

Building instructions Isotest6a

New kit for Isotest6a



Insulation tester to determine the leakage current of capacitors (no electrolytic capacitors) with test voltages of 20-500V.

The description to the isotest of Mr. Gerhard Heigl is on www.radio-ghe.at under "new technology for old radios" <https://www.radio-ghe.at/neuetech/neuetechn.htm> to find. The device has gone through several stages of development. From 1983 version 1 until March 2013 version 6a. Which is here described in detail.

<https://www.radio-ghe.at/neuetech/isotest6.info.htm>

In this instruction document I take the Isotest6a March 2013 as a basis.

https://www.radio-ghe.at/neuetech/isotest_6a.htm

Adjustment and functional description see original documentation by Gerhard Heigl.

There were other versions like 6s and 7 which are not considered here.

Minimal changes due to today's unavailability of components and ease of operation have called for a new print layout. Wima MKP capacitors are no longer available - replacement by Wima MKS-4

- The FET BF245 is no longer available. Replacement type is BF545 in SMD SOT23
- The 10MΩ resistors are divided into 3 individual resistors.
- Discharge button provided for discharge the Device under Test.
- Clamp button for testing resistances above 200MΩ (see description "Radio repair with the Isotest6a" on page of www.radio-ghe.at)
- The circuit drawing updated.
- Print template created. Feb2019 - Change with subprint for ALPS poti
- Drilling template for housing processing created.
- Self-adhesive labels (front side, scale, back with operating instructions)

NEW in 2019: A print change has become necessary due to replacement of the Piher Stereo Potis (delivery bottleneck). The new ALPS pots are smaller and have better sync values.

Complete set of materials including labels and print can be obtained from the author. Scale and socket side labels are made from paper. On the other hand, the front and back labels are made of washable laminated plastic. The edges are pre-cut with a cutting plotter. With this material cars are wrapped to represent advertising space. Wear and dirt is not present here.


Original device 2013 (left) and the new version from 2018 (right) with two additional buttons

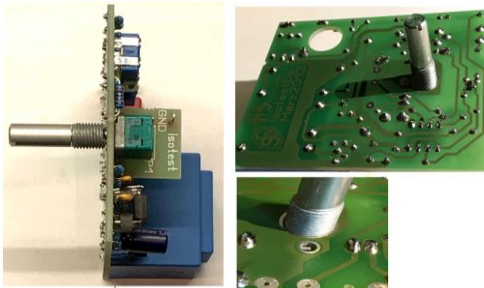


2

Buidling the board

Fit the PCB as indicated. The BF545 usually has current gain type "A" so R1 has the value of 2K2. This is marked on the board according to the type of solderes FET.

1. Solder two wire bridges of the GND area.
2. Solder resistors. Bending the resistance wires with a bending gauge is beneficial.
3. Diodes and IC socket
4. Ceramic capacitors
5. 3 pcs. 10K trimmer
6. 8 pcs. Solder lugs (all in north / south direction, except MP, I + and I- in east / west direction)
7. Bendig Soder lugs  is an advantage for soldering.
8. Transformer (without the Wima 0.1 / 1000V can it be better maneuvered in the holes.) Do the 2 pcs Wima capacitors, BC546 and Elko.
9. Install Alps Poti on the subprint. Shorten the axle as needed. (see page 11) **Do not solder in the subprint, until the axis length has been shortened!**
10. **Important: Shorten all excess lengths of the wires at the solder joints. Wima capacitors, trimmers, transformers etc.**

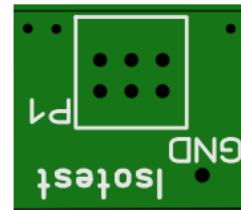
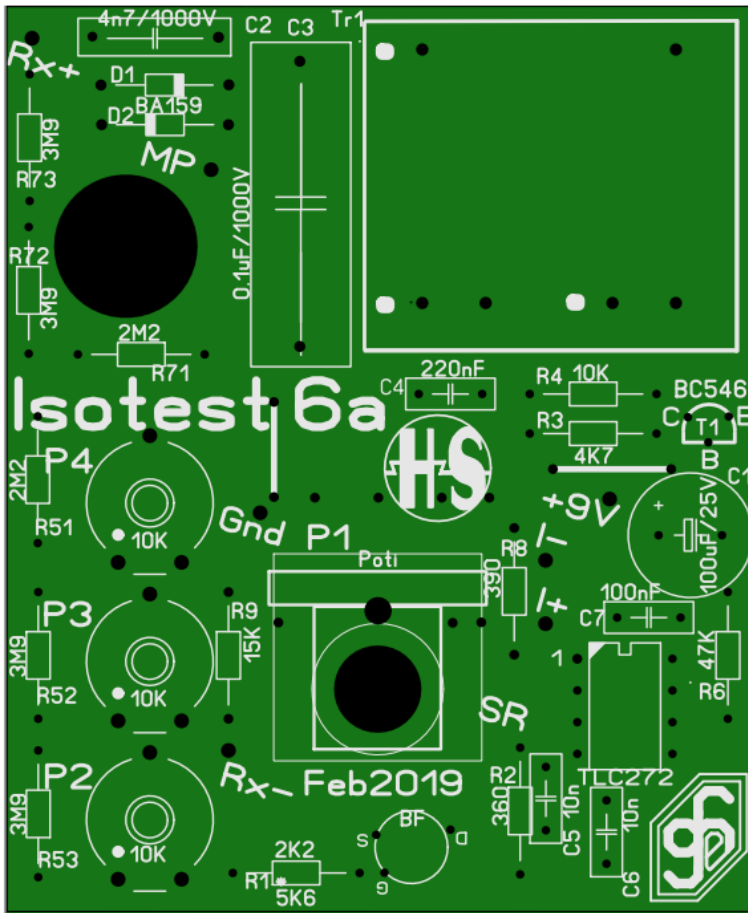


