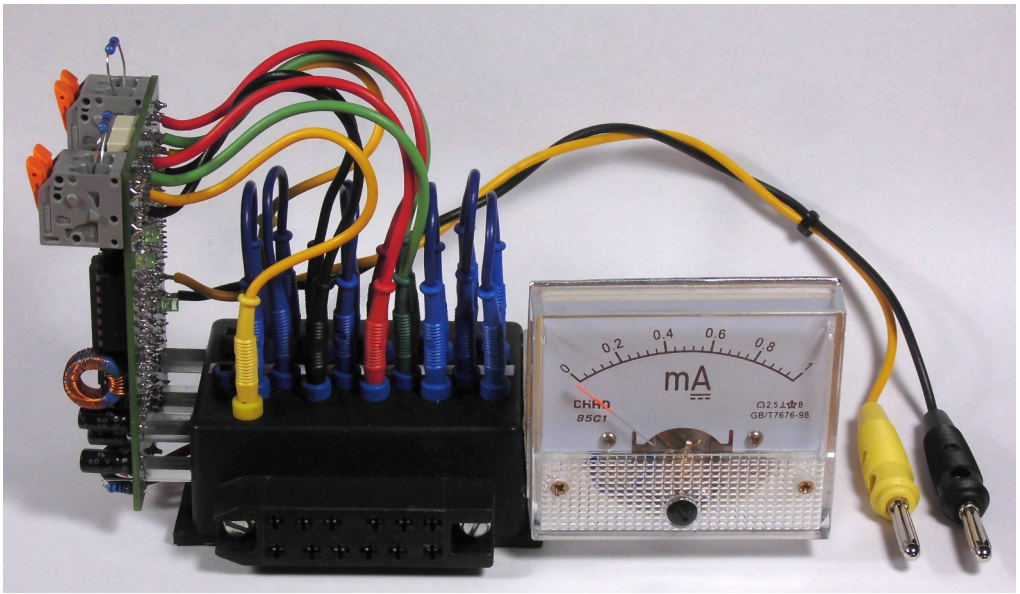
Introduction and working method:

If you want to create a new data set for the RoeTest database, you usually use the static data from the manufacturer's data sheet. If only operating data is specified, you need to think carefully about how this is to be understood.

With a few exceptions, only the operating data is given for mixing tubes. For the oscillator section, the grid leakage resistance and the grid current in the oscillating state are usually given. Sometimes also the cathode resistance or additional footnotes with further information. Comparative values were determined for these tubes in order to "test" them with DC voltages, which provide equivalent results. However, if you want to test mixed tubes with the data from the data sheet, you also need a source for the grid current specified in the data sheet.

The G1G3 oscillator generates an RF AC voltage in the low medium wave range, which in turn is rectified by the grating-cathode path of the device under test, thus generating the grating current specified in the data sheet. The grid leakage current is required twice. The first is required to generate a reference grid current. The second generates the actual grid current in conjunction with the tube to be tested and the RF AC voltage. The control ensures that the actual grid current corresponds to the reference grid current.

The hardware for the G1G3 oscillator consists of two parts. The connector box is the hardware interface between the RoeTest and the G1G3 oscillator, which is plugged between the RoeTest and the socket box. The G1G3 oscillator is connected to the connector box with 4 pairs of wires. There is also a measuring instrument which displays the actual grid current determined. This is only for checking purposes.



Example of connecting a triode heptode:

