Nominal properties

Joint Committee for Guides in Metrology (JCGM)
Working Group on the International Vocabulary of Metrology (VIM) - WG2

JCGM/WG2 webinar:
An overview of the VIM4

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Nominal properties in VIM3

VIM3

nominal property
property of a phenomenon, body, or substance, where **the property has no magnitude**

VIM3

measurement
……

NOTE 1 **Measurement does not apply to nominal properties**

VIM3

reference material
material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended **use in** measurement or in **examination of nominal properties**

The definitions of quantity, ordinal quantity and nominal property have been aligned

VIM3

quantity
property of a phenomenon, body, or substance, where the **property has a magnitude** that can be expressed as **a number and a reference**

ordinal quantity
quantity defined by a conventional measurement procedure, for which a total ordering relation can be established, according to magnitude, with other quantities of the same kind, but for which **no algebraic operations** among those quantities exist

nominal property
property of a phenomenon, body, or substance, where the **property has no magnitude**

VIM4CD

quantity <general>
property whose instances can be compared **by ratio** or only by order

ordinal quantity <general>
quantity whose instances can be compared **by order** but not by ratio

nominal property <general>
property whose instances can be compared **only by equivalence**

The scale types in VIM

VIM3

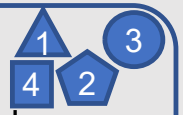
qantity-value scale
ordered set of **quantity values** of **quantities** of a given **kind of quantity** used in ranking,
according to magnitude, quantities of that kind

ordinal quantity-value scale
quantity-value scale for **ordinal quantities**

VIM4CD

measurement scale
1 2 3 4 5 6
ordered set of individual quantities of the same kind, where each quantity is associated with an element of a set of ordered identifiers

ordinal scale
1 2 3 4 5
measurement scale, accepted by agreement, whose elements are related by order only

reference set of nominal properties


set of individual nominal properties of the same kind, accepted by agreement, where each nominal property is associated with an element of a set of identifiers

The **numerals** are not numerical values, but **identifiers** of elements in a set

