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Instructions on how to use the DCC schema to create a digital calibration certificate for weights and weight sets

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Deutscher Kalibrierdienst (DKD) – German Calibration Service

Since its foundation in 1977, the German Calibration Service has brought together calibration laboratories of industrial enterprises, research institutes, technical authorities, inspection and testing institutes. On 3rd May 2011, the German Calibration Service was reestablished as a *technical body* of PTB and accredited laboratories.

This body is known as *Deutscher Kalibrierdienst* (DKD for short) and is under the direction of PTB. The guidelines and guides developed by DKD represent the state of the art in the respective areas of technical expertise and can be used by the *Deutsche Akkreditierungsstelle GmbH* (the German accreditation body – DAkkS) for the accreditation of calibration laboratories.

The accredited calibration laboratories are now accredited and supervised by DAkkS as legal successor to the DKD. They carry out calibrations of measuring instruments and measuring standards for the measurands and measuring ranges defined during accreditation. The calibration certificates issued by these laboratories prove the traceability to national standards as required by the family of standards DIN EN ISO 9000 and DIN EN ISO/IEC 17025.

Contact:
Physikalisch-Technische Bundesanstalt (PTB)
DKD Executive Office
Bundesallee 100 38116 Braunschweig
P.O. Box 33 45 38023 Braunschweig
Germany
Telephone: +49 531 592 8021
Internet: https://www.ptb.de/cms/en/metrological-services/dkd.html

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Authors:

Dr.-Ing. Gisa Foyer, Physikalisch-Technische Bundesanstalt, Braunschweig, Deutschland
Martin Häfner, Häfner Gewichte GmbH, Oberrot, Deutschland
Dr. Julian Haller, Sartorius Lab Instruments GmbH & Co. KG, Göttingen, Deutschland
Christian Müller-Schöll, Mettler-Toledo Int. Inc., Greifensee, Schweiz
Steffen Osang, Minebea Intec Bovenden GmbH & Co. KG, Bovenden, Deutschland
Alexander Scheibner, Physikalisch-Technische Bundesanstalt, Braunschweig, Deutschland

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Foreword

DKD expert reports aim to provide background information and references in connection with other DKD documents as, for example, the DKD guidelines. In some cases, they may even go far beyond these documents. They do not replace the original DKD documents but do provide a lot of supplementary information worth knowing. The expert reports do not necessarily reflect the views of the DKD's Management Board or Technical Committees in all details.

DKD expert reports are intended to present significant aspects from the field of calibration. Through publication by the DKD they are made available to the large community of calibration laboratories, both nationally and internationally.

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1 Background

Advancing digitalisation does also affect the field of calibration. In view of this development and responding to the needs of industry, the digital calibration certificate (DCC) has been developed [1, 2]. The DCC is an XSD file (XML Schema Definition) that serves as a kind of template for digital calibration certificates for all measurands in XML format (Extensible Markup Language). Its implementation therefore requires further, subject-related specifications. To examine potential applications for the mass calibration of weights and weight sets and to determine the related specifications, the DKD Technical Committee *Mass and Weighing Instruments* has set up a group of experts who have created the present document.

This document describes the contents of the digital calibration certificate for mass, volume and density calibrations of weights and weight sets. The focus here is on the flexible information in the DCC. The mandatory information, such as details of the calibration laboratory, customer or calibration date, is described in [1]. The application of the specifications described here to similar calibration items, such as mass standards or density standards, is possible in many cases without any problems.

The present document refers to version 3.2.1 of the DCC schema. For implementation, it is recommended to refer to the latest version of the schema. This version is completely downward compatible and allows, among other things, improved indication of references.

Given the continuous changes in the field of digital certificates, this report can only reflect the current state of discussions – something to be taken into account in any kind of evaluation or referencing. These changes may refer to changes in the schema file or to higher-level specifications such as coordinated *refType* attributes. The validity of the remaining regulations remains unaffected.

2 DCC - General remarks

The term DCC is used hereinafter to refer to the XSD schema file and its specifications. Detailed examples of the implementation in an XML file can be found in the tables and in the appendix.

2.1 Structure

Generally, the DCC consists of a main element dcc:digitalCalibrationCertificate with five child elements: dcc:administrativeData, dcc:measurementResults, dcc:comments, dcc:document und ds:Signature. Most elements contain sub-elements in which the actual information (calibration certificate number, customer information, calibration results...) is arranged on different levels. This document focuses on the elements dcc:administrativeData and dcc:measurementResults. The remaining elements are explained in the DCCWiki. A potentially relevant use of the ds:Signature element is the "eAttestation" of the German accreditation body DAkkS [2].

2.2 Attributes

It is also possible to attach so-called attributes to various elements. In the DCC these are *id*, *refType* and *refId*. Links are possible with the help of *id* and *refId* (more on this at https://dccwiki.ptb.de/en/id_refid). This is used in section 4.1. *refType* attributes are used to improve machine comprehensibility and are used in particular for elements that occur more than once. More details on the definition and grouping of *refType* attributes can be found in Chapter 5.

2.3 Namespaces

The "namespaces" used in XML indicate the affiliation of an element to a schema. Due to the fact that the digital SI (D-SI) has its own schema in the digital calibration certificate, there are the namespaces "dcc" and "si". The labelling is carried out using the namespace and a separating colon (example: dcc:administrativeData and si:real).

2.4 Notation

In the DCC, lower camel case is used for all contents (elements, attributes, and specifications in *refType*). This means that a) words are combined, b) the initial letter is written in lower case and c) new word beginnings within the composition are written in upper case. Examples of this are dcc:coreData, dcc:respAuthority and dcc:nominalValue.

2.5 Multi-language support

Depending on the element type in the DCC, it is possible to specify several languages. Many values are expressed as numbers, dates, or the like. In these cases, multi-language support is not possible. For the elements dcc:name, dcc:description and dcc:text, however, more than one language can be used continuously (multi-language support). The language is specified in sub-elements by the corresponding country abbreviation: <dcc:content lang="de">Conventional weight</dcc:content> for a German-language variant. Information on the languages used can be found in the element dcc:coreData in the sub-elements dcc:usedLangCodeISO639_1 and dcc:mandatoryLangCodeISO639_1.

2.6 Basic rules in the DCC

2.6.1 The plural in element descriptions

Within the DCC, we often find a combination of the plural form in the parent element and the singular form in the child element.

Example: dcc:measurementResults → dcc:measurementResult

In all cases, it is possible to create a list of child elements here, with the parent element serving as a kind of collective folder. In some cases, it is also possible to globally define a name, a description and other information for a list at parent element level.

2.6.2 Local before global

A lot of information, such as measurement methods or general comments, can be stored at various points in the DCC. Hence, the following statement applies: Local information takes precedence over global information. In the absence of local information, the global information passes on to the next level (below).

Example: If a general reference to accreditation is made in the DCC, then it is to be assumed that the accreditation applies to all the information listed. Individual results outside the scope of accreditation should then be explicitly marked. Alternatively, information on accreditation can also be given exclusively for each individual result.

2.7 D-SI indications in the DCC

The digital SI (D-SI) is described in a separate XML schema; elements are therefore marked with the prefix "si". It concentrates on the indication of numerical values including their uncertainty. A measurement uncertainty can also be dispensed with (see specification of the nominal value in section 3.6).

It should be noted that measurement uncertainties in the D-SI must always be indicated using the same unit as the measurement result. For more information on this schema, see [3] and [4].

The D-SI does also contain various sub-elements. For the mass calibration certificate, however, only the si:real element is used. The sub-elements of the si:real element are listed in the following table.

Element	Explanation	Sample value
si:label	Designation (optional)	nominal value
si:value	Numerical value (double)	1.00000009
si:unit	Unit to numerical value	\kilogram
si:dateTime	Time stamp (optional)	
selection (both optional):	Selection for specifying the measurement uncertainty (optional)	-
si:expandedUnc	Expanded measurement uncertainty Coverage factor Coverage probability Distribution function (optional)	0.00000032 2 0.95
si:coverageInterval	not used here	-

Table 1: Examples of contents in the element D-SI

3 Using the DCC elements for calibrations of weights

3.1 Identification of the calibration certificate

In the dcc:administrativeData element, there are two options for specifying the identification features of the calibration certificate in the dcc:coreData sub-element: dcc:uniqueIdentifier and dcc:identifications. The calibration certificate number should be specified under dcc:uniqueIdentifier and additional information can be stored in individual dcc:identification elements. Possible entries are described in Table 1.

Element	Explanation	Value	Sample value	*refType*
dcc:uniqueIdentifier	Calibration certificate no.	arbitrary text (string)	Example calibration	-
dcc:identifications	List for sub-elements	contains child elements	1 - ∞ dcc:identification	-
dcc:identifications/ dcc:identification	Transaction number	contains child elements	dcc:issuer: calibrationLaboratory dcc:value: 437000111 dcc:name: SAP number	basic_orderNo
dcc:identifications/ dcc:identification	Order number	contains child elements	dcc:issuer: customer dcc:value: 4999922 dcc:name: order number	basic_orderNo

Table 2: Examples of content elements in the element dcc:coreData

3.2 Description of the calibration item(s)

The calibration item is described in the sub-element dcc:items. Therefore, the content here depends on the type of object to be calibrated. Generally, the sub-element contains further sub-elements: dcc:name, dcc:equipmentClass, dcc:description, dcc:owner, dcc:identifications and dcc:item. All elements - except dcc:item - are used in the mass calibration certificate to describe a set of weights as a whole.

In the element dcc:identifications, a list of properties or descriptions can be created, each consisting of a name/designation, a value and the issuing authority. Thus, identifications or identification numbers can be stored here. In the case of an individual calibration certificate for a weight that actually belongs to a set, information regarding the set of weights must also be entered here to ensure compatibility and to identify the piece of weight.

Element	Explanation	Value	Sample value	refType
dcc:name	Name of the calibration item (optional)	-	Set of weights up to 2 kg	-
dcc:equipmentClass	Product standard & accuracy class according to standard (optional)	contains child elements	dcc:reference: OIML R111-1:2004 dcc:classID: E2	-
dcc:description	Housing/box (optional)	-	Storage: The weights are stored in a box of varnished wood.	-
dcc:owner	Owner of the calibration item(s) (optional)	contains child elements		-
dcc:identifications/ dcc:identification	Serial number (of the weight set)	contains child elements	dcc:issuer: manufacturer dcc:value: xyz1234567 dcc:name:de: serial number	basic_serialNo
dcc:item	Several calibration items or parts of an object	contains child elements	see Table 4	-

Table 3: Examples of contents in the element dcc:*items*

The sub-element dcc:item can be used more than once and the descriptions of individual weights can be stored here. In case of calibrating individual weights, the information should also be stored here. In both cases, the assignment of an *id* to this element is important in order to be able to assign the measurement results to the respective object. Again, the elements dcc:name, dcc:description, dcc:manufacturer and dcc:identifications are available for describing the objects. It is recommended to include individual information necessary for the recognition and description of the objects in a list of dcc:identifications with name, description and issuing body. These can be serial numbers, position in the weight set box, shape, material, and others. For frequently used identifiers, the *refType* attributes in section 5.3 must be used.

To specify properties of the calibration item that require a numerical value, the dcc:item element contains the dcc:itemQuantities sub-element, in which values such as the nominal value or dimensions (height, depth, width, diameter) can be specified. Definitions for the *refType* attribute can also be found in section 5.3.

Element	Explanation	Sample value	refType
dcc:name	Name of the element of the set of weights (nominal value)	"2 kg"	-
dcc:equipmentClass	Product standard & accuracy class according to standard (optional)	dcc:reference: OIML R111-1:2004 dcc:classID: E2	-
dcc:description	Human readable description (optional)	Description of packaging	-
dcc:manufacturer/ dcc:name	Name of manufacturer	Weights & Co Ltd.	-
dcc:identification	Internal identification number of the element‘s position in the weight set	dcc:issuer: manufacturer dcc:value: ABC1234 dcc:name: identification number	mass_setPositionNo
dcc:identifications	Shape	dcc:issuer: manufacturer dcc:value: knob weight dcc:name: shape	mass_shape
dcc:identification	Material	dcc:issuer: manufacturer dcc:value: stainless steel dcc:name: Material	mass_material
dcc:identification	Marking including differentiator	dcc:issuer: owner dcc:value: 2* dcc:name: user marking	basic_marking
dcc:itemQuantity	Nominal value	si:value: 2 si:unit: kg	basic_nominalValue
dcc:itemQuantity	Diameter	si:value: 0.12 si:unit: m	mass_diameter

Table 4: Examples of contents in the element dcc:*item*

3.3 Description of the measurement methods

The element dcc:measurementResult contains the sub-element dcc:usedMethods to describe the calibration methods used. This sub-element consists of any number of child elements dcc:usedMethod; each of these child elements contains a name and a description.

Element	Sub-element	Explanation	Sample value
dcc:usedMethod	dcc:name	Name of a (partial) method	Determination of the conventional weighing value
	dcc:description	Description of a (partial) method (optional)	In-house procedure according to instructions xy
	dcc:norm	Indication of a standard	OIML R111-1:2004
dcc:usedMethod	dcc:name	Name of a (partial) method	Determination of the mass
	dcc:description	Description of a (partial) method (optional)	In-house procedure according to instructions xy
	dcc:norm	Indication of a standard	OIML R111-1:2004

Table 5: Example of contents in the element dcc:usedMethods

3.4 Description of measuring equipment

In the element dcc:measuringResult, it is possible to insert several dcc:measuringEquipment elements documenting the measuring equipment used. These elements in turn have eight sub-elements which are described in the following table.

Element	Explanation	Sample value
dcc:name	Name of the measuring equipment	Weighing instrument A
dcc:equipmentClass	Device class (optional)	dcc:reference: OIML R111 dcc:classID: E2
dcc:description	Description of the measuring equipment	comparator balance
dcc:desriptionData	Additional, attached documents	pdf of the calibration certificate of the measuring equipment
dcc:certificate	currently not used indication of a checksum for comparison with a document is intended here	-
dcc:manufacturer	Manufacturer of the measuring equipment, including contact data	manufacturer a street b city xy
dcc:model	type of measuring equipment (model)	Type A8j
dcc:identifications	further information about the measuring equipment in the form of the dcc:identifications as in paragraph 3.2	dcc:issuer: manufacturer dcc:value: 492755j38d dcc:name: identification number

Table 6: Examples of contents in the element dcc:measuringEquipment

3.5 Description of influence quantities

The element dcc:measurementResult contains the sub-element dcc:influenceConditions to describe the influences or boundary conditions acting on the calibration. The element consists of any number of child elements dcc:influenceCondition, which, in addition to name and description, can also have an optional status specification and a dcc:data element for specifying numerical values with or without measurement uncertainty or formulas. When using numerical values, the D-SI schema is used here; it is described in more detail in section 2.7.

