

JSI roundtable workshop Geneva, 30/31.3.26

About JCGM VIM

Luca Mari

lmari@liuc.it luca.mari@unicatt.it
<https://lmari.github.io>

Scope

Size

Official languages

Main users (if known;-), regulatory adoption,...

Governing Body

Revision Cycle (Frequency, last release, Transparency of change process)

Licensing/reuse

Digital access (without much detail at this point)

The International Vocabulary of Metrology (VIM)

First edition: 1984

This Vocabulary has been prepared simultaneously in English and French by a joint working group consisting of experts appointed by :

BIPM International Bureau of Weights and Measures

IEC International Electrotechnical Commission

ISO International Organization for Standardization

OIML International Organization of Legal Metrology

The Vocabulary is published in the name of these organizations.

International vocabulary of
basic and general terms in
metrology

Vocabulaire international
des termes fondamentaux et
généraux de **métrologie**



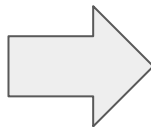
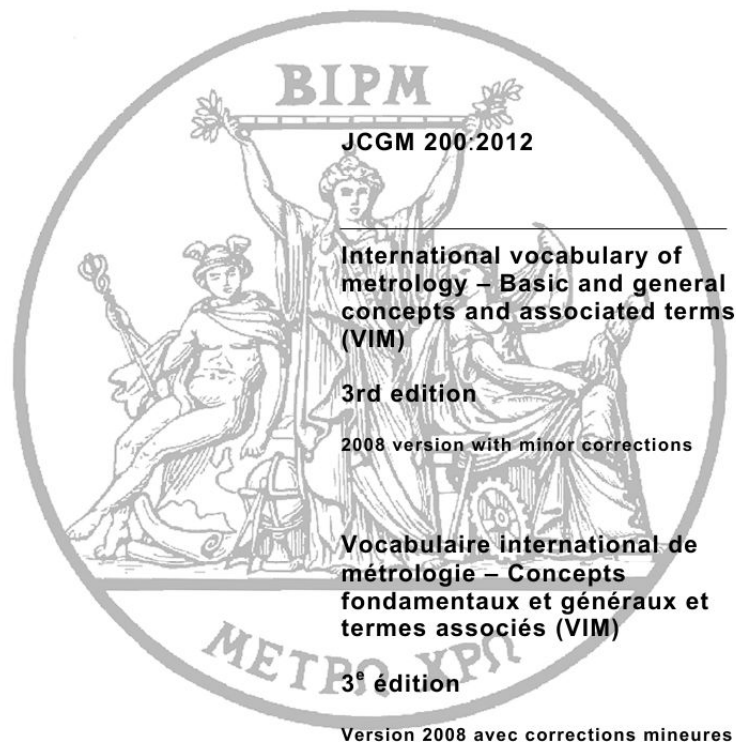
Joint Committee for Guides in Metrology (JCGM, 1997)

The current membership of the JCGM:

- the two inter-governmental organizations concerned with metrology:
 - the Bureau International des Poids et Mesures (**BIPM**)
 - the Organisation Internationale de Métrologie Légale (**OIML**)
- the two principal international standardization organizations:
 - the International Organization for Standardization (**ISO**)
 - the International Electrotechnical Commission (**IEC**)
- three international unions:
 - the International Union of Pure and Applied Chemistry (**IUPAC**)
 - the International Union of Pure and Applied Physics (**IUPAP**)
 - the International Federation of Clinical Chemistry and Laboratory Medicine (**IFCC**)
- one international accreditation organization:
 - the International Laboratory Accreditation Cooperation (**ILAC**)



The VIM: third (2008) and draft fourth (2026) editions



International Vocabulary of Metrology

**Fourth edition – Voting Draft
(VIM4 – Voting Draft)**

9 February 2026

The VIM: some facts

“Guidance documents shall be approved by consensus of the member organizations. Such documents shall then be published in the name of all the member organizations and constitute recommendations of these organizations.” [[JCGM Charter](#), 7.1.6]

“Copyright of any JCGM document is shared jointly by the JCGM’s member organizations.” [[JCGM Charter](#), A.3.1]

“JCGM official documents are distributed in PDF format to member organizations for publication [...] [[JCGM Charter](#), A.2.2]

PDF (free) version via [the BIPM website](#): <https://doi.org/10.59161/JCGM200-2012>

