



Calibration certificates go digital

Considerable added value through easy use of all calibration data at a later stage

Especially interesting for

- the fundamentals of digital metrology
- calibration laboratories
- quality management and certification
- Industry 4.0

Conventional calibration certificates could soon become history. To furnish proof that a measuring instrument has been calibrated and of how this has been done, metrology institutes throughout the world could, in the near future, use digital calibration certificates (DCCs) rather than their analogue version. Especially the fact that they are machine-readable speaks in favour of DCCs for production and quality monitoring processes in which digitalization is becoming ever more important. The ultimate goal consists in developing universal DCC exchange formats valid for all areas of metrology.

In industrial production, the quality of products can only be guaranteed if the measuring equipment used is calibrated at regular intervals – i.e. if it is traced directly or indirectly to the national standards. Ensuring that this is possible is one of the central tasks of national metrology institutes. In this context, calibration certificates play a decisive role in each metrological quality management system.

But digital calibration certificates can do more than just serve as a proof of metrological traceability. Since the newly developed DCC is based on the internationally accepted and approved exchange format XML (Extensible Markup Language), it is machine-readable; moreover all indications, including the numerical calibration curves, can be directly and automatically transferred into all digitally supported processes. At the same time, cryptographic signatures are used as security procedures to guarantee that the integrity and the authenticity of a calibration certificate is still ensured. The cryptographic procedures used for DCCs have proven their worth in other areas such as the civil register office ("Standesamt"), waste management or in the purchasing department of the German federal administration.

The digital calibration certificate is already being further developed: a digital twin could contain even more data and software and would thus enable the measurement process to be simulated. Physical weights already have such digital twins which have been successfully tested. This "digital weight" contains both information from calibrations and estimations concerning the expected behaviour of the weight under certain ambient conditions.

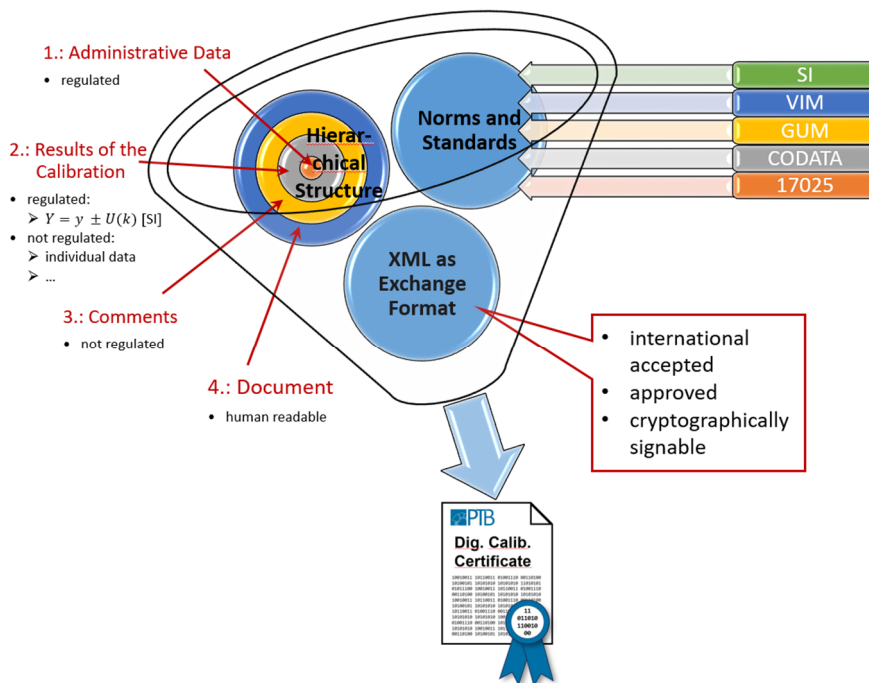
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Fundamental structure of the digital calibration certification (DCC):

1. The (regulated) administrative data contain essential information. They are indispensable for unambiguous identification. Their data fields are therefore defined by default.
2. The area of measurement results is regulated if the following statements based on the SI are made: symbol, measurement value, expanded measurement uncertainty, coverage factor, unit and time (optional). In addition, it is also possible to realize units outside the SI (e.g. nautical miles, millimetre of mercury, degree Oechsle). Independent of this, the indications stated in SI units always apply.
3. Comments and diagrams are saved in the non-regulated part. Data may also be deposited here in already existing data exchange formats (or in formats to be created).
4. A file which can be read by man and could be similar to the analogue calibration certificate completes the DCC.