Ambient conditions can also be specified with upper and lower limits instead of a single value. For this purpose, two dcc:quantity elements with maximum and minimum values are created in the same dcc:data element. For differentiation, the dcc:quantity elements each receive a *refType*: basic_max and basic_min.

For influencing conditions that refer to properties from previous measurements, it is possible to refer to existing documents with the element dcc:certificate.

Element	Sub-element	Sample value	*refType*
dcc:influenceCondition	dcc:name	Temperature	basic_temperature
	dcc:data	21.5°C U = 0.5°C (k = 2)	basic_mean
dcc:influenceCondition	dcc:name	Density of the weight	mass_density
	dcc:certificate	dcc:referral: Certificate XXX issued YYYY-MM-DD from YYY dcc:referralID: 1.82-17 zt 5	-
	dcc:data	8010 kg/m³ U = 30 kg/m³ (k = 2)	basic_referencedValue
dcc:influenceCondition	dcc:name	Air pressure	basic_airPressure
	dcc:data (with 2 dcc:quantity elements)	1008.04 hPa U = 0.06 hPa (k = 2)	basic_min
		1008.18 hPa U = 0.06 hPa (k = 2)	basic_max

Table 7: Example of contents in the element dcc:influenceCondition

3.6 Description of results

The element dcc:results offers the possibility to insert several result elements. These again have three sub-elements: dcc:name (mandatory), dcc:description (optional) and dcc:data (mandatory). Hence, each result has a name. For mass, these would be "Conventional weighing value" and "Mass" (see introduction chapter 4).

NOTE: Since the same measurements are used to determine mass and conventional weight value, these results are listed here in just one dcc:measurementResult (see also example in Appendix A). Therefore, they are indicated as two results of the same measurement, each of them having the same ambient conditions (see section 3.5).

In both cases, two or, if applicable, three sub-elements dcc:data are used to represent the measurement result. This element in turn provides the possibility to enter texts, lists, formulas, and individual measurement values. In the case of the mass calibration certificate, the sub-element dcc:quantity and, within it, the si:real are used, as is the case with the sub-element dcc:influenceConditions (see paragraph 4.2).

The nominal value of the weight is specified in machine-readable form in the *results* element. This is done in addition to its specification in the *item* element (identification for the human user) since the nominal value also corresponds to the uncorrected indication value of an indicating measuring device (see 3.6 and 4.1 in [5]).

As for the result "conventional weighing value", the nominal value as well as the determined value and/or also the deviation of the nominal value can be indicated here. For the result of mass, the nominal value and the determined value are indicated. For each of the two results ("conventional weighing value" and "mass"), a dcc:data element is used containing a simple string of dcc:quantity elements (see Table 7 and examples given in the appendix). In this case, the D-SI scheme is used. It is described in more detail section 2.7.

NOTE: There are calibrations for which only one dcc:result element is present. This applies, for example, but not only, to mass calibrations of density standards. In these cases, it is not necessary to specify a nominal value.

Element	Sub-element	Explanation	Sample value	refType
dcc:results	dcc:result	Parent element for a single result	Child elements	mass_conventionalMass
dcc:result	dcc:name	Name of the result	Conventional weighing value	-
dcc:result	dcc:data (with 3 dcc:quantity elements)	Result	1.0000009 kg U = 0.0000032 kg (k = 2)	basic_measuredValue
		Nominal value (si:real)	1 kg	basic_nominalValue
		Deviation	0.0000009 kg U = 0.0000032 kg (k = 2)	basic_measurementError
dcc:results	dcc:result	Parent element for a single result	Child elements	mass_mass
dcc:result	dcc:name	Name of the result	Mass	-
dcc:result	dcc:data	Result	1.0000003 kg U = 0.0000032 kg (k = 2)	basic_measuredValue

Table 7: Examples of contents in the element dcc:results

3.7 Special case dcc:measurementMetaData

The element dcc:measurementMetaData can be found in several places in the area dcc:measurementResults. Specifically, this is the case for the following elements:

- dcc:measurementResult
- dcc:quantity (sub-element of dcc:data, present in the elements dcc:influenceCondition, dcc:result and dcc:statement)
- dcc:list (sub-element of dcc:data, present in the elements dcc:influenceCondition, dcc:result and dcc:statement)

It contains any number of sub-elements dcc:metaData, which are structured identically to the dcc:statement element. These are used to make statements not only globally for the entire calibration certificate (dcc:statements), but also in relation to individual measurement results (dcc:measurementResult) and individual measured values (dcc:quantity and dcc:list).

An example of use is the specification of reference temperature, pressure etc. for e.g. the conventional weight value (see Table 8). In addition, statements on conformity or the scope of accreditation can be specified. Details on these scenarios can be found in the following chapter.

Element	Sub element	Explanation	Sample value
dcc:metaData	refType		basic_referenceTemperature
	dcc:data	dcc:quantity: 20 °C	

Table 8: Example of contents in the element dcc:measurementMetaData

4 Application rules for weights and weight sets in DCCs

4.1 Weight sets in DCCs

Weights can be available individually or as a set. In principle, the calibrations of the individual pieces in a set are regarded as individual calibrations. It should therefore also be possible to issue several individual DCCs. In the future, a tool is planned with which these individual DCCs of a weight set can be summarised (“envelope”). However, it is also possible to display the calibrations of the individual pieces together within a single DCC.

In general, it is desirable to find a standardised solution for this. In this report, the current possibilities are presented without a decision in favour of one variant in order to support further discussion. The proposals developed therefore also focus on compatibility between the approaches. To ensure this, some general rules must be followed:

Analogous to the subdivision of the element dcc:items into any number of item elements, several results dcc:measurementResult can be accommodated in the measurement results part dcc:measurementsResults of the DCC. The suggestion for mass calibrations is to use one dcc:measurementResult per weight item. The premise here is generally to use one dcc:measurementResult for each “separable” measurement. This means that if, in case of doubt, several calibration certificates can be issued, the information must be separated. This also ensures compatibility if data from several documents is to be used. For mass calibration in particular, this means that it should not matter whether one single calibration certificate or a corresponding number of individual calibration certificates are issued for a set of weights.

Each dcc:item is given a unique id attribute for the assignment of the weight to the result. In addition to a name and a human-readable description, each dcc:measurementResult element also has the refId attribute, which is used to set the reference to objects listed in the dcc:items area. The values of id and refId must be identical.

4.2 Classification of properties of a weight: dcc:itemQuantities vs. dcc:influenceCondition

4.2.1 Definitions from DCCWiki:

dcc:itemQuantities (https://dccwiki.ptb.de/en/dccitem) “The element dcc:itemQuantity was introduced to specify machine-readable physical properties. It is used exclusively to specify unchangeable values which originate, for example, from the manufacturer’s data sheet. This field is not used to reproduce the entire data sheet.”

dcc:influenceCondition (https://dccwiki.ptb.de/en/dccmeasurementResult) “In this element, the influences (e.g., environmental parameters) on the measurement can be entered. Measurement results can also be stored here that are no longer up-to-date due to adjustment or repair.”

dcc:influenceCondition (https://dccwiki.ptb.de/en/dccinfluenceConditionType) “In dcc:influenceConditionType conditions are described which have influence on the calibration results. In this type, it is also possible to store the measurement values that are no longer current if a repair or adjustment was carried out on the calibration item.”

4.2.2 Difference in structure

dcc:itemQuantity	**dcc:influenceCondition**
composed similarly to one dcc:quantity-element	Has a dcc:data element which can contain several dcc:quantity elements
No additional information such as dcc:measurementMetaData possible	dcc:quantity elements can have additional information such as dcc:measurementMetaData
Only one general refType identifier can be given at dcc:itemQuantity (e.g. mass_density)	one general refType identifier can be given at dcc:influenceCondition (e.g. mass_density); additional refType identifier (e.g. basic_referencedValue) can be given at each dcc:quantity element

4.2.3 Conventions of use

Quantities that may vary for the same calibration item from one calibration to another calibration and that are known to have an influence on the calibration result and/or its uncertainty should be given as dcc:influenceCondition. For such quantities usually values measured during the calibration are taken.

Quantities that can be considered to be always the same for one calibration item and that are primarily documented for the characterization of the item should be given as dcc:itemQuantity (even though they have an influence on the calibration result and/or its uncertainty). For such quantities usually assumed or estimated values or values taken from specifications are taken.

4.2.4 Examples in the field of mass

dcc:itemQuantity

- basic_nominalValue
- mass_compressibility
- mass_length
- mass_width
- mass_height
- mass_centerOfGravityHeight
- mass_surfaceRoughnessRa
- mass_surfaceRoughnessRz
- mass_density
- mass_magneticPolarization

dcc:influenceCondition

- mass_volume
- mass_magneticPolarization
- mass_magneticSusceptibility
- mass_density
- mass_surfaceRoughnessRa
- mass_surfaceRoughnessRz

4.3 Good Practice: interventions in a DCC

Each single measurement of a chain of interventions shall be given in a dcc:measurementResult with the corresponding ambient conditions, methods, equipment and results.

Each measurement of a chain of interventions shall include a dcc:influenceCondition element with a dcc:status element:

Type of intervention	Content of dcc:status element
none (as found)	-
Cleaning; adjustment	beforeAdjustment and afterAdjustment
Repair; exchange	beforeRepair and afterRepair

In case of a replaced calibration item, both items shall be listed in dcc:items and the dcc:measurementResult elements shall reference these with refId.

NOTE: According to the DCCWiki the previous results should be given in a dcc:influenceCondition element. This is demonstrated in a good practice example. This solution should only be considered for purely informative reasons.

4.3.1 Example for before and after adjustment

```
<dcc:administrativeData>
  ...
  <dcc:items>
    <dcc:item id="item1">
      ...
    </dcc:item>
...
  </dcc:items>
  ...
</dcc:administrativeData>
<dcc:measurementResults refId="item1">
  <dcc:measurementResult>
    <dcc:influenceConditions>
      <dcc:influenceCondition>
      <dcc:name>
        <dcc:content>Calibration before adjustment</dcc:content>
      </dcc:name>
      <dcc:status>beforeAdjustment</dcc:status>
      </dcc:influenceCondition>
      ...
    </dcc:influenceConditions>
    ...
  </dcc:measurementResult>
  <dcc:measurementResult refId="item1">
    <dcc:influenceConditions>
      <dcc:name>
        <dcc:content>Calibration after adjustment</dcc:content>
      </dcc:name>
      <dcc:influenceCondition>
      ...
      <dcc:status>afterAdjustment</dcc:status>
      </dcc:influenceCondition>
      ...
    </dcc:influenceConditions>
    ...
  </dcc:measurementResult>
</dcc:measurementResults>
```

4.3.2 Example for exchange of item in a set

```
<dcc:administrativeData>
  ...
  <dcc:items>
    <dcc:item id="item1">
      ...
      <dcc:identifications>
        <dcc:identification refType="mass_setPositionNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>b4</dcc:value>
        </dcc:identification>
      </dcc:identifications>
    </dcc:item>
    <dcc:item id="item2">
      ...
      <dcc:manufacturer>
        <dcc:name>
          <dcc:content>Weights Co Ltd.</dcc:content>
        </dcc:name>
      </dcc:manufacturer>
      <dcc:identifications>
        <dcc:identification refType="mass_setPositionNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>a2</dcc:value>
        </dcc:identification>
      </dcc:identifications>
    </dcc:item>
    <dcc:item id="item3">
      ...
      <dcc:manufacturer>
        <dcc:name>
          <dcc:content>Mass Creators GmbH</dcc:content>
        </dcc:name>
      </dcc:manufacturer>
      <dcc:identifications>
        <dcc:identification refType="mass_setPositionNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>a2</dcc:value>
        </dcc:identification>
      </dcc:identifications>
    </dcc:item>
  </dcc:items>
  ...
</dcc:administrativeData>
<dcc:measurementResults>
  <dcc:measurementResult refId="item1">
    ...
  </dcc:measurementResult>
  <dcc:measurementResult refId="item2">
    <dcc:influenceConditions>
      <dcc:influenceCondition>
      <dcc:name>
        <dcc:content>Calibration before weight piece exchange</dcc:content>
      </dcc:name>
      <dcc:status>beforeRepair</dcc:status>
      </dcc:influenceCondition>
      ...
    </dcc:influenceConditions>
    ...
  </dcc:measurementResult>
  <dcc:measurementResult refId="item3">
```

```
      <dcc:influenceConditions>
        <dcc:influenceCondition>
        <dcc:name>
          <dcc:content>Calibration after weight piece exchange</dcc:content>
        </dcc:name>
        <dcc:status>afterRepair</dcc:status>
        </dcc:influenceCondition>
        ...
      </dcc:influenceConditions>
      ...
    </dcc:measurementResult>
</dcc:measurementResults>
```

4.4 Good Practice: decision rules in a DCC

NOTE 1: It is generally up to the laboratory to decide which quantities shall/must be given.

NOTE 2: In ISO/IEC 17025:2017 7.1.3 there is an explicit difference between decision rules taken from a requested specification or standard and those agreed with the customer. It is therefore recommended to use the dcc:norm element to reference a standard or specification as the source of the decision rule and to use the dcc:reference element for decision rules agreed with the customer.