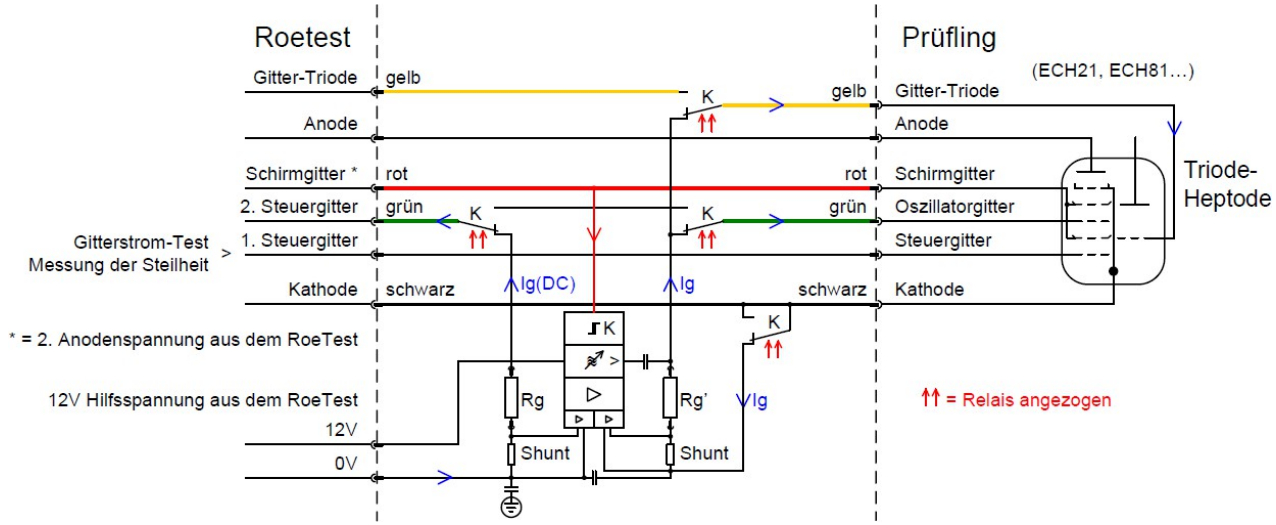
First, the necessary grid resistors "Rg" and "Rg'" must be plugged into the two pairs of terminals. The value can be found in the tube data sheet.

Connect the yellow wire pair to the supply line of the triode grid. This pair of wires is only required for tubes without an internal connection between the triode grid and the 3rd grid of the heptode. If the G1G3 oscillator is activated, the triode grid and the oscillator grid of the heptode are connected to each other. For all other tube types, this pair of wires is plugged into the yellow parking sockets on the connector box.

Connect the red wire pair to the supply line from the screen grid. This connection is necessary to activate the G1G3 oscillator during the measurement. The screen grid voltage source is not significantly loaded.

Connect the green wire pair to the supply line of the oscillator grid. If the G1G3 oscillator is activated, the grid current of the device under test is regulated using the reference grid current as described on the first page.

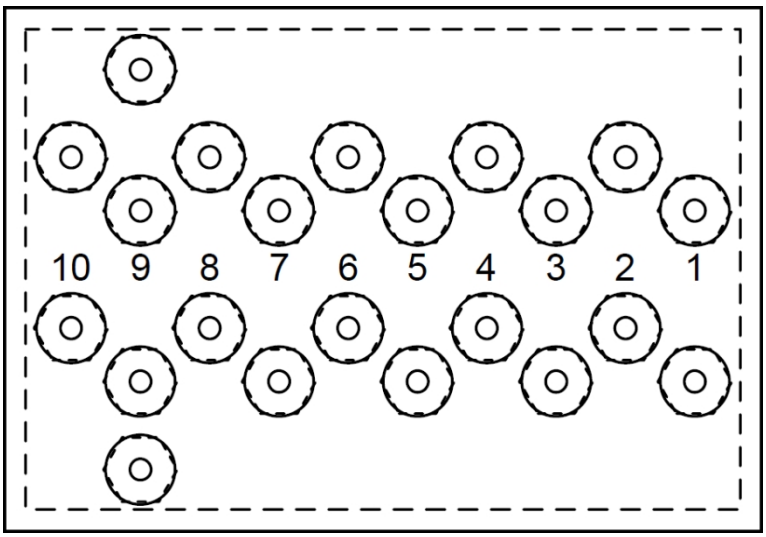
Switch the black wire pair into the supply line to the cathode. For directly heated tubes, as described in the data sheet, either in the -f or in the +f supply line.




Block diagram for the tube type described.

Important:
If the 12V auxiliary voltage is not taken from the RoeTest, the 0V of the external voltage source must always be connected to the 0V of the RoeTest.

