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Pressure and Temperature Calibration Module “PTCM”

Introduction

The company Endress+Hauser Flowtec AG (E+H) in Reinach BL manufactures flowmeters of various designs. An important part of the production and key process to ensure the accuracy of a measuring device is calibration. E+H uses several density and flow calibration rigs for this purpose.
These calibration rigs use pressure and temperature sensors that are relevant to measurement and which must be recalibrated regularly. This process is currently carried out manually by employees from the rig manufacturing department and is very time-consuming. In the future, this process is to be automated to a large extent and performed by employees from the rig operating department.
The task of this thesis is the completion of the design, assembly, validation and commissioning of the mobile pressure and temperature sensor calibration module (PTCM), which was previously developed as part of an industrial project. The objective is to reduce the time required for sensor calibration, reduce measurement uncertainty and increase repeatability. Furthermore, the process is to be automated to a large extent and operation is to be simplified.

Fig. 1: Rendering of the mobile pressure and temperature sensor calibration module (PTCM)

Procedure

Details have been added to the design and small modifications have been made, so that at the beginning of the thesis the components for the frame could be ordered as quickly as possible. In parallel, a software engineer was working on the automation and the development of the visualization. After finishing the frame of the PTCM, the electronics were installed and the devices were placed, this completed the physical construction. First versions of the software could already be implemented and tested at this time. Besides the mechanical tests, the measurement uncertainty budget was recalculated to ensure that the accuracy requirements were met. At the end of the work, measurements with test devices could be performed and evaluated.

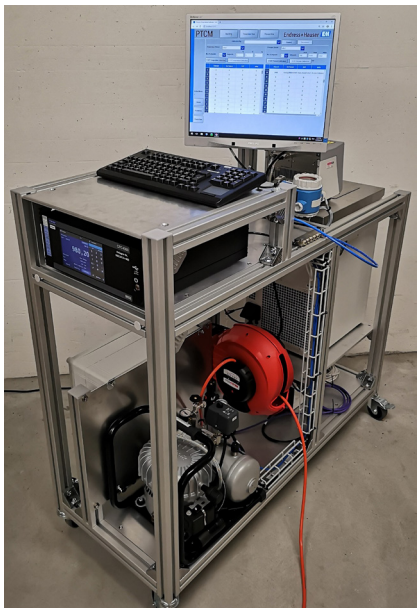

Fig. 2: Picture of the PTCM

Results

Mechanically, the PTCM is almost completed, there are only small adaptations to be made. However, the software is only usable as proof of concept, and there is still some effort required in order to be able to use the PTCM in the field. Especially the connection with the calibration rigs is not yet realized. In terms of measurement the PTCM is usable and its measurement uncertainty is in the required range.