All three scale types are used in laboratory medicine

Of all quantities and properties measured or examined in laboratory medicine*

60 % are evaluated on ratio or differential scales

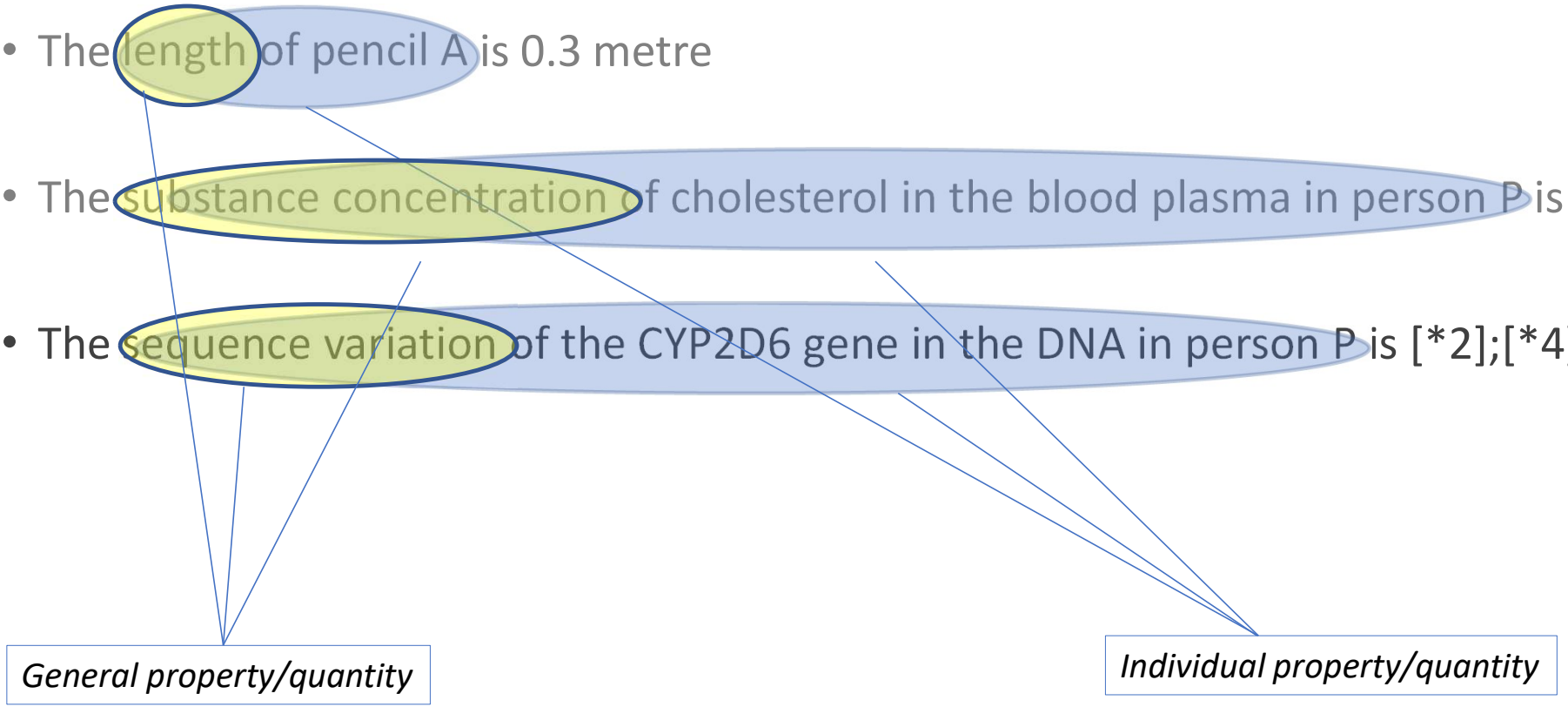
30 % are evaluated on ordinal scale

10 % are evaluated on nominal scale

*) Both according the LOINC system and the IFCC-IUPAC NPU system

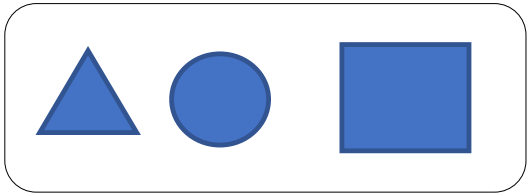
The common structure for quantities and nominal properties

- The length of pencil A is 0.3 metre
- The substance concentration of cholesterol in the blood plasma in person P is 4.5 mmol/L
- The sequence variation of the CYP2D6 gene in the DNA in person P is [*2];[*4]

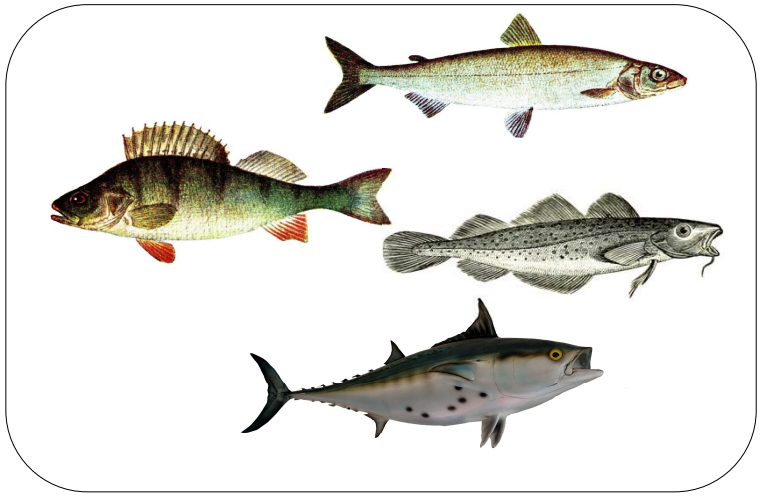


Other examples of nominal properties

Shape of objects



taxon of fish



Sequence variation for a specific gene

*4;*2A; *12; *13;..