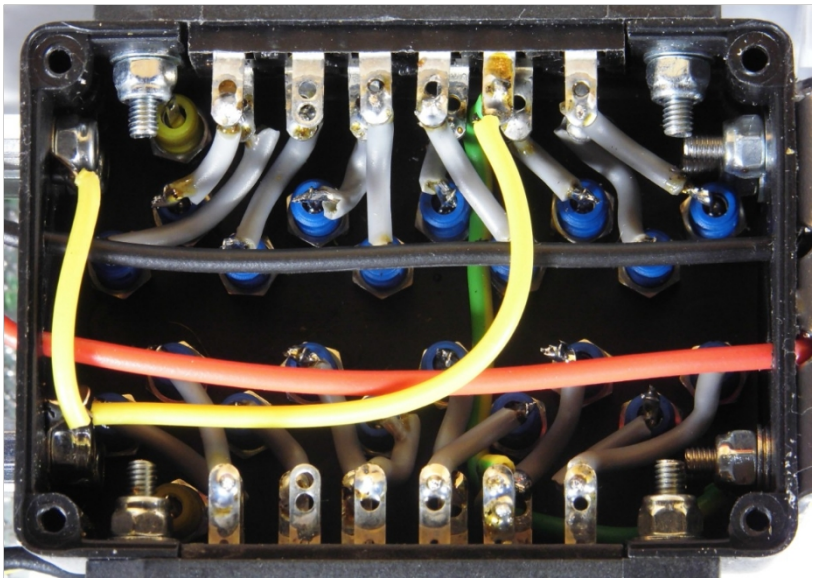
Suggestion for the plug arrangement of the plug box:




Material used (Reichelt):

| | | | |
|---|---|---|---|
| MBI 1 BL | Miniature socket | , 2 mm, | blue20 pieces |
| MBI 1 GE | miniature socket | , 2 mm, | yellow2 pieces |
| GEH KS 35 | Small housing | , 72 x 50 x 35 | mm1 piece |
| MSTF2 BL | Spring-loaded 2mm plug, blue | asrequired | |
| ML | Male connector, 12-pin, DIN 41622, contacts various | 1 piece | |
| FL B12 | female multipoint connector | , 12-pin, DIN 41622, contacts vers. | |
| | 1 piece | | |

Tip for replicating: Print out the drilling pattern to scale, center it on the top of the housing, center punch and drill. Then stick a protective strip of adhesive tape over the narrow area with the numbers, cut out the area and stick it between the sockets.

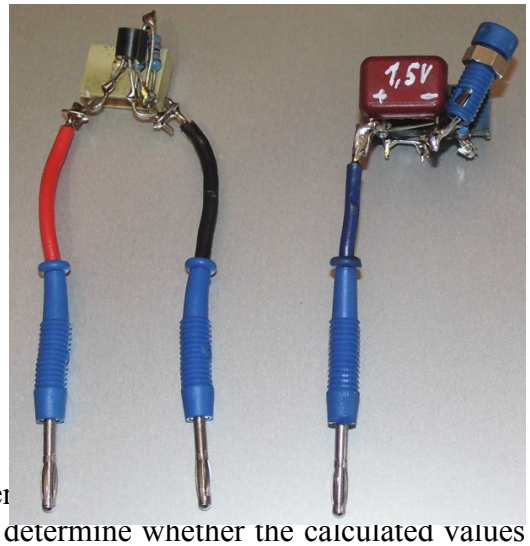


Wiring inside the connector box. The red and black wires are the connection of the measuring device to the circuit board.

Shunt controller:

Some tubes require more than two anode voltages which the RoeTest provides. Shunt regulators such as the AZ431A ($V_{KA}$ max = 36V) with a reference voltage of 2.5V or AZ431L ($V_{KA}$ max = 18V) with a reference voltage of only 1.24V are suitable for generating these. The maximum permissible cathode current is 100mA, which is completely sufficient for measurements on mixing tubes. In principle, these regulators behave like adjustable Z-diodes.

The maximum cathode-anode voltage of the regulator must not be exceeded. If shunt regulators are required for higher voltages, suitable Z diodes must be connected in series.

