly instructed and has the necessary experience.
- knows the relevant standards, accident prevention rules and operating conditions.
- is able to carry out the necessary operations and is aware of the possible dangers involved.
- must immediately inform his superior about any conditions of the unit that could affect safety.

- The High Voltage Testing Sets PGK50 and PGK 80 are exclusively for testing the dielectric strenght of electrical equipment with a maximum capacity of **20 iF.**

Any other or additional use is deemed to be in contravention of the intended use. The manufacturer shall not be liable for damage resulting from any such use. In such a case the risk shall be borne solely by the user.

☞ **The local safety and accident prevention regulations are always applicable to the operation of the PGK 50 and PGK 80.**

Warranty



12 month warranty time

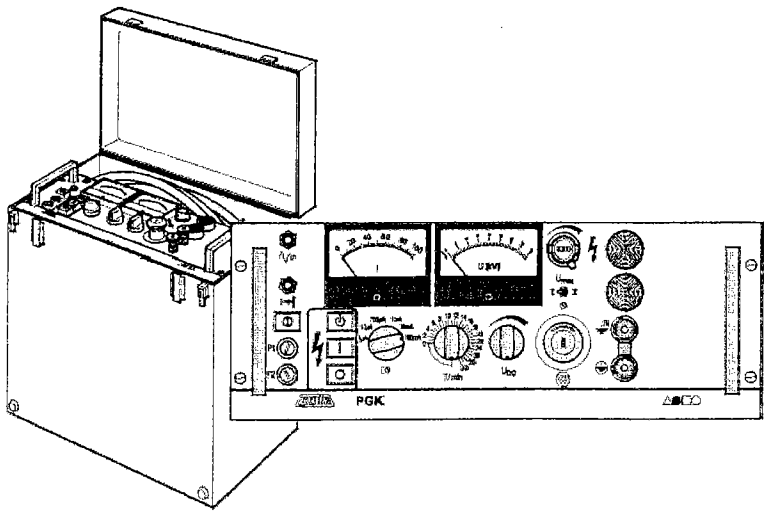
At the customer's **written request** we undertake to repair or replace at our discretion and as quickly as possible all parts that become faulty or useless as the demonstrable result of poor material, faulty design or defective execution.
The **12 month** warranty time starts with delivery.
We shall bear the costs of any faulty parts requiring replacement, but not the costs of transport to us and back to the customer, nor the costs of packing and insurance! We shall not be liable for any damage resulting from normal wear and tear, improper handling, non-observance of Operating Instruction and safety regulations.
We shall also refuse to accept any liability if the customer carries out repairs or changes to the unit himself or has others carry out them! The warranty does not cover damage in transit, batteries, fuses and any readjustments in accordance with the Operating Instruction! We draw attention in addition to the '**General Terms of Sales and Delivery**' of:

BAUR Prüf- und Messtechnik GmbH, Raiffeisenstrasse 8
A-6832 Sulz/Austria

CONTENTS

1 Product Information

1.1 General view of PGK



A compact and ligth weight High Voltage Testing Set
The primary area of application is in-field testing of cables. High voltage is generated by a high voltage transformer and a voltage multiplier. Thanks to an operating frequency of 20kHz small dimensions are possible. Packaged in a handy carrying case with handles and carrying strap, the PGK units are portable and therefore equipped for field applications.

Test voltages

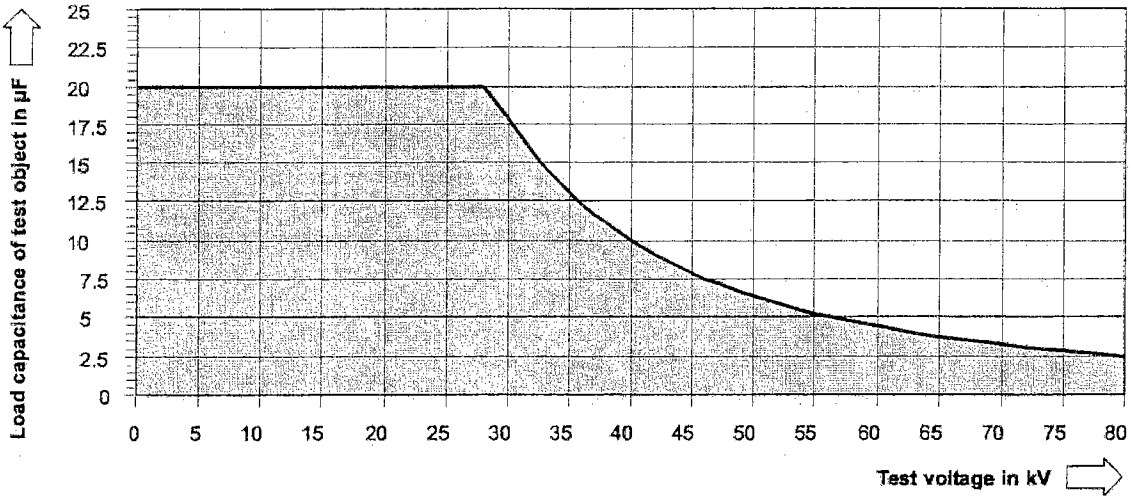
Type	PGK 50	PGK 80
Max. test voltage	50 kV DC	80 kV DC
at an output current of:	2 mA	0.8 mA

Features
- automatic, SF_6 insulated discharge unit
- timer (0-30 minutes)
- connection for an electric gate, emergency-stop switch and external warning lamps
- connection for Y/t plotter for recording the current flow
- shielded high voltage cables with clamps for connecting the test object
- integrated thermal switch
- carrying case with handles, foldable mounting legs and cable compartment

1.2 Discharge device

The discharge device of the PGK 50/80 consists of a pressure tank (overpressure = 3 bar) filled with insulating gas (SF_6 sulphur hexafluoride). A NC-contact and a discharge resistor are installed in the pressure tank. The discharge resistance is 69 kΩ including transient protection and is configured for a maximum surge power of 8.000 Ws.

Diagram1
The discharge device works automatically and independent of instrument position and remains activated even at power failure. The response of the discharge device is a loud switching noise.



During two discharges: Observe 15 minute pause time!
With discharges <8000 Ws: Reduce pause time accordingly!

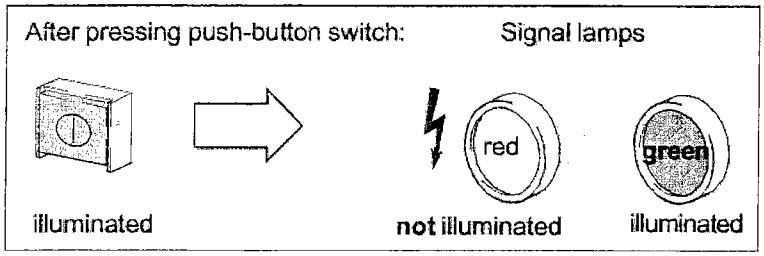
After completion of a test **wait at least 10 seconds after the switching noise of the discharge device.** Therafter handle the test object as follows:

1. Discharge with discharge rod,
2. Ground,
3. Short out!

Do not open discharge device. Servicing the Testing Set may only be performed by instructed service personnel. The local rules and regulations regarding handling of SF_6 gas must be observed.

