

Foreword

Dear Nixie friend,

Thank you for purchasing this state-of-the-art Nixie thermometer DIY kit. You have purchased a product that captivates as a DIY version a component quality and choice of materials that is outstanding in the market and will certainly draw the attention of their acquaintances in the future.

However, this also means that you should not "cobble together" this kit in record time. Take a quiet evening and about one hour time to build.

Also, you should already have the necessary equipment and knowledge to be able to build such a high-quality DIY kit without complications. The resulting success will definitely reward you for your effort and stamina.

The instructions assume electronic fundamentals, i.e. you already know that ICs, LEDs and transistors are poled components and may not be soldered in reverse polarity. These parts are also very sensitive for electrostatic discharge. Furthermore, the usage of a temperature-controlled soldering station with max. 1 mm wide tip and correspondingly fine electronic solder as well as appropriate tools (multimeter, TX10, PH1/2 and mini slotted screwdriver, side cutter, tweezers, magnifying glass, etc.) are advised.

Please follow the steps and tips and hints in this manual. These are all tried out and tested and allow you a trouble-free setup.

Important Safety Instructions

During installation, commissioning and measurements and repair special care is required! Assembling of the circuit is at your own risk. The functionality can not be guaranteed, nor the suitability for certain purposes. The user himself has to check this and is responsible for this suitability.

No liability can be accepted for damages arising during or as a result of the assembly or operation, in particular for damages resulting from a lack of electronic skills.

The thermometer may only be operated in a touch-proof housing in dry indoor environment. Operation without or with defective tubes is not permitted!

The person who has completed a kit or has made an assembly ready by extension or enclosure installation, is according to VDE 0869 a manufacturer and therefore provided to supply all documents when selling the device and also give his name and address.

Devices which are assembled from kits themselves are to be considered as an industrial product in terms of safety.

And now, after these necessary introductory words - fire up your soldering station ...

First functional test

You have received the PCB already pre-assembled in such a stage that a first functional test and an adjustment of the voltages can be performed first.

In addition to the pre-assembled board, you will need a 5 V USB supply, a digital multimeter and a miniature slotted screwdriver.

Connect the circuitry to the USB supply.

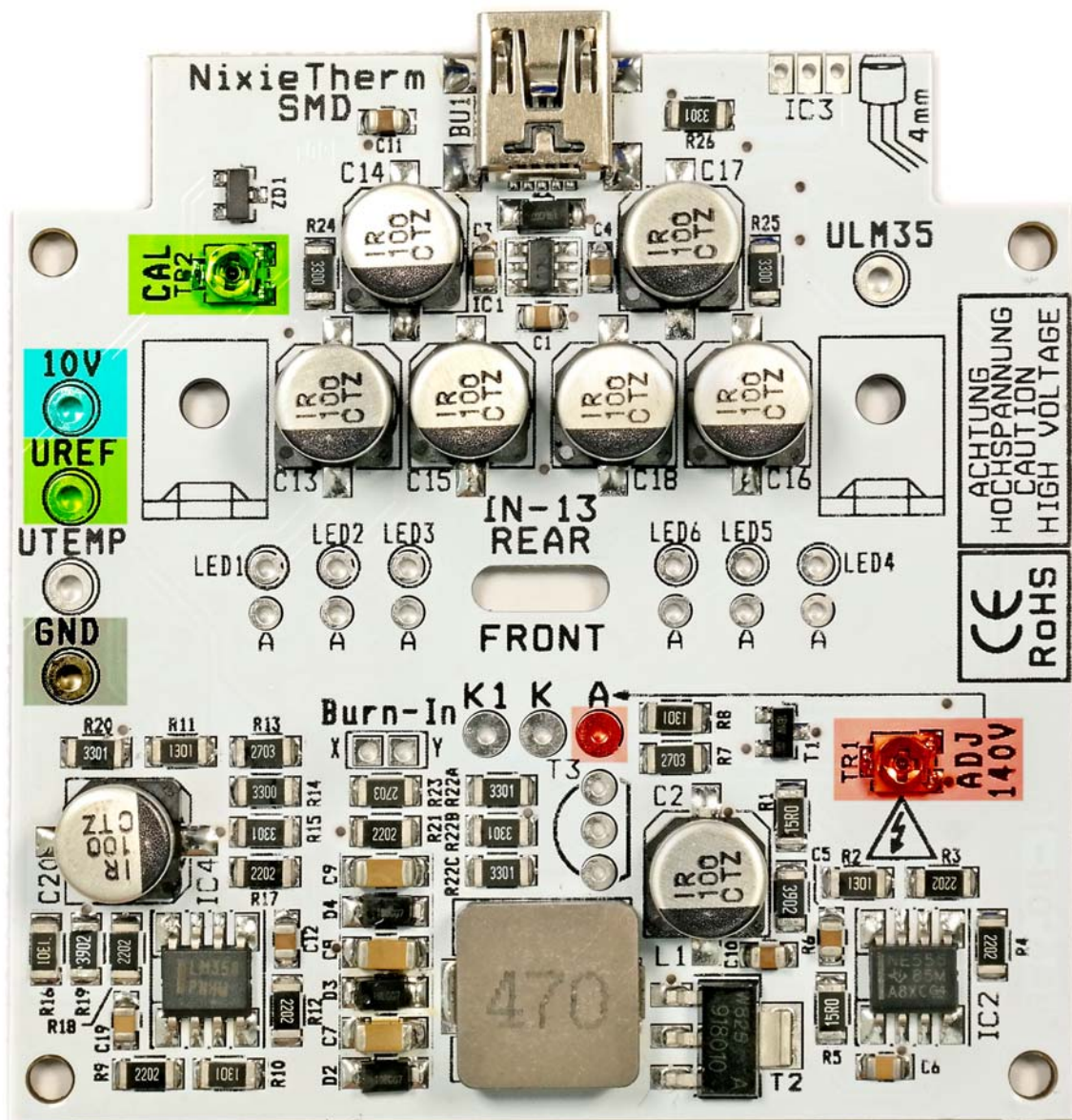
Attention: On the board now around 140 V voltage are present!