NOTE 3: The type of the decision rule is given in dcc:declaration. Typically, one of the following statements is used:

1. binary statement for simple acceptance rule
2. binary statement with guard band
3. non-binary statement with guard band

4.4.1 Used refType identifiers

1. basic_decisionRule
2. basic_minTUR
3. basic_maxPFA
4. basic_maxPFR
5. basic_guardBand

4.4.2 Example for weights for which the decision rule is taken from OIML R111-1:2004

```
<dcc:statement refType="basic_decisionRule">
<dcc:norm>OIML R111-1:2004</dcc:norm>
  <dcc:declaration>
    <dcc:name>
      <dcc:content lang="en">Decision rule</dcc:content>
    </dcc:name>
  <dcc:content lang="en">Binary Statement with Guard Band w=U</dcc:content>
    </dcc:declaration>
  <dcc:data>
  <dcc:quantity refType="basic_minTUR">
    <dcc:name>
      <dcc:content lang="en">Min. TUR</dcc:content>
    </dcc:name>
    <dcc:description>
      <dcc:content lang="en">Minimum allowed Test Uncertainty ratio. For smaller TUR values, no conformity statemen
t is made.</dcc:content>
    </dcc:description>
    <si:real>
          <si:value>3</si:value>
          <si:unit>\one</si:unit>
          </si:real>
```

```
  </dcc:quantity>
  <dcc:quantity refType="basic_maxPFA">
    <dcc:name>
      <dcc:content lang="en">Max. PFA</dcc:content>
    </dcc:name>
    <dcc:description>
      <dcc:content lang="en">Maximum probability of false acceptance associated with the applied decision rule</dcc:co
ntent>
    </dcc:description>
    <si:real>
          <si:value>0.02275</si:value>
          <si:unit>\one</si:unit>
          </si:real>
  </dcc:quantity>
  <dcc:quantity refType="basic_maxPFR">
    <dcc:name>
      <dcc:content lang="en">Max. PFR</dcc:content>
    </dcc:name>
    <dcc:description>
      <dcc:content lang="en">Maximum probability of false rejection associated with the applied decision rule</dcc:cont
ent>
    </dcc:description>
    <si:real>
          <si:value>0.97725</si:value>
          <si:unit>\one</si:unit>
          </si:real>
  </dcc:quantity>
  <dcc:formula refType="basic_guardBand">
      <dcc:latex>w=U</dcc:latex>
    </dcc:formula>
 </dcc:data>
</dcc:statement>
```

4.4.3 *Example for decision rule agreed with the customer*

```
<dcc:statement refType="basic_decisionRule">
  <dcc:reference>customer</dcc:reference>
  <dcc:declaration>
    <dcc:name>
      <dcc:content lang="en">Decision Rule</dcc:content>
    </dcc:name>
    <dcc:content lang="en">Binary Statement for Simple Acceptance Rule (w=0)</dcc:content>
  </dcc:declaration>
  <dcc:data>
    <dcc:quantity refType="basic_minTUR">
      <dcc:name>
        <dcc:content lang="en">Min. TUR</dcc:content>
      </dcc:name>
      <dcc:description>
        <dcc:content lang="en">Minimum allowed Test Uncertainty ratio - for smaller TUR values, no conformity state
ment is made</dcc:content>
      </dcc:description>
      <si:real>
        <si:value>10</si:value>
        <si:unit>\one</si:unit>
      </si:real>
    </dcc:quantity>
    <dcc:quantity refType="basic_maxPFA">
      <dcc:name>
        <dcc:content lang="en">Max PFA</dcc:content>
      </dcc:name>
```

```
        <dcc:description>
          <dcc:content lang="en">Maximum probability of false acceptance associated with the applied decision rule</dcc:
content>
        </dcc:description>
        <si:real>
          <si:value>0.5</si:value>
          <si:unit>\one</si:unit>
        </si:real>
      </dcc:quantity>
      <dcc:quantity refType="basic_maxPFR">
        <dcc:name>
          <dcc:content lang="en">Max. PFR</dcc:content>
        </dcc:name>
        <dcc:description>
          <dcc:content lang="en">Maximum probability of false rejection associated with the applied decision rule</dcc:c
ontent>
        </dcc:description>
        <si:real>
          <si:value>0.5</si:value>
          <si:unit>\one</si:unit>
        </si:real>
      </dcc:quantity>
      <dcc:formula refType="basic_guardBand">
        <dcc:latex>w=0</dcc:latex>
      </dcc:formula>
    </dcc:data>
</dcc:statement>
```

4.5 Good Practice: usage of refType="basic_isInCMC"

This refType is used to clearly and transparently identify those results that are covered by the CMCs (calibration and measurement capabilities) or the scope of accreditation of a calibration laboratory.

This refType may only be used in DCCs of accredited calibration laboratories if at least part of the reported results are within the scope of accreditation or in DCCs of calibration laboratories of national metrology institutes if at least part of the reported results are within their CMCs according to the BIPM database.

At first, the refType is to be used with a dcc:statement element in the administrative part of the DCC as follows:

```
<dcc:statement refType="basic_isInCMC">
  <dcc:reference>{0,unbounded}</dcc:reference><!--A link to the scope of accreditation (e.g. in the database of the accred
itation body or the BIPM) can be provided here. In the future, a link to a machine-readable CMC database is also conceivabl
e.-->
  <dcc:declaration>
    <dcc:content lang="en">This result is within the calibration and measurement capabilities of the laboratory.</dcc:conte
nt>
  </dcc:declaration><!-- Identical explanations can also be given in other languages -->
  <dcc:valid>true</dcc:valid><!--Element must be "true" -->
   <dcc:respAuthority>Deutsche Akkreditierungsstelle GmbH</dcc:respAuthority><!-- Indication of the relevant accredit
ation body -->
</dcc:statement>
```

The refType shall then be added to every measurement result, for which the above dcc:statement is true. This shall always be done at the highest possible applicable level of the DCC:

- <dcc:measurementResult refType="basic_isInCMC"> means that all results within this dcc:measurementResult block are within the CMCs
- <dcc:result refType="basic_isInCMC"> means that all results within this dcc:result block are within the CMCs
- If only some of the results of an XMLListtype element are within the CMCs, this should be indicated by a dcc:measurementMetaData element:

```
<si:realListXMLList>
        <si:valueXMLList>0.00000000 0.00000001 -0.00000001 0.00000001 -0.00000001</si:valueXMLList>
        <si:unitXMLList>\kilogram</si:unitXMLList>
        <si:expandedUncXMLList>
          <si:uncertaintyXMLList>0.000000033 0.000000073 0.00000012 0.00000019 0.00000027</si:uncertaintyXMLList>
          <si:coverageFactorXMLList>2.87 2.01 2.00 2.00 2.00</si:coverageFactorXMLList>
          <si:coverageProbabilityXMLList>0.95</si:coverageProbabilityXMLList>
          <si:distributionXMLList>normal</si:distributionXMLList>
        </si:expandedUncXMLList>
      </si:realListXMLList>
      <dcc:measurementMetaData>
        <dcc:metaData refType="basic_isInCMC basic_isInCMC basic_isInCMC basic_isInCMC basic_isInCMC">
    </dcc:measurementMetaData>
```

4.5.1 *Used refType identifiers*

1. basic_isInCMC

4.5.2 *Example for a DAkkS accredited calibration lab:*

```
<dcc:statement refType="isInCMC">
  <dcc:reference>D-K-xxxxx-yy-zz</dcc:reference>
  <dcc:declaration>
    <dcc:content lang="en">This result is within the calibration and measurement capabilities.</dcc:content>
  </dcc:declaration>
  <dcc:valid>true</dcc:valid>
  <dcc:respAuthority>
    <dcc:name>
      <dcc:content>DAkkS</dcc:content>
    </dcc:name>
    <dcc:eMail>info@dakks.de</dcc:eMail>
    <dcc:location>
      <dcc:city>Braunschweig</dcc:city>
    </dcc:location>
  </dcc:respAuthority>
</dcc:statement>
```

4.5.3 *Example for an NMI:*

```
<dcc:statement refType="isInCMC">
  <dcc:reference>CIPM-MRA</dcc:reference>
  <dcc:declaration>
    <dcc:content lang="en">This result is within the calibration and measurement capabilities.</dcc:content>
  </dcc:declaration>
  <dcc:valid>true</dcc:valid>
  <dcc:respAuthority>
    <dcc:name>
      <dcc:content>CIPM</dcc:content>
    </dcc:name>
```

```
      <dcc:eMail>info@cipm.de</dcc:eMail>
      <dcc:location>
        <dcc:city>Paris</dcc:city>
      </dcc:location>
    </dcc:respAuthority>
</dcc:statement>
```

4.6 Good Practice: Conditions at the calibration item

If a specific medium at the calibration item is described, for example a measuring liquid or a gas with a special composition or reduced pressure, a dcc:measuringEquipment element with the refType “mass_medium” shall be used.

The environmental conditions and other influencing factors of the described medium are also tagged with the refType “mass_medium”.

4.6.1 Used refType identifiers

1. mass_medium

4.6.2 Example of a volume calibration for a weight in liquid

```
<dcc:measurementResult>
  ...
  <dcc:measuringEqupiments>
    <dcc:measuringEquipment refType="mass_medium">
      <dcc:name>
        <dcc:content>Measurement fluid<dcc:content>
      </dcc:name>
      <dcc:description>
        <dcc:content>The measurement has been performed in water.</dcc:content>
      </dcc:description>
      <dcc:measuringEquipmentQuantities>
        <dcc:measuringEquipmentQuantity>
          <dcc:name>
            <dcc:content lang="en">Density of water</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>997</si:value>
            <si:unit>\kilogram\metre\tothe{-3}</si:unit>
            <si:expandedUnc>
              <si:uncertainty>1</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:measuringEquipmentQuantity>
      </dcc:measuringEquipmentQuantities>
    </dcc:measuringEquipment>
  </dcc:measuringEqupiments>
  <dcc:influenceConditions>
    <dcc:influenceCondition refType="basic_temperature mass_medium">
      <dcc:name>
        <dcc:content lang="en">measuring liquid temperature</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_min">
          <dcc:name>
            <dcc:content lang="en">measuring liquid temperature (minimal)</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>20.0000</si:value>
```

```
            <si:unit>\degreeCelsius</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.0040</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
        <dcc:quantity refType="basic_max">
          <dcc:name>
            <dcc:content lang="en">measuring liquid temperature (maximal)</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>20.0001</si:value>
            <si:unit>\degreeCelsius</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.0040</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
  </dcc:influenceConditions>
  ...
</dcc:measurementResult>
```

4.6.3 Example of a weight calibrated at reduced air pressure

```
<dcc:measurementResult>
  ...
  <dcc:measuringEqupiments>
    <dcc:measuringEquipment refType="mass_medium">
      <dcc:name>
        <dcc:content>Vacuum<dcc:content>
      </dcc:name>
      <dcc:description>
        <dcc:content>The measurement has been performed in a vacuum.</dcc:content>
      </dcc:description>
    </dcc:measuringEquipment>
  </dcc:measuringEqupiments>
  <dcc:influenceConditions>
    <dcc:influenceCondition refType="basic_airPressure mass_medium">
      <dcc:data>
        <dcc:quantity refType="basic_mean">
          <si:real>
            <si:value>2</si:value>
            <si:unit>\pascal</si:unit>
            <si:expandedUnc>... </si:expandedUnc>
          </si:real>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
  </dcc:influenceConditions>
  ...
</dcc:measurementResult>
```

4.7 Good Practice: Density and volume of weights

The results from density and volume calibrations for weights are reported in the same way as the mass results. This also applies to other details such as influence conditions (temperature,

air pressure, etc.), description of the measuring equipment (especially the measuring liquid) and description of the calibration item (identifiers and properties such as the volume expansion coefficient).

Each individual result must be reported in a separate dcc:measurementResult element, analogous to the indication of the number of weights or interventions. This applies to results of different measurands (volume, mass, density) and for measurements under different ambient conditions.

Density and volume results generally do not contain nominal values. Therefore, the specification in dcc:result is omitted and only the measured value is given.

4.7.1 Example of a volume result

```
<dcc:result refType="mass_volume">
  <dcc:name>
    <dcc:content lang="en">volume</dcc:content>
  </dcc:name>
  <dcc:data>
    <dcc:quantity refType="basic_measuredValue">
      <si:real>
        <si:value>147.75593E-6</si:value>
        <si:unit>\metre\tothe{3}</si:unit>
        <si:expandedUnc>
                <si:uncertainty>5E-10</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                    <si:coverageProbability>0.95</si:coverageProbability>
          </si:expandedUnc>
      </si:real>
      <dcc:measurementMetaData>
        <dcc:metaData refType="basic_referenceTemperature">
          <dcc:data>
            <dcc:quantity>
              <dcc:name>
                <dcc:content lang="en">temperature</dcc:content>
              </dcc:name>
              <si:real>
                <si:value>20.00</si:value>
                <si:unit>\degreeCelsius</si:unit>
              </si:real>
            </dcc:quantity>
          </dcc:data>
        </dcc:metaData>
        <dcc:metaData refType="basic_referenceAirPressure">
          <dcc:data>
            <dcc:quantity>
              <dcc:name>
                <dcc:content lang="en">air pressure</dcc:content>
              </dcc:name>
              <si:real>
                <si:value>101325</si:value>
                <si:unit>\pascal</si:unit>
              </si:real>
            </dcc:quantity>
          </dcc:data>
        </dcc:metaData>
      </dcc:measurementMetaData>
    </dcc:quantity>
  </dcc:data>
</dcc:result>
```

5 List of refType identifiers for mass calibration

5.1 Scope

This document gives a list of refType-terms based on the concept of the DCC (Digital Calibration Certificate) described under “wording” (DCCWiki). The list also gives definitions for terms that are already accepted as “basic” but focuses on the special terms needed for calibration certificate in mass for weights and mass pieces. These carry the prefix „mass_ “. The list is split into categories and within those ordered alphabetically. The order has no implication on the importance or frequency of use of the term. All uses are recommendations.

It is planned to transfer the list of all refType-terms (both basic_ and subject-specific) to a publicly accessible database in the near future for better referencing and dynamic expansion.

5.2 Introduction

The list contains refType identifiers in the following form of description:

refType identifier (title of the chapter)

definition of the identifier

PREFIX:	either basic_ or mass_
SOURCE:	source of the definition of the identifier
NOTE:	note for a better understanding of the identifier; reference to external definitions; reference to another source for explanation of use
EXAMPLE:	Specific example for the use of the refType identifier.
ELEMENT:	dcc element at which the identifier is supposed to be used

5.3 Alphabetical list of identifiers

5.3.1 acceptanceLimitLower

lower bound of permissible measured quantity values

PREFIX:	basic_
NOTE 1:	acceptance limit in JCGM 106:2012, 3.3.8
NOTE 2:	Used as information in a conformity statement for a measured quantity value either in dcc:result or as a referenced value in dcc:influenceCondition.
EXAMPLE:	For weight pieces according to OIML R111-1:2004 it is nominal value minus maximum permissible error plus expanded measurement uncertainty.
ELEMENT:	dcc:quantity in dcc:metaData

5.3.2 acceptanceLimitUpper

upper bound of permissible measured quantity values

PREFIX:	basic_
NOTE 1:	acceptance limit in JCGM 106:2012, 3.3.8
NOTE 2:	Used as information in a conformity statement for a measuremed quantity value either in dcc:result or as a referenced value in dcc:influenceCondition.
EXAMPLE:	For weight pieces according to OIML R111-1:2004 it is nominal value plus maximum permissible error minus expanded measurement uncertainty.
ELEMENT:	dcc:quantity in dcc:metaData

5.3.3 airDensity

ambient air density

PREFIX: mass_
ELEMENT: dcc:influenceCondition

5.3.4 airPressure

ambient air pressure

PREFIX: mass_
ELEMENT: dcc:influenceCondition

5.3.5 calibrationMark

full alphanumeric content of the calibration mark

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: The calibration mark usually is the visual appearance of the calibration label according to ILAC P8:03/2019, Section 8.1
NOTE 2: Content depends on regulations such as DAkkS document 71 SD 0 025 and can vary.
ELEMENT: dcc:identification in dcc:coreData

5.3.6 centerOfGravityHeight

distance from the base of the horizontal plane to the centre of gravity

PREFIX: mass_
NOTE: The center of gravity is the central point of gravitational force acting on a body.
ELEMENT: dcc:itemQuantity