1.3 Important key commands

Power On/Off



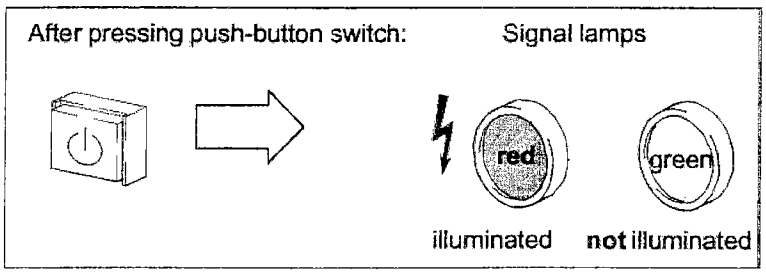
Testing Set on STANDBY

- control lines of the Testing Set are connected to mains.
- Primary circuits of high voltage supply are not connected to mains.
- Discharge device is connected to high voltage output.

Ready for switching on for High Voltage

Preconditions:

- **All persons must leave hazard area!**
- **Secure hazard area according to local safety rules and regulations.**

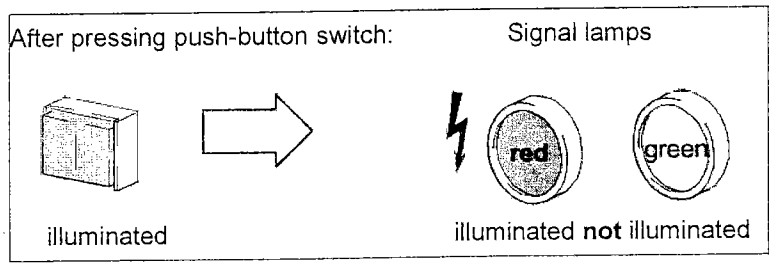


Testing Set is '**READY FOR SWITCHING ON**'

- The operating condition for High Voltage is activated. The requirement for clearing the H.V. is met.
- Primary circuits of high voltage supply are **not** connected to mains.
- Discharge unit **no longer connected** to high voltage output.

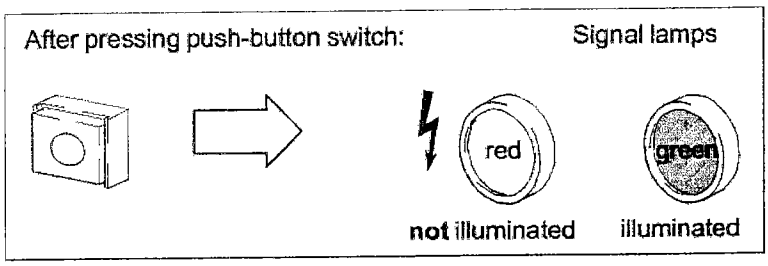
High Voltage Clearance

Precondition:
- Testing Set is **READY FOR SWITCHING ON**



Testing Set is activated
- Primary circuits of high voltage supply are connected to mains.
- The high voltage output can be alive.

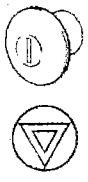
High Voltage OFF



Testing Set on **STANDBY**
- The mode of operation changes from ACTIVATED to STANDBY.
- Primary circuits of high voltage supply are disconnected from mains.
- Discharge device is connected to high voltage conducting parts.

Before removing safety precautions

Use appropriate equipment:
make sure that all parts that are not earthed (low resistance) are no longer alive!

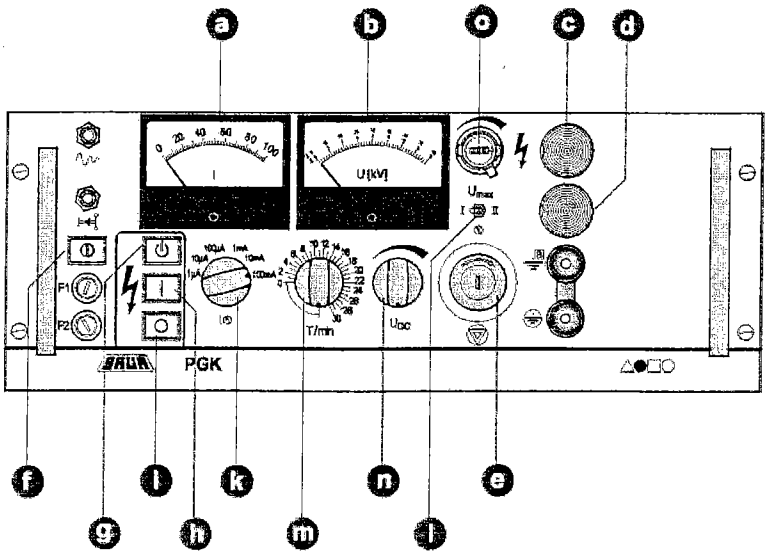


Emergency-Stop push-button switch,

The Emergency-Stop pushbutton switch:
- is used for **immediate shutdown** in case of danger. (High lockable voltage will be switched off and discharge device is activated).
- is equipped with a **key lock.**
- Pressing the Emergency-Stop push-button switch and removal of the key assures protection against unauthorized

1.4 Display and Operating Elements

Control panel PGK

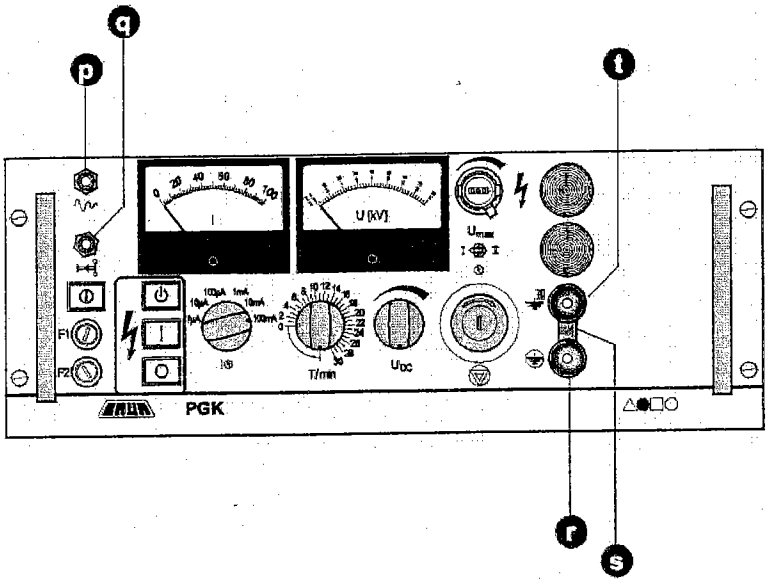


Legend

Pos.	Display elements
a	Amperemeter for indication of output current
b	Voltmeter for display of output voltage in kV
c	Signal lamp, red
d	Signal lamp, green
	Operating elements
e	Emergeny-Stop push-button switch, lockable
f	Power ON/OFF push-button switch (with Power On pilot lamp)
g	Ready for switching on H.V. push-button switch
h	High voltage clearing (with pilot lamp)
i	High voltage OFF
k	Current measuring range switch (1 µA/10µA/100µA/1 mA/10mA/100mA)
l	Voltage measuring range switch I/II
m	Timer (0-30 minutes)
n	Voltage regulating knob for setting output voltage
o	Potentiometer for fine adjustment (with scale 0-999); for output voltage limitation

1.5 PGK Interfaces

Control panel of PGK



Legend

Pos.	Interfaces
p	Connecting socket (6.3-mm-dia.) for plotter
q	Connecting socket (6.3-mm-dia.) for electric gate, EMERGENCY-STOP switch and warning lamps
r	Protective earth terminal
s	Short circuit bridge for earthing of measuring earth terminal
t	Measuring earth terminal