On this picture the poti axis is still uncut.

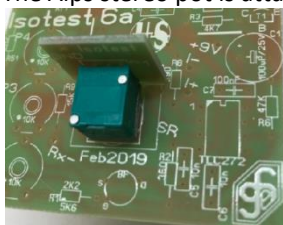
PCB

The single sided board is manufactured with solder-stop-lacquer and component imprint.

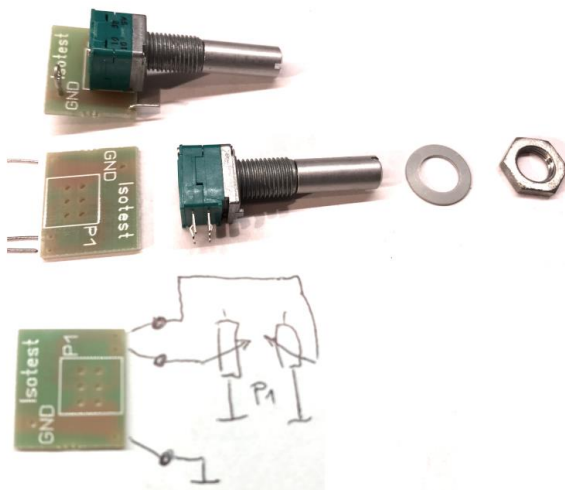
Subprint (poti) 3



The Alps stereo pot is attached to the main print by means of a subprint.



This eliminates the wiring work on the terminals. In addition, a GND pin is attached here, this facilitates the adjustment process.



Since the pot is mainly made of metal, a knob with nut cover is used as the touch protection.

Circuit schema



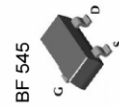
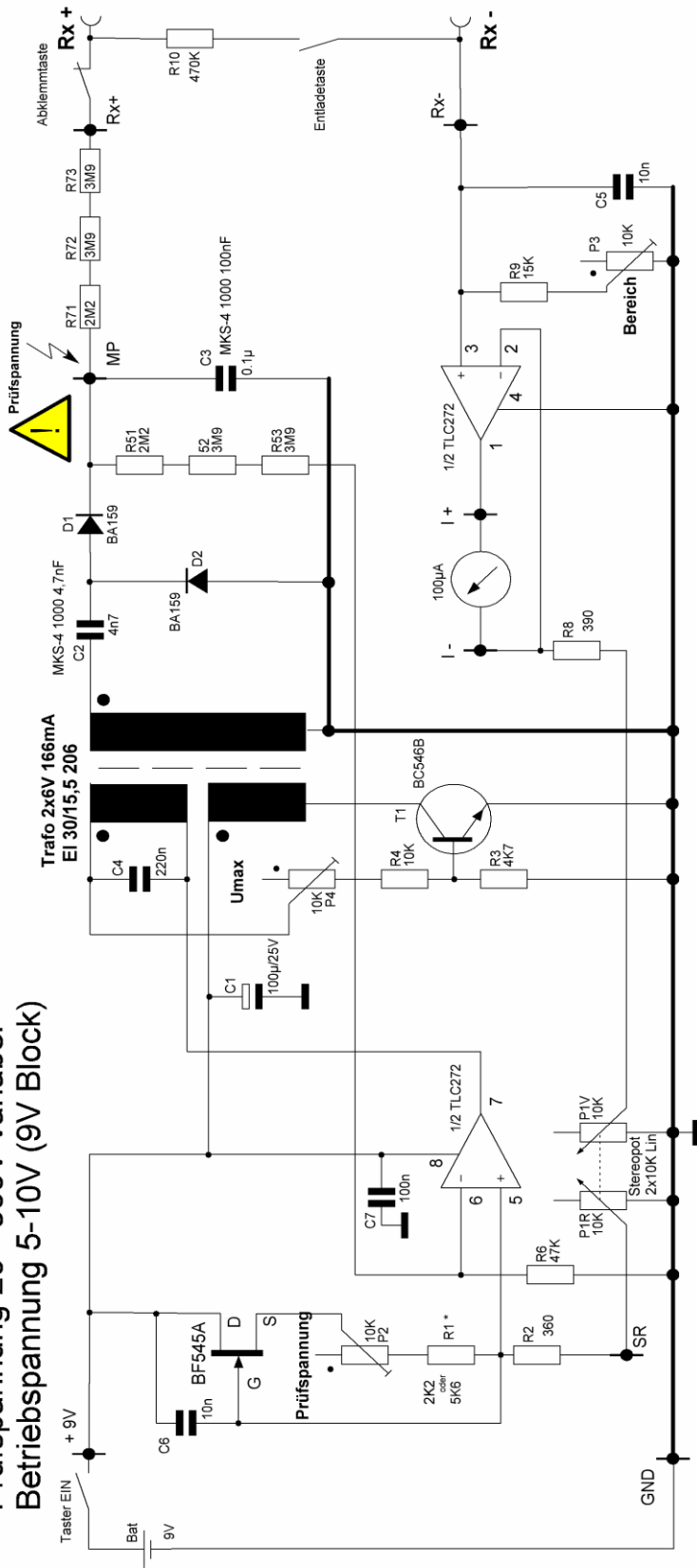
Isotest 6a März 2013