HTML (free unofficial) version via [the BIPM website](#)

The VIM: some facts

VIM3 (# entries per chapter)

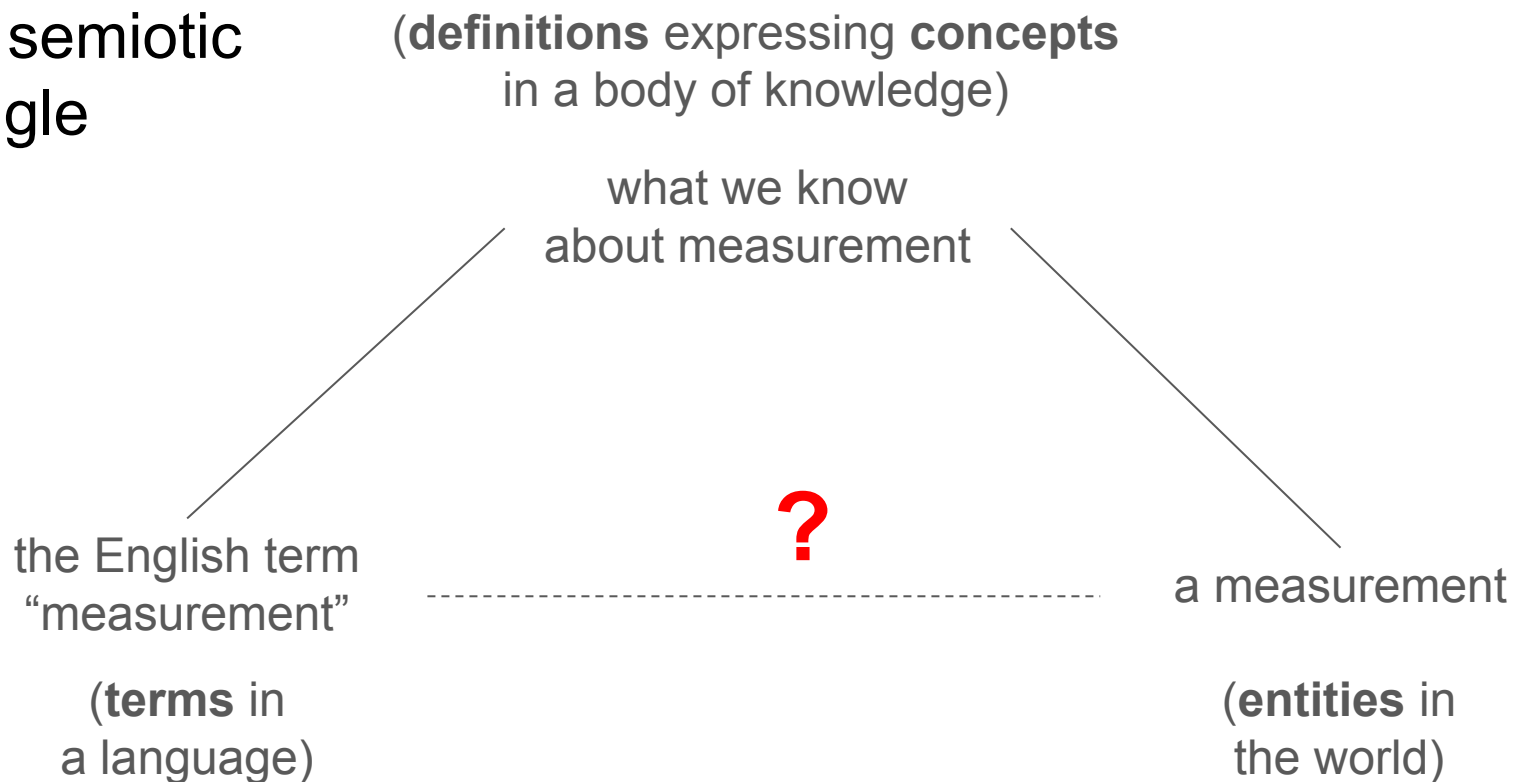
- 1 Quantities and units (33)
 - 2 Measurement (52)
 - 3 Devices for measurement (12)
 - 4 Properties of measuring devices (28)
 - 5 Measurement standards (Etalons) (17)
- (~140 entries)

VIM4 voting draft (# entries per chapter)