Switch the digital multimeter to the voltage range and measure as follows:

- Black probe on **GND**, red probe on **10V**: Voltage reading 10V +/- 0.6V
- Black probe on **GND**, red probe on **UREF**: Voltage reading roughly 4V.
Adjust the value to 4V with the **CAL** trimmer potentiometer.
- Black probe on **GND**, red probe on **A**: Voltage reading roughly 140V.
Adjust the value to 140V with the **ADJ** trimmer potentiometer.

As the printed circuit boards were machine assembled, swapped or missing components are normally impossible.

Do not continue with your work when you can't read or adjust the given voltages, but look for the fault (possibly can be a cold solder pad on a SMD part)!



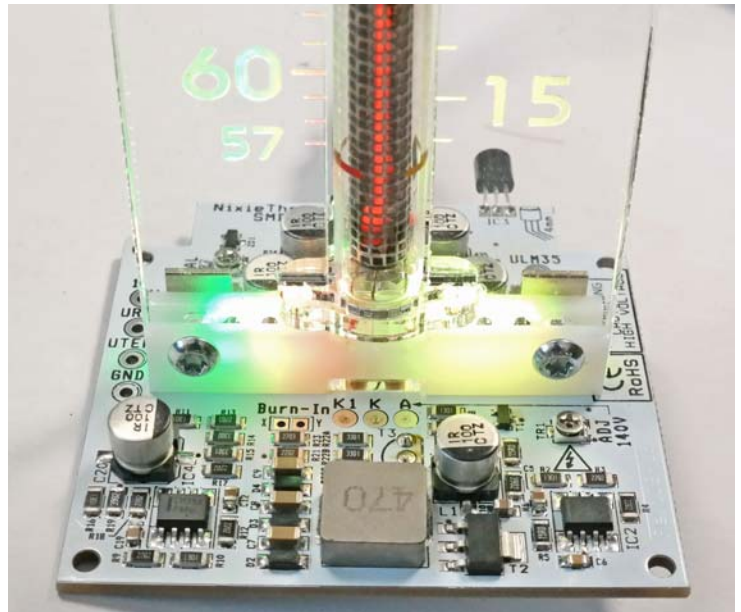
Burn-in procedure

Many - but not all - IN-13 tubes are initially unable of displaying the full height of the glow column.

Therefore onnect the NixieTherm board to the USB supply. The LEDs should begin with their play of different colors, and the tube should already indicate a middle temperature value.

Tip: If you only see one glow and not the small "pilot glow" lefthand from the main column and also not the anode grid, the tube is installed the wrong way round and you have to "turn" it after removing the scale. Now fit a short piece of wire (for example from the LEDs or the tube) into the burn-in pads X and Y. The glow column of the tube will now be brighter and will move up. The burn-in procedure is finished when the glow column reaches the top of the tube. This may take several minutes. Do not be impatient.

Note: The tube and the transistor T3 on the bottom will become warm during this procedure.