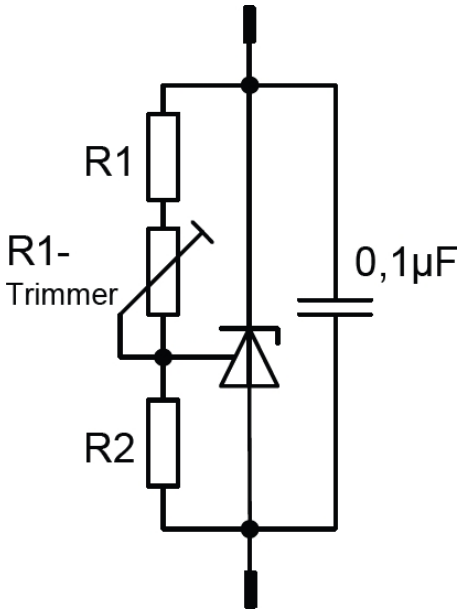



These small circuits can be easily wired freely. Both examples in the photo are required for measurements on octodes such as AK1, AK2 and CK1. The example on the left is used to reduce the oscillator anode voltage from 90V to 70V for the screen grid. The example on the right is used to generate the 1.5V cathode voltage of the same tubes.

A small table is used to calculate the resistors, which deter available potentiometers as a result. The check is used to determine whether the calculated values will fulfill their purpose.

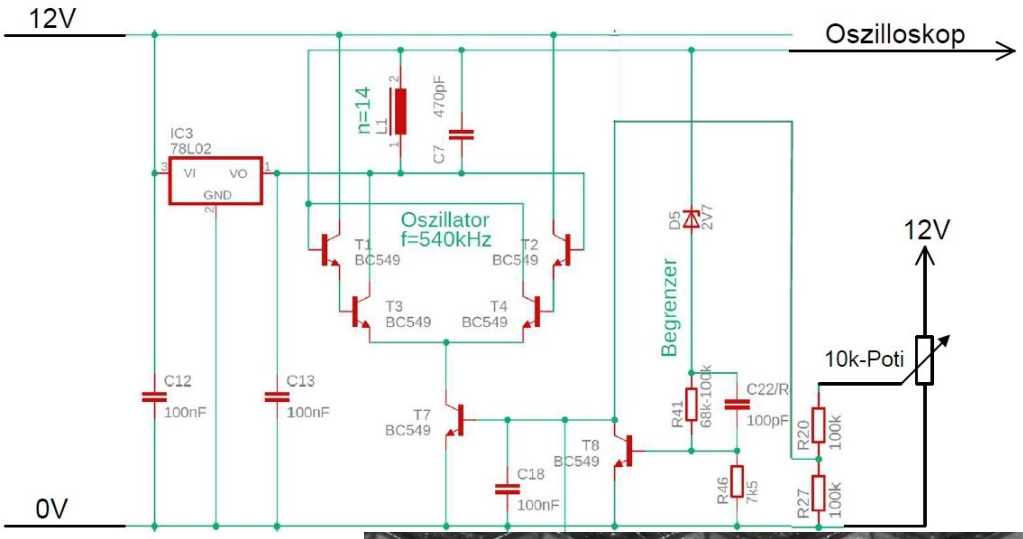
Example with the results for 1.5V:

| | | | | | |
|---|---|---|---|---|---|
| **Wunsch** | **U KA soll** | **1,5** | **V** | | |
| **Wunsch** | **I R2** | **0,12** | **mA** | | |
| **Wunsch** | **Bereich (+/-)** | **10** | **%** | | |
| Datenblatt | Vref | 1,24 | V | | **AZ431L** |
| Datenblatt | Iref | 0,00015 | mA | | |
| | | | | | |
| errechnet | R2 | 10,34626617 | k Ohm | | |
| **Ergebnis:** | **R2** | **10** | **k Ohm** | | |
| errechnet | I R1 neu | 0,12415 | mA | | |
| errechnet | U R1 max | 0,41 | V | | |
| errechnet | U R1 min | 0,11 | V | | |
| errechnet | R1 max | 3,302456706 | k Ohm | | |
| errechnet | R1 min | 0,88602497 | k Ohm | | |
| **Ergebnis:** | **R1** | **0,82** | **k Ohm** | | |
| errechnet | R1 Trimmer | 2,416431736 | k Ohm | | |
| **Ergebnis:** | **R1 Trimmer** | **2** | **k Ohm** | | |
| | | | | | |
| **Kontrolle:** | | | | | |
| errechnet | VKA min | 1,34 | V | -10,5 | % |
| errechnet | VKA max | 1,59 | V | 6,0 | % |