5.3.7 certificateId

identifier of the calibration certificate

PREFIX: mass_
ELEMENT: dcc:identification in dcc:coreData

5.3.8 certificateNo

number of the calibration certificate

PREFIX: mass_
ELEMENT: dcc:identification in dcc:coreData

5.3.9 co2Fraction

fraction of carbon dioxide

PREFIX: mass_
NOTE: The fraction of carbon dioxide can be measured or calculated.
ELEMENT: dcc:influenceCondition

5.3.10 conventionalMass

result of the calibration for a conventional value of the result of weighing in air

PREFIX: mass_
NOTE 1: Based on OIML R111-1:2004 2.7
NOTE 2: See also JCGM 200:2012 (VIM) 2.12 “conventional quantity value”
ELEMENT: dcc:result

5.3.11 compressibility

compressibility

PREFIX: mass_
SOURCE: ISO 80000-4:2019
ELEMENT: dcc:itemQuantity

5.3.12 conformity

statement of conformity for a result

PREFIX: basic_
NOTE 1: ISO/IEC 17025:2017 7.8.4.1 e)
NOTE 2: for more information on use see good practice
ELEMENT 1: dcc:statement
ELEMENT 2: dcc:metaData

5.3.13 cubicExpansionCoefficient

volumetric thermal expansion coefficient

PREFIX: mass_
SOURCE: ISO 80000-5:2019, 5-3.2
ELEMENT 1: dcc:itemQuantity
ELEMENT 2: dcc:influenceCondition

5.3.14 decisionRule

statement as to which decision rule is used for conformity statements

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: ISO/IEC 17025:2017 3.7, 7.1.3, 7.8.6.1, 7.8.6.2
NOTE 2: for more information on use see good practice
ELEMENT: dcc:statement

5.3.15 density

density of the calibration item

PREFIX: mass_
ELEMENT 1: dcc:influenceCondition
ELEMENT 2: dcc:itemQuantity
ELEMENT 3: dcc:result

5.3.16 diameter

extent of a cylindrical or spherical object in horizontal direction

PREFIX: mass_
ELEMENT: dcc:itemQuantity

5.3.17 guardBand

guard band used with the applied decision rule

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: ILAC G8:09/2019 1.7, 4.1
NOTE 2: for more information on use see “good practice“
ELEMENT: dcc:quantity in dcc:statement with refType decisionRule

5.3.18 height

vertical extent of an object

PREFIX: mass_
ELEMENT: dcc:itemQuantity

5.3.19 humidityRelative

ambient relative air humidity

PREFIX: basic_
ELEMENT: dcc:influenceCondition

5.3.20 inventoryNo

inventory number as fixed by the user or owner

PREFIX: mass_
NOTE 1: can be the inventory number of a set (dcc:items) or a single piece (dcc:item)
NOTE 2: issuer is the owner (see element dcc:issuer) - issuer user is not given
ELEMENT 1: dcc:identification in dcc:items
ELEMENT 2: dcc:identification in dcc:item

5.3.21 isInCMC

reference to existing CMCs that cover the result

PREFIX: basic_ (suggested – to be confirmed)
NOTE: ISO/IEC 17025:2017 7.8.4.1 c)
ELEMENT 1: dcc:statement
ELEMENT 2: dcc:metaData
ELEMENT 3: dcc:measurementResult
ELEMENT 4: dcc:result

5.3.22 itemId

machine-readable identifier of physical element (e.g. weight)

PREFIX: mass_
NOTE 1: can be the item identifier of a set (dcc:items), a single piece (dcc:item) or a piece in a set (dcc:item)
NOTE 2: issuer can be calibration laboratory, customer or owner (see element dcc:issuer)

ELEMENT 1:	dcc:identification in dcc:items
ELEMENT 2:	dcc:identification in dcc:item

5.3.23 length

horizontal extent of an object

PREFIX:	mass_
NOTE:	The length describes a distance measured perpendicular to the width.
ELEMENT:	dcc:itemQuantity

5.3.24 magneticPolarization

resulting parameter from multiplication of magnetization and magnetic constant

PREFIX:	mass_
NOTE 1:	Magnetization according to OIML R111-1:2004 2.9.7
NOTE 2:	Magnetic constant according to OIML R111-1:2004 2.9.5
NOTE 3:	Limit values for magnetic polarization of weights are specified in OIML R111-1:2004, chapter 9.
NOTE 4:	The entry can be a measurement result or a statement that the test has been passed or failed.
ELEMENT 1:	dcc:influenceCondition
ELEMENT 2:	dcc:itemQuantity

5.3.25 magneticSusceptibility

Measure of the ability of a medium to modify a magnetic field

PREFIX:	mass_
SOURCE:	OIML R111-1:2004 2.9.6
NOTE 1:	It provides information about the ratio of magnetization to magnetic field strength.
NOTE 2:	Susceptibility describes a material's proportionality constant (physical quantity) with the unit of one, which can be used to specify the magnetizability of matter within the magnetic flux density.
NOTE 3:	Limit values for magnetic susceptibility of weights are specified in OIML R111-1:2004, chapter 9.
NOTE 4:	The entry can be a measurement result or a statement that the test has been passed or failed.
ELEMENT 1:	dcc:influenceCondition
ELEMENT 2:	dcc:result
ELEMENT 3:	dcc:itemQuantity

5.3.26 manufacturingDate

manufacturing date of the calibration item or items

PREFIX:	basic_ (suggested – to be confirmed)
NOTE 1:	can be the manufacturing date of a set (dcc:items), a single piece (dcc:item) or a piece in a set (dcc:item)
NOTE 2:	issuer is the manufacturer (see element dcc:issuer)
ELEMENT 1:	dcc:identification in dcc:items

ELEMENT 2: dcc:identification in dcc:item

5.3.27 marking

marking on the calibration item

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: can be the marking of a set (dcc:items) or a single piece (dcc:item)
NOTE 2: to be used only once per item, several markings are combined in one element
ELEMENT 1: dcc:identification in dcc:items
ELEMENT 2: dcc:identification in dcc:item

5.3.28 mass

result of a mass calibration

PREFIX: mass_
ELEMENT 1: dcc:result
ELEMENT 2: dcc:influenceCondition
ELEMENT 3: dcc:itemQuantity

5.3.29 material

material of the calibration item

PREFIX: mass_
NOTE not to be used for the material of packaging
ELEMENT: dcc:identification in dcc:item

5.3.30 max

maximum value of an influence condition

PREFIX: basic_ (suggested – to be confirmed)
ELEMENT: dcc:quantity in dcc:influenceCondition

5.3.31 maxPFA

maximum specific risk (given as **P**robability of **F**alse **A**cceptance) associated with the applied decision rule

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: ILAC G8:09/2019 1.14, 5.2
NOTE 2: for more information on use see “good practice“ examples
ELEMENT: dcc:quantity in dcc:statement with refType decisionRule

5.3.32 maxPFR

maximum specific risk (given as **P**robability of **F**alse **R**ejection) associated with the applied decision rule

PREFIX: basic_ (suggested – to be confirmed)
NOTE 1: ILAC G8:09/2019 1.14, 5.2
NOTE 2: for more information on use see “good practice“ examples
ELEMENT: dcc:quantity in dcc:statement with refType decisionRule

5.3.33 mean

mean value of an influence condition

PREFIX:	basic_ (suggested – to be confirmed)
ELEMENT:	dcc:quantity in dcc:influenceCondition

5.3.34 measuredValue

quantity value representing a measurement result

PREFIX:	basic_
SOURCE:	JCGM 200:2012 (VIM) 2.10 “measured quantity value”
ELEMENT:	dcc:quantity

5.3.35 measurementError

measured quantity value minus a reference quantity value

PREFIX:	basic_
SOURCE:	JCGM 200:2012 (VIM) 2.16 “measurement error”
NOTE:	can be indicated in each dcc:result
ELEMENT:	dcc:quantity

5.3.36 measuringEquipmentNo

measuring or test equipment number of the calibration item

PREFIX:	mass_
NOTE 1:	can be the measuring equipment number of a set (dcc:items) or a single piece (dcc:item)
NOTE 2:	issuer is the owner (see element dcc:issuer)
NOTE 3:	measuring equipment according to ISO 9000:2015(en), 3.11.5: measuring instrument, software, measurement standard, reference material or auxiliary apparatus or combination thereof necessary to realize a measurement process
ELEMENT 1:	dcc:identification in dcc:items
ELEMENT 2:	dcc:identification in dcc:item

5.3.37 medium

liquid or gas in which the measurement is performed

PREFIX:	mass_
NOTE :	Information if the measurement took place at increased or decreased pressure (e.g. vacuum) may be added.
ELEMENT:	dcc:measuringEquipment

5.3.38 min

minimum value of an influence condition

PREFIX:	mass_ (suggested – to be confirmed)
ELEMENT:	dcc:quantity in dcc:influenceCondition

5.3.39 minTUR

minimum **T**est **U**ncertainty **R**atio for which conformity statements are made

PREFIX:	basic_ (suggested – to be confirmed)
NOTE 1:	ILAC G8:09/2019 1.13
NOTE 2:	corresponds to the term *"measurement capability index"* according to JGCM 106:102 - 7.6 and ISO/TR 14253-6:2012(E): 3.8
NOTE 3:	for more information on use see "good practice" examples
ELEMENT:	dcc:quantity in dcc:statement with refType decisionRule

5.3.40 nominalValue

rounded or approximate value of a characterizing quantity of a measuring instrument or measuring system that provides guidance for its appropriate use

PREFIX:	basic_ (suggested – to be confirmed)
SOURCE:	JCGM 200:2012 (VIM) 4.6 „nominal quantity value"
NOTE:	The nominal value can be a means of identification as well as part of a result.
ELEMENT 1:	dcc:identification in dcc:item
ELEMENT 2:	dcc:quantity

5.3.41 orderNo

a number identifying a request or order placed by a customer

PREFIX:	basic_ (suggested – to be confirmed)
NOTE:	issuer can be calibration laboratory or customer (see element dcc:issuer)
ELEMENT:	dcc:identification in dcc:coreData

5.3.42 referenceAirPressure

reference air pressure for a conventional or calculated quantity value

PREFIX:	basic_
ELEMENT:	dcc:metaData

5.3.43 referencedValue

Measured value from another calibration/measurement

PREFIX:	basic_ (suggested – to be confirmed)
ELEMENT 1:	dcc:quantity in dcc:influenceCondition
ELEMENT 2:	dcc:quantity in dcc:metaData

5.3.44 referenceTemperature

reference temperature for a conventional or calculated quantity value

PREFIX:	basic_
ELEMENT:	dcc:metaData

5.3.45 serialNo

number used to identify an individual occurrence of an item of production

PREFIX:	basic_ (suggested – to be confirmed)

NOTE 1:	can be the serial number of a set (dcc:items), a single piece (dcc:item) or a set piece (dcc:item)
NOTE 2:	to be used only once per item, usually assigned by manufacturer
NOTE 3:	compare ISO 8000 8000-2:2022(en) 3.13.2
ELEMENT 1:	dcc:identification in dcc:items
ELEMENT 2:	dcc:identification in dcc:item

5.3.46 setPositionNo

internal identification number of the element position in the set

PREFIX:	mass_
NOTE:	database identifier for the element position in the set (e.g. of weights)
ELEMENT:	dcc:identification in dcc:item

5.3.47 shape

shape of the calibration item

PREFIX:	mass_
ELEMENT:	dcc:identification in dcc:item

5.3.48 surfaceRoughnessRa

mean height of the roughness profile

PREFIX:	mass_
SOURCE:	OIML R111-1:2004
NOTE 1:	Maximum values of surface roughness are given in OIML R111-1:2004, table 6 of chapter 11.
NOTE 2:	The entry can be a measurement result or a statement that the test has been passed or failed.
ELEMENT 1:	dcc:influenceCondition
ELEMENT 2:	dcc:itemQuantity

5.3.49 surfaceRoughnessRz

maximum height of the roughness profile

PREFIX:	mass_
SOURCE:	OIML R111-1:2004
NOTE 1:	Maximum values of surface roughness are given in OIML R111-1:2004, table 6 of chapter 11.
NOTE 2:	The entry can be a measurement result or a statement that the test has been passed or failed.
ELEMENT 1:	dcc:influenceCondition
ELEMENT 2:	dcc:itemQuantity

5.3.50 temperature

ambient temperature

PREFIX:	basic_
ELEMENT:	dcc:influenceCondition

5.3.51 toleranceLimitLower

lower bound of permissible values of a property

PREFIX:	basic_
NOTE 1:	tolerance limit in JCGM 106:2012, 3.3.4
NOTE 2:	Used as information in a conformity statement for a measurement quantity value either in dcc:result or as a referenced value in dcc:influenceCondition.
EXAMPLE:	For weight pieces according to OIML R111-1:2004 it is the nominal value minus the maximum permissible error.
ELEMENT:	dcc:quantity in dcc:metaData

5.3.52 toleranceLimitUpper

upper bound of permissible values of a property

PREFIX:	basic_
NOTE 1:	tolerance limit in JCGM 106:2012, 3.3.4
NOTE 2:	Used as information in a conformity statement for a measurement quantity value either in dcc:result or as a referenced value in dcc:influenceCondition.
EXAMPLE:	For weight pieces according to OIML R111-1:2004 it is the nominal value plus the maximum permissible error.
ELEMENT:	dcc:quantity in dcc:metaData

5.3.53 uncertainty

description of the method to determine and describe the measurement uncertainties stated in the document

PREFIX:	basic_
NOTE 1:	References to guidelines such as EA-4/02 M:2022 should be used.
ELEMENT:	dcc:usedMethod

5.3.54 volume

volume of the calibration item

PREFIX:	mass_
ELEMENT 1:	dcc:influenceCondition
ELEMENT 2:	dcc:result
ELEMENT 3:	dcc:itemQuantity

5.3.55 width

horizontal extent of an object

PREFIX:	mass_
NOTE:	The width is the horizontal extent measured perpendicular to the length.
ELEMENT:	dcc:itemQuantity

6 Guidance on reading information from a DCC for weights and weight sets

In addition to creating a digital calibration certificate, reading it also presents a challenge. The principles described in this report are intended to enable clear addressing of information. This is illustrated in the following examples. XSLT has been used for all examples; an

equivalent procedure is of course also possible in other programming languages. Other solutions with the same result are also possible for all examples.

6.1 Date of calibration

This is a single entry in the format YYYY-MM-DD in the DCC.

Procedure:

1. Go to dcc:endPerformanceDate
2. Output value

XSLT example:

```
<xsl:value-of select="//dcc:endPerformanceDate"/>
```

6.2 Nominal value of all weights

Nominal values of weights are stored as dcc:itemQuantity and dcc:quantity. The elements themselves contain sub-elements that must be addressed individually. This is not considered here.

6.2.1 Nominal value in dcc:item

The nominal values are stored in dcc:itemQuantity elements with a refType="basic_nominalValue".