Installation into the enclosure

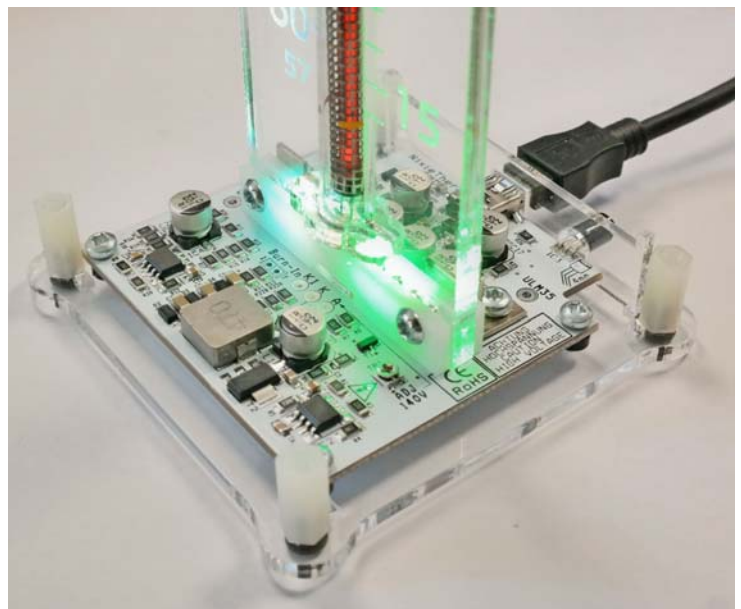
Remove the burn-in wire and the power supply from the NixieTherm. Peel up the protective film from the bottom panel and the rear panel from both sides.

Attach the four M3 x 12 plastic spacers to the bottom panel with four M 3 x 8 pan head screws. Then fit the four plastic self-adhesive feet to the edges of the bottom. Stick the M2.5 x 6 screw through the drill holes of the printed circuit board at it edges and slide a self-retaining 2 mm distance over the screw thread from the solder side. Insert the circuit board together with the rear panel and tighten the circuit board.

Re-plug the power supply to the NixieTherm and let it operating for about an hour. In the meantime, place an accurate thermometer next to the NixieTherm.

After one hour adjust the displayed temperature range of the NixieTherm with the trimmer **CAL** to the value of the reference thermometer minus one degree.

Finally, remove the protective films from the three side panels and the top panel of the case, insert the side panels and then attach carefully the top cover. The side panels need sometimes a slight adjustment to fit into the top cover's outouts. After tightening the top cover with the remaining four M3 x 8 pan head screws, your NixieTherm is ready for use. **Congratulations.**

