



# Mitch Marks

*Business Development at HBK*

Mitch has worked in electric motor development for 9 years and specializes in the test and measurement of traction motors and drives. He focuses on developing new testing techniques and accelerating the development process through testing. He has been with HBK since 2017 as a member of the electric power testing team. He has an undergraduate and a master's degree in electrical engineering from the University of Wisconsin – Madison WEMPEC program.

## Understanding Measurement Uncertainty for Electric Drives

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To optimize the performance of an electric powertrain, its efficiency must be verified both during development and during operation with measurements. These measurements will have an associated measurement uncertainty (MU) due to the accuracy of the measuring device and environmental conditions of the test. The MU indicates the probability with which a measurement result is in a specified interval around the “true” value.

The measurement result therefore generally does not match the actual value, so that each real measurement is subject to a certain measurement deviation/error. This measurement error propagates from the measured quantities to other quantities calculated from these measurands. An error in voltage and current measurement, for example, propagates to the electric power, efficiency and ultimately the range of a vehicle.

This presentation explains the estimation of measurement uncertainty for electric power motors and inverters. There will be a real-world example and methods to improve measurement uncertainty.