Procedure:

1. Search (first) dcc:itemQuantity
2. Go to element with refType="basic_nominalValue"
3. Output value
4. Start again with 1. and search for next dcc:item

XSLT example:

```
<xsl:for-each select="//dcc:itemQuantities">
  <xsl:value-of select="dcc:itemQuantity[@refType='basic_nominalValue']"/>
</xsl:for-each>
```

6.2.2 Nominal value in dcc:result

The nominal values are stored in dcc:quantity elements with a refType="basic_nominalValue".

Procedure:

1. Search (first) dcc:result
2. Go to dcc:data/dcc:quantity
3. Go to element with refType="basic_nominalValue"
4. Output value
5. Start again with 1. and search for next dcc:item

XSLT example:

```
<xsl:for-each select="//dcc:result">
  <xsl:value-of select="dcc:data/dcc:quantity[@refType='basic_nominalValue']"/>
</xsl:for-each>
```

6.3 Conventional mass result of a weight with known serial number

The serial number is stored as dcc:identification in the dcc:item element of the weight. The conventional mass result is stored in the associated dcc:measurementResult. The result is available as si:real with several sub-elements that must be addressed individually. This is not considered here.

Procedure:

1. Search id of all dcc:item
2. Find dcc:item with desired serial number and note (down) id of the dcc:item element
3. Search dcc:measurementResult with matching refId=id
4. Search dcc:result with refType=mass_conventionalMass
5. Go to quantity with refType=basic_measuredValue
6. Output value of the corresponding si:real

XSLT example:

```
<xsl:for-each select="//dcc:item/@id">
  <xsl:if test="../dcc:identifications/dcc:identification/dcc:value='87B3'">
    <xsl:for-each select="//dcc:measurementResult[@refId=current()]/dcc:results/dcc:result">
      <xsl:if test="contains(@refType,'mass_conventionalMass')">
        <xsl:value-of select="dcc:data/dcc:quantity[@refType='basic_measuredValue']/si:real"/>
      </xsl:if>
    </xsl:for-each>
  </xsl:if>
</xsl:for-each>
```

7 Bibliography

[1] Documentation on the DCC scheme, https://dccwiki.ptb.de/en/home

[2] Press release “Digital accreditation symbol and digital calibration certificate: DAkkS and PTB prepare introduction” https://www.dakks.de/en/pressrelease/digital-accreditation-symbol-and-digital-calibration-certificate-dakks-and-ptb-prepare-introduction.html

[3] Hutzschenreuter, Daniel, et al. (2020). SmartCom Digital System of Units (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 - Second Edition (D-SI 1.3.0-2). Zenodo. https://doi.org/10.5281/zenodo.3816686

[4] Hutzschenreuter, Daniel, et al. (2019). SmartCom Digital-SI (D-SI) XML exchange format for metrological data version 1.3.0 (1.3.0). Zenodo. https://doi.org/10.5281/zenodo.3366902

[5] International vocabulary of metrology – Basic and general concepts and associated terms (VIM)- 3rd edition. https://jcgm.bipm.org/vim/en/index.html; Internationales Wörterbuch der Metrologie – Grundlegende und allgemeine Begriffe und zugeordnete Benennungen (VIM), Deutsch-englische Fassung ISO/IEC Leitfaden 99:2007, Korrigierte Fassung 2012, 4. Auflage, DIN Deutsches Institut für Normung e. V.

8 Revision history

Revision	Date	Changes
0	04/2022	First version
1	01/2024	Inclusion of further authors Adaptation to DCC version 3.2.1 (new: dcc:itemQuantities, dcc:referral, ...): Revision of chapters 1 and 2 Inclusion of good practice conventions: Chapter 4 new Update of the refType definitions to the current state of development: Chapter 5 new Guidance on reading out information: Chapter 6 new Deletion of Appendix A Update of the examples and inclusion of a 3rd example

Appendix A Example of a digital calibration certificate for a single weight

```
<?xml version="1.0" encoding="utf-8"?>
<!--ISO/IEC 17025:2017 7.8.2.1a-->
<dcc:digitalCalibrationCertificate xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:dcc="https://ptb.de/dcc" xmlns:si="https://ptb.de/si" xsi:schemaLocation="https://ptb.de/dcc https://www.ptb.de/dcc/dcc.xsd https://ptb.de/si https://www.ptb.de/si/SI_Format.xsd" schemaVersion="3.2.1">
  <!--This is an example for a single weight piece. It was developed in the DKD (German calibration service) technical committee of mass and weighing instruments.
  V2.1 , Date: 15.01.2024
  Features: bilingual, single weight, mass and conventional mass in one DCC
  -->
  <dcc:administrativeData>
    <dcc:dccSoftware>
      <dcc:software>
        <dcc:name>
          <dcc:content>Notepad++</dcc:content>
        </dcc:name>
        <dcc:release>v8.5.2</dcc:release>
      </dcc:software>
    </dcc:dccSoftware>
    <dcc:refTypeDefinitions>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="de">Allgemeine Begriffe</dcc:content>
          <dcc:content lang="en">general terms</dcc:content>
        </dcc:name>
        <dcc:namespace>basic</dcc:namespace>
        <dcc:link>DCCWiki</dcc:link>
      </dcc:refTypeDefinition>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="de">Masse Begriffe</dcc:content>
          <dcc:content lang="en">mass terms</dcc:content>
        </dcc:name>
        <dcc:namespace>mass</dcc:namespace>
        <dcc:link>DKD Expert report</dcc:link>
      </dcc:refTypeDefinition>
    </dcc:refTypeDefinitions>
    <dcc:coreData>
      <dcc:countryCodeISO3166_1>DE</dcc:countryCodeISO3166_1>
      <dcc:usedLangCodeISO639_1>de</dcc:usedLangCodeISO639_1>
      <dcc:usedLangCodeISO639_1>en</dcc:usedLangCodeISO639_1>
      <dcc:mandatoryLangCodeISO639_1>de</dcc:mandatoryLangCodeISO639_1>
      <dcc:uniqueIdentifier>13412-adf2-3</dcc:uniqueIdentifier>
      <dcc:identifications>
        <dcc:identification refType="basic_orderNo">
          <dcc:issuer>calibrationLaboratory</dcc:issuer>
          <dcc:value>06.02.03#0001</dcc:value>
          <dcc:name>
            <dcc:content lang="de">Aktennummer</dcc:content>
            <dcc:content lang="en">File number</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:beginPerformanceDate>2021-06-01</dcc:beginPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:endPerformanceDate>2021-06-02</dcc:endPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:performanceLocation>laboratory</dcc:performanceLocation><!--ISO/IEC 17025:2017 7.8.2.1 c)-->
      <dcc:issueDate>2021-06-03</dcc:issueDate><!--ISO/IEC 17025:2017 7.8.2.1 j)-->
    </dcc:coreData>
    <dcc:items><!--ISO/IEC 17025:2017 7.8.2.1 g)-->
```

```
    <dcc:manufacturer>
      <dcc:name>
        <dcc:content>Weights Co Ltd.</dcc:content>
      </dcc:name>
    </dcc:manufacturer>
    <dcc:identifications>
      <dcc:identification refType="basic_serialNo">
        <dcc:issuer>manufacturer</dcc:issuer>
        <dcc:value>13473h2123f</dcc:value>
        <dcc:name>
          <dcc:content lang="de">Seriennummer</dcc:content>
          <dcc:content lang="en">Serial No.</dcc:content>
        </dcc:name>
      </dcc:identification>
    </dcc:identifications>
    <dcc:item id="weightABC1234">
      <dcc:name>
        <dcc:content lang="de">2 kg OIML Gewicht</dcc:content>
        <dcc:content lang="en">2 kg OIML weight</dcc:content>
      </dcc:name>
      <dcc:equipmentClass>
        <dcc:reference>OIML R111-1:2004</dcc:reference>
        <dcc:classID>E2</dcc:classID>
      </dcc:equipmentClass>
      <dcc:identifications>
        <dcc:identification refType="mass_shape">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>Knob weight</dcc:value>
          <dcc:name>
            <dcc:content lang="de">Form</dcc:content>
            <dcc:content lang="en">Form</dcc:content>
          </dcc:name>
        </dcc:identification>
        <dcc:identification refType="basic_marking">
          <dcc:issuer>owner</dcc:issuer>
          <dcc:value>CBA-123</dcc:value>
          <dcc:name>
            <dcc:content lang="de">Kennzeichnung auf dem Gewicht</dcc:content>
            <dcc:content lang="en">Marking on weight</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:itemQuantities>
        <dcc:itemQuantity refType="basic_nominalValue">
          <dcc:name>
            <dcc:content lang="en">Nominale Masse</dcc:content>
            <dcc:content lang="en">Nominal mass</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>2</si:value>
            <si:unit>\kilogram</si:unit>
          </si:real>
        </dcc:itemQuantity>
      </dcc:itemQuantities>
    </dcc:item>
  </dcc:items>
  <dcc:calibrationLaboratory><!--ISO/IEC 17025:2017 7.8.2.1 b)-->
    <dcc:contact>
      <dcc:name>
        <dcc:content>Physikalisch-Technische Bundesanstalt (PTB)</dcc:content>
      </dcc:name>
```

```
            <dcc:eMail>info@ptb.de</dcc:eMail>
            <dcc:location>
              <dcc:further>
                <dcc:content lang="de">Abteilung 1 Mechanik und Akustik</dcc:content>
                <dcc:content lang="en">Division 1 Mechanics and Acoustics</dcc:content>
              </dcc:further>
              <dcc:street>Bundesallee</dcc:street>
              <dcc:streetNo>100</dcc:streetNo>
              <dcc:postCode>38116</dcc:postCode>
              <dcc:city>Braunschweig</dcc:city>
              <dcc:countryCode>DE</dcc:countryCode>
            </dcc:location>
          </dcc:contact>
        </dcc:calibrationLaboratory>
        <dcc:respPersons>
          <dcc:respPerson>
            <dcc:person>
              <dcc:name>
                <dcc:content>Michael</dcc:content>
              </dcc:name>
            </dcc:person>
            <dcc:role>authorisation of certificate</dcc:role>
            <dcc:mainSigner>true</dcc:mainSigner><!--ISO/IEC 17025:2017 7.8.2.1 o)-->
          </dcc:respPerson>
          <dcc:respPerson>
            <dcc:person>
              <dcc:name>
                <dcc:content>Alexander</dcc:content>
              </dcc:name>
            </dcc:person>
          </dcc:respPerson>
        </dcc:respPersons>
        <dcc:customer><!--ISO/IEC 17025:2017 7.8.2.1 e)-->
          <dcc:name>
            <dcc:content>Customer</dcc:content>
          </dcc:name>
          <dcc:location>
            <dcc:streetNo>6</dcc:streetNo>
            <dcc:street>Hello Street</dcc:street>
            <dcc:postCode>10</dcc:postCode>
            <dcc:city>Braunschweig</dcc:city>
            <dcc:countryCode>DE</dcc:countryCode>
          </dcc:location>
        </dcc:customer>
        <dcc:statements>
          <dcc:statement>
            <dcc:declaration><!--ISO/IEC 17025:2017 7.8.2.1 l)-->
              <dcc:content lang="de">Die Ergebnisse beziehen sich nur auf den in diesem DCC beschriebenen Gegenstand.<
/dcc:content>
              <dcc:content lang="en">The results refer only to the object calibrated in this DCC.</dcc:content>
            </dcc:declaration>
          </dcc:statement>
          <dcc:statement refType="basic_isInCMC"><!--ISO/IEC 17025:2017 7.8.4.1 c)-->
            <dcc:reference>D-K-xxxxx-yy-zz</dcc:reference>
            <dcc:declaration>
              <dcc:content lang="de">Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale
Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).</dcc:content>
              <dcc:content lang="en">This calibration certificate documents the metrological traceability to national standar
ds, which realize the units of measurement according to the International System of Units (SI).</dcc:content>
            </dcc:declaration>
            <dcc:valid>true</dcc:valid>
            <dcc:respAuthority>
```

```
            <dcc:name>
              <dcc:content>DAkkS</dcc:content>
            </dcc:name>
            <dcc:location>
              <dcc:city>Braunschweig</dcc:city>
            </dcc:location>
          </dcc:respAuthority>
        </dcc:statement>
        <!--<dcc:statement>
          <dcc:convention>Tracebility</dcc:convention>
          <dcc:traceable>true</dcc:traceable>
          <dcc:declaration>
            <dcc:content lang="de">Die Messung ist auf das SI rückführbar.</dcc:content>
            <dcc:content lang="en">The measurement is traceable to the SI.</dcc:content>
          </dcc:declaration>
        </dcc:statement>-->
        <dcc:statement><!--ISO/IEC 17025:2017 7.8.4.3-->
          <dcc:declaration>
            <dcc:content lang="de">Die Ergebnisse gelten zum Zeitpunkt der Kalibrierung. Es obliegt dem Verwender, zu
gegebener Zeit eine Rekalibrierung zu veranlassen.</dcc:content>
            <dcc:content lang="en">The measurement results are valid at the time of calibration. The user is responsible fo
r arranging a recalibration in due time.</dcc:content>
          </dcc:declaration>
        </dcc:statement>
        <dcc:statement refType="basic_decisionRule">
          <dcc:reference>OIML R111-1:2004</dcc:reference>
          <dcc:declaration>
            <dcc:content lang="en">binary</dcc:content>
          </dcc:declaration>
          <dcc:data>
            <dcc:quantity refType="basic_minTUR">
              <dcc:name>
                <dcc:content lang="en">Minimum allowed Test Uncertainty ratio - for smaller TUR values, no conformit
y statement is made</dcc:content>
              </dcc:name>
              <si:real>
                <si:value>3</si:value>
                <si:unit>\one</si:unit>
              </si:real>
            </dcc:quantity>
            <dcc:formula refType="basic_guardBand">
              <dcc:latex>w=U</dcc:latex>
            </dcc:formula>
          </dcc:data>
        </dcc:statement>
      </dcc:statements>
    </dcc:administrativeData>
    <dcc:measurementResults>
      <dcc:measurementResult refId="weightABC1234" refType="isInCMC">
        <dcc:name>
          <dcc:content lang="de">Massekalibrierung</dcc:content>
          <dcc:content lang="en">mass calibration</dcc:content>
        </dcc:name>
        <dcc:usedMethods>
          <!--ISO/IEC 17025:2017 7.8.2.1 f)-->
          <dcc:usedMethod>
            <dcc:name>
              <dcc:content lang="de">Bestimmung des konventionellen Wägewerts</dcc:content>
              <dcc:content lang="en">Determination of the conventional weighing value</dcc:content>
            </dcc:name>
            <dcc:norm>OIML R111-1:2004</dcc:norm>
```

```
        </dcc:usedMethod>
        <dcc:usedMethod>
          <dcc:name>
            <dcc:content lang="de">Verwendete Methode der Massekalibrierung</dcc:content>
            <dcc:content lang="en">Used method of True Mass calibration</dcc:content>
          </dcc:name>
          <dcc:norm>OIML R111-1:2004</dcc:norm>
        </dcc:usedMethod>
        <dcc:usedMethod refType="basic_uncertainty">
          <dcc:name>
            <dcc:content lang="de">Messunsicherheit</dcc:content>
            <dcc:content lang="en">Measurement uncertainty</dcc:content>
          </dcc:name>
          <dcc:description>
            <dcc:content lang="de"> Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsic
herheit
                durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt. Sie wurde gemäß dem EA-4/02
M:2013 ermittelt.
                Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95 % im zugeordneten Wertein
tervall.</dcc:content>
            <dcc:content lang="en"> The reported expanded uncertainty is stated as the standard uncertainty multiplied
by a coverage factor k=2.
                The coverage factor k=2 for a normal distribution corresponds to a coverage probability of appr
ox. 95 %.</dcc:content>
          </dcc:description>
          <dcc:norm>EA-4/02 M:2022</dcc:norm>
        </dcc:usedMethod>
      </dcc:usedMethods>
      <dcc:influenceConditions>
        <!--ISO/IEC 17025:2017 7.8.4.1 b)-->
        <dcc:influenceCondition refType="mass_density">
          <dcc:name>
            <dcc:content lang="de">Dichte</dcc:content>
            <dcc:content lang="en">Density</dcc:content>
          </dcc:name>
          <dcc:certificate>
            <dcc:referral>
              <!--ISO/IEC 17025:2017 7.8.2.1 p)-->
              <dcc:content lang="en">Certificate XXXXX by yyyy dated YYYY-MM-DD</dcc:content>
            </dcc:referral>
            <dcc:referralID>1.82-2017 qwe-1</dcc:referralID>
            <dcc:procedure>analogue</dcc:procedure>
            <dcc:value>analogue</dcc:value>
          </dcc:certificate>
          <dcc:data>
            <dcc:quantity refType="basic_referencedValue">
              <si:real>
                <si:value>8010</si:value>
                <si:unit>\kilogram\metre\tothe(-3)</si:unit>
                <si:expandedUnc>
                  <si:uncertainty>30</si:uncertainty>
                  <si:coverageFactor>2</si:coverageFactor>
                  <si:coverageProbability>0.95</si:coverageProbability>
                </si:expandedUnc>
              </si:real>
            </dcc:quantity>
          </dcc:data>
        </dcc:influenceCondition>
        <dcc:influenceCondition refType="basic_temperature">
          <dcc:name>
            <dcc:content lang="de">Temperatur</dcc:content>
```

```
        <dcc:content lang="en">temperature</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_mean">
          <si:real>
            <si:value>294.05</si:value>
            <si:unit>\kelvin</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.50</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
    <dcc:influenceCondition refType="mass_airDensity">
      <dcc:name>
        <dcc:content lang="de">Luftdichte</dcc:content>
        <dcc:content lang="en">air density</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_mean">
          <si:real>
            <si:value>1.1635</si:value>
            <si:unit>\kilogram\metre\tothe(-3)</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.0035</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
    <dcc:influenceCondition refType="basic_relativeHumidity">
      <dcc:name>
        <dcc:content lang="de">rel. Luftfeuchte</dcc:content>
        <dcc:content lang="en">relative humidity</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_mean">
          <si:real>
            <si:value>0.417</si:value>
            <si:unit>\one</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.020</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
  </dcc:influenceConditions>
  <dcc:results><!--ISO/IEC 17025:2017 7.8.2.1 m)-->
    <dcc:result refType="mass_conventionalMass basic_isInCMC">
      <dcc:name>
        <dcc:content lang="de">Konventioneller Wägewert</dcc:content>
        <dcc:content lang="en">Conventional mass</dcc:content>
      </dcc:name>
```

```
    <dcc:data>
      <dcc:quantity refType="basic_nominalValue">
        <dcc:name>
          <dcc:content lang="de">Nennwert</dcc:content>
          <dcc:content lang="en">Nominal value</dcc:content>
        </dcc:name>
        <si:real>
          <si:value>2</si:value>
          <si:unit>\kilogram</si:unit>
        </si:real>
      </dcc:quantity>
      <dcc:quantity refType="basic_measuredValue">
        <si:real>
          <si:value>2.00000020</si:value>
          <si:unit>\kilogram</si:unit>
          <si:dateTime>2021-06-01T12:01:02</si:dateTime>
          <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
            <si:uncertainty>0.00000053</si:uncertainty>
            <si:coverageFactor>2</si:coverageFactor>
            <si:coverageProbability>0.95</si:coverageProbability>
          </si:expandedUnc>
        </si:real>
        <dcc:measurementMetaData>
          <dcc:metaData refType="basic_conformity"><!--ISO/IEC 17025:2017 7.8.4.1 e)-->
            <dcc:convention>section 5.3.2</dcc:convention>
            <dcc:norm>OIML R111-1:2004</dcc:norm>
            <dcc:conformity>pass</dcc:conformity>
            <dcc:data>
              <dcc:quantity refType="basic_toleranceLimitLower">
                <si:real>
                  <si:value>1.999997</si:value>
                  <si:unit>\kilogram</si:unit>
                </si:real>
              </dcc:quantity>
              <dcc:quantity refType="basic_toleranceLimitUpper">
                <si:real>
                  <si:value>2.000003</si:value>
                  <si:unit>\kilogram</si:unit>
                </si:real>
              </dcc:quantity>
            </dcc:data>
          </dcc:metaData>
        </dcc:measurementMetaData>
      </dcc:quantity>
      <dcc:quantity refType="basic_measurementError">
        <si:real>
          <si:value>0.0000002</si:value>
          <si:unit>\kilogram</si:unit>
          <si:dateTime>2021-06-01T12:01:02</si:dateTime>
          <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
            <si:uncertainty>0.00000053</si:uncertainty>
            <si:coverageFactor>2</si:coverageFactor>
            <si:coverageProbability>0.95</si:coverageProbability>
          </si:expandedUnc>
        </si:real>
      </dcc:quantity>
    </dcc:data>
  </dcc:result>
  <dcc:result refType="mass_mass">
    <dcc:name>
      <dcc:content lang="de">Masse</dcc:content>
```

```
            <dcc:content lang="en">Mass</dcc:content>
          </dcc:name>
          <dcc:data>
            <dcc:quantity refType="basic_nominalValue">
              <dcc:name>
                <dcc:content lang="de">Nennwert</dcc:content>
                <dcc:content lang="en">Nominal value</dcc:content>
              </dcc:name>
              <si:real>
                <si:value>2</si:value>
                <si:unit>\kilogram</si:unit>
              </si:real>
            </dcc:quantity>
            <dcc:quantity refType="basic_measuredValue">
              <si:real>
                <si:value>1.9999998</si:value>
                <si:unit>\kilogram</si:unit>
                <si:dateTime>2021-06-01T12:01:02</si:dateTime>
                <si:expandedUnc>
                  <si:uncertainty>0.0000032</si:uncertainty>
                  <si:coverageFactor>2</si:coverageFactor>
                  <si:coverageProbability>0.95</si:coverageProbability>
                </si:expandedUnc>
              </si:real>
            </dcc:quantity>
          </dcc:data>
        </dcc:result>
      </dcc:results>
    </dcc:measurementResult>
  </dcc:measurementResults>
</dcc:digitalCalibrationCertificate><!--ISO/IEC 17025:2017 7.8.2.1 d)-->
```

