

Central Office of Measures

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Article by the Central Office of Measures in a peer-reviewed international journal

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On August 18, 2023, an article by the Central Office of Measures and the Physikalisch-Technische Bundesanstalt (PTB) was published in the peer-reviewed international journal „Energies” (impact factor = 3.2; 140 ministerial points) with open access.

The article was created as a result of the European project [19ENG08 WindEFCY](#) and summarizes some of the work carried out at GUM in collaboration with PTB. The article describes the calibration procedure and determination (using linear regression with weighted least squares method, WLS) of the torque transducer characteristics with a measurement range up to 5 MN m at the PTB facility enabling measurements up to 1.1 MN m.



Article

Estimation of Uncertainty for the Torque Transducer in MNm Range—Classical Approach and Fuzzy Sets

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Abstract: The article provides an analysis of the metrological properties of a 5 MN·m torque transducer. The relative electrical signal (given in electrical units, mV/V) as a function of torque measured in both the clockwise and anticlockwise directions was monitored. To fit the data, the weighted method of least squares with both a straight-line and a cubic spline curve was used. The results of the analysis indicated that the straight-line fitting method produced smaller values of expanded uncertainty than the cubic spline fitting method. Additionally, the study confirmed the assumptions that the Monte Carlo method for propagating uncorrelated distributions was more accurate than the uncertainty propagation method, regardless of the type of curve fitting used. From the estimated uncertainty coverage corridor at selected measurement points, confidence intervals—expanded uncertainties were determined. Additionally, the fuzzy sets approach to the evaluation of uncertainty was presented, and the approximate value of the expanded uncertainty was calculated.



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The overall goal of the project 19ENG08 WindEFCY is to support Europe's transition to renewable energy sources in the form of wind turbines.

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