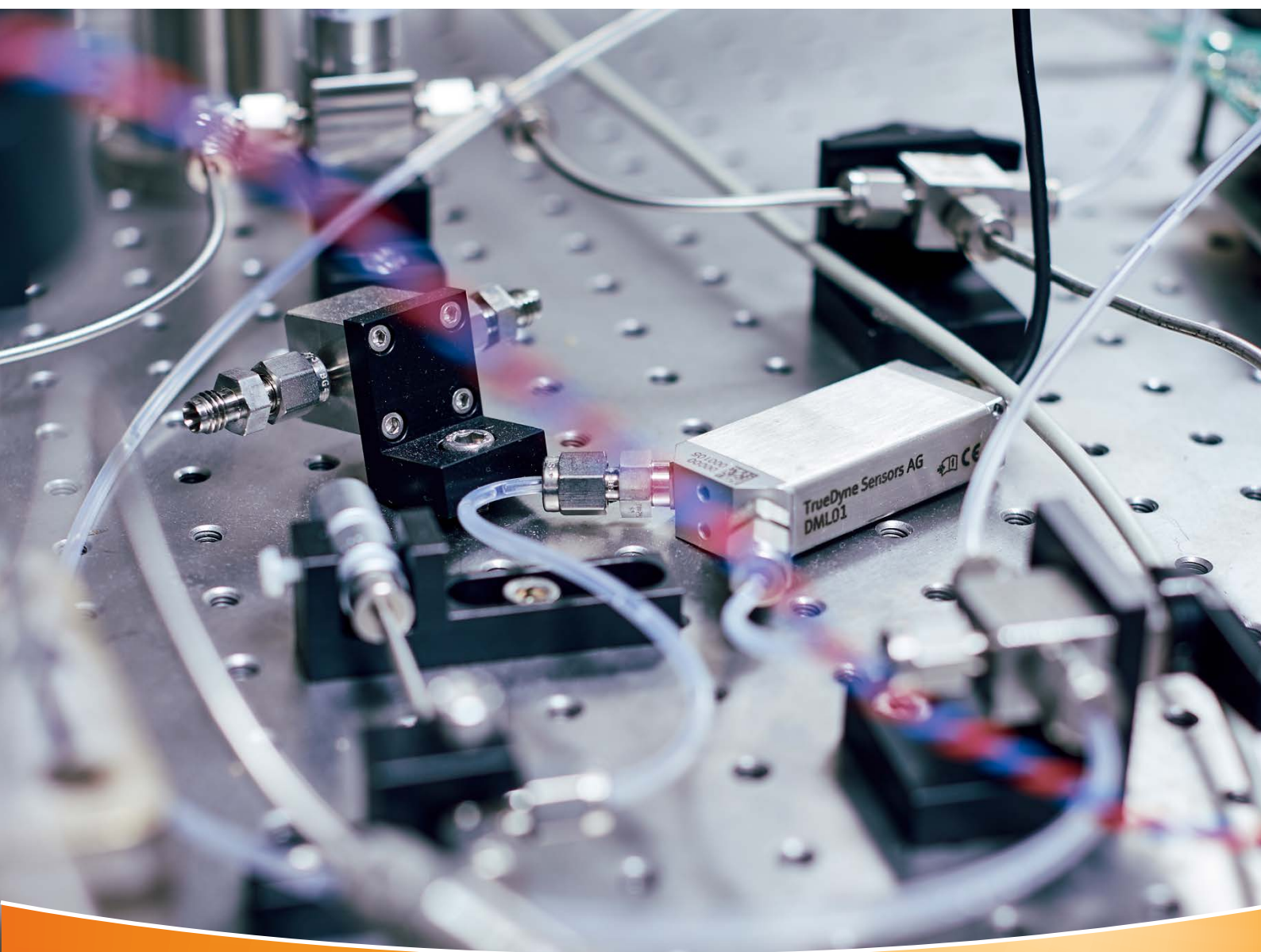


Cooperation

**Manufacturer & service provider:
Exchange of experience in density
measurement technology**



A close cooperation for reliable measurement results of density sensors

Over the last few years, TrueDyne Sensors AG has acquired a great deal of expertise and know-how in the field of micro sensor technology and vibrating systems. The density module from TrueDyne Sensors AG is a flexural resonator measuring system in the MEMS technology with a measuring channel in sub-millimeter size. Measuring systems like these enable numerous companies to expand and improve their products and production sequences within the process. The high accuracy, the extremely compact design and the real-time measurement play a central role in these density modules.