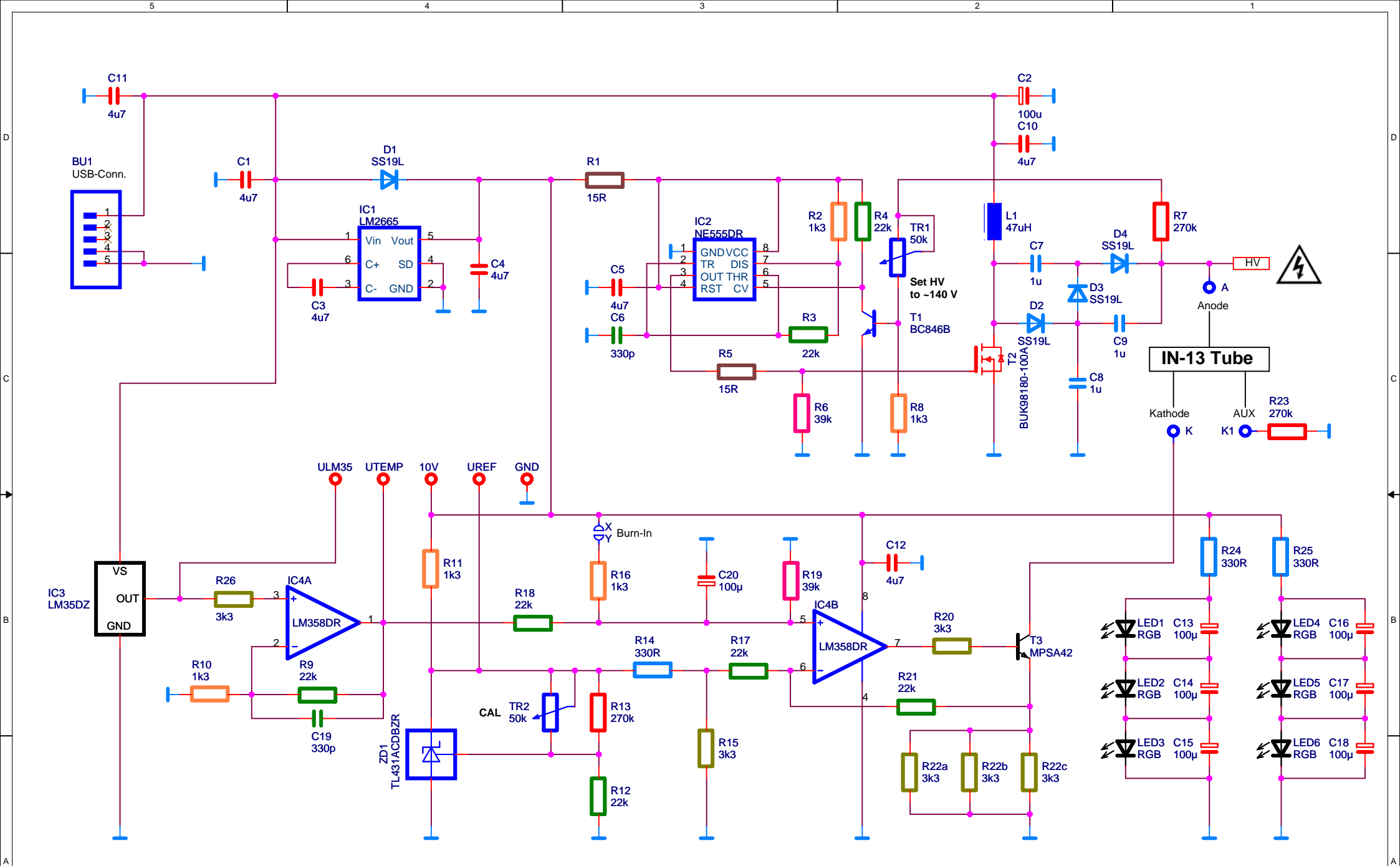


Stückliste / BOM NixieTherm SMD

Check	Qty.	Value	Package	Ref.
SMD-Bauteile vorbestückt / SMD components preassembled				
	1	Mini USB type B SMD PCB connector	SMD	BU1
	2	Trimmer 3 x 3mm 50k 0.1W	MODEL 35	TR1,TR2
	7	4u7 16V Ceramic	0805	C1,C3,C4,C5,C10,C11,C12
	2	330pF 25V Ceramic	0805	C6,C19
	3	1µ 100V Ceramic	1206	C7,C8,C9
	8	100µ 10V / 16V	SMD Size D	C2,C13,C14,C15,C16,C17,C18,C20
	4	SS19L Schottky Diode	Sub SMA	D1,D2,D3,D4
	1	LM2665 Charge Pump	SOT23-6	IC1
	1	NE555D Timer	SO-8	IC2
	1	LM358DR Dual Operational Amplifier	SO-8	IC4
	1	BUK98180-100A N-Ch. MosFet	SOT223	T2
	1	TL431ACDBZR Adj. Reference Diode	SOT23	ZD1
	1	47µH Shielded Inductor 3.3A	10x10mm	L1
	2	15R	1206	R1,R5
	3	330R	1206	R14,R24,R25
	5	1k3	1206	R2,R8,R10,R11,R16
	6	3k3	1206	R15,R20,R22a,R22b,R22c,R26
	7	22k	1206	R3,R4,R9,R12,R17,R18,R21
	2	39k	1206	R6,R19
	3	270k	1206	R7,R13,R23
	1	BC846B Small Signal Transistor	SOT23	T1
	62	Total SMD parts preassembled		

Check	Qty.	Value	Package	Ref.
Zu bestückende Bauteile und Mechanik / Trough hole components and Mechanics				
	1	LM35DZ Temp-Sensor	TO-92	IC3
	6	RGB LED 3mm slow colour change	3mm	LED1,LED2,LED3,LED4,LED5,LED6
	1	MPSA42 HV-Transistor	TO-92 Ammo	T3
	8	Fk M3 x 8 Tx Flathat Screw	M3 x 18	Fixing top and bottom cover
	2	M3 x 12 Tx Screw	M3 x 12	Fixing the mounting brackets on scale
	4	DI 12mm Spacer white	M3	Spacers for top and bottom cover
	2	Mounting Brackets	M3 + 3,2mm	
	2	GF M3 x 6 Tx Selftapping Screw	M3 x 6	Fixing scale on PCB
	4	Spacer 2.7 x 2 mm	for M2.5	Spacers for PCB
	4	GF M2.5 x 6 Pz Selftapping Screw	M2.5 x 6	Fixing PCB on bottom
	1	Rubber Tube	20 mm	Isolation of the IN-13 wires
	4	Bumpers selfadhesive transparent	8 x 2.2 mm	
	39	Total parts		

Check	Qty.	Value	Package	Ref.
Divers				
	1	NixieTherm SMD board preassembled		NixieTherm SMD
	1	Scale engraved		
	1	Acrylic enclsoure parts		
	1	IN-13 tubes optional		
	1	USB power supply optional		



Black coloured parts are through hole components

Title		
NixieTherm SMD		
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