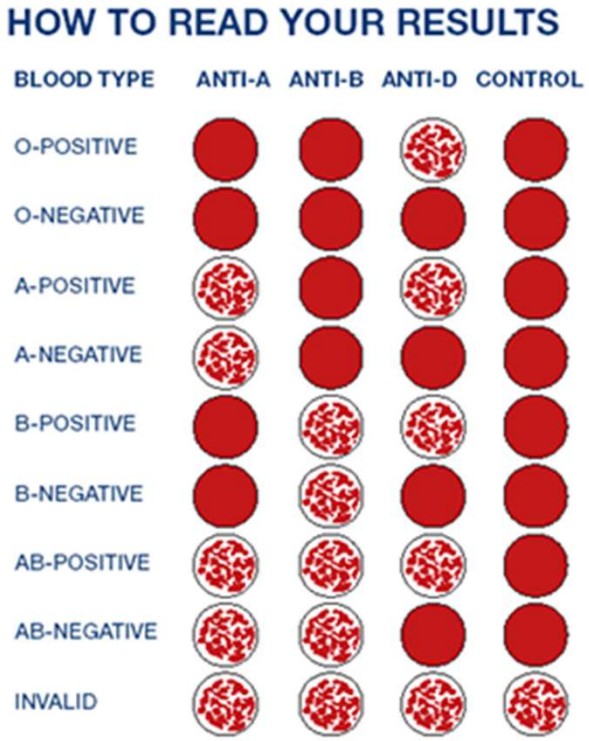
taxon of fruit

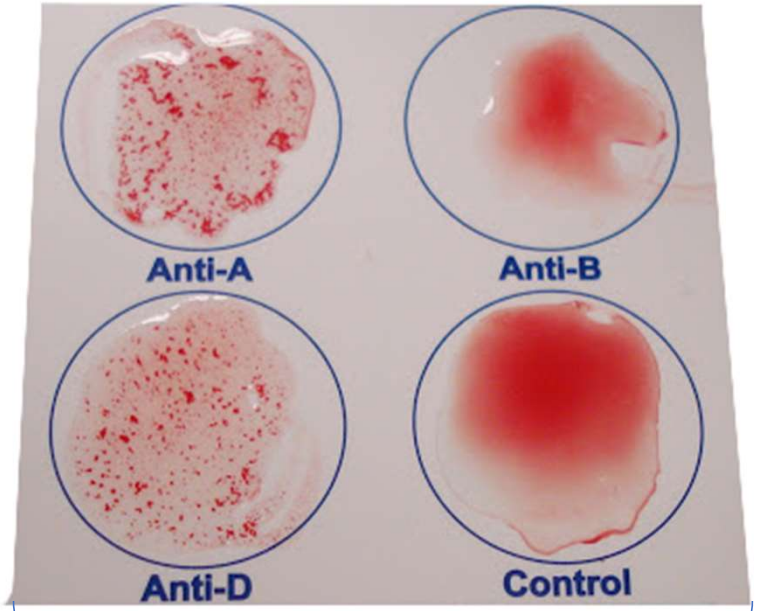
Shape of characters in the latin alphabet

A; B; C; D; E; عG;..