1.6 Technical Data – PGK 50 and PGK 80

Power supply	230 V, 50/60 Hz	Optional: 110 / 115 / 120 / 127 / 220 / 240 V		
Rated power	690 VA			
Installed load	**PGK 50**	1610 VA	**PGK 80**	PGK 80 1380 VA
Rated output voltage		50 kV DC neg.		80 kV DC neg.
Rated output current		2 mA		0.8 mA
Short circuit output current		25 mA		20 mA

Accuracy	+/2 2,5%
Timer	0 – 30 min
Discharge device	for a maximum discharge energy of 1 discharge per 15 minutes, T_u=20°C, max. 8000 WS

Voltage measuring range

I	PGK 50:	0 – 50 kV	PGK 80:	0 – 80 kV
II		0 – 10 kV		0 – 16 kV

Current measuring range	1 µA / 10 µA / 100 µA / 1 mA / 10 mA / 100 mA
Smallest readable current	20 nA

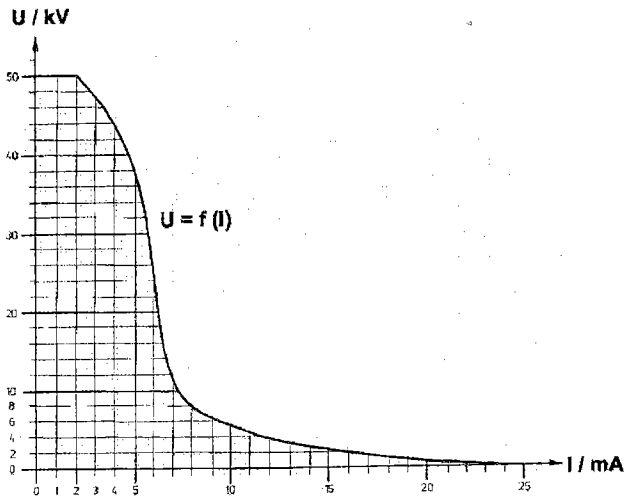
Relative humidity	not condensing	
Ambient temperature	Working:	0°C ... +45°C
	Storage:	-20°C ... +60°C

Dimensions (WxHxD)	500 x 285 x 460 mm
Weight	25 kg

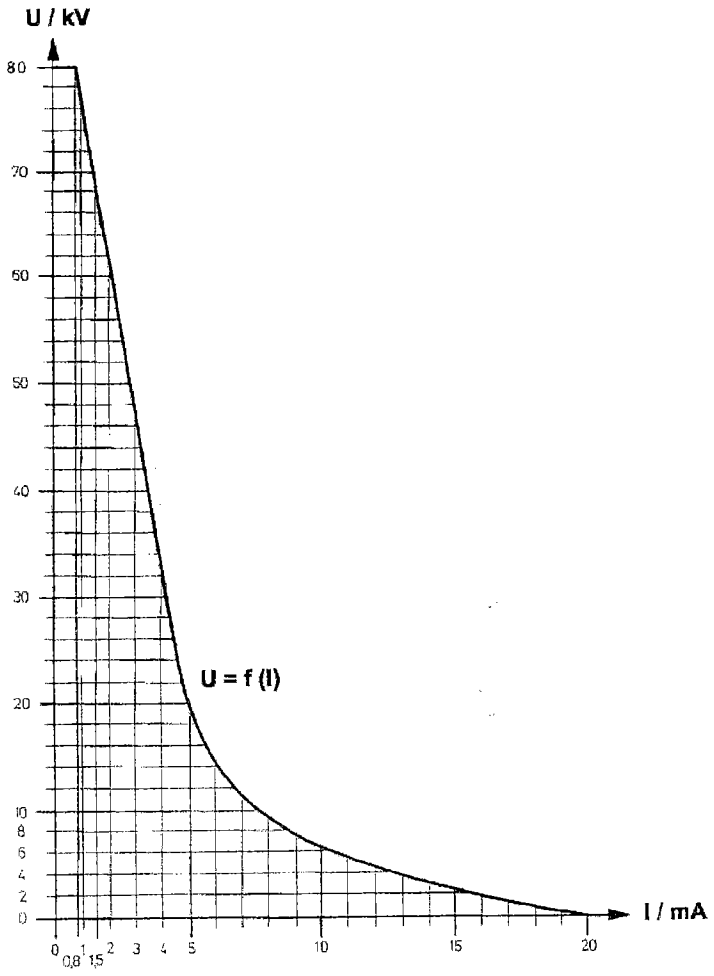
Conforms to CE standard	Low voltage directive 73/23/EEC EN 61010-1, VDE 0104, EMC directive 89/336/EEC with Modification 91/263/EEC, 92/31/EEC, VDE 0843 part 2, IEC 801-2/VDE 0843 part 4, IEC 801-4, VDE 0875 part 11, EN 55 011

1.7 PGK Load Curves

PGK 50 load curve



PGK 80 load curve



2 Packing and Shipping

The Testing Sets are shipped in robust cardboard cartons. If Testing Sets are not used immediately, store in carton in dry room!
Complaints concerning damage should be made to us without delay, using a standard damage claims form.

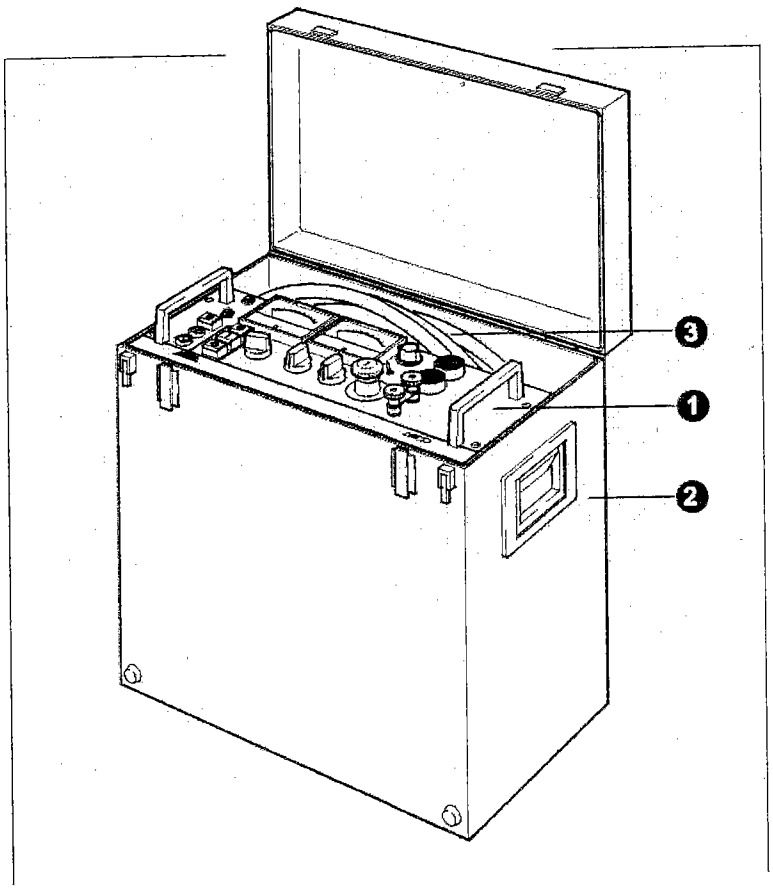
Damage during transport
Confirmation of visible damage should immediately be obtained from the carrier. The extent and probable cause of the damage should be stated.