erstellt von Gerhard Heigl

Isolationsmessgerät bis 200Megaohm

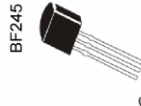
Prüfspannung 20 - 500V variabel

Betriebsspannung 5-10V (9V Block)



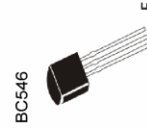
BF 545

Der SMD SOT23 Typ BF545 wird auf der Lötseite an den SMDpads angelötet. Ein Code am Bauteil bezeichnen, die Stromverstärkung. 20* für A 21* für B 22* für C "" steht für das Fertigungsland (p.t. oder w) siehe Datenblätter



BF245

BF *45 A R1 = 2K2
BF *45 B R1 = 5K6
Je nach Stromverst.
Typ A oder B ändern



BC546

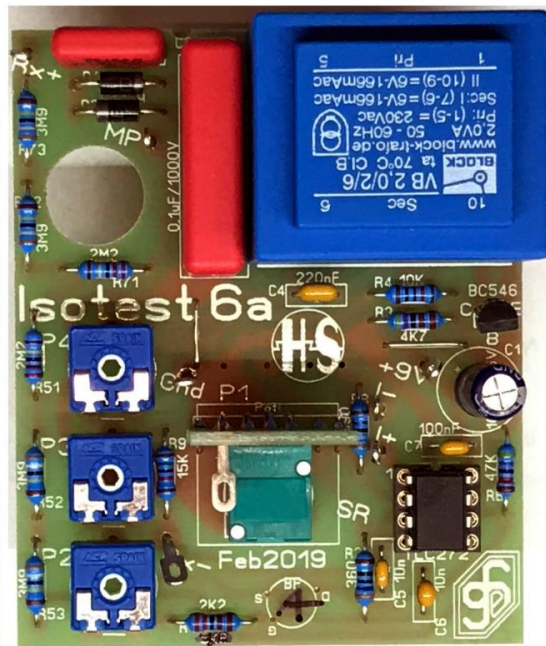


Isotest6a Feb2019
Schaltplan gez. am
28 Feb. 2019
H Stummer

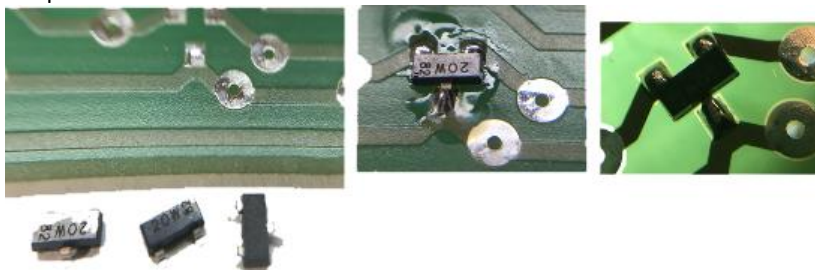
Clamp button and discharge button added. Okt.2018 Heinrich Stummer

Interior View of an open Isotest

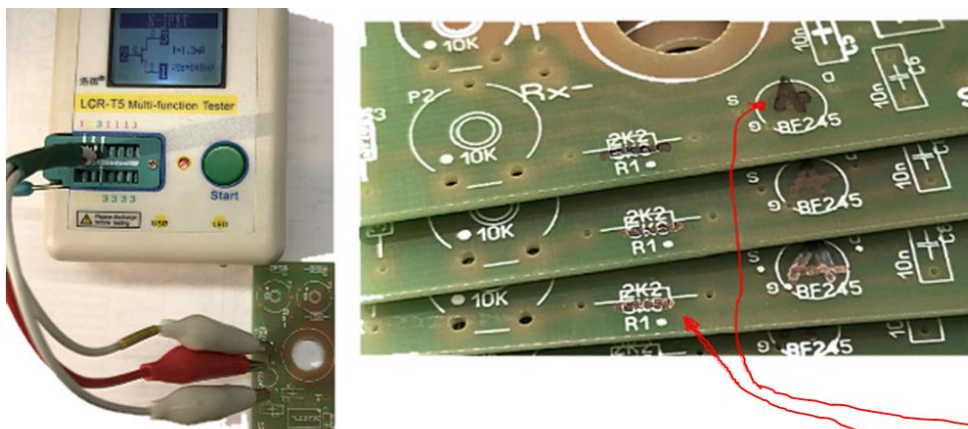
fully equipped board



SMD BF545 The SMD BF545 is already soldered on the board..
See parts list.