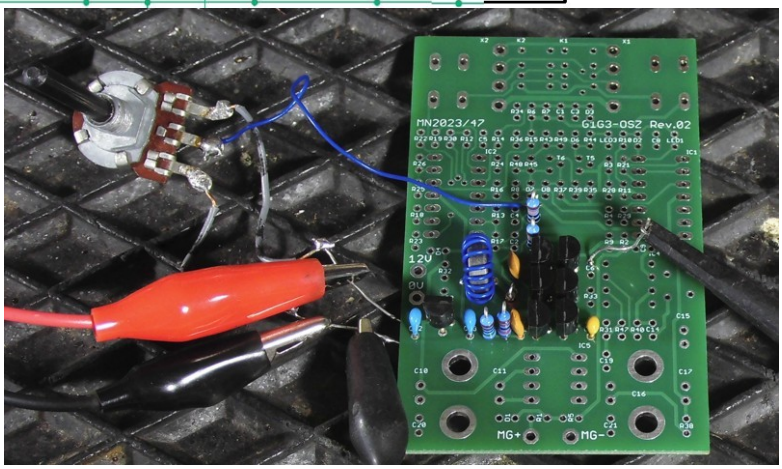


One-time setting of the limiter:

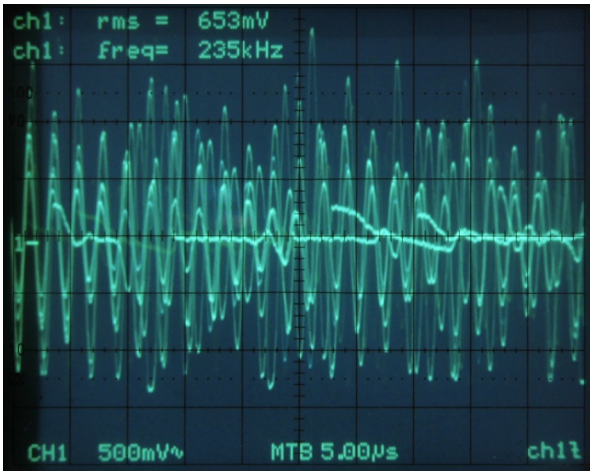
R41 of the oscillator circuit must be determined individually for each replica. Scattering of the transistors makes this necessary. For this purpose, only the oscillator is initially fitted, which is provisionally controlled with an external 10kΩ potentiometer. R41 is fitted with a 100kΩ resistor.

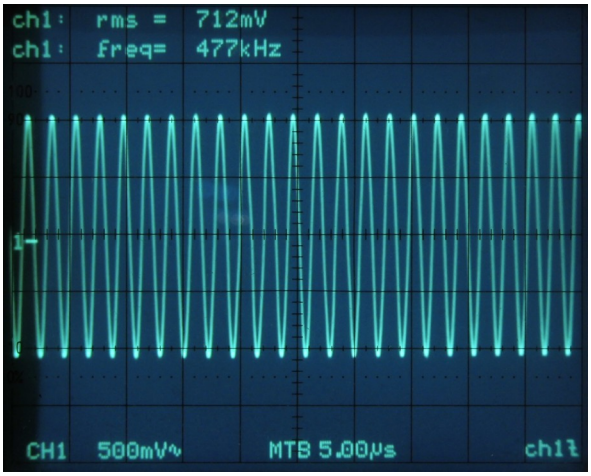



The oscillator output voltage should now be about 700mV rms at maximum control (see the photo at the bottom right of the page). If the oscillator is overdriven (see the photo at the bottom left of this page), the next lower value is set for R41, e.g. 82kΩ, finer gradations are of course also possible.