If damage is discovered during unpacking, contact the responsible transportation company **immediately.** Request a written loss assessment and make them responsible for the damage.

We also refer to the **'General Terms of Sales and Delivery'** of:

BAUR Prüf- und Messtechnik GmbH, A-6832 Sulz / Austria

Items included



Standard items

Pos.	Designation
1	High voltage Testing Set PGK50 or PGK80 including test log and operating instructions
2	Carrying case with handles, foldable mounting legs and cable compartment
3	Shielded high voltage cables with connecting clamps, power cord, earth lead, measuring earth lead, carrying strap

3 Preparations for a Test

3.1 Connect test object

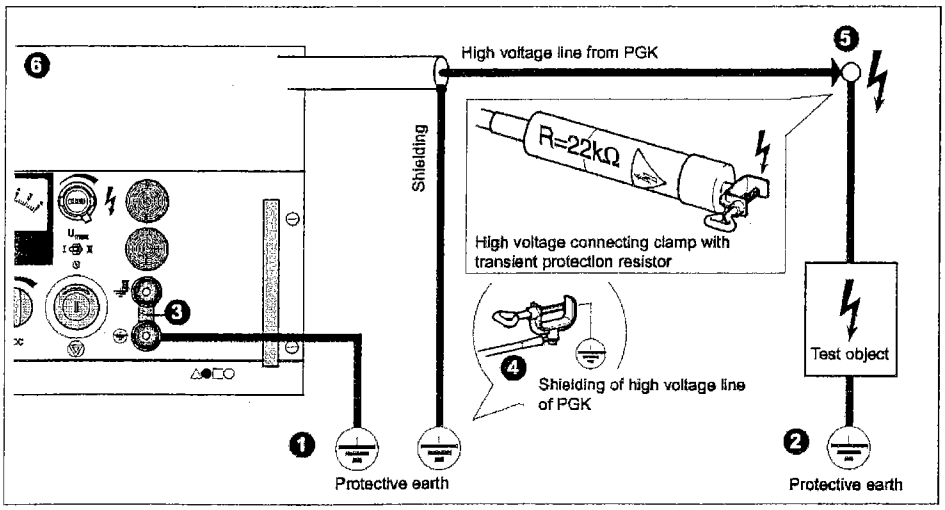
Test configuration A and B must be strictly adhered to!
The current measuring section of the PGK has an available test range of 10µA to 100 mA.

Important:

Test configuration A for test current ranges of 10µA to 100mA.
Test object is earthed!
Test configuration B for test current ranges of 1 µA to 100mA.
Test object is isolated!

The described procedure for test configuration A and B must be strictly adhered to!
The local safety and accident prevention rules apply!

Test configuration A
For test current ranges of 1 m A to 100mA. Test object is earthed! In test configuration A all secondary output currents will be registered. At voltages higher than 10kV corona and insulation currents of the PGK of with more than 100nA may occur. These currents will be registered during the return flow from the high voltage source to the current measuring device.



Step	Procedure for test configuration A
1	Connect protective earth clamp of PGK ⏚ to earth.
2	Connect test object to protective earth.
3	Connect short circuit bridge between test earth terminal ⏚B and protective earth terminal ⏚ .
4	Connect shielding of high voltage lead to protective earth.
5	Connect high voltage lead to test object.
6	Plug in powercord of PGK.

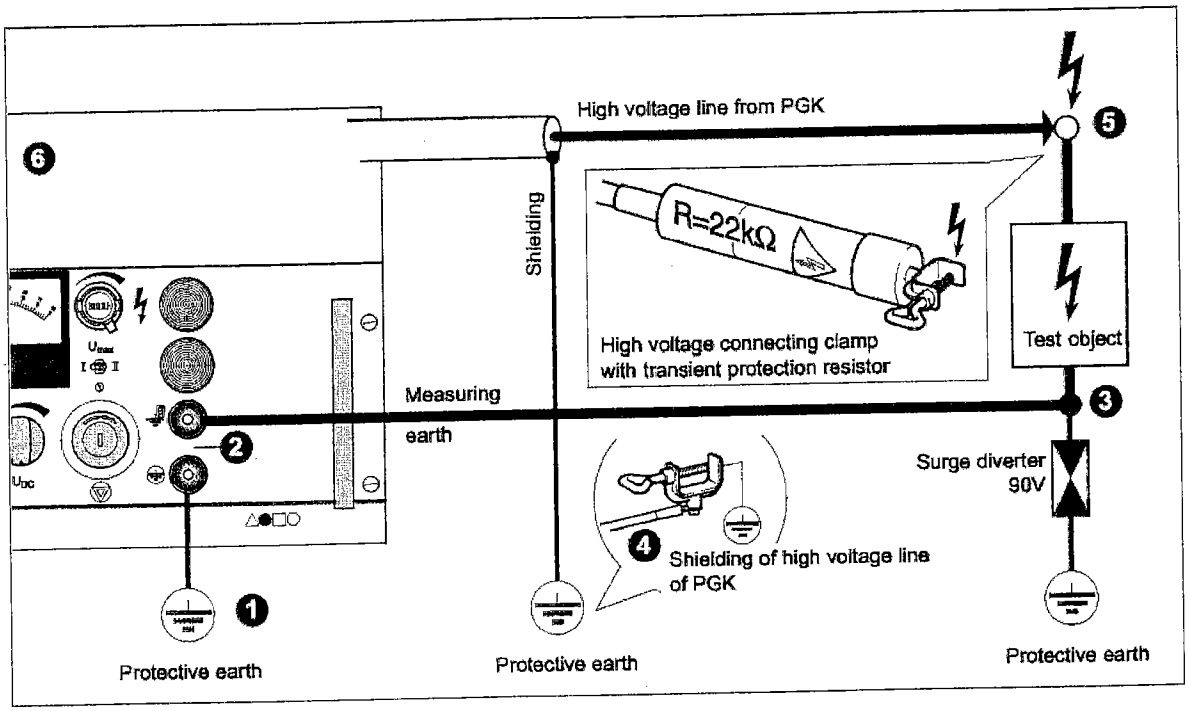
Test configuration B
For test current ranges of 1µA to 100mA. Test object is isolated!

When short circuit bridge is removed
A current flowing off via earth is not registered by the current measuring device and consequently not limited by the current limiter to permissible values.
If, in this configuration, during a certain period of t>1 min, a short or a stationary arc occurs for example, the PGK may be damaged due to excessive output current.
If there is no surge diverter

If there is no surge diverter

Never loosen test earth terminal ⏚[B] on PGK during testing!

When removing the cable from the test earth terminal ⏚[B] the test object is no longer earth-connected. **Warning, the cable might carry High Voltage!**

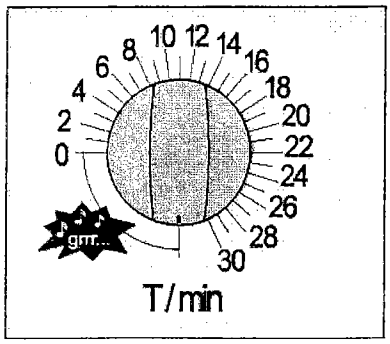


Step	Procedure for test configuration B
1	Connect protective earth clamp of PGK ⏚ to earth.
2	If available: Remove short circuit bridge between measuring earth terminal and protective earth terminal.
3	Connect surge diverter (90V) to measuring earth terminal and test object.
4	Connect shielding of high voltage cable to protective earth.
5	Connect high voltage lead to test object.
6	Plug in powercord of PGK.

