

Thermal response time of short direct sensors – Experimental determination in different set-ups and consequences in a real installation

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In district heating sub-stations without a storage tank, i. e. in installations, where fast transients for flow and temperature can be expected during summer operation, the thermal response of a temperature sensor is considered to be one of the crucial parameters for measuring accuracy. EN 1434-1:2022 has therefore defined in Annex C normative requirements for fast response temperature sensors like e. g. a thermal response time $\tau_{0.5}$ of max 2,5 s for a direct short sensor.

The thermal response time $\tau_{0.5}$ of a temperature sensor is among others therefore a part of the pattern approval test according to EN 1434 (Clause 7.4.4.2 of EN 1434:2022, based on Clause 6.5.2 of EN IEC 60751:2008 (or Clause 6.5.5 of EN IEC 60751:2022)) and typically stated in the type approval certificate and data sheets of temperature sensors.

Results of the determination of the thermal response time $\tau_{0.5}$ for a direct short temperature sensor from different laboratory set-ups as well as a production set-up will be presented and discussed. Furthermore, it will be demonstrated how the ability to determine the thermal response time in a production set-up can be used for quality assurance in production. The influence of the thermal response time on the measurement of thermal energy is finally investigated with a comparative test in a real installation without a storage tank, which is exclusively used for heating up the hot tap water used in hand washbasins.