Blood groups are examples of nominal properties

- The ABO system and RhD system are often examined together

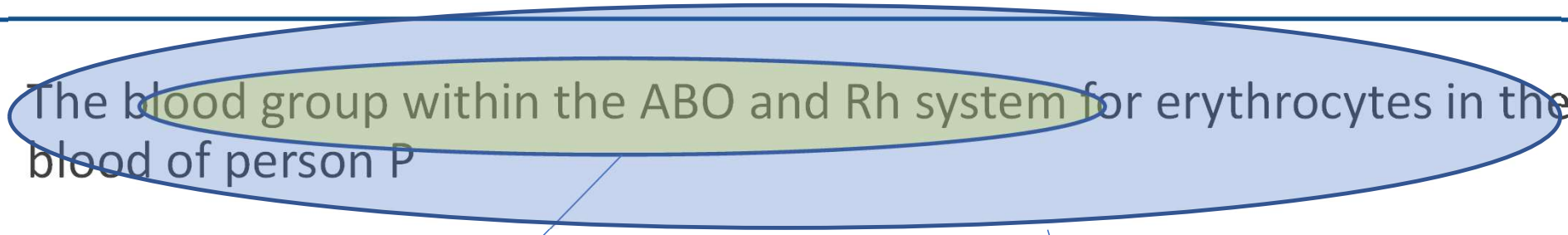




The agglutination reaction is the *examining principle*

The *examining method*

The ABO and Rh blood group is a nominal property



is ”AB Rh neg”

General property

Individual property

Increased need for comparability of laboratory test results

- Seamless exchange of data between applications
- Use of data in decision trees and computable care guidelines
- Cross border exchange of data for documentation (e.g. Corona Pass!)

The basic principles for metrology should apply for all types of test results, not only for quantities

The basic prerequisite for comparability of test results are:

1. Metrological traceability to a common **reference material**
2. Some expression of **uncertainty, or reliability,** of the values

Reference material

VIM3

reference material

material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended use in measurement or in examination of **nominal properties**

…….

NOTE 3 ‘Reference material’ comprises materials embodying quantities as well as **nominal properties**

VIM4CD

reference material

material, sufficiently homogeneous and stable with reference to one or more specified properties, which has been established to be fit for its intended use in measurement or in **examination**

……..

NOTE 4 Properties of reference materials can be quantities or **nominal properties**.

Examination reliability

‘examination uncertainty’ is not defined in VIM4CD, but instead the inverse concept ‘examination reliability’, with similarities to ‘examination trueness’ from “VIN”