3.2 Set timer

After a preset period the high voltage is switched off

The discharge device of the PGK 50/80 can be activated by switching off the high voltage manually or by the timer. Set timer before or during a high voltage test.



Turn knob to desired period

After the preset period (0-30 minutes)
- an acoustic signal is activated
- the high-voltage is switched off
- the discharge device is activated

Option:
After preset period activate acoustic signal only
If desired that after the preset period the high voltage is not acoustic signal only switched off and only the acoustic signal is activated:

Please refer to Section 5. Maintenance / Timer - activate acoustic signal only.

3.3 Connect plotter

Record test current up to 1mA or 10mA with Y/t plotter

The test current can be recorded during the required period via the plotter output of the PGK. The connection is wired-up in such a way, that it alternatively operates as current loop with a current of 0-1 mA or 0-10mA, independently of the set current measuring range. Full triggering of the recorder output of 1 mA or 10mA corresponds to the full deflection on the mA-meter (1 µA, 10 µA, 100 µA; 1 mA, 10 mA, 100 mA).

Use current loop 1-3 or 2-3 only!
Never use both current loops simultaneously!

Plug assignment for plotter connection
6.3-mm-dia. Stereo jack plug

1-3 Current loop 0 to 10mA
2-3 Current loop 0 to 1mA

Use plotters with earth-free input only!
Maximum permissible voltage between position 3 and case earthing: - 30 V

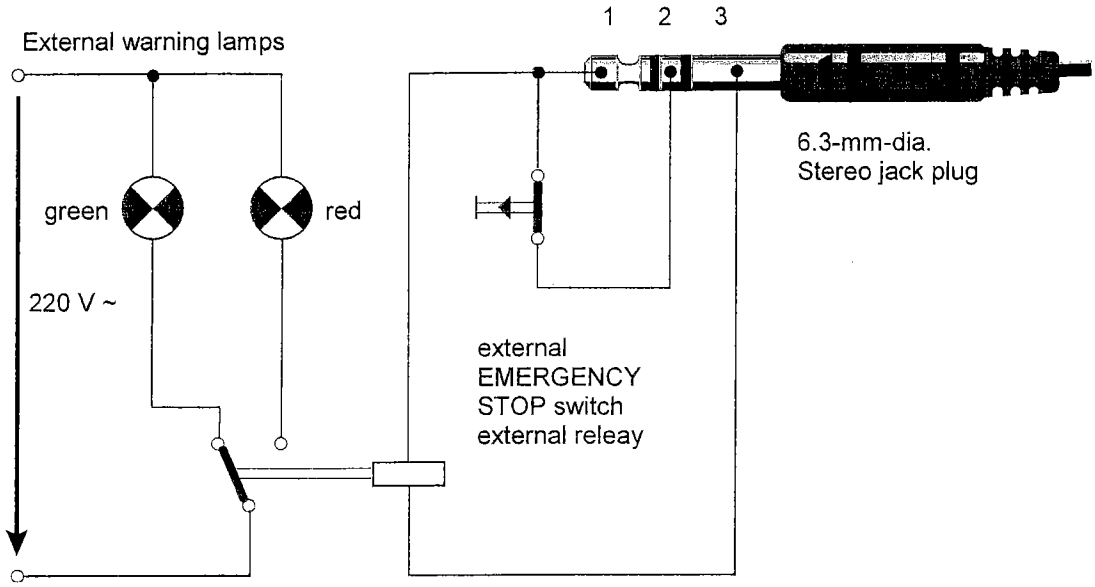
3.4 Connect EMERGENCY-STOP switch, electric gate signal lamps

Remote controlled high voltage switch-off

Switch-off is accomplished by activating one or more EMERGENCY STOP switches or an external electric gate (NC-contact). External warning lamps can be controlled by a relay.

Plug contact No. 3 is connected to case earthing!

Plug assignment e.g. for relay connection



Coil specifications for external relay:
U_{Coil} = 12 V I_{Coil} = 100 mA

Connection state:
Relay pulls in:
- at high voltage switch-on of PGK
- when red signal lamp of PGK is illuminated.

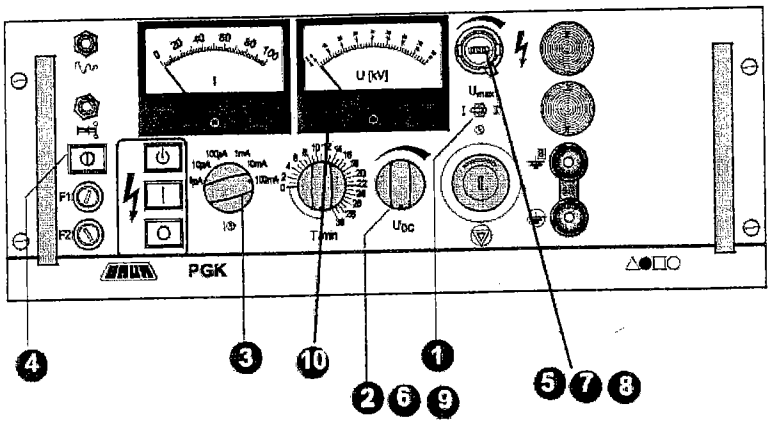
Relay drops out:
- at high voltage switch-off of PGK
- when green signal lamp of PGK is illuminated

4 Performing High Voltage Test

4.1 Switch on PGK and perform high voltage test

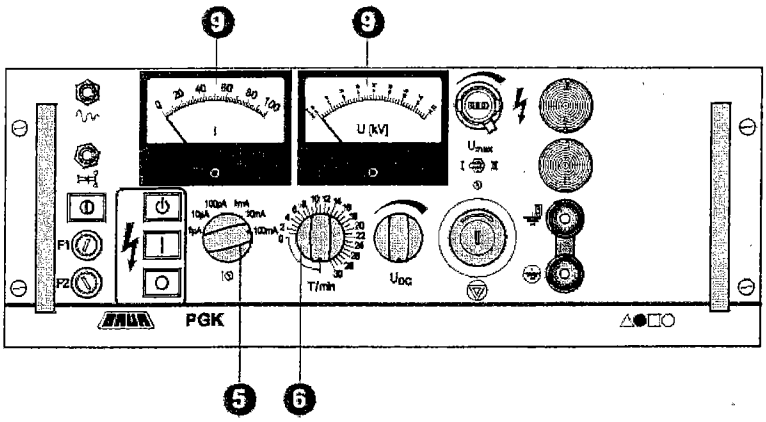
Preconditions
- All necessary procedures according to section 3.*Preparations for a Test* have been completed.
- Safety precautions according to local safety rules and regulations are met.

PGK control panel



Prepare Testing Set for **STANDBY**

Step	Proceedings
1	Set required range I/I I for voltage indication.
2	Turn voltage regulating knob fully counterclockwise (= locking pos.).
3	Set current measuring range switch to 100mA.
4	Press power **ON/OFF** ⏻ push-button switch. Power ON lamp and signal lamp (green) light up. Testing Set is **on STANDBY.**
	Voltage fine-tuning
5	Turn the fine-tuning button as far as possible to the left
6	Turn the max. voltage button as far as possible to the right.
7	Adjust the desired voltage with the fine tuning button.
	Voltage-Limiting
8	Preselect the desired max. voltage with the fine tuning button.
9	Adjust voltage with the max. voltage button. Advice: Preselected voltage decrease with load.
10	The voltage at the test object is shown on the voltage display.