A test of the solderes BF545 is possible with a suitable semiconductor tester.



Here, the current gain type of the BF545 is noted on the PCB. Therefore the Value for R1 is 2K2 and marked on the PCB. (If a „B“ Type is used the value for R1 is 5K6)

Parts list

Isotest 6a Feb 2019			Preis per FEB 2020	
Anz:	Bauteil	Bestellnummer	Einzelpr.	Gesamtpr.
1	Trafo 2x6V BLOCK VB 2.0/2/6	EI 30/15,5 206	3,23	3,23
1	Drehspulinstr 100µA	PM 2-100µA	10,03	10,03
1	Halbschale SD10	SD 10 SW HALB	0,63	0,63
1	Halbschale SD20	SD 20 SW HALB	0,81	0,81
1	Bananenbuchse rot	BB 4 RT	0,39	0,39
1	Bananenbuchse schwarz	BB 4 SW	0,39	0,39
1	IC Sockel 8pol	GS 8P	0,20	0,20
8	Lötösen	RLP 100	0,01	0,11
1	Stereopoti 10k lin	ALPS 10K Lin stereo	3,00	3,00
3	Trimpoti 9mm 10K lin	ACP 9-L 10K	0,22	0,66
1	Battanschl. 9V	CLIP 9V-T	0,32	0,32
1	TLC272	TLC 272 ACP	1,95	1,95
2	BA159	BA 159	0,03	0,06
1	BC546B	BC 546B	0,04	0,04
1	BF545A	BF 545A SMD	0,40	0,40
2	Drucktaster blau SCHL.	T 250A BL od. Pollin 420030	0,50	1,00
1	Elko 100µF/25V RM 2,5 6.5x11mm	150 EHR 92018	0,04	0,04
1	100nF 1000V RM 22,5	MKS4-1000 100N	0,46	0,46
1	4n7 1000V RM10	MKS4-1000 4,7N	0,22	0,22
1	220nF RM5	Z5U-5 220N	0,11	0,11
1	100nF RM5	Z5U-5 100N	0,07	0,07
2	10nF RM5	Z5U-5 10N	0,03	0,06
2	Wid 2M2 0,6W	METALL 2,20M	0,03	0,05
4	Wid 3M9 0,6W	METALL 3,90M	0,03	0,10
1	Wid 2K2 0,6W	METALL 2,20K	0,03	0,03
1	Wid 4K7 0,6W	METALL 4,70K	0,03	0,03
1	Wid 470K	METALL 470K	0,03	0,03
1	Wid 10K 0,6W	METALL 10,0K	0,03	0,03
1	Wid 15K 0,6W	METALL 15,0K	0,03	0,03
1	Wid 47K 0,6W	METALL 47,0K	0,03	0,03
1	Wid 390 0,6W	METALL 390	0,03	0,03
1	Wid 360 0,6W	METALL 360	0,03	0,03
1	Print mit SMD BF545A bestückt	Sonderanf.	11,00	11,00
1	Skala + alle Aufkleber	Sonderanf.	1,00	1,00
1	Drehknopf 6mm	KNOPF 14-6 SW	1,35	1,35
1	Mutterabdeckung	MD14 SW	0,36	0,36
1	Abdeckkappe dazu blau knopf	DECKEL 14M BL	0,25	0,25
1	Drucktaster ÖFFNER GELB PBS-10-C	Pollin 420009	0,50	0,50
				0,00
SUMME				39,00

All parts according to parts list can be obtained complete from the author for this price.