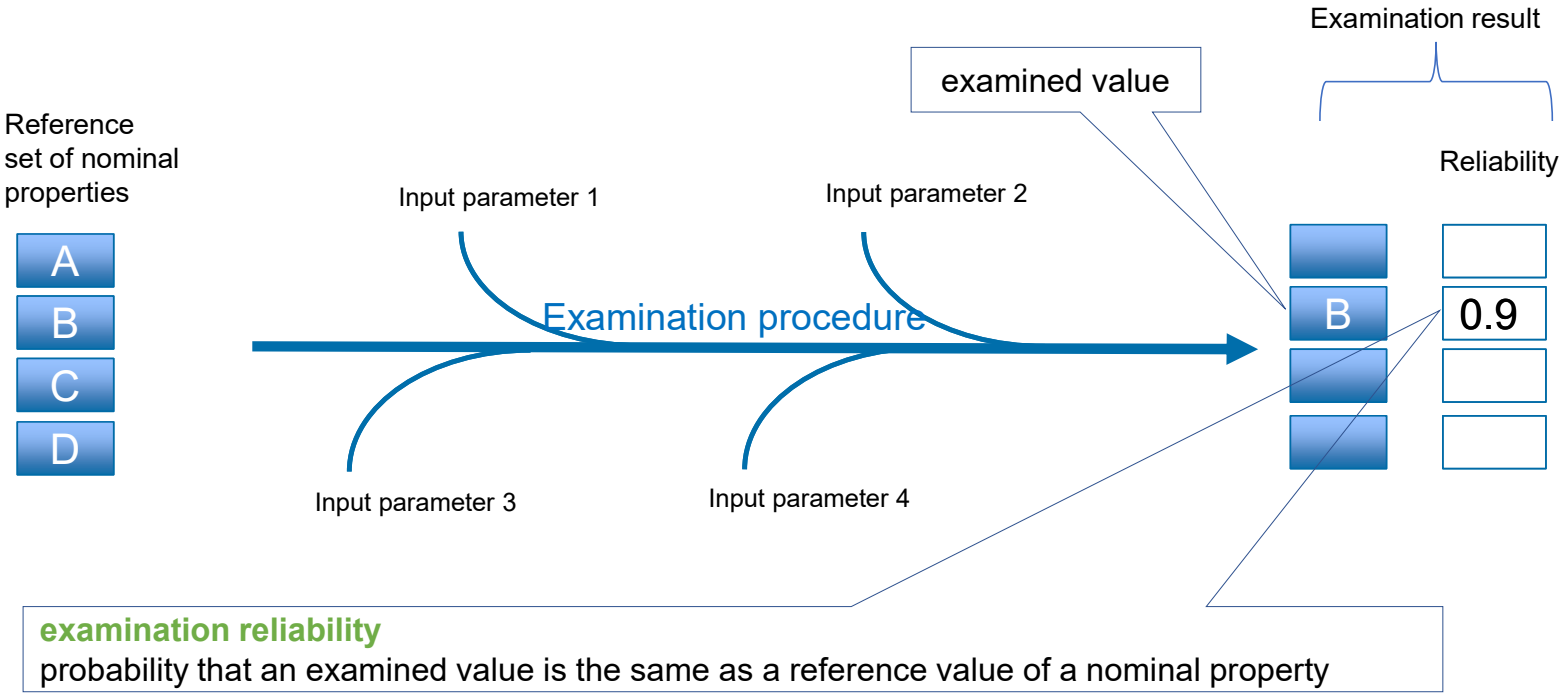
VIN

examination trueness
fraction of examined values identical to one or more reference nominal property values among all the examined values provided

VIM4CD

examination reliability
probability that an examined value is the same as a reference value of a nominal property