PGK control panel

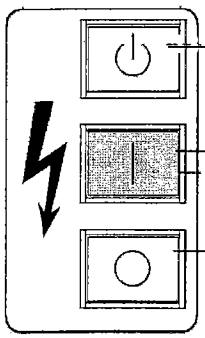
Setting current measuring range and timer

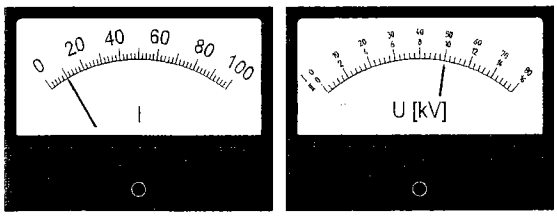
Step	Additional adjustments
5	Set current measuring range switch to required measuring range.
6	As requested: Set timer to required shut-down time of high voltage (0-30 minutes).

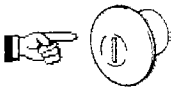
Prior to high voltage clearance

All persons must leave hazard zone!
Secure hazard zone according to local safety rules and regulations!

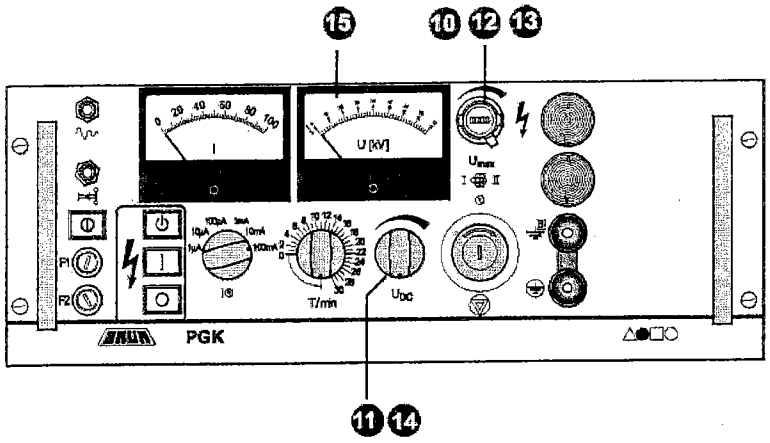
H.V. control panel



	Perform high-voltage test
7	Press ready for switching on H.V. push-button switch ⏻. Testing Set is READY FPR SWITCHING H.V. Green pilot lamp extinguish, red pilot lamp is illuminated.
8	Press H.V. clearing switch I. Testing Set is ACTIVATED; pilot lamp of switch and red pilot lamp is illuminated
9	Read test values for voltage and current on the respective meters. 



In case of emergency, cut off Testing Set with the EMERGENCY STOP push-button switch ⏻.

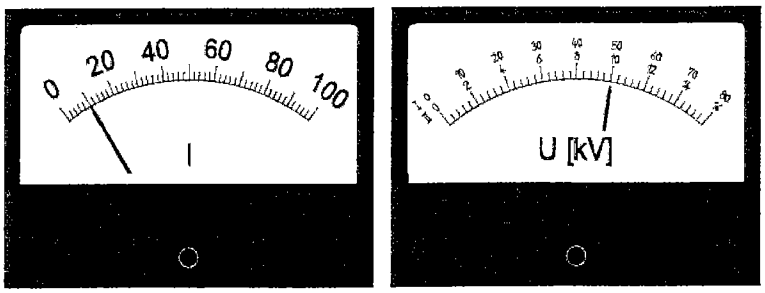


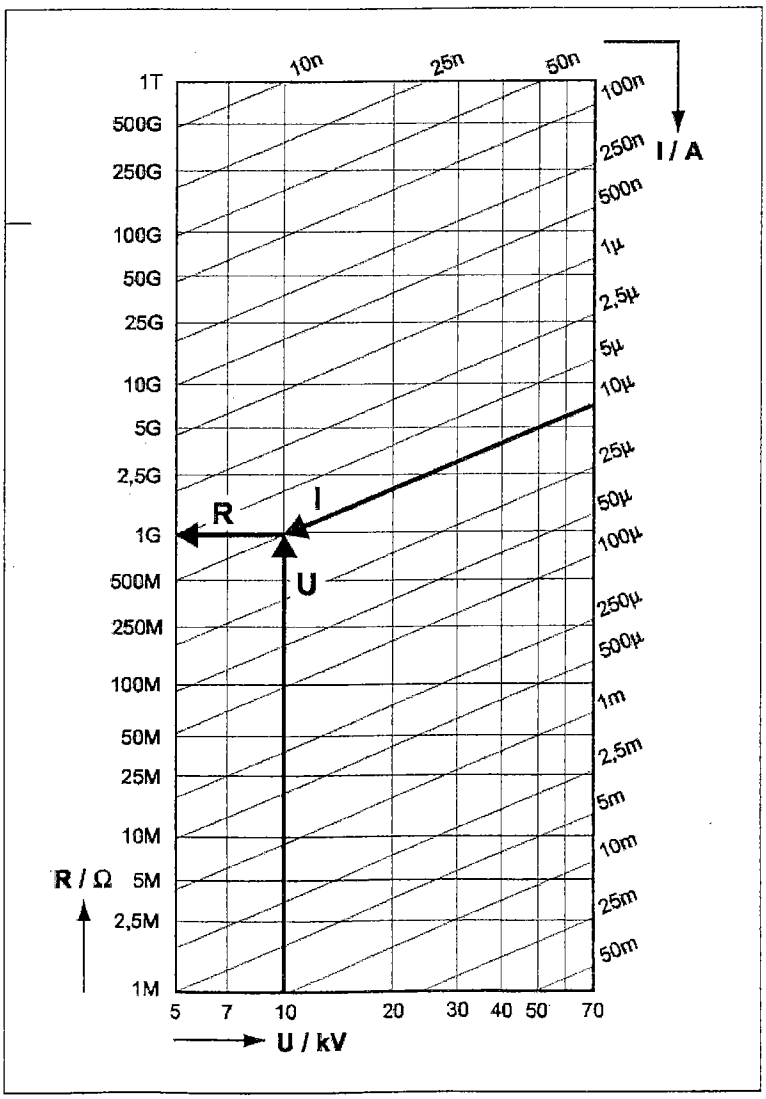
	Carry out voltage fine adjustment
10	Turn potentiometer for fine adjustment fully counterclockwise.
11	Turn voltage regulating knob fully clockwise.
12	Fine-adjust required voltage level with potentiometer.
	Carry out voltage limitation
13	Preselect required maximum voltage with potentiometer.
14	Adjust voltage with voltage regulating knob. Note: Preselected voltage will drop under load.
15	Read voltage of test object on voltmeter.

4.2 Determine resistance value

By means of a diagram and with the measured current and voltage values:
- determine the appropriate resistance value.