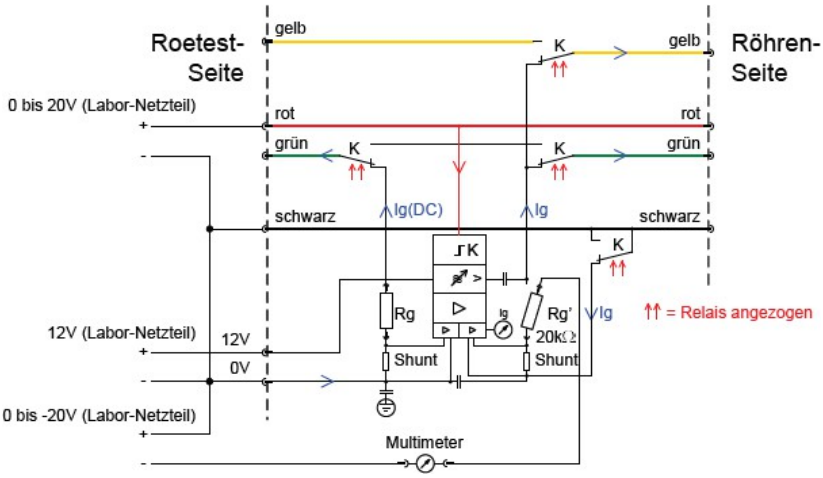

If the oscillator is still overdriven, the value for R41 is reduced further.



One-off adjustment of the measuring device to the actual value amplifier:

R1 is used to adjust the output voltage from the actual value amplifier to the measuring device. If necessary, R5 can also be changed, but only if necessary.



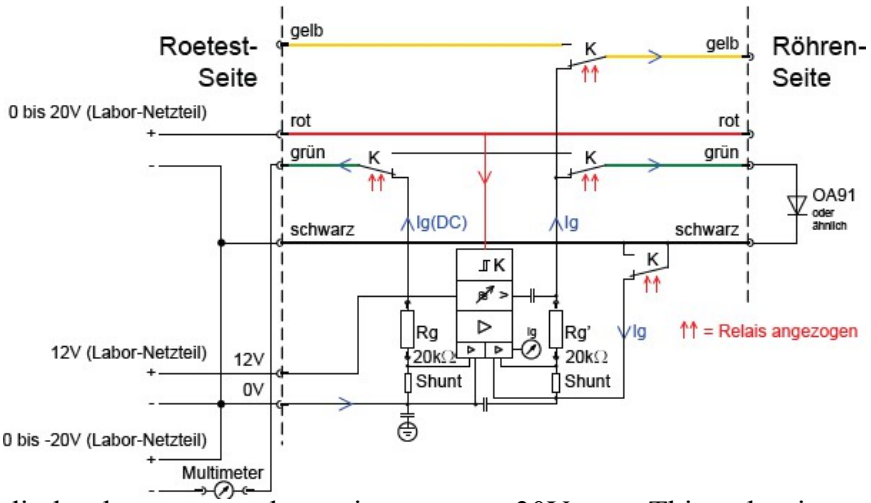

- Activate the relays by applying a voltage to the red connection line (they switch on when the voltage exceeds approx. 16V and switch off again when the voltage falls below approx. 7V) Connect the black connection line to 0V.

- In X1 (slot for "RG'"), as shown in the drawing above, insert a resistor of 20kΩ plug. Connect a multimeter in series with this resistor.

- Now artificially generate a "grid current", i.e. apply a negative voltage to the multimeter. Carefully turn up the laboratory power supply. It can happen that something has been wired incorrectly. Select R1 so that both measuring devices deliver approximately identical results at around 750µA.

Final function check:

Connect the module as shown in the drawing on the right. The diode replaces the grid-cathode path of the tube to be tested. Use a diode with a small capacitance, 1N4148 and BAT41/42 are not suitable for this purpose. The current impressed in Rg must be displayed on the measuring device. The oscilloscope can be used to measure the rectified HF alternating voltage at the anode of the diode.




In open circuit, without the OA91 diode, the output voltage rises to over 30V rms. This value is necessary for measuring DK91 tubes with Rg=100kΩ at 250µA grid current.