

CASE STUDY 02 • EXAMPLE

Hall interior heat map – overheating cable connection (example)

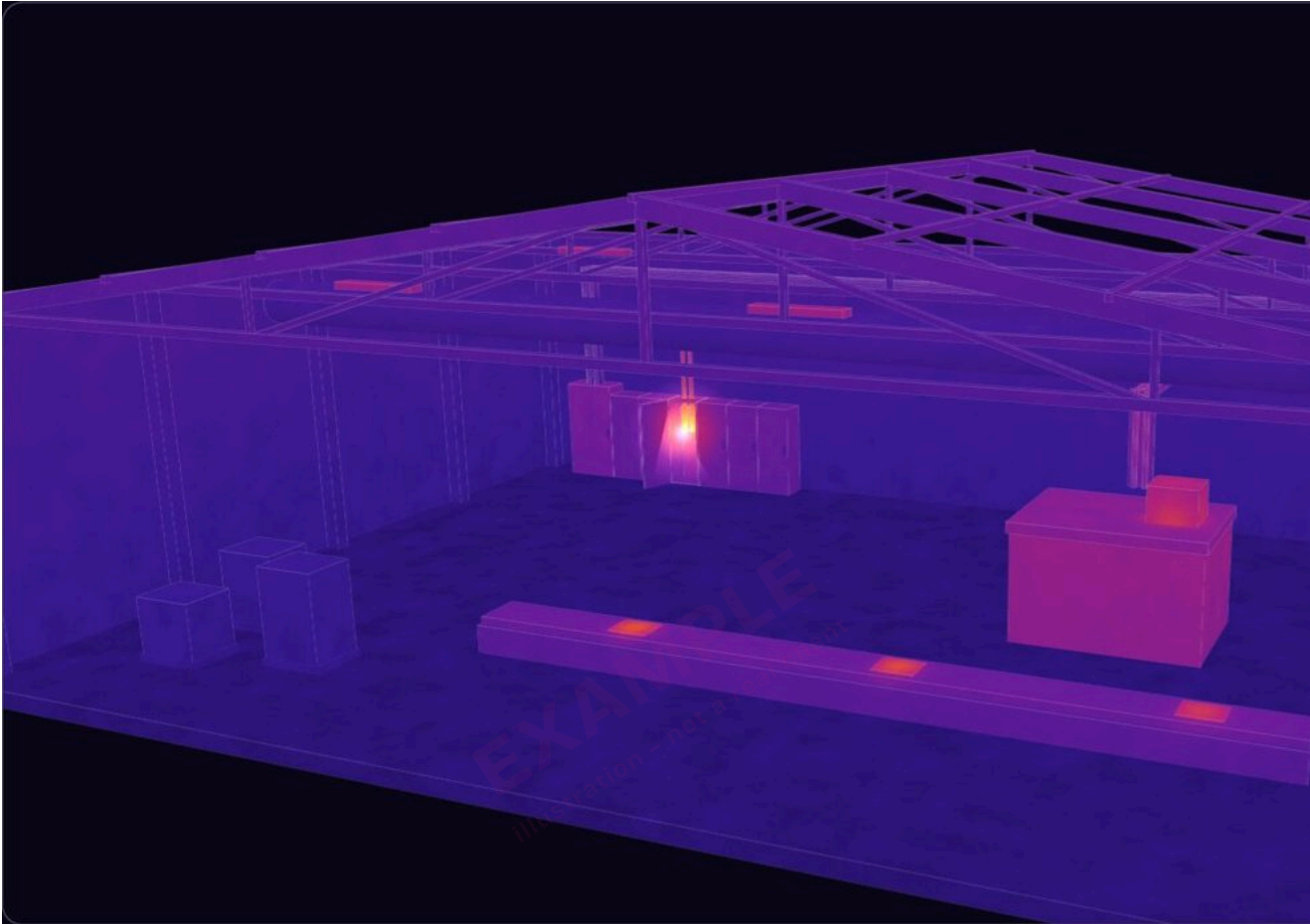
A loose terminal dissipates a few watts – yet it reads 78 °C on a thermogram. This example shows what an early warning is good for, and what it is not.

78 °C
the loose terminal on the simulated thermogram
(hall air ≈ 28 °C)
simulated value

12.8 W
extra loss in the terminal (160 A, +0.5 mΩ)
estimate

≈ 5,100 HUF/yr
value of the wasted energy (HUF 4,000–5,900)
estimate

45,000 HUF
terminal re-torque + checks (HUF 25,000–90,000)
estimate



Simulated 3D interior heat map of the hall: simplified geometry (HöKép3D's own procedurally generated model), invented temperatures.

1 It runs, and nothing looks wrong

A small production hall runs one or two shifts: a press, a conveyor, a compressor. The machines are fed from a row of switchgear cabinets along the back wall. One feeder carries 160 A per phase for about 3,000 hours a year (assumption).

Nothing looks wrong: no trips, no smell. Maintenance is in next year's plan. The question is whether the row contains a connection that still works but is already getting hot – and where.