- 1 Quantities and units (34)
 - 2 Measurement (17)
 - 3 Measurement quality (30)
 - 4 Measuring devices and their properties (33)
 - 5 Measurement standards (etalons)
and metrological traceability (27)
 - 6 Nominal properties and examinations (20)
- (~160 entries)

The VIM is a concept system (i.e., an informal ontology):
it is about **types** (e.g., quantity, measurement unit),
not **tokens** (e.g., length, mass; metre, kilogram)

The semiotic triangle



A **vocabulary** is a **concept system** and can become an **ontology**

From a vocabulary / concept system towards an ontology /1

Condition 1: **definitions should be intensional**

(“definition that conveys the intension of a concept by stating the immediate superordinate concept and the delimiting characteristic(s)

Note: Intensional definitions are preferable to other types of definitions [...]: they should be used whenever possible. [ISO 704:2022, Terminology work – Principles and methods])

For example: ‘measurement’: “process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity” [VIM3]

measurement IS A process
(*subordinate / subtype*) (superordinate / supertype)

to be a process is a **necessary** condition
for something to be a measurement

of experimentally obtaining... (*delimiting characteristics*)
delimiting characteristics provide **sufficient** conditions
for something to be a measurement



Intensional definitions establish
a **hierarchical structure**

Intensional definitions set
necessary and sufficient conditions

From a vocabulary / concept system towards an ontology /2

Condition 2: **the substitution principle must apply**

(in any definition it must be possible to replace a term for a concept defined in the vocabulary by the definition corresponding to that term, without introducing contradiction or circularity)

[VIM3] 'measurement': "process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity"

[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"

'measurement': "process of experimentally obtaining one or more quantity values that can reasonably be attributed to a property of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference"

The substitution principle sets a **necessary condition of structural consistency**

From a vocabulary / concept system towards an ontology /3

Condition 3: **any ambiguity should be identified and removed**

(a formalization has also this purpose)

[VIM3] ‘measurement’: “process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity”

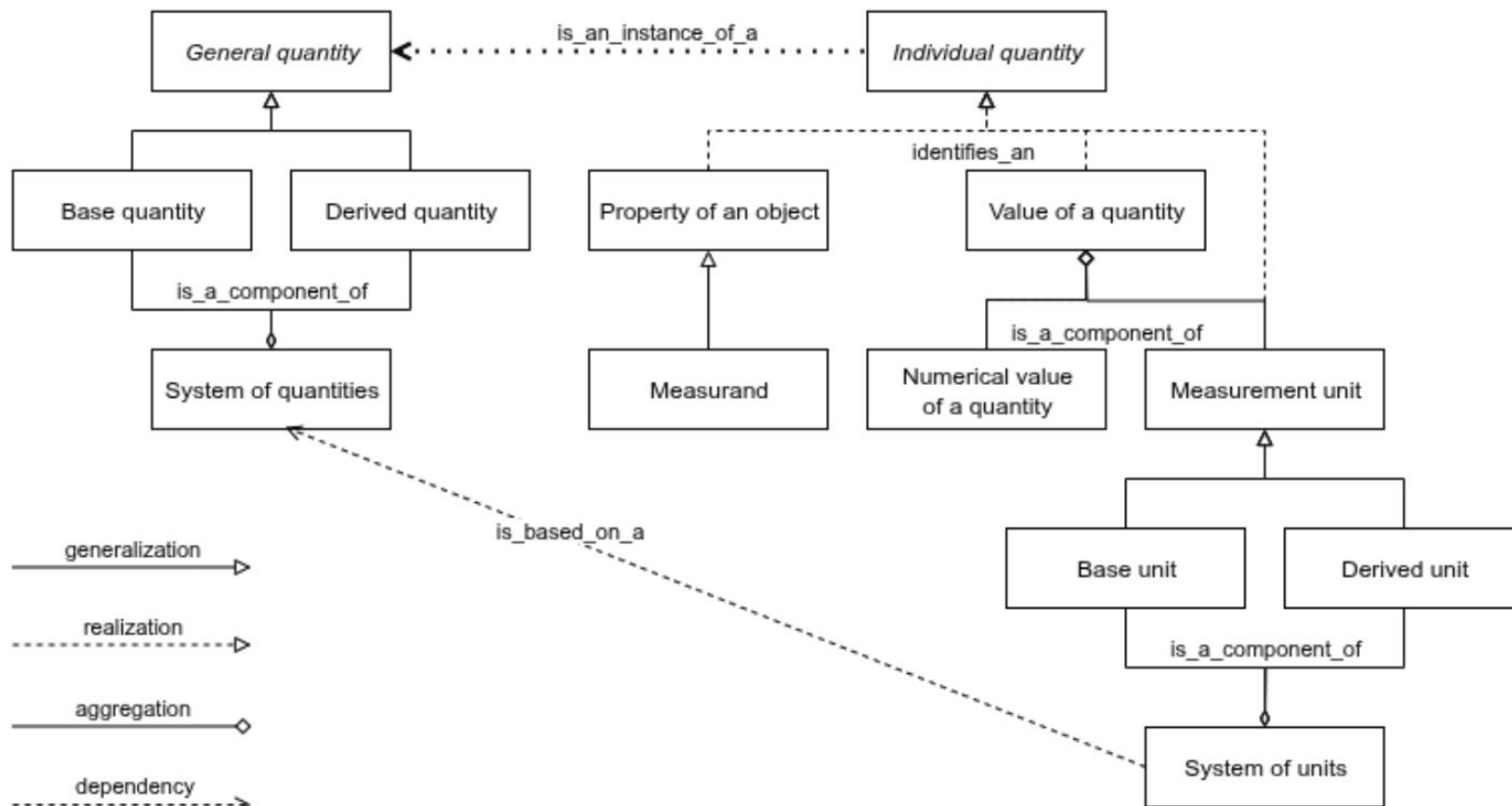
Measurement: ExperimentalProcess and (hasOutput some (QuantityValue and (attributedTo some Quantity)))