7

Total cost of material excl. Postage and packaging = € 39.-

Postage and packaging

Porto (Germany) 10,60 + packaging 0,40 = 11,-

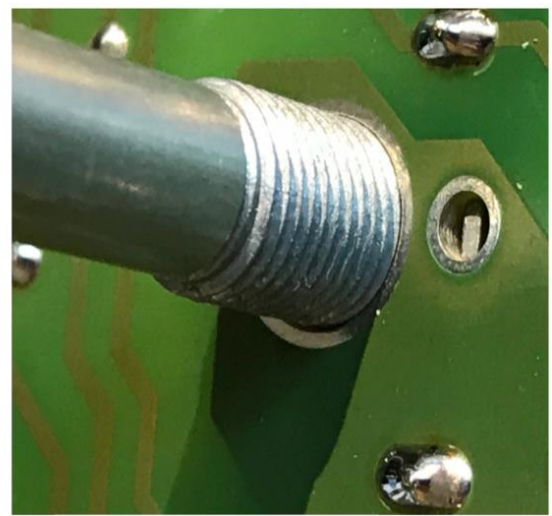
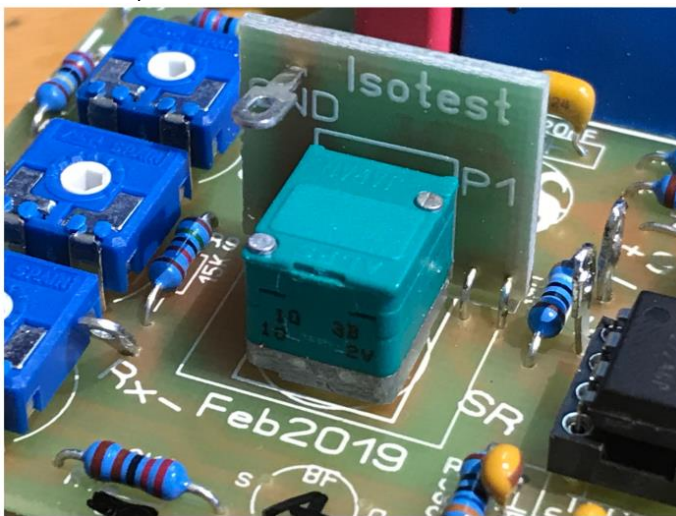
Porto (other EU) 13,60 + packaging 0,40 = 14,-

Porto (Austria) 4,60 + packaging 0,40 = 5,-

Other countries postage fees on request.

Due of mechanical reasons, a potentiometer with sufficient flange length must be used.

Since the Piher 10K Lin stereo pot of the OKT2018 version was not always available, I was looking for another poti. The ALPS 10K Stereo Poti is smaller and also has improved tracking - better accuracy. The installation is considerably simplified by the subprint. The fastening nut is also attached to the outside of the housing. This nut fixes the print in the case.



The poti lays fed up with the print, the nose snaps into the hole to prevent twisting. Then solder the wire pieces. The subprint intentionally is not located on the main print to avoid mechanical stress on the poti connections.

CAUTION: The bore diameter of the flange is now **7 mm**.

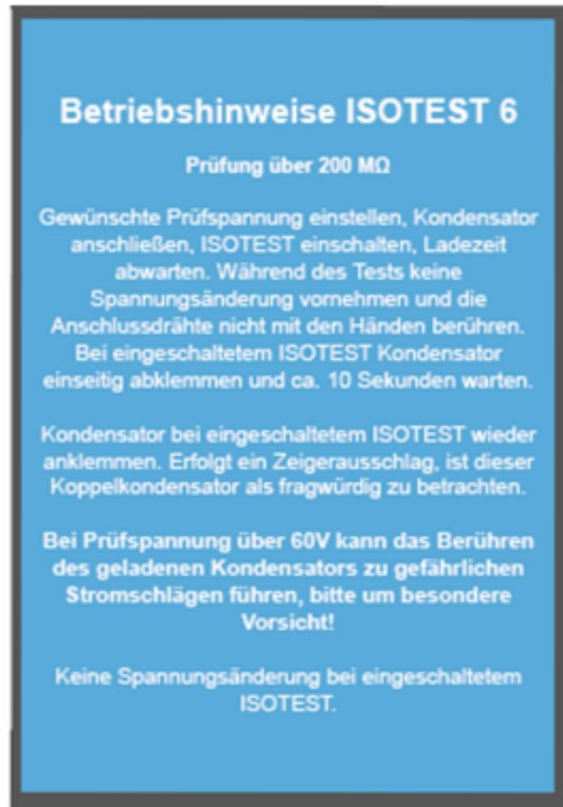
Perhaps. 2 short test leads made from Banana plugs with crocodile clips are helpful. (Not part of this kit)



Thus the **Isotest** is always ready for use.

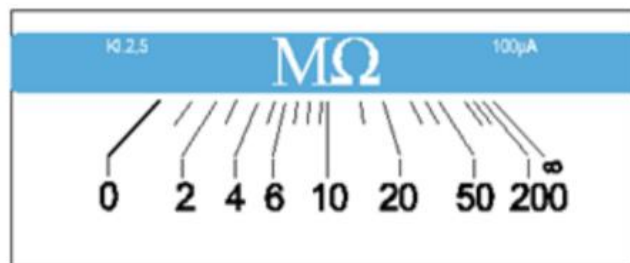
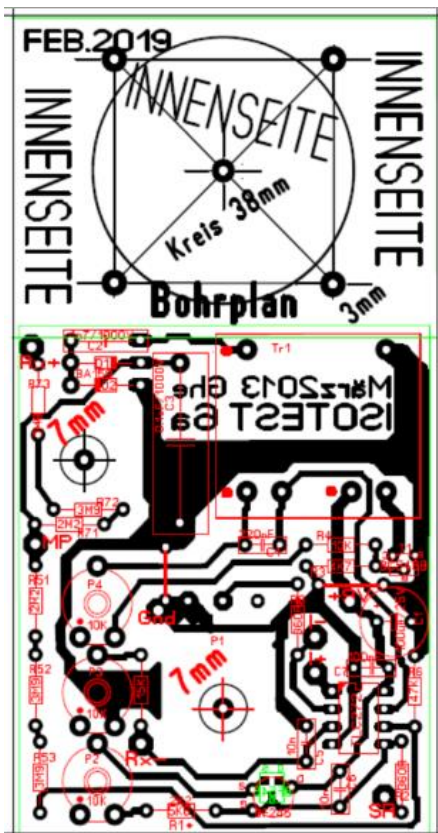
Labels etc.