How we would measure

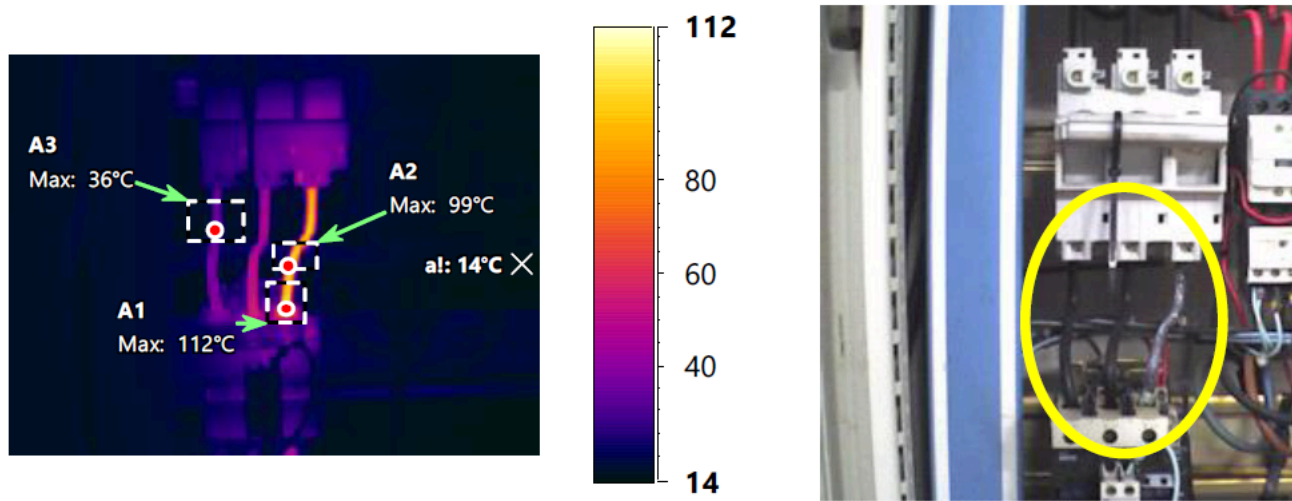
1. Planning: which cabinets are covered, when normal operating load is present and which authorised electrician opens the covers. **2. Measuring under load** from a safe distance; we never touch live parts. **3. Documenting:** per cabinet a thermogram and a visual photo of the same view, load current, ambient temperature, emissivity. **4. Assessment:** ΔT against similar components and against ambient, A/B/C priority; if we find a deviation we say so on site.

Load	160 A per phase (assumption)
Hours at this load	≈ 3,000 h/yr (assumption)
The fault	+0,5 mΩ contact resistance on one phase
Hall air	≈ 28 °C (simulated)

EXAMPLE / ILLUSTRATION – Example – illustration built from open-licensed images and simulated data, not a real client.

2 What it looks like in reality

Real, open-licensed thermograms of loose or overloaded electrical connections. The images are unmodified; temperatures come from each image's own scale and markers. They were taken with different cameras under different conditions, so they are not comparable with one another.



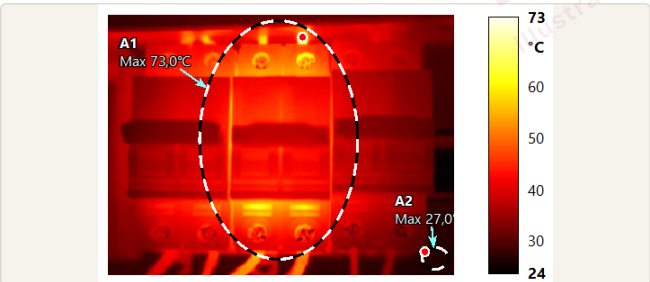
Contrôles-électriques, „Défaut de connexion porte fusibles thermographie infrarouge”, Wikimedia Commons, CC BY-SA 4.0 – unmodified · The best example of how a report is built: thermogram and visual photo side by side. A1 112 °C, A2 99 °C, A3 (reference) 36 °C; A1 – A3 = 76 K.



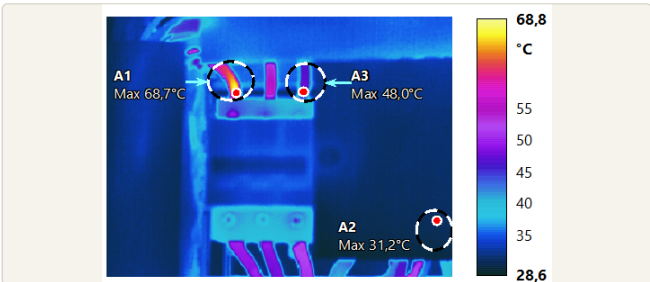
Sönke Krüll, „Elektroschuetz”, Wikimedia Commons, CC BY 3.0 – unmodified · Contactor cable termination: ≈ 108 °C while neighbouring conductors stay at 35–60 °C.



Hofflashhome, „Electrical fault”, Wikimedia Commons, CC BY-SA 3.0 – unmodified · One phase is hotter than the other two – the textbook case for comparing with similar components.



