

EURAMET 1601 Pilot study:

Comparison of dynamic pressure measurements

RISE Research Institutes, Sweden

Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

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The EURAMET pilot study “**Comparison of dynamic pressure measurements**” (**Project No. 1601**) was initiated to address the lack of traceable dynamic pressure calibration methods and internationally recognized CMCs. The study compared two independent approaches using shock tubes at PTB and RISE. The shock can be operated as a primary dynamic pressure standard, determining the pressure step from shock-wave velocity and the initial thermodynamic conditions. On the other hand, shock tube can be used as a generator of repeatable pressure steps while its amplitude is measured using other traceable methods, such as laser absorption spectroscopy. In this study, the respective shock tubes at RISE and PTB were used as both primary standards and pressure generators where laser absorption spectroscopy method was deployed to measure the reference pressure amplitudes. The comparison therefore provided an important validation of complementary approaches for establishing traceability in dynamic pressure measurements and supporting future dynamic calibration capabilities.

The concept developed in this pilot study was subsequently extended within the MaritimeMET project (**23IND09, Metrology for green maritime shipping**). The project addresses, among other topics, **traceable dynamic measurements of in-cylinder pressure and temperature** relevant to engine development. It specifically recognizes that dynamic pressure sensors are normally calibrated quasi-statically, which can introduce significant measurement uncertainties, and therefore investigates improved traceable methods under dynamic operating conditions.

The results originating from the pilot comparison, together with further investigations carried out within MaritimeMET, have resulted in the 2026 publication “**Laser absorption spectroscopy for traceable dynamic pressure measurement in shock tubes: an inter-laboratory comparison**” in *Measurement Science and Technology*. The work represents an important step toward establishing validated, SI-traceable methods for dynamic pressure measurement and, ultimately, supporting future internationally recognized calibration capabilities (CMCs).