Appendix B Example of a digital calibration certificate for a set consisting of two weights

```
<?xml version="1.0" encoding="utf-8"?>
<!--ISO/IEC 17025:2017 7.8.2.1a-->
<dcc:digitalCalibrationCertificate xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:dcc="https://ptb.
de/dcc" xmlns:si="https://ptb.de/si" xsi:schemaLocation="https://ptb.de/dcc https://www.ptb.de/dcc/dcc.xsd https://ptb.de
/si https://www.ptb.de/si/SI_Format.xsd" schemaVersion="3.2.1">
  <!--This is an example of a mass set of two mass pieces. It was developed in the DKD (German calibration service) techni
cal committee of mass and weighing instruments.
  Version of the example: V2.1 , Date: 15.01.2024
  Features: mass set, conventional mass
  -->
  <dcc:administrativeData>
    <dcc:dccSoftware>
      <dcc:software>
        <dcc:name>
          <dcc:content>Notepad++</dcc:content>
        </dcc:name>
        <dcc:release>v8.5.2</dcc:release>
      </dcc:software>
    </dcc:dccSoftware>
    <dcc:refTypeDefinitions>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="en">general terms</dcc:content>
        </dcc:name>
        <dcc:namespace>basic</dcc:namespace>
        <dcc:link>DCCWiki</dcc:link>
      </dcc:refTypeDefinition>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="en">mass terms</dcc:content>
        </dcc:name>
        <dcc:namespace>mass</dcc:namespace>
        <dcc:link>DKD Expert report</dcc:link>
      </dcc:refTypeDefinition>
    </dcc:refTypeDefinitions>
    <dcc:coreData>
      <dcc:countryCodeISO3166_1>DE</dcc:countryCodeISO3166_1>
      <dcc:usedLangCodeISO639_1>en</dcc:usedLangCodeISO639_1>
      <dcc:mandatoryLangCodeISO639_1>en</dcc:mandatoryLangCodeISO639_1>
      <dcc:uniqueIdentifier>13412-adf2-3</dcc:uniqueIdentifier>
      <dcc:identifications>
        <dcc:identification refType="basic_orderNo">
          <dcc:issuer>calibrationLaboratory</dcc:issuer>
          <dcc:value>06.02.03#0002</dcc:value>
          <dcc:name>
            <dcc:content lang="en">File number</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:beginPerformanceDate>2019-04-01</dcc:beginPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:endPerformanceDate>2019-06-28</dcc:endPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:performanceLocation>laboratory</dcc:performanceLocation><!--ISO/IEC 17025:2017 7.8.2.1 c)-->
      <dcc:issueDate>2019-07-03</dcc:issueDate><!--ISO/IEC 17025:2017 7.8.2.1 j)-->
    </dcc:coreData>
    <dcc:items><!--ISO/IEC 17025:2017 7.8.2.1 g)-->
      <dcc:name>
        <dcc:content lang="en">1 OIML set of weights with 2 weights, 1 kg and 2 kg</dcc:content>
      </dcc:name>
      <dcc:equipmentClass>
```

```
      <dcc:reference>OIML R111-1:2004</dcc:reference>
      <dcc:classID>E2</dcc:classID>
    </dcc:equipmentClass>
    <dcc:description>
      <dcc:content lang="en">Case The weights are accommodated in a box of varnished wood; the calibration mark is
applied to the box.</dcc:content>
    </dcc:description>
    <dcc:manufacturer>
      <dcc:name>
        <dcc:content>Weights Co Ltd.</dcc:content>
      </dcc:name>
    </dcc:manufacturer>
    <dcc:identifications>
      <dcc:identification refType="basic_serialNo">
        <dcc:issuer>manufacturer</dcc:issuer>
        <dcc:value>xyz1234567</dcc:value>
        <dcc:name>
          <dcc:content lang="en">Serial Number</dcc:content>
        </dcc:name>
      </dcc:identification>
    </dcc:identifications>
    <dcc:item id="weightABC5678">
      <dcc:name>
        <dcc:content lang="en">1 kg</dcc:content>
      </dcc:name>
      <dcc:description>
        <dcc:content lang="en">Description of box/case (optional)</dcc:content>
      </dcc:description>
      <dcc:identifications>
        <dcc:identification refType="basic_marking">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>**</dcc:value>
          <dcc:name>
            <dcc:content lang="en">marking</dcc:content>
          </dcc:name>
        </dcc:identification>
        <dcc:identification refType="mass_setPositionNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>01A4</dcc:value>
          <dcc:name>
            <dcc:content lang="en">set position number</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:itemQuantities>
        <dcc:itemQuantity refType="basic_nominalValue">
          <dcc:name>
            <dcc:content lang="en">Nominal mass</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>1</si:value>
            <si:unit>\kilogram</si:unit>
          </si:real>
        </dcc:itemQuantity>
      </dcc:itemQuantities>
    </dcc:item>
    <dcc:item id="weightABC1234">
      <dcc:name>
        <dcc:content lang="en">2 kg</dcc:content>
      </dcc:name>
      <dcc:description>
```

```
        <dcc:content lang="en">Description of box/case (optional)</dcc:content>
      </dcc:description>
      <dcc:identifications>
        <dcc:identification refType="basic_marking">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>-</dcc:value>
          <dcc:name>
            <dcc:content lang="en">marking</dcc:content>
          </dcc:name>
        </dcc:identification>
        <dcc:identification refType="mass_setPositionNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>87B3</dcc:value>
          <dcc:name>
            <dcc:content lang="en">set position number</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:itemQuantities>
        <dcc:itemQuantity refType="basic_nominalValue">
          <dcc:name>
            <dcc:content lang="en">Nominal mass</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>2</si:value>
            <si:unit>\kilogram</si:unit>
          </si:real>
        </dcc:itemQuantity>
      </dcc:itemQuantities>
    </dcc:item>
  </dcc:items>
  <dcc:calibrationLaboratory><!--ISO/IEC 17025:2017 7.8.2.1 b)-->
    <dcc:contact>
      <dcc:name>
        <dcc:content>Physikalisch-Technische Bundesanstalt (PTB)</dcc:content>
      </dcc:name>
      <dcc:eMail>info@ptb.de</dcc:eMail>
      <dcc:location>
        <dcc:further>
          <dcc:content lang="en">Division 1 Mechanics and Acoustics</dcc:content>
        </dcc:further>
        <dcc:street>Bundesallee</dcc:street>
        <dcc:streetNo>100</dcc:streetNo>
        <dcc:postCode>38116</dcc:postCode>
        <dcc:city>Braunschweig</dcc:city>
        <dcc:countryCode>DE</dcc:countryCode>
      </dcc:location>
    </dcc:contact>
  </dcc:calibrationLaboratory>
  <dcc:respPersons>
    <dcc:respPerson>
      <dcc:person>
        <dcc:name>
          <dcc:content>Michael</dcc:content>
        </dcc:name>
        <dcc:eMail>info@ptb.de</dcc:eMail>
      </dcc:person>
      <dcc:role>authorisation of certificate</dcc:role>
      <dcc:mainSigner>true</dcc:mainSigner><!--ISO/IEC 17025:2017 7.8.2.1 o)-->
    </dcc:respPerson>
  </dcc:respPersons>
  <dcc:customer>
```

```
        <dcc:name>
          <dcc:content>Customer</dcc:content>
        </dcc:name>
        <dcc:location>
          <dcc:streetNo>6</dcc:streetNo>
          <dcc:street>Hello Street</dcc:street>
          <dcc:postCode>10</dcc:postCode>
          <dcc:city>Braunschweig</dcc:city>
          <dcc:countryCode>DE</dcc:countryCode>
        </dcc:location>
      </dcc:customer>
      <dcc:statements>
        <dcc:statement>
          <dcc:declaration><!--ISO/IEC 17025:2017 7.8.2.1 l)-->
            <dcc:content lang="en">The results refer only to the object calibrated in this DCC.</dcc:content>
          </dcc:declaration>
        </dcc:statement>
        <dcc:statement refType="basic_isInCMC"><!--ISO/IEC 17025:2017 7.8.4.1 c)-->
          <dcc:reference>D-K-xxxxx-yy-zz</dcc:reference>
          <dcc:declaration>
            <dcc:content lang="en">This calibration certificate documents the metrologicaltraceability to national standard
s, which realize the units of measurement according to the International System of Units (SI).</dcc:content>
          </dcc:declaration>
          <dcc:valid>true</dcc:valid>
          <dcc:respAuthority>
            <dcc:name>
              <dcc:content>DAkkS</dcc:content>
            </dcc:name>
            <dcc:location>
              <dcc:city>Braunschweig</dcc:city>
            </dcc:location>
          </dcc:respAuthority>
        </dcc:statement>
        <dcc:statement><!--ISO/IEC 17025:2017 7.8.4.3-->
          <dcc:declaration>
            <dcc:content lang="en">The measurement results are valid at the time of calibration. The user is responsible fo
r arranging a recalibration in due time.</dcc:content>
          </dcc:declaration>
        </dcc:statement>
        <dcc:statement refType="basic_decisionRule">
          <dcc:reference>OIML R111-1:2004</dcc:reference>
          <dcc:declaration>
            <dcc:content lang="en">binary</dcc:content>
          </dcc:declaration>
          <dcc:data>
            <dcc:quantity refType="basic_minTUR">
              <dcc:name>
                <dcc:content lang="en">Minimum allowed Test Uncertainty ratio - for smaller TUR values, no conformit
y statement is made</dcc:content>
              </dcc:name>
              <si:real>
                <si:value>3</si:value>
                <si:unit>\one</si:unit>
              </si:real>
            </dcc:quantity>
            <dcc:formula refType="basic_guardBand">
              <dcc:latex>w=U</dcc:latex>
            </dcc:formula>
          </dcc:data>
        </dcc:statement>
      </dcc:statements>
    </dcc:administrativeData>
```

```
<dcc:measurementResults>
  <dcc:measurementResult refId="weightABC1234">
    <dcc:name>
      <dcc:content lang="en">mass calibration</dcc:content>
    </dcc:name>
    <dcc:usedMethods>
    <!--ISO/IEC 17025:2017 7.8.2.1 f)-->
      <dcc:usedMethod>
        <dcc:name>
          <dcc:content lang="en">Determination of the conventional weighing value</dcc:content>
        </dcc:name>
        <dcc:norm>OIML R111-1:2004</dcc:norm>
      </dcc:usedMethod>
        <dcc:usedMethod refType="basic_uncertainty">
          <dcc:name>
            <dcc:content lang="en">Measurement uncertainty</dcc:content>
          </dcc:name>
          <dcc:description>
            <dcc:content lang="en"> The reported expanded uncertainty is stated as the standard uncertainty multiplie
d by a coverage factor k=2.
                        The coverage factor k=2 for a normal distribution corresponds to a coverage probability of appr
ox. 95 %.</dcc:content>
          </dcc:description>
        <dcc:norm>EA-4/02 M:2022</dcc:norm>
      </dcc:usedMethod>
    </dcc:usedMethods>
    <dcc:influenceConditions>
      <!--ISO/IEC 17025:2017 7.8.4.1 b)-->
      <dcc:influenceCondition refType="mass_density">
        <dcc:name>
          <dcc:content lang="en">Density</dcc:content>
        </dcc:name>
        <dcc:certificate>
          <dcc:referral>
            <!--ISO/IEC 17025:2017 7.8.2.1 p)-->
            <dcc:content lang="en">Certificate XXXXX by yyyy dated YYYY-MM-DD</dcc:content>
          </dcc:referral>
          <dcc:referralID>1.82-2017 qwe-1</dcc:referralID>
          <dcc:procedure>analogue</dcc:procedure>
          <dcc:value>analogue</dcc:value>
        </dcc:certificate>
        <dcc:data>
          <dcc:quantity refType="basic_referencedValue">
            <si:real>
              <si:value>8010</si:value>
              <si:unit>\kilogram\metre\tothe(-3)</si:unit>
              <si:expandedUnc>
                <si:uncertainty>30</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
      <dcc:influenceCondition refType="basic_temperature">
        <dcc:name>
          <dcc:content lang="en">temperature</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_mean">
```

```
            <si:real>
              <si:value>294.05</si:value>
              <si:unit>\kelvin</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.50</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
      <dcc:influenceCondition refType="mass_airDensity">
        <dcc:name>
          <dcc:content lang="en">air density</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_mean">
            <si:real>
              <si:value>1.1635</si:value>
              <si:unit>\kilogram\metre\tothe(-3)</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.0035</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
      <dcc:influenceCondition refType="basic_relativeHumidity">
        <dcc:name>
          <dcc:content lang="en">relative humidity</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_mean">
            <si:real>
              <si:value>0.417</si:value>
              <si:unit>\one</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.020</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
    </dcc:influenceConditions>
    <dcc:results><!--ISO/IEC 17025:2017 7.8.2.1 m)-->
      <dcc:result refType="mass_conventionalMass basic_isInCMC">
        <dcc:name>
          <dcc:content lang="en">Conventional mass</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_nominalValue">
            <dcc:name>
              <dcc:content lang="en">Nominal value</dcc:content>
            </dcc:name>
            <si:real>
              <si:value>2</si:value>
              <si:unit>\kilogram</si:unit>
```

```
            </si:real>
          </dcc:quantity>
          <dcc:quantity refType="basic_measuredValue">
            <si:real>
              <si:value>2.00000020</si:value>
              <si:unit>\kilogram</si:unit>
              <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
                <si:uncertainty>0.00000053</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
            <dcc:measurementMetaData>
              <dcc:metaData refType="basic_conformity"><!--ISO/IEC 17025:2017 7.8.4.1 e)-->
                <dcc:convention>section 5.3.2</dcc:convention>
                <dcc:norm>OIML R111-1:2004</dcc:norm>
                <dcc:conformity>pass</dcc:conformity>
                <dcc:data>
                  <dcc:quantity refType="basic_toleranceLimitLower">
                    <si:real>
                      <si:value>1.999997</si:value>
                      <si:unit>\kilogram</si:unit>
                    </si:real>
                  </dcc:quantity>
                  <dcc:quantity refType="basic_toleranceLimitUpper">
                    <si:real>
                      <si:value>2.000003</si:value>
                      <si:unit>\kilogram</si:unit>
                    </si:real>
                  </dcc:quantity>
                </dcc:data>
              </dcc:metaData>
            </dcc:measurementMetaData>
          </dcc:quantity>
          <dcc:quantity refType="basic_measurementError">
            <si:real>
              <si:value>0.0000002</si:value>
              <si:unit>\kilogram</si:unit>
              <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
                <si:uncertainty>0.00000053</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:result>
    </dcc:results>
  </dcc:measurementResult>
  <dcc:measurementResult refId="weightABC5678">
    <dcc:name>
      <dcc:content lang="en">mass calibration weight 2</dcc:content>
    </dcc:name>
    <dcc:usedMethods>
    <!--ISO/IEC 17025:2017 7.8.2.1 f)-->
      <dcc:usedMethod>
        <dcc:name>
          <dcc:content lang="en">Determination of the conventional weighing value</dcc:content>
        </dcc:name>
        <dcc:norm>OIML R111-1:2004</dcc:norm>
      </dcc:usedMethod>
        <dcc:usedMethod refType="basic_uncertainty">
```

```
            <dcc:name>
              <dcc:content lang="en">Measurement uncertainty</dcc:content>
            </dcc:name>
            <dcc:description>
              <dcc:content lang="en"> The reported expanded uncertainty is stated as the standard uncertainty multiplied by a coverage factor k=2.
                                The coverage factor k=2 for a normal distribution corresponds to a coverage probability of approx. 95 %.</dcc:content>
            </dcc:description>
            <dcc:norm>EA-4/02 M:2022</dcc:norm>
          </dcc:usedMethod>
        </dcc:usedMethods>
        <dcc:influenceConditions>
          <dcc:influenceCondition refType="mass_density">
            <dcc:name>
              <dcc:content lang="en">Density</dcc:content>
            </dcc:name>
            <dcc:certificate>
              <dcc:referral>
                <!--ISO/IEC 17025:2017 7.8.2.1 p)-->
                <dcc:content lang="en">Certificate XXXXX by yyyy dated YYYY-MM-DD</dcc:content>
              </dcc:referral>
              <dcc:referralID>1.82-2017 qwe-1</dcc:referralID>
              <dcc:procedure>analogue</dcc:procedure>
              <dcc:value>analogue</dcc:value>
            </dcc:certificate>
            <dcc:data>
              <dcc:quantity refType="basic_referencedValue">
                <si:real>
                  <si:value>8010</si:value>
                  <si:unit>\kilogram\metre\tothe(-3)</si:unit>
                  <si:expandedUnc>
                    <si:uncertainty>30</si:uncertainty>
                    <si:coverageFactor>2</si:coverageFactor>
                    <si:coverageProbability>0.95</si:coverageProbability>
                  </si:expandedUnc>
                </si:real>
              </dcc:quantity>
            </dcc:data>
          </dcc:influenceCondition>
          <dcc:influenceCondition refType="basic_temperature">
            <dcc:name>
              <dcc:content lang="en">temperature</dcc:content>
            </dcc:name>
            <dcc:data>
              <dcc:quantity refType="basic_mean">
                <si:real>
                  <si:value>294.05</si:value>
                  <si:unit>\kelvin</si:unit>
                  <si:expandedUnc>
                    <si:uncertainty>0.50</si:uncertainty>
                    <si:coverageFactor>2</si:coverageFactor>
                    <si:coverageProbability>0.95</si:coverageProbability>
                  </si:expandedUnc>
                </si:real>
              </dcc:quantity>
            </dcc:data>
          </dcc:influenceCondition>
          <dcc:influenceCondition refType="mass_airDensity">
            <dcc:name>
              <dcc:content lang="en">air pressure</dcc:content>
```

```
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_mean">
            <si:real>
              <si:value>1.1635</si:value>
              <si:unit>\kilogram\metre\tothe(-3)</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.0035</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
      <dcc:influenceCondition refType="basic_relativeHumidity">
        <dcc:name>
          <dcc:content lang="en">relative humidity</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_mean">
            <si:real>
              <si:value>0.417</si:value>
              <si:unit>\one</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.020</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
          </dcc:quantity>
        </dcc:data>
      </dcc:influenceCondition>
    </dcc:influenceConditions>
    <dcc:results>
      <dcc:result refType="mass_conventionalMass basic_isInCMC">
        <dcc:name>
          <dcc:content lang="en">Conventional mass</dcc:content>
        </dcc:name>
        <dcc:data>
          <dcc:quantity refType="basic_nominalValue">
            <dcc:name>
              <dcc:content lang="en">Nominal value</dcc:content>
            </dcc:name>
            <si:real>
              <si:value>1</si:value>
              <si:unit>\kilogram</si:unit>
            </si:real>
          </dcc:quantity>
          <dcc:quantity refType="basic_measuredValue">
            <si:real>
              <si:value>1.00000012</si:value>
              <si:unit>\kilogram</si:unit>
              <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
                <si:uncertainty>0.00000030</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
            <dcc:measurementMetaData>
              <dcc:metaData refType="basic_conformity"><!--ISO/IEC 17025:2017 7.8.4.1 e)-->
                <dcc:convention>section 5.3.2</dcc:convention>
```

```
                    <dcc:norm>OIML R111-1:2004</dcc:norm>
                    <dcc:conformity>pass</dcc:conformity>
                    <dcc:data>
                      <dcc:quantity refType="basic_toleranceLimitLower">
                        <si:real>
                          <si:value>0.9999984</si:value>
                          <si:unit>\kilogram</si:unit>
                        </si:real>
                      </dcc:quantity>
                      <dcc:quantity refType="basic_toleranceLimitUpper">
                        <si:real>
                          <si:value>1.0000016</si:value>
                          <si:unit>\kilogram</si:unit>
                        </si:real>
                      </dcc:quantity>
                    </dcc:data>
                  </dcc:metaData>
                </dcc:measurementMetaData>
              </dcc:quantity>
              <dcc:quantity refType="basic_measurementError">
                <si:real>
                  <si:value>0.0000001</si:value>
                  <si:unit>\kilogram</si:unit>
                  <si:expandedUnc>
                    <si:uncertainty>0.0000003</si:uncertainty>
                    <si:coverageFactor>2</si:coverageFactor>
                    <si:coverageProbability>0.95</si:coverageProbability>
                  </si:expandedUnc>
                </si:real>
              </dcc:quantity>
            </dcc:data>
          </dcc:result>
        </dcc:results>
      </dcc:measurementResult>
    </dcc:measurementResults>
</dcc:digitalCalibrationCertificate><!--ISO/IEC 17025:2017 7.8.2.1 d)-->
```