... and the “reasonably”?

Measurement: ExperimentalProcess and (hasOutput some (QuantityValue and (attributedTo some Quantity) and (hasJustification some ReasonableJustification)))

This requires us to make explicit **what entities exist** in our ontology and **what relations connect them**

An example (part of Chapter 1, VIM4 voting draft)



From a vocabulary / concept system towards an ontology /4

This would be ready for a full formalization

Class: Measurement

EquivalentTo:

ExperimentalProcess

and hasOutput some (

QuantityValue

and attributedTo some Quantity

and hasJustification some ReasonableJustification

)

This ontology can be handled by a digital system,
and allows for some inferences

```
@prefix : <http://example.org/metrology#> .  
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .  
@prefix owl: <http://www.w3.org/2002/07/owl#> .
```

```
:Measurement a owl:Class ;  
  owl:equivalentClass [  
    a owl:Class ;  
    owl:intersectionOf (  
      :ExperimentalProcess  
      [  
        a owl:Restriction ;  
        owl:onProperty :hasOutput ;  
        owl:someValuesFrom [  
          a owl:Class ;  
          owl:intersectionOf (  
            :QuantityValue  
            [  
              a owl:Restriction ;  
              owl:onProperty :attributedTo ;  
              owl:someValuesFrom :Quantity  
            ]  
          ]  
          a owl:Restriction ;  
          owl:onProperty :hasJustification ;  
          owl:someValuesFrom :ReasonableJustification  
        ]  
      ]  
    ]  
  ]  
).
```

Inferences in an ontology

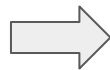
Measurement: **ExperimentalProcess** and (**hasOutput** some (**QuantityValue** and (**attributedTo** some **Quantity**) and (**hasJustification** some **ReasonableJustification**)))

```
:m1 a :ExperimentalProcess ;  
    :hasOutput :qv1 .
```

```
:temp1 a :Quantity .
```

```
:j1 a :ReasonableJustification .
```

```
:qv1 a :QuantityValue ;  
    :attributedTo :temp1 ;  
    :hasJustification :j1 .
```



```
:m1 rdf:type :Measurement .
```

```
:m2 a :Measurement ;  
    :hasOutput :qv2 .
```

```
:qv2 :attributedTo :temp2 ;  
    :hasJustification :j2 .
```



```
:qv2 rdf:type :QuantityValue .  
:temp2 rdf:type :Quantity .
```

Some open issues

1. Metrology is a complex body of knowledge: would we be able to develop an ontology?
2. Metrology is a moving target: are we ready for one ontology?
3. GenAI is becoming more and more powerful: do we still need an ontology?