PT100 Sensors — Tolerance Classes, 2/3/4-Wire Connection and PT100 vs PT1000

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What a PT100 actually is (100 :• of platinum at 0 °C per IEC 60751), how much accuracy class AA, A and B really buy, why lead resistance dictates the 2-, 3- or 4-wire decision, when PT1000 makes the problem vanish, and the checks that separate a drifting sensor from a bad connection.

The platinum contract

A PT100 is a platinum resistor laser-trimmed to 100.00 :’ B 2 v—F, 7F æF &F—6VB 6Æ÷ R ,$ƒ ã3ƒR ©/°C), defined by IEC 60751 — which is why any instrument reading "PT100" understands any maker's sensor. Accuracy is bought by class:

Class | Tolerance at 0 °C | At 100 °C | Buy it for |

B | ±0.30 °C | ±0.80 °C | General plant monitoring — the default |

A | ±0.15 °C | ±0.35 °C | Control loops, energy metering |

AA (1/3 B) | ±0.10 °C | ±0.27 °C | Laboratory and custody-transfer duty |

Stocked hardware spans the industrial shapes — the Danfoss MBT 5250 in 1/2 3 × 150 mm, 3/4 3 × 100 mm and 200 mm insertion builds, process-equipment elements like the MBT 5250-pattern UV-plant sensor, and monitoring types such as the Raychem MONI-PT100 for trace-heating control — 185 PT100 rows in all; dimensional selection runs through the sensor finder.

Wires: the whole game is lead resistance

2-wire: lead resistance adds straight onto the reading — 0.4 :’ öb 6 le reads as +1 °C. Acceptable only for short runs and rough duty.

3-wire: the instrument measures one lead and subtracts it twice — cancels leads if they match. The industrial standard, good to a corroded terminal's first surprise.

4-wire: separate current and sense pairs, lead resistance vanishes entirely — the class-A-and-better companion.

PT1000 sidesteps it: ten times the base resistance makes lead ohms ten times less significant — why building automation and compact transmitters went PT1000. Instrument input must match; the slope scales identically.

Field diagnostics in three measurements

"H110 :’ B &ööÒ FV× W ature (PT100) between element wires = sensor plausible; open or megohms = broken element; a few ohms to the sheath = moisture ingress — the usual death of trace-heated and washdown installations.

Reading jumps when the cable moves = connection, not sensor: terminal corrosion defeats 3-wire compensation asymmetrically.

Slow response: a thermowell adds seconds to minutes — spring-loaded inserts, contact paste and correct immersion depth (10× diameter as the rule of thumb) recover most of it.

Quoted within 24 hours against the nameplate code or the duty: insertion length, process connection, class, wiring and head/transmitter choice — with 4–20 mA head transmitters (see the MBS pressure-side companion) where the cable run argues against raw RTD wiring.

Frequently asked questions
How accurate is a standard PT100?Class B — ±0.3 °C at 0 °C, widening to ±0.8 °C at 100 °C per IEC 60751. Class A roughly halves it, AA again — but wiring and installation errors routinely exceed class differences, so buy class only after fixing both.When do I need a 4-wire PT100?When the accuracy target is tighter than the lead-resistance uncertainty — class A and better duty, long or uncertain cable runs, laboratory work. 3-wire covers ordinary plant control; 2-wire only short, rough-duty runs.Can I connect a PT1000 to a PT100 input?No — the instrument would read wildly high. The input must be configured (or built) for the element type; many modern transmitters accept both via configuration, which is the clean migration path.Why does my PT100 read a few degrees high, consistently?In 2-wire connection, that is the cable: every 0.39 :’ of loop resistance adds one apparent degree. Move to 3- or 4-wire, or offset-calibrate the loop if rewiring is impossible.How deep must a sensor sit in the pipe?Rule of thumb: immersion of at least ten times the probe diameter, tip in the flowing core — short immersion reads the pipe wall, not the fluid. Thermowell response adds on top; spring-loaded tips and paste close the gap.

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