Contrôles-électriques, „Surcharge sur un disjoncteur électrique thermographie infrarouge”, Wikimedia Commons, CC BY-SA 4.0 – unmodified · Mounted without spacing: A1 – A2 = 46 K; a heat-removal problem, not a loose connection.



Contrôles-électriques, „Défaut de connexion décelé grâce à la thermographie infrarouge...”, Wikimedia Commons, CC BY-SA 4.0 – unmodified · Loosely tightened or poorly crimped connection: A1 – A2 = 37.5 K.

How we read it: ΔT , not absolute temperature

Comparison	Against what	Watch out for
ΔT vs a similar component	The same-load, same-type neighbour – e.g. the terminals of the other two phases	If all three phases are equally faulty there is no good reference
ΔT vs ambient	Cabinet or hall air temperature	Load-dependent: at lower current the fault looks smaller
Absolute temperature	The limit allowed by the manufacturer	Apparent temperature also depends on emissivity and reflections

In the example the loose terminal is +38 K above the neighbouring phase terminal and about +50 K above the hall air. Our report gives A/B/C priorities: for an A item we tell you on site and the fix does not wait for the next maintenance.

EXAMPLE / ILLUSTRATION – Example – illustration built from open-licensed images and simulated data, not a real client.

3 In numbers: little energy, real risk

$$P = n \cdot I^2 \cdot R_{extra} = 1 \cdot (160 \text{ A})^2 \cdot 0,5 \text{ m}\Omega = 12.8 \text{ W}$$

Case	Power	Energy	Cost, central (range)	Local rise (illustrative)
One phase	12.8 W	38 kWh/yr	5,100 (4,000–5,900) HUF/yr	13–51 K
All three phases	38.4 W	115 kWh/yr	15,000 (12,000–18,000) HUF/yr	38–154 K

Worked example: 160 A, +0.5 mΩ, 3,000 h/yr, electricity ≈ 132 HUF/kWh (104–153). Estimate, not a guarantee; net. Local rise = P · R_th, R_th = 1–4 K/W; an illustration, not a measurement.

Why does 12.8 W show on a thermogram? Because the heat is generated in a contact area of a few square centimetres and can hardly escape. The wasted energy is worth a few thousand forints a year, so it is not the point: the terminal can get worse with time – and a thermogram shows it before the consequences do.

4 Recommended action

1. **Flag on site** (priority A: the loose terminal): we tell your electrician on the day of the measurement.
2. **Fix by an authorised electrician**: isolate, inspect the terminal, re-torque or replace; check neighbouring terminals and cable insulation.
3. **Check the cable run** (priority B): moderate warming along the cable is a reason to check load rating and bundling.
4. **Re-scan under load**: we measure the same point at a comparable load again; the thermogram shows whether the ΔT is gone.

Item (net)	Amount, central (range)
Wasted energy (one phase)	5,100 (4,000–5,900) HUF/yr
Terminal re-torque + checks	45,000 (25,000–90,000) HUF
Replace terminal / contactor	120,000 (60,000–250,000) HUF
Thermographic cabinet screening	12,000 HUF per cabinet with a package; stand-alone 60,000 HUF per cabinet, minimum 60,000 HUF

What we do not put a price on. The real stake is failure, downtime and fire risk; we have no reliable source for downtime cost and will not invent a number. One sourced fact: of 736 fires investigated in Hungary in 2022, 73 (9.9%) had electrical energy as the cause (national disaster-management sample, all building types, no breakdown for business premises). An early warning, not a savings project.

This is not the mandatory electrical inspection. Thermographic cabinet screening does not replace the statutory mandatory inspection of electrical installations, the fire-safety inspection or an energy performance certificate; those are carried out by professionals authorised under Hungarian law. It gives an early warning and certifies no compliance. The camera sees the surface only; no load, no heating; bare metal is a poor emitter; an image describes one moment.

Credits and sources

- Contrôles-électriques – „Défaut de connexion porte fusibles thermographie infrarouge”, „Surcharge sur un disjoncteur électrique thermographie infrarouge”, „Défaut de connexion décelé grâce à la thermographie infrarouge utilisée en maintenance préventive des installations électriques” – CC BY-SA 4.0, Wikimedia Commons, unmodified
- Sönke Krüll – „Elektroschuetz” – CC BY 3.0, Wikimedia Commons, unmodified
- Hotflashhome – „Electrical fault” – CC BY-SA 3.0, Wikimedia Commons, unmodified
- The heat map: own simplified geometry (three.js) and simulation. Figures: HőKép3D worked example “E” (electrical hot spot), 9 October 2026, rounded to 2 significant digits. OKF: investigation of 2022 fires.

Engineering thermal-imaging survey – not an accredited or certified inspection. It does not replace an energy performance certificate, a statutory energy audit, mandatory electrical-safety or fire-safety inspections; those are carried out by professionals authorised under Hungarian law. Figures are estimates, not guarantees.

Curious where heat escapes from your facility?
Request a quote: we survey at night, register the images on a 3D model and rank what to fix first. · hokep3d.hu · info@hokep3d.hu