Front and back are made of a washable, laminated plastic label with air duct back. The outlines are pre-cut by a cutting plotter. The two holes (potentiometer and button) are punched out.



Drilling template (innerside of case)

Scale and socket side Adhesive label Paper



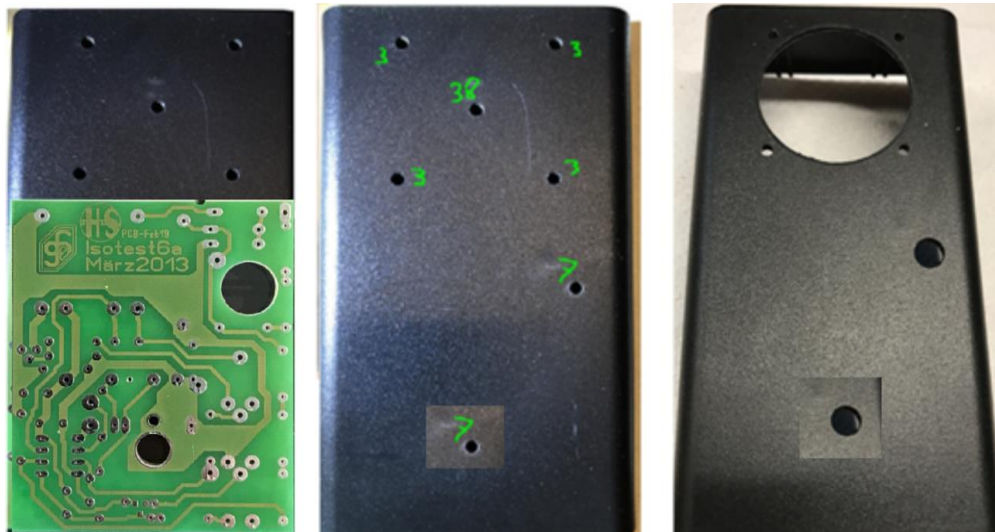
This illustrations are not true to scale and original drawn by vector graphics!

Case

First, break out all the bars inside the housing shell with pliers.
 Mark the holes in the SD20 housing half from the **inside** using the drilling template.
 Insert the template upwards (towards the instrument)



There are 7 holes, which are drilled with 3mm from the **inside** to the outside. The front side lies just on the surface and the drill does not run sideways, since the plastic is soft. Then drill to the desired diameter.
 Check for coverage. Drill to 7mm for button, 7mm for potentiometer and 38mm for the rotary instrument.



Socket side with additional buttons



Cut out the label on the black line and stick it to the upper front side. Pre-drill holes with 3mm and then expand to 6mm and 7mm. Smooth the holes with a round file.



Remove the bars here so that the buttons can sit exactly in the housing.

Apply front label. Insert the shaft of a 7 mm drill into the potentiometer hole. Before that, the housing surface should be degreased (isopropyl alcohol). Pay attention to cleanliness. In the case of the label, both holes are punched out. Pull the label over the 7 mm drill shaft, the edge should be parallel with the lower edge of the housing. Rub label firmly.



The hole for the button does not have to fit exactly.

Important: Label Parallel to the bottom edge and exactly to the 7 mm hole (Poti). At the 7mm hole (button) remove any protruding foil with file or grater. This will later be covered by the mounting nut of the Button. Remove the supernatant foil with a blunt knife or scissors.



Thus, the case is now ready for installation.

Poti axis and knob with nut cover

Before installing the potentiometer, the potentiometer axis should be shortened.

Assemble the printed print (due to the height of the solder joints) loosely with the potentiometer and insert it



into the housing by trial. Fasten print with washer and nut.

Determine the required length of the axle using a vernier caliper.

Remove print again and separate Poti from the print. Clamp the poti axis in a vice and the



Cut axle with a metall saw..

Reinstall the poti for checking (including print).



Mount knob incl. Nut cover as touch protection.



Check free space under the button with another label for instance. The knob must not rub on the front panel. With adjustment paper discs from the bureau puncher, the distance can be adjusted. Place paper discs on top of the axle as required.



It is best to glue the nut cover to the button.

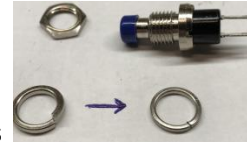
Thus, the potentiometer is now ready for installation and can be soldered now.