Testo Industrial Services GmbH support the manufacturer of density sensors in ensuring these quality criteria. Because detailed measurements in an independent calibration laboratory ensure safety for the customer. The two companies - manufacturer and service provider, specialized in the field of flow, introduced a close cooperation project in 2018.

The goal

Cooperation Testo & TrueDyne

The goal of the cooperation project was to have the DLO-M1 density sensor from TrueDyne Sensors AG verified, under laboratory conditions, by a manufacturer-independent calibration service provider. Above all, the main issue was to test the sensor's „suitability for everyday use“. This serves as the basis for recommending the density sensor to users of calibration systems.

Services provided by Testo Industrial Services GmbH

- Provision of laboratory space and calibration test benches
- Many years of know-how in the field of calibration technology
- Definition of test procedures and measurement methods
- Derivation of argumentation approaches based on the results

The procedure

Performance of density measurements

Equipment used for the measurements:

- Liquid calibration stand - Testo KKF80 MU ± 0.08 % F.S.
- Temperature sensor 1/10 DIN
- Pressure sensor ± 0.04 % F.S.
- DLO-M1 density sensor - TrueDyne Sensors AG
- VDI Heat Atlas 10th edition 2006, Db a14 Table 12. Kinematic viscosity of water
- Density table according to NIST

Testo Industrial Services GmbH

Calibration service provider for more than 220 accredited calibration procedures

Testo Industrial Services GmbH is one of the leading calibration service providers in Germany. The calibration laboratory for flow meters performs manufacturer- and media-independent calibrations for liquids and gases. As the field of calibration is extremely diverse, a wide range of test benches and calibrators are required. Testo uses seven self-developed test benches. These enable the calibration of different flow rates with very low measurement uncertainties.



Liquid calibrator for small flow rates of 0.8 ml/min - 40 l/min



„Our measuring systems systems meet the highest standards of accuracy. With our partner and calibration expert, Testo Industrial Services GmbH, we can continuously test and prove this quality requirement. The measurement results also help us to standardize our products for future calibration processes.“

Josua Ritter, Managing Director at
TrueDyne Sensors AG in Reinach, Switzerland

The challenges

Factors to consider during density measurements

- Measurement errors due to the smallest of temperature differences
- Consideration of reference systems, e.g. density table for water, mineral content, compressibility of the medium
- Reproducibility of the measurements for the comparison of measurement results

The result

Long-term use of measurement results

The cooperation project resulted in the successful verification of the DLO-M1 density sensor by the manufacturer-independent calibration laboratory Testo Industrial Services GmbH.

The following results can be derived:

- The measurement results were very convincing. The density deviation was well clearly below $\pm 0.2 \text{ kg/m}^3$, which leads to a measurement uncertainty of $< 0.02 \%$ of the measured value.
- The measured values could be tested in a reproducible manner at various pressure levels.
- The suitability of the DLO-M1 density sensor from TrueDyne Sensors AG is ensured for calibration systems.

TrueDyne Sensors AG

Manufacturer of density and viscosity sensors in sub-millimeter sizes

TrueDyne Sensors AG is a subsidiary of Endress+Hauser. With the company foundation in 2015, the main focus of competence was set on the development of smallest sensor technology. The heart of the technology is the OMEGA-chip, whose function is based on the flexural resonator measuring principle. The chip in the MEMS technology consists of a measuring channel in sub millimeter size and an integrated platinum temperature sensor for real-time on-board temperature measurement.

The measuring channel is hardly thicker than a hair and thus opens up new prospects for density measurement technology directly in the process.



Smallest possible density and viscosity sensors from TrueDyne Sensors AG

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