Appendix C Example of a digital calibration certificate of a mass standard

```
<?xml version="1.0" encoding="utf-8"?>
<!--ISO/IEC 17025:2017 7.8.2.1 a)-->
<dcc:digitalCalibrationCertificate
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:dcc="https://ptb.de/dcc"
xmlns:si="https://ptb.de/si"
xsi:schemaLocation="https://ptb.de/dcc https://www.ptb.de/dcc/dcc.xsd https://ptb.de/si https://www.ptb.de/si/SI_Format.xsd"
schemaVersion="3.2.1">

<!-- examplary calibration certificate for a mass standard (silicon sphere)
Version of the example: V1.1, Date: 1501.2024
Features: use of si:hybrid
-->

  <dcc:administrativeData>
    <dcc:dccSoftware>
      <dcc:software>
        <dcc:name>
          <dcc:content>Notepad++</dcc:content>
        </dcc:name>
        <dcc:release>v8.4.7</dcc:release>
      </dcc:software>
    </dcc:dccSoftware>
    <dcc:refTypeDefinitions>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="en">general terms</dcc:content>
        </dcc:name>
        <dcc:namespace>basic</dcc:namespace>
        <dcc:link>DCCWiki</dcc:link>
      </dcc:refTypeDefinition>
      <dcc:refTypeDefinition>
        <dcc:name>
          <dcc:content lang="en">mass terms</dcc:content>
        </dcc:name>
        <dcc:namespace>mass</dcc:namespace>
        <dcc:link>DKD Expert report</dcc:link>
      </dcc:refTypeDefinition>
    </dcc:refTypeDefinitions>
    <dcc:coreData>
      <dcc:countryCodeISO3166_1>DE</dcc:countryCodeISO3166_1>
      <dcc:usedLangCodeISO639_1>en</dcc:usedLangCodeISO639_1>
      <dcc:mandatoryLangCodeISO639_1>en</dcc:mandatoryLangCodeISO639_1>
      <dcc:uniqueIdentifier>PTB-abcde 17</dcc:uniqueIdentifier>
      <dcc:identifications>
        <dcc:identification refType="basic_orderNo">
          <dcc:issuer>calibrationLaboratory</dcc:issuer>
          <dcc:value>1.81-17.xyz</dcc:value>
          <dcc:name>
            <dcc:content lang="en">Reference No.</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:beginPerformanceDate>2017-04-23</dcc:beginPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:endPerformanceDate>2017-04-25</dcc:endPerformanceDate><!--ISO/IEC 17025:2017 7.8.2.1 i)-->
      <dcc:performanceLocation>laboratory</dcc:performanceLocation><!--ISO/IEC 17025:2017 7.8.2.1 c)-->
      <dcc:issueDate>2017-04-26</dcc:issueDate><!--ISO/IEC 17025:2017 7.8.2.1 j)-->
    </dcc:coreData>
    <dcc:items><!--ISO/IEC 17025:2017 7.8.2.1 g)-->
```

```
      <dcc:identifications>
        <dcc:identification refType="basic_serialNo">
          <dcc:issuer>manufacturer</dcc:issuer>
          <dcc:value>SiQPkg_02_a</dcc:value>
          <dcc:name>
            <dcc:content lang="en">Serial No.</dcc:content>
          </dcc:name>
        </dcc:identification>
      </dcc:identifications>
      <dcc:item id="weight01">
        <dcc:name>
          <dcc:content lang="en">1 Silicon sphere to 1 kg</dcc:content>
        </dcc:name>
        <dcc:description>
          <dcc:name>
            <dcc:content lang="en">Case</dcc:content>
          </dcc:name>
          <dcc:content lang="en">The mass standard is accommodated in a transport container; the calibration mark is a
pplied to the container.</dcc:content>
        </dcc:description>
        <dcc:manufacturer>
          <dcc:name>
            <dcc:content>Physikalisch-Technische Bundesanstalt (PTB)</dcc:content>
          </dcc:name>
          <dcc:location>
            <dcc:further>
              <dcc:content lang="en">Working Group 5.56 Manufacturing Technology</dcc:content>
            </dcc:further>
          </dcc:location>
        </dcc:manufacturer>
        <dcc:identifications>
          <dcc:identification refType="mass_shape">
            <dcc:issuer>manufacturer</dcc:issuer>
            <dcc:value>sphere</dcc:value>
            <dcc:name>
              <dcc:content lang="en">Form</dcc:content>
            </dcc:name>
          </dcc:identification>
          <dcc:identification refType="mass_material">
            <dcc:issuer>manufacturer</dcc:issuer>
            <dcc:value>silicon</dcc:value>
            <dcc:name>
              <dcc:content lang="en">Material</dcc:content>
            </dcc:name>
          </dcc:identification>
        </dcc:identifications>
        <dcc:itemQuantities>
          <dcc:itemQuantity refType="basic_nominalValue">
            <dcc:name>
              <dcc:content lang="en">Nominal mass</dcc:content>
            </dcc:name>
            <si:real>
              <si:value>1</si:value>
              <si:unit>\kilogram</si:unit>
            </si:real>
          </dcc:itemQuantity>
        </dcc:itemQuantities>
      </dcc:item>
    </dcc:items>
    <dcc:calibrationLaboratory><!--ISO/IEC 17025:2017 7.8.2.1 b)-->
      <dcc:contact>
```

```
            <dcc:name>
              <dcc:content>Physikalisch-Technische Bundesanstalt (PTB)</dcc:content>
            </dcc:name>
            <dcc:location>
              <dcc:further>
                <dcc:content lang="en">Working Group 1.81 Realization of Mass</dcc:content>
              </dcc:further>
              <dcc:street>Bundesallee</dcc:street>
              <dcc:streetNo>100</dcc:streetNo>
              <dcc:postCode>38116</dcc:postCode>
              <dcc:city>Braunschweig</dcc:city>
              <dcc:countryCode>DE</dcc:countryCode>
            </dcc:location>
          </dcc:contact>
        </dcc:calibrationLaboratory>
        <dcc:respPersons>
          <dcc:respPerson>
            <dcc:person>
              <dcc:name>
                <dcc:content>Vorname1 Name1</dcc:content>
              </dcc:name>
            </dcc:person>
            <dcc:mainSigner>true</dcc:mainSigner><!--ISO/IEC 17025:2017 7.8.2.1 o)-->
          </dcc:respPerson>
          <dcc:respPerson>
            <dcc:person>
              <dcc:name>
                <dcc:content>Vorname2 Name2</dcc:content>
              </dcc:name>
            </dcc:person>
          </dcc:respPerson>
        </dcc:respPersons>
        <dcc:customer><!--ISO/IEC 17025:2017 7.8.2.1 e)-->
          <dcc:name>
            <dcc:content>Physikalisch-Technische Bundesanstalt (PTB)</dcc:content>
          </dcc:name>
          <dcc:location>
            <dcc:further>
              <dcc:content lang="en">Working Group 1.15 Metrology in Weighing Technology</dcc:content>
            </dcc:further>
            <dcc:street>Bundesallee</dcc:street>
            <dcc:streetNo>100</dcc:streetNo>
            <dcc:postCode>38116</dcc:postCode>
            <dcc:city>Braunschweig</dcc:city>
            <dcc:countryCode>DE</dcc:countryCode>
          </dcc:location>
        </dcc:customer>
        <dcc:statements>
          <dcc:statement><!--ISO/IEC 17025:2017 7.8.4.1 c)-->
            <dcc:declaration>
              <dcc:content lang="en">PTB is the National Metrology Institute and the supreme technical authority of the Fe
deral Republic of Germany for metrology. It meets the requirements for calibration and testing laboratories as defined in DIN
EN ISO/IEC 17025.</dcc:content>
            </dcc:declaration>
          </dcc:statement>
          <dcc:statement><!--ISO/IEC 17025:2017 7.8.2.1 l)-->
            <dcc:declaration>
              <dcc:content lang="en">The results refer only to the object calibrated in this DCC.</dcc:content>
            </dcc:declaration>
          </dcc:statement>
          <dcc:statement><!--ISO/IEC 17025:2017 7.8.4.3-->
            <dcc:declaration>
```

```
            <dcc:content lang="en">The measurement results are valid at the time of calibration. The applicant is responsi
ble for arranging a recalibration in due time.</dcc:content>
          </dcc:declaration>
        </dcc:statement>
      </dcc:statements>
    </dcc:administrativeData>
    <dcc:measurementResults>
      <dcc:measurementResult refId="weight01">
        <dcc:name>
          <dcc:content lang="en">Measurement results</dcc:content>
        </dcc:name>
        <dcc:usedMethods>
          <dcc:usedMethod refType="basic_uncertainty">
            <dcc:name>
              <dcc:content lang="en">Measurement uncertainty</dcc:content>
            </dcc:name>
            <dcc:description>
              <dcc:content lang="en"> The uncertainty stated is the expanded measurement uncertainty obtained by multip
lying the standard measurement uncertainty be the coverage factor k = 2.
                                It has been determine in accordance with  JCGM 100:2008. The value of the measureand then n
ormally lies, with a probability of approximately 95  %, with th eatrributed coverage interval.</dcc:content>
            </dcc:description>
            <dcc:norm>JCGM 100:2008</dcc:norm>
          </dcc:usedMethod>
          <dcc:usedMethod>
            <dcc:name>
              <dcc:content lang="en">Procedure for mass calibration</dcc:content><!--ISO/IEC 17025:2017 7.8.2.1 f)--
>
            </dcc:name>
            <dcc:description>
              <dcc:content lang="en">The calibration ensued through comparison with the reference standards of PTB usi
ng the substitution method with air buoyancy correction.</dcc:content>
            </dcc:description>
          </dcc:usedMethod>
        </dcc:usedMethods>
        <dcc:measuringEquipments>
          <dcc:measuringEquipment>
            <dcc:name>
              <dcc:content lang="en">Reference standards of PTB</dcc:content>
            </dcc:name>
          </dcc:measuringEquipment>
        </dcc:measuringEquipments>
        <dcc:influenceConditions><!--ISO/IEC 17025:2017 7.8.4.1 b)-->
          <dcc:influenceCondition refType="basic_temperature">
            <dcc:name>
              <dcc:content lang="en">temperature</dcc:content>
            </dcc:name>
            <dcc:data>
              <dcc:quantity refType="basic_min">
                <dcc:name>
                  <dcc:content lang="en">temperature min</dcc:content>
                </dcc:name>
                <si:hybrid>
                  <si:real>
                    <si:value>294.00</si:value>
                    <si:unit>\kelvin</si:unit>
                    <si:expandedUnc>
                      <si:uncertainty>0.02</si:uncertainty>
                      <si:coverageFactor>2</si:coverageFactor>
                      <si:coverageProbability>0.95</si:coverageProbability>
                    </si:expandedUnc>
```

```
            </si:real>
            <si:real>
              <si:value>20.85</si:value>
              <si:unit>\degreecelsius</si:unit>
            </si:real>
          </si:hybrid>
        </dcc:quantity>
        <dcc:quantity refType="basic_max">
          <dcc:name>
            <dcc:content lang="en">temperature max</dcc:content>
          </dcc:name>
          <si:hybrid>
            <si:real>
              <si:value>294.01</si:value>
              <si:unit>\kelvin</si:unit>
              <si:expandedUnc>
                <si:uncertainty>0.02</si:uncertainty>
                <si:coverageFactor>2</si:coverageFactor>
                <si:coverageProbability>0.95</si:coverageProbability>
              </si:expandedUnc>
            </si:real>
            <si:real>
              <si:value>20.86</si:value>
              <si:unit>\degreecelsius</si:unit>
            </si:real>
          </si:hybrid>
        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
    <dcc:influenceCondition refType="basic_humidityRelative">
      <dcc:name>
        <dcc:content lang="en">relative humidity</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_min">
          <dcc:name>
            <dcc:content lang="en">humidity min</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>0.435</si:value>
            <si:unit>\one</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.01</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
        <dcc:quantity refType="basic_max">
          <dcc:name>
            <dcc:content lang="en">humidity max</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>0.438</si:value>
            <si:unit>\one</si:unit>
            <si:expandedUnc>
              <si:uncertainty>0.01</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
        </dcc:quantity>
```

```
    </dcc:data>
  </dcc:influenceCondition>
  <dcc:influenceCondition refType="mass_airPressure">
    <dcc:name>
      <dcc:content lang="en">air pressure</dcc:content>
    </dcc:name>
    <dcc:data>
      <dcc:quantity refType="basic_min">
        <dcc:name>
          <dcc:content lang="en">Air pressure min</dcc:content>
        </dcc:name>
        <si:hybrid>
          <si:real>
            <si:value>100804</si:value>
            <si:unit>\kilogram\metre\tothe{-1}\second\tothe{-2}</si:unit>
            <si:expandedUnc>
              <si:uncertainty>6</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
              <si:coverageProbability>0.95</si:coverageProbability>
            </si:expandedUnc>
          </si:real>
          <si:real>
            <si:value>1008.04</si:value>
            <si:unit>\milli\bar</si:unit>
          </si:real>
        </si:hybrid>
      </dcc:quantity>
      <dcc:quantity refType="basic_max">
        <dcc:name>
          <dcc:content lang="en">Air pressure max</dcc:content>
        </dcc:name>
        <si:hybrid>
          <si:real>
            <si:value>100818</si:value>
            <si:unit>\kilogram\metre\tothe{-1}\second\tothe{-2}</si:unit>
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              <si:uncertainty>6</si:uncertainty>
              <si:coverageFactor>2</si:coverageFactor>
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            </si:expandedUnc>
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            <si:unit>\milli\bar</si:unit>
          </si:real>
        </si:hybrid>
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    </dcc:data>
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  <dcc:influenceCondition refType="mass_volume">
    <dcc:name>
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    </dcc:name>
    <dcc:certificate>
      <dcc:referral><!--ISO/IEC 17025:2017 7.8.2.1 p)-->
        <dcc:content lang="en">Volume calibration certificate dated 2017-04-11</dcc:content>
      </dcc:referral>
      <dcc:referralID>1.82-2017 qwe-1</dcc:referralID>
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    </dcc:certificate>
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```