Observe selected measuring ranges

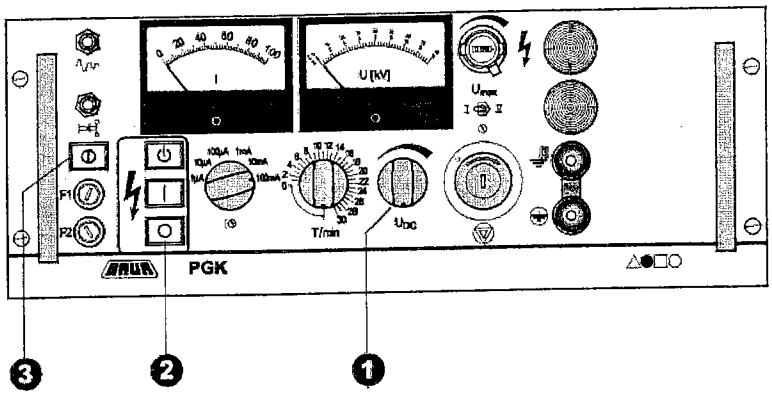




Example
I = 10 µA, U = 10 kV
→ R = 1 GΩ

Diagram
Voltage U, Current I
→ Resistance R

4.3 Switch off PGK



Before switching off, first reduce high voltage

Step	Standard switch-off procedure
1	Turn voltage regulating knob fully counterclockwise. A possible residual charge on the test object is indicated on the voltmeter.
2	Press push-button switch for High voltage OFF [O].
3	Switch off Testing Set by pressing Power ON/OFF push-button switch [⏻] . Power-On pilot lamp and green signal lamp are extinguished.

Shut-down is also accomplished
- after selected period on timer has been elapsed.
- by opening of the external electric gate (optional).
- by pressing the EMERGENCY STOP switch (in case of danger).
- by tripping of the internal thermal switch.
  The thermal switch provides instrument protection against excessive operating temperatures. At an operating temperature of more than 85°C the high voltage is switched off and the discharge device is activated.
  After tripping of the thermal switch, a cool-off period of the Testing Set is required before the high voltage can be switched on again.

After completion of test
Despite the automatically activated discharge device, it must be assumed that the test object is still charged with maximum voltage.

Wait al least 10 second after the acoustic signal of the discharge device before proceeding with the test object as follows:

1. **Discharge with discharge rod,**
2. **Ground**
3. **Short out!**

5 Servicing

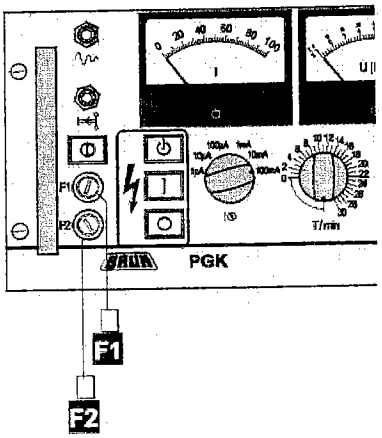
Servicing, without exception, must only be carried out with Testing Set switched off.
Strictly observe safety precautions (refer to pages.....!) before starting servicing the Testing Set.

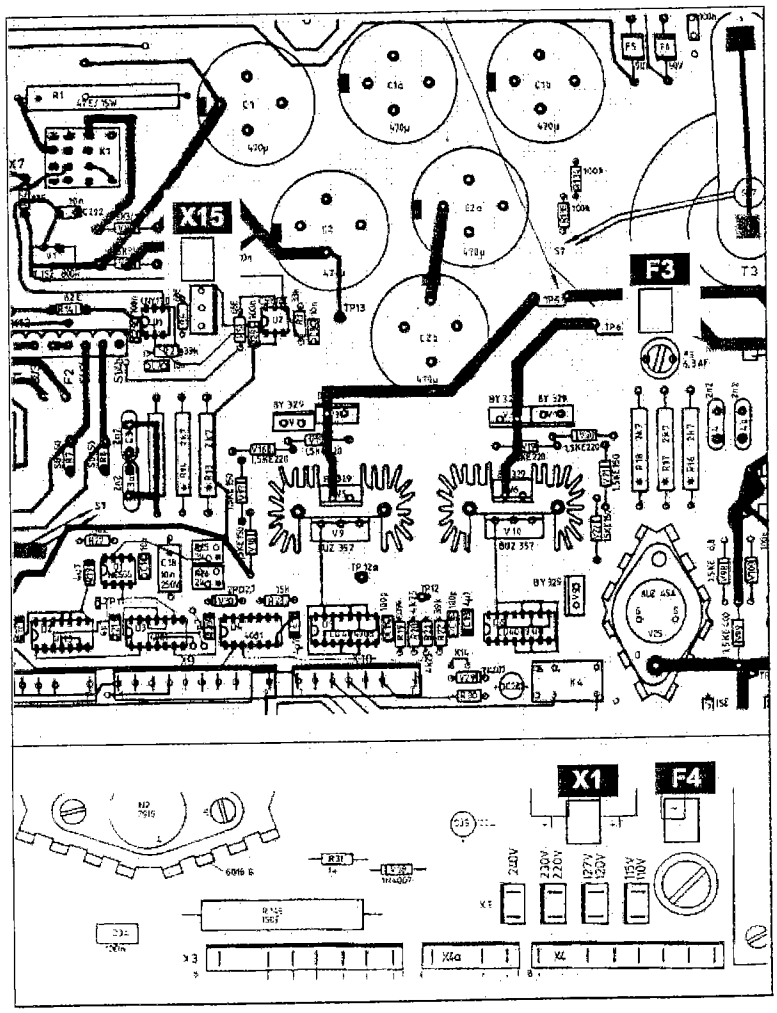
Recommended cleaning procedure:
Carefully clean dirty surfaces and connection cables of the Testing Set with a petroleum ether moistened cloth. Please do no use solvents, acetone, spirit, alcohol etc.!

5.1 Set mains voltage

Selectable mains voltages

The PGK50/80 mains voltage is factory installed according to customer requirements. Jumper locations and fuses for the appropriate mains voltages are provided as follows:





Component layout of power PCB

Component layout of voltage supply PCB

Mains voltage	Position plug X15	Position plug X1	Mains fuse F1, F2 (ø6.3x32)	Fuse F4 (ø5x20)	Fuse F3 (ø5x20)
110 V	110 V	110 / 115 V	8 AT	0.8 AT	6.3 A fast
115 V	110 V	110 / 115 V	8 AT	0.8 AT	6.3 A fast
120 V	110 V	120 / 127 V	8 AT	0.8 AT	6.3 A fast
127 V	110 V	120 / 127 V	8 AT	0.8 AT	6.3 A fast
220 V	220 V	220 / 230 V	6.3 AT	0.4 AT	6.3 A fast
230 V	220 V	220 / 230 V	6.3 AT	0.4 AT	6.3 A fast
240 V	220 V	240 V	6.3 AT	0.4 AT	6.3 A fast

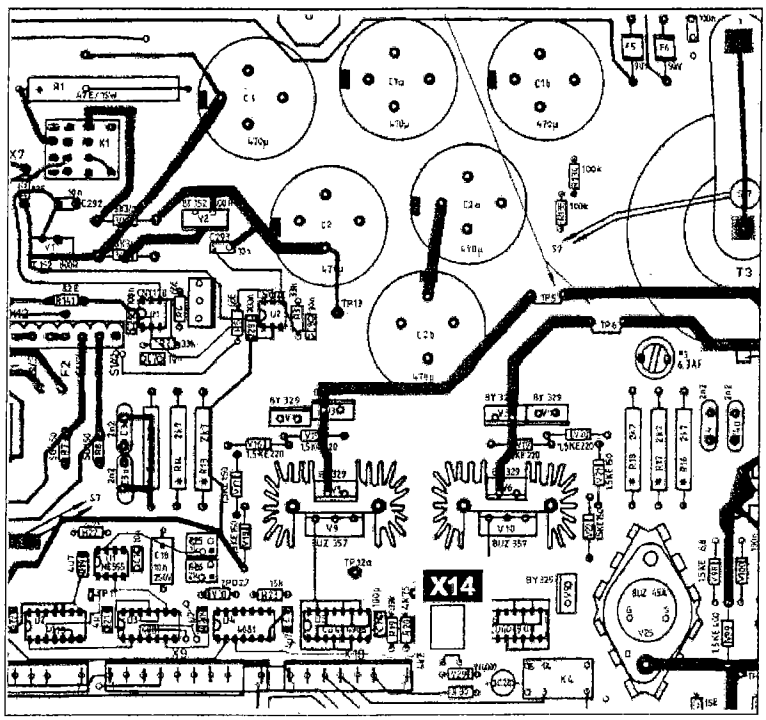
Check set mains voltage on type plate and make corrections if required.

