

What this unit does

A handheld tester that measures fencing gear in **real ohms** and says pass or fail against the FIE limits. It does everything the Build A lamp tester does (continuity, shorts) and adds the part that matters to a scoring box: **how much resistance** each wire, weapon and lame actually has. It also catches the faults the lamps cannot see: an A to C short, wires crossed in a plug, leaky (damp or dirty) insulation, and brief breaks while you flex a cord.

No modes, no numbers to read. Plug in a cord, a weapon on a cord, or touch the probe to a lame: it works out which it is. The answer is a **red / yellow / green light** and a **sound** (a chirp for pass, a buzz for fail, a tick for every tip press, a click for every break while you flex), so your hands can stay on the gear. The screen adds a big word (PASS, FAIL, PRESS TIP, BREAKS 3) and bars that show how close each reading is to its limit.

	Build A lamp tester	This tester (Build C)	Commercial
Body cord continuity	yes	yes, each wire in ohms	yes
Shorts A-B, B-C	yes (separate plug-in)	yes, with both ends plugged	yes
Short A-C, crossed wires, leaky	no	yes	some
Weapon resistance (2 ohm / 1 ohm)	no	yes, cord subtracted	yes
Lame / mask (5 ohm)	no	yes, with weighted probe	yes
Flex test (counts breaks)	watch the lamp	clicks for every break of 0.2 ms+	some
Reading it	two lamps	traffic light + sounds, picks the test itself	screen, menus
Cost	about \$35	about \$33 budget, \$64 all-Mouser	\$150 to \$300+

The limits it checks (FIE Material Rules, August 2026)

What	Limit	Rule
Body cord, each wire, plug to plug or plug to clip	1 ohm max	m.29.1c, m.31.1b
Foil and epee weapon circuit	2 ohm max	m.5.4a
Sabre weapon	1 ohm max	m.5.4a
Lame, any two points (500 g probe with a 4 mm radius end)	5 ohm max	m.28.5a
Sabre mask, clip to any point	under 5 ohm	m.32.5
Mask wire, clip to clip	1 ohm max	m.27.1, m.32

Insulation (wires that must not touch): under 1 k = **SHORT**, 1 k to 100 k = **LEAKY** (damp, dirt, worn insulation), over 100 k = ok.

How accurate

About 0.001 ohm at 1 ohm, with 0.0001 ohm resolution (4-wire sensing against a precision 10 ohm reference, read by a 16-bit converter). The limits are 1, 2 and 5 ohm, so this is far more than enough. The plug-to-jack contact resistance is part of the reading, exactly as it is for a scoring box.

Cheap "ADS1115" modules: some are really the 12-bit ADS1015. The tester detects this at power-on and tells you. It still works, in 0.03 ohm steps, which is still fine for 1 ohm limits.

Bill of materials (one unit)

Qty	Part	Where	Each	Budget each
1	Raspberry Pi Pico (or Pico 2) SC0915 (\$4.00) or Pico 2 SC1631 (\$5.00), no headers needed	Mouser	\$4.00	\$4.00
4	8-channel analog mux, DIP-16 CD74HC4051E (TI)	Mouser	\$1.04	\$1.04
1	ADS1115 16-bit ADC module Blue breakout, I2C, 10 pins (VDD GND SCL SDA ADDR ALRT A0-A3)	Amazon multipack	\$3.00	\$3.00
1	0.96 in OLED, SSD1306, I2C 128 x 64, 4 pins (GND VCC SCL SDA)	Amazon multipack	\$3.00	\$3.00
1	10 ohm 0.1 % resistor (R_REF) Vishay RN55C10R0BRE6. A 1 % 10 ohm also works: readings 1 % of value	Mouser	\$1.68	\$0.10
1	330 ohm 1 % resistor (R_LIM) YAGEO MFR-25F52-330R	Mouser	\$0.11	\$0.11
1	10 k resistor (pull-up) any 1/4 W	Mouser / kit	\$0.10	\$0.10
4	100 nF ceramic capacitor K104K15X7RF53L2, one per mux chip	Mouser	\$0.25	\$0.05
1	1N5817 Schottky diode Diotec 1N5817	Mouser	\$0.30	\$0.30
1	Slide switch (power) Same Sky SLW-874744-6A-RA-N-D	Mouser	\$0.51	\$0.27
1	6 mm tactile push button any through-hole 6 x 6 mm	Mouser / kit	\$0.15	\$0.05
1	5 mm red LED, diffused Kingbright WP7113ID	Mouser	\$0.21	\$0.05
1	5 mm yellow LED, diffused Kingbright WP7113YD	Mouser	\$0.23	\$0.05
1	5 mm green LED, diffused Kingbright WP7113SGD (568 nm; a blue-green 3 V LED would be dim)	Mouser	\$0.25	\$0.05
3	150 ohm resistor (LEDs) any 1/4 W	Mouser / kit	\$0.10	\$0.02
1	Passive piezo buzzer, 12 mm Same Sky CPT-1206-3TH-T (passive: the Pico plays the tones)	Mouser	\$0.54	\$0.40
8	4 mm panel banana jack 108-0740-001 (as Build A), or generic 4 mm panel sockets	Mouser / Amazon	\$3.10	\$0.50
1	TP4056 charge module, protected USB-C, DW01A + FS8205 fitted (same as Build A)	Amazon multipack	\$0.80	\$0.80
1	18650 holder, wire leads Keystone 1042 or generic	Mouser / Amazon	\$5.63	\$0.60
1	18650 cell, protected, 2000+ mAh reputable brand	Amazon	\$6.00	\$6.00
1	Perfboard ~5 x 7 cm 0.1 in pitch; 4 x DIP-16 sockets optional	Amazon multipack	\$0.60	\$0.60
1	Probe: banana plug + hardware CT2002A plug (\$2), M8 bolt, M8 acorn nut, steel washers, ring terminal	Mouser + hardware store	\$5.00	\$4.00

1	Wire, heat-set inserts, screws 26 AWG silicone in 4+ colours; M2 inserts (kits cover many units)	Amazon kits	\$1.50	\$1.50
Total per unit			\$63.87	\$33.40

Mouser prices checked live on 2026-10-08 (single quantity). "Budget" uses generic jacks, holder and 1 % reference from Amazon multipacks; the jacks are most of the difference. Amazon listings change often, so search the part description rather than a link.

Already built the Build A lamp tester? Its jacks (six of the eight), charge module, cell and holder move straight over. New parts then come to about **\$23**.

Build order

Step	Doc	Do this
1	Doc 34	Flash the Pico first (drag one file onto it), with nothing else connected
2	Case	Print the jack spacing coupon from Build A and confirm a real cord plugs in. Read case/CASE_NOTES.md (what to measure, where tall parts may not sit on the perfboard), then print the case
3	Doc 32	Wire it, step by step, ticking each numbered wire
4	Doc 34	Bring-up checks: lights and beep at power-on, ADC found, READY with nothing in, known resistors read right
5	Doc 33	Test known good gear, then your real gear

Doc 31 explains the circuit. You do not need it to build, but read the first page: it is why two wires go to every jack.