```
        <dcc:quantity refType="basic_referencedValue">
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            <si:value>0.00042935318</si:value>
            <si:unit>\metre\tothe{3}</si:unit>
            <si:expandedUnc>
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            </si:expandedUnc>
          </si:real>
          <dcc:measurementMetaData>
            <dcc:metaData refType="basic_referenceTemperature">
              <dcc:declaration>
                <dcc:content lang="en">Reference temperature</dcc:content>
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              <dcc:data>
                <dcc:quantity>
                  <si:hybrid>
                    <si:real>
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                      <si:unit>\kelvin</si:unit>
                    </si:real>
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                      <si:value>20</si:value>
                      <si:unit>\degreecelsius</si:unit>
                    </si:real>
                  </si:hybrid>
                </dcc:quantity>
              </dcc:data>
            </dcc:metaData>
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        </dcc:quantity>
      </dcc:data>
    </dcc:influenceCondition>
  </dcc:influenceConditions>
  <dcc:results><!--ISO/IEC 17025:2017 7.8.2.1 m)-->
    <dcc:result refType="mass_mass">
      <dcc:name>
        <dcc:content lang="en">Measuring result</dcc:content>
      </dcc:name>
      <dcc:data>
        <dcc:quantity refType="basic_nominalValue">
          <dcc:name>
            <dcc:content lang="en">nominal value</dcc:content>
          </dcc:name>
          <si:real>
            <si:value>1</si:value>
            <si:unit>\kilogram</si:unit>
          </si:real>
        </dcc:quantity>
        <dcc:quantity refType="basic_measuredValue">
          <dcc:name>
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          </dcc:name>
          <si:real>
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            <si:dateTime>2018-02-26T12:18:38</si:dateTime>
            <si:expandedUnc><!--ISO/IEC 17025:2017 7.8.4.1 a)-->
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```

```
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                </si:real>
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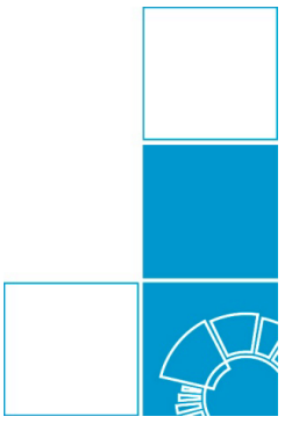

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