Reliability of an examined value

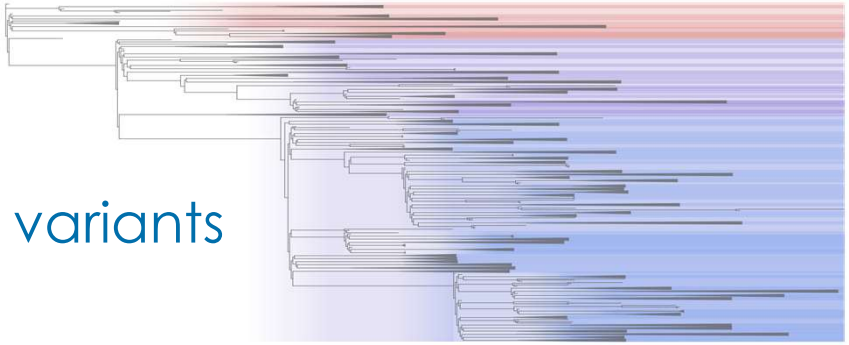


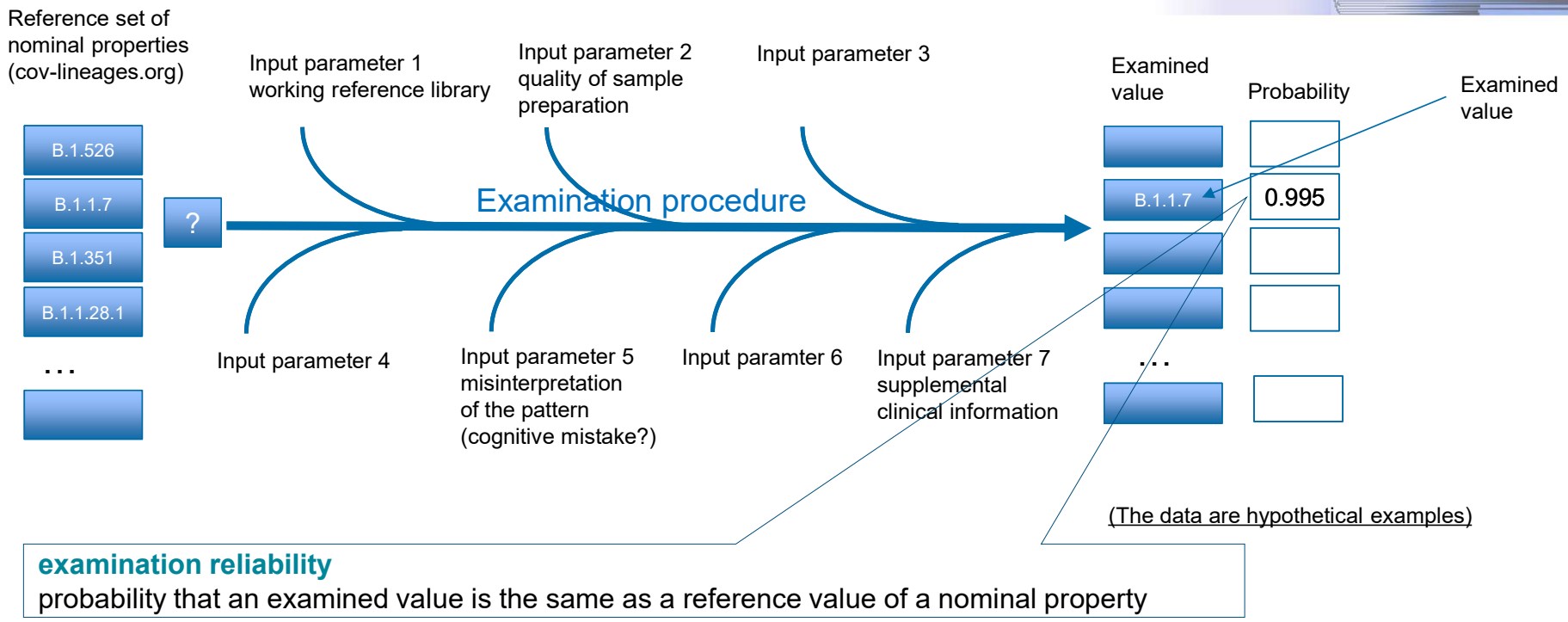
examination reliability
probability that an examined value is the same as a reference value of a nominal property

The probability is conditional and depends on a given reference set of nominal properties

Reliability of an examined value

the example classification of SARS CoV-2 virus variants





examination reliability
probability that an examined value is the same as a reference value of a nominal property

The probability is conditional and depends on a given reference set of nominal properties

Why ”examination”?

ISO 15189

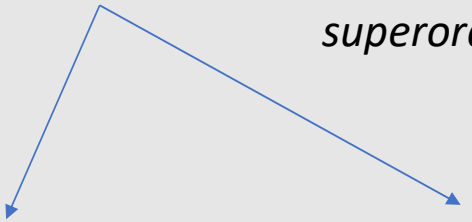
examination *Superordinate, e.g. in ISO 15189*

measurement

nominal property examination
examination of a nominal property
measurement
classification
evaluation

VIM4CD

~~examination~~ *”Examination” is not a superordinate term in VIM4CD*



measurement

examination
examination of a nominal property
~~Nominal property examination~~
~~Measurement~~
classification
~~evaluation~~

Concepts for examinations and measurements have been aligned, when possible, in VIM4CD

examination principle

Example: agglutination reaction (for examination of blood group)

examination method

Example: agglutination pattern for erythrocytes mixed with antibodies to A and B antigen respectively

examination procedure

Example: a standard operating procedure

measurement principle

Example: thermoelectric effect (for temperature measurement)

