



## Task Description for a Study or Thesis Project

# Experimental Investigation on the Ball Bearing Distribution of Profile Rail Guides

At the Chair of Machine Tool Development and Adaptive Controls, an innovative measurement method is currently being developed to determine the distribution of rolling elements in the load zone of a profile rail guide. This method can estimate the dynamic state of the profile rail guide (PRG) and the loads imposing on the guide carriage. A key aspect of the method is the precise determination of the position of the ball bearings within the load zone between the guide carriage and rails. Due to the compact design of PRGs, selected inductive proximity sensors are employed. These sensors detect the presence of ball bearings and switch on or off accordingly. The corresponding switching signals enable us to determine the dynamic distribution of the ball bearings. Additionally, using a static model, the loads imposing on the carriage can be calculated. This technology opens new opportunities for optimizing the functionality and efficiency of systems based on PRGs.



*Fig. 1: Profile Rail Guide with Integrated Sensors*

*The exact tasks can be adjusted in scope and tailored upon request.*

### Required Knowledge and Skills of the Student:

- Enthusiasm for hands-on experimentation and working with measurement systems.
- Familiarity with methods for processing and analyzing experimental data.
- Understanding of statistical methods is advantageous for data interpretation and analysis.

### Key Tasks:

- Planning and conducting experimental setups to investigate the system.
- Processing and evaluating experimental data with a focus on statistical approaches.
- Verifying the outcomes and implementing them in practical scenarios on the test bench.

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