Mounting

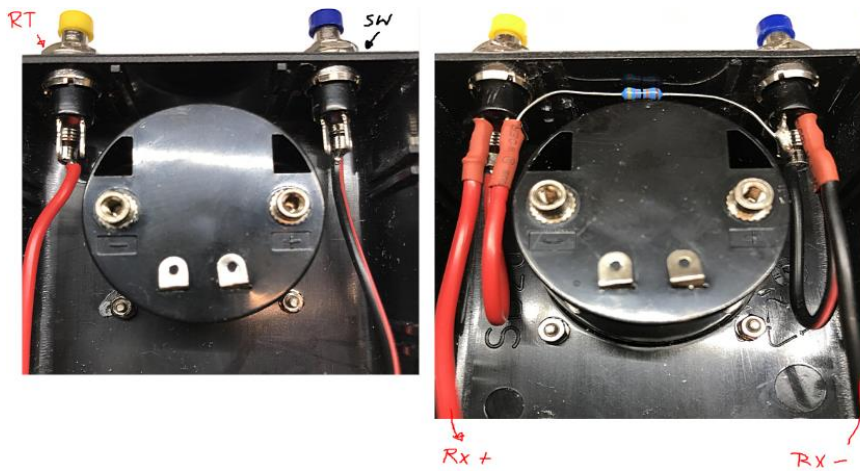
Before mounting, a suitable stranded wire must be soldered to the socket. Remove the colored plastic ring so that the soldering heat does not deform it. The mounting order sockets of instrument can also be reversed, how to do better.



- Install bush with plastic ring in housing. Hold the nut tight, tighten the plastic ring.
- Install instrument inverted (mech zero point right at ∞). (4mm socket wrench helpful)



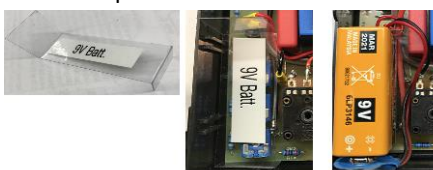
- Install button. **IMPORTANT:** Release tension of the spring washers otherwise the adhesive labels will be damaged when tightened.
- Wiring



- „Socket RED“ to right pin „Button Yellow“ (opener) from there Resistor R10 470K to the left pin „Button BLUE“
- Left pin „Button Yellow“ (opener) to solder lug **RX+** on PCB . Stranded wire.
- „Socket BLACK“ to right pin of „Button BLUE and to Solder Lug **RX-** on PCB. Stranded wire.
- Install Button ON (blue).



- Install PCB. Tighten nut with washer carefully from the outside. The Poti axis should have already been shortened before.
- Solder straded wires to **RX+** und **RX-**
- Solder Instrument wires + und - an **I+** und **I-**
- 9V Battery Clip black to GND . Red left Pin „Button ON“.
- Right Pin „Button ON“ to solder lug **9V+** PCB.
- Secure both strands on the pushbutton with shrink tubing against breaking off.
- Make an 18mm x 75mm plastic insulating strip. Carrier foils of the front-back labels are suitable. Make two pleats as "Z" at 1cm and 5cm as in the picture, the rest of 1.5cm will stay on top .



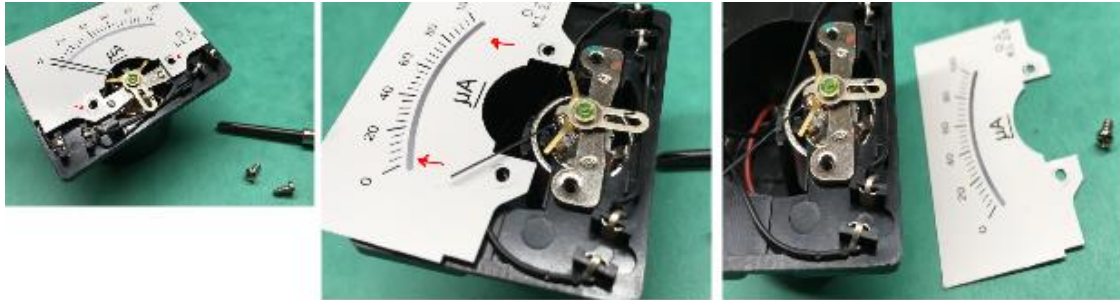
Avoid shorting the trimmers through the battery case

Instrument

Cut out the scale on the black edge. Lift the plastic lid off the Instrument.



detach two screws, pull off the sheet scale in the direction of the arrow under the pointer



Align the scale on the right edge and the horizontal line (marked in red here) and stick on.



Cut paper supernatants left and bottom. Reassemble sheet scale.



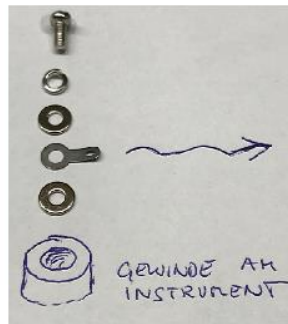
Put on cover.

Adjust mechanical zero point to ∞



Connection to instrument

Mounting in housing



For Isotest6a use only the scale shown (range: 0-200M Ω - ∞). Other scales of Isotest variants other than Isotest6a are not suitable and lead to incorrect results.