5.2 Timer – activate acoustic signal only

Optional: after set period, activate acoustic signal only

If only an acoustic signal should be heard after the set period has acoustic signal only elapsed, please proceed as follows:

Component layout of power PCB

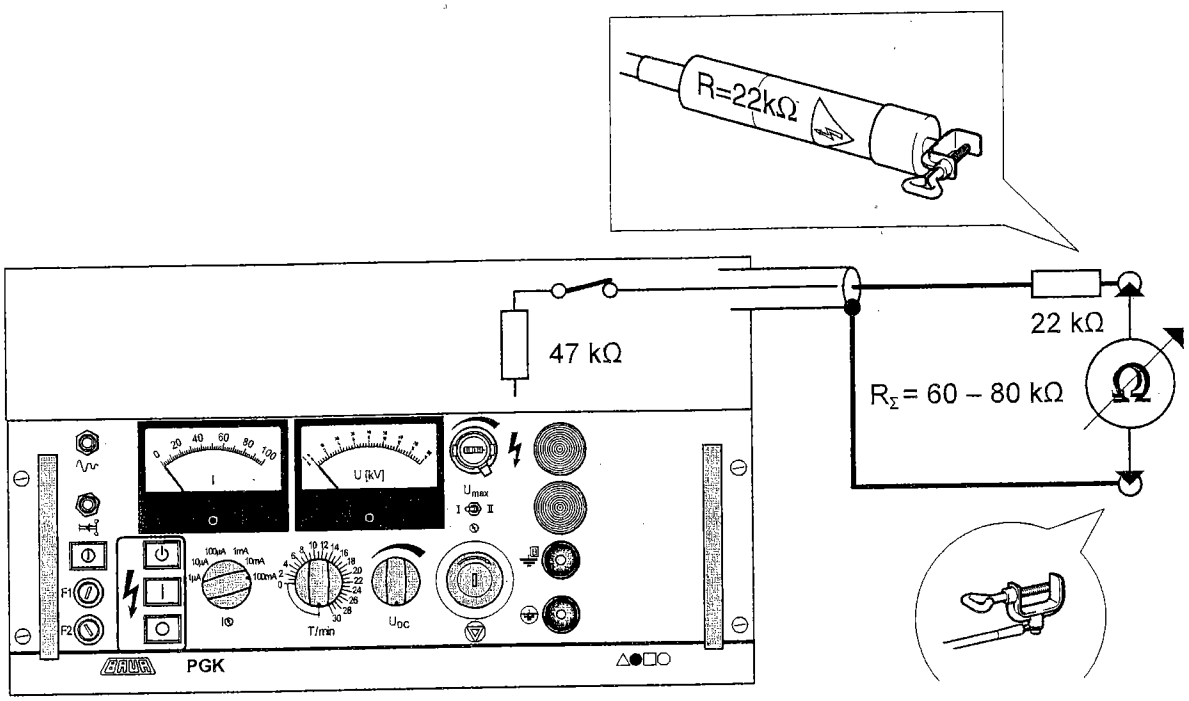


Cut jumper on power PCB

Step	Proceedings
1	Open PGK.
2	Cut jumper X14 on power PCB.
3	Close PGK again.

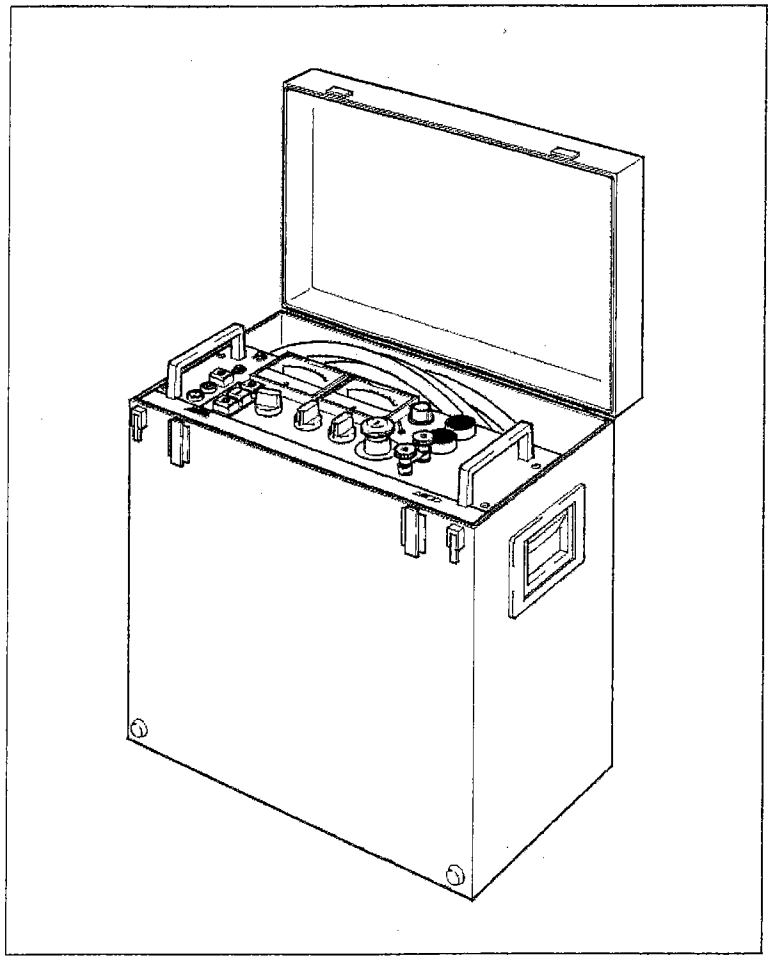
5.3 Check transient protection resistor

Depending on the frequency of usage, check periodically transient protection resistor and discharge device using an Ohmmeter. The total resistance R_Σ must be between 60 and 80 kΩ.



6 Spare Parts and Options

General view of PGK



Ident no.	Description
554-004	Mains cable, SEV 1011-S24507-IEC320/C13
554-005	Mains cable, Schuko
554-009	Mains cable, UL 498/C22.2-42 - CEE(22) V
554-011	Mains cable, BS 1363 - CEE(22) V
563-076	Glass tube fuse ø 6.3 x 32 / 6.3 AT (slow-blow)
563-077	Glass tube fuse ø 6.3 x 32 / 8 AT (110 V / slow-blow)

When ordering spare parts, always specify type of Testing Set (PGK50/80) and serial number according to type plate!