

A universal and flexible structure for digital calibration certificates (DCC)

Document describing the basic concept

This document specifies the principle design specifications for digital calibration certificates. These principles are the basis for all applications that will: process, transmit or receive calibration certificates according to the specifications of DIN EN ISO/IEC 17025 [1].

In order to exchange calibration certificates in a digital environment, it is essential to have a uniform and internationally accepted fundamental design. This design must be defined in a way that all information specified in the ISO 17025 [1] standard are respected.

The metrological data included in digital certificates must consist of a numerical value and a corresponding unit as a minimum. These specifications are described in deliverable 1 [2] of the project.

The overall purpose is to build the foundations for uniform digital communications based on existing metrological standards (figure 1).



Figure 1 SmartCom paradigm digital communication of metrological data based on fundamental metrological guides.

Fundamental DCC-Layout

The DCC designed within the project is structured in 4 layers (Fig. 2).

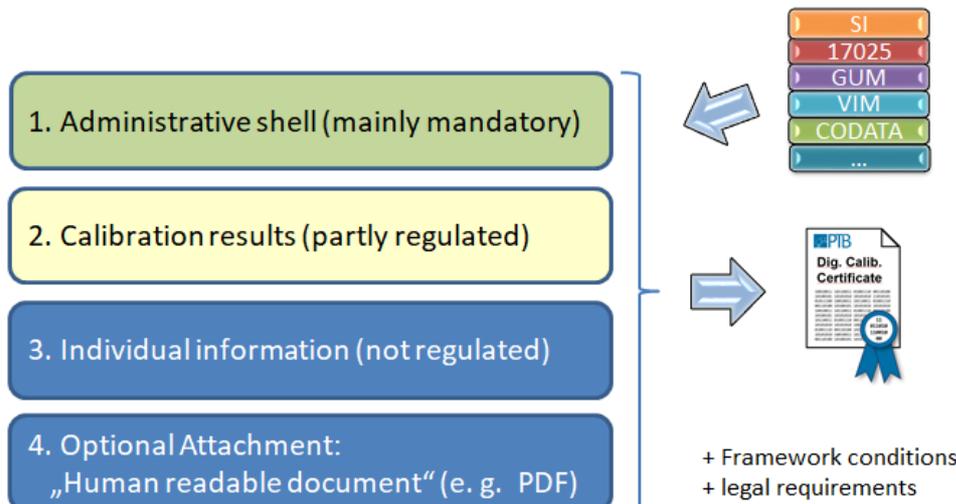


Figure 2 General structure of digital calibration certificates

Administrative Layer

The administrative layer represents regulated (administrative) data. It contains required information of core interest (i.e. is not optional), for example, for the unambiguous identification and collection of administrative information of the DCC.

Calibration results

This layer contains: regulated area of the measurement results, following the rules for the D SI format [1]; as well as an unregulated area for individual additional information e. g. individual calibration information.

Individual information

For general, optional, and additional comments, calculation tables and graphics of any individual data formats, typically requested by the recipient of the certificate

Optional Attachment

Here, a human viewable file can be stored (e.g. pdf format), which will typically be a conventional analogue calibration certificate. This layer will not be machine readable.

In Figure 3 the practical implementation is shown.

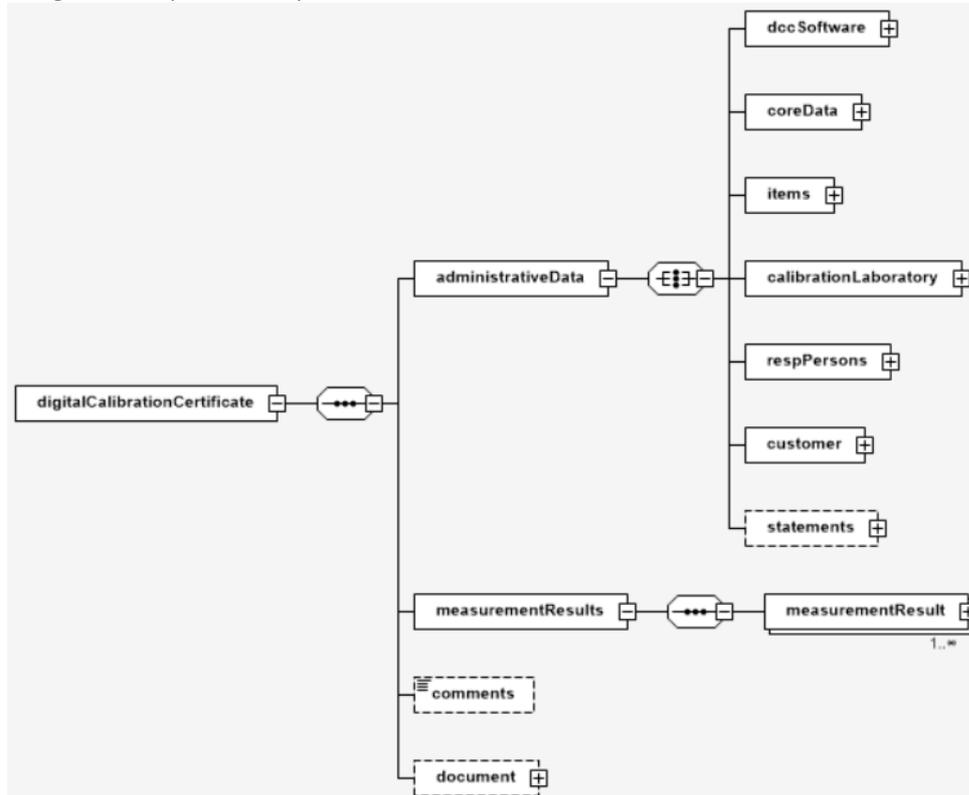


Figure 3 practical implementation

Layer 1:

| | |
|--------------------------------|--|
| Dcc Software: | Description of used software |
| Core date: | administrative information like language settings or date |
| Items: | description of calibrated items |
| Calibration laboratory: | unambiguous identification of calibration laboratory |
| Resp. person: | person responsible for the calibration |
| customer: | formal description of customer data |
| statements: | general statements according ISO 17025 or institutional specifications |

Layer 2-4: To be used as described above

General Framework conditions

- (long-term) preservation of readability, integrity and authenticity
- stable data format
- electronic signatures
- allow for mutual recognition across borders
- comply with privacy policy
- interoperability
- preservation of controllability of data
- allow for verification/ validation of data
- ensure usability
- allow for withdrawal

Summary

In the future, calibration services will require the exchange of comprehensive digital contents of all kinds between customer/applicant and calibration service provider. Therefore, digital interfaces must be developed and provided in a way, that ensures: authenticity; completeness of the transmitted data; data integrity and protection against manipulation as well as the protection of confidentiality. A first step is to define the fundamental structure of such digital documents. The fundamental structure will be based on agreed standards including DIN EN ISO/IEC 17025 for calibration certificates. The structure described above provides for the integration of all aspects of DIN EN ISO/IEC 17025. Firstly, industrial applications have been considered and have proven to be suitable for industrial needs.

The structure described above has been developed within the EMPIR project SmartCom and is not dependent on any programming language and will work with many file formats including XML and JSON. Used identifiers and correct expression of measurement results have been harmonised worldwide to ensure international (machine) readability of the documents.

References

- [1] DIN EN ISO/IEC 17025:2018-03 General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2017)
- [2] Digital System of Unites – D-SI, Guide for the use of the metadata-format used in metrology for the easy-to-use, safe, harmonised and unambiguous digital transfer of metrological data. DOI: 10.5281/zenodo.3522631

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