Adjustment

According to text from Mr. Gerhard Heigl https://www.radio-ghe.at/neuetechnik/isotest_6a.htm
Power supply with current limiting approx. 50mA and 7V voltage directly to the + 9V and GND

1)

- Bridge the resistor R6 (47K) with a wire jumper. Lower wire from R6 to GND Pin on SubPrint
Otherwise **P4** will not react as desired. The adjustment range covers about 100V. So from 460V -



560V (at 7V supply voltage)

- Connect digital multimeter (10Mohm internal resistance) to **MP** ⚠ and to GND.
- Adjust to approx. 520V with **P4** . (The circuit draws approximately 37mA)

2)

- Remove the wire jumper from R6 (47K)
- Connect digital multimeter (10Mohm internal resistance) to **MP** ⚠ and to GND.
- Set the potentiometer P1 to the maximum value (500V).
- Set **P2** to approx. 500V with P2.

3)

- With a new battery (about 9.5V) make this adjustment. (Therefore the battery test sees a weaker battery)
- Set the mechanical zero point on the instrument to ∞ .
- Short Sockets RX+ and RX-
- Adjust the needle to zero with **P3** .
- The battery test (500V and RX short-circuited) will no longer reach Zero for a weaker battery. The condition of the battery can thus be judged.

Note: Adjustment of point 1 + 2 can be performed with the PCB not installed and without the instrument.
For **Adj.3** , the board must be installed, Instrument required.

Test

Connect a digital multimeter (10Mohm internal resistance) to RX Sockets. Individually test the positions 500, 400, 300, 200, 100 and 20 volts. (Turn potentiometer only when the device is off) A resistance of about 10M Ω should be displayed. The voltmeter therefore reads half the set voltage. Deviations of 10% are OK. Experience has shown that the range below 50V is somewhat inaccurate. Depends also on the synchronization of the potentiometer. This is OK.



Use in operation

Here, an old 20nF/125V capacitor is tested. The leakage is very bad.



The capacitor is defective although a component tester still indicates 50nF, but that's well known.

This guide has been verified by building multiple devices. (with BF545A and BF545B)



Tools

Socket Wrench 4mm, fork key 9, 10 und 11mm. Plier, file.

Drills 3,6,7 mm.

Stepdrill 6-30mm if avail.

Punch 38mm if avail.

A bending gauge for Resistors is helpful.



On special request. If someone does not have the appropriate mechanical equipment. I can deliver the housing finished . All holes, cutout, etched labels attached. Please ask.

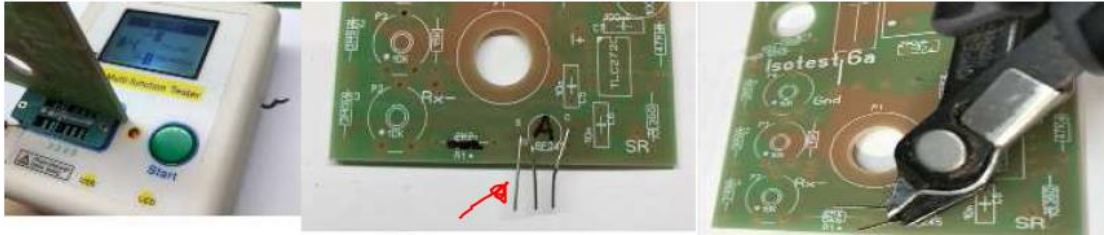


Condition ist finished, like this one.



Misc.

16

All delivered FETs on the boards are tested with a semiconductor tester before delivery. Therefore, wires are soldered to S, G, D.



Before fitting, these wires should be cut over the print surface. **Attention:** do not unsolder -> **cut off.** (less stress for board and FET)

- The print is fastened to the flange by the potentiometer in the housing. A nut + washer from the outside. There is no nut inside directly on the print.
- The four fixing screws of the rotary coil instrument are not always glued vertically by the manufacturer. In no case try to bend here! When bending, the screws will turn after tightening, and the nut can not be attached. Here is the 3mm hole to expand. (File or 3.5 - 4mm drill)
- Since the measuring point **MP**  is no longer required during operation, insulate it with a short piece of shrink tubing after adjustment.
- The manual is intended for experienced technicians.
- Voltages > 500 V  inside the device must be observed. Operation only with closed housing.
- Capacitors should always be discharged before and after the test.

In case something is unclear, something in this document was not sufficiently presented, I am happy for questions and suggestions available, please send a short mail, I try to answer this promptly..

Copyright

Reproduction or use of the texts, images, electronic circuits and designs in other electronic or printed form is not permitted without the express written consent of the authors. A commercial use of the here presented electronic circuits, texts, pictures, templates and designs is not permitted..

All rights to Isotest6 are exclusive to Mr. Gerhard Heigl, A-3130, Herzogenburg, Österreich <https://www.radio-ghe.at/>

Links

The most recent documents about this and other projects can be seen here on my website.

<https://saintummers.at>

<https://saintummers.at/bau/isotest.html> PDF download avail.

Archived documentation of the Oct.2018 version (The "okt2019 kit" is no longer available)

<https://saintummers.eu/bau/files/isotest/isotest6a-okt2018-dokuv9.pdf>

Contact:

Orders please send requests via e-mail. **Kits are available.**