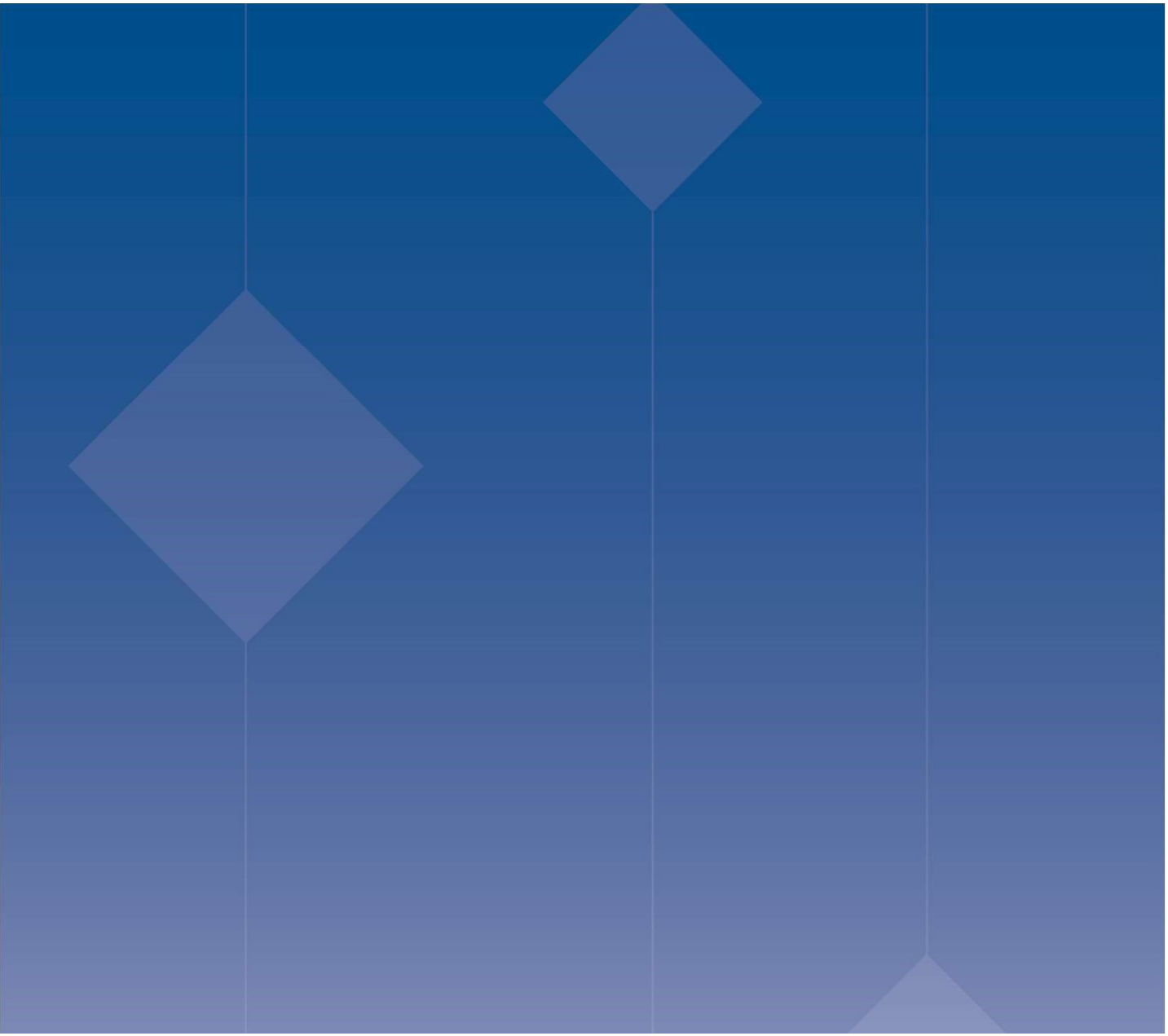
measurement method

Example: substitution measurement method

measurement procedure

Example: a standard operating procedure

In all 17 basic entries for nominal properties are included in VIM4 CD



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