

About the Portuguese *VIM3* version

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Abstract. For the first time, a unique Portuguese version of the International Vocabulary of Metrology (VIM) was organized and published by the National Metrology Institutes (NMIs) of Portugal and Brazil. This challenge could be met thanks to the experiences of the respective translations of the previous editions of the VIM and to the new Orthographic Agreement (AO) of the Portuguese speaking countries. After a brief historical review of the VIMs and their Portuguese versions, this communication aims to display the main steps that led to the final joint translation. Advantage was taken of this 3rd edition and of the AO to update the Portuguese multiplicative prefix writing “kilo” in coherence with the respective symbol “k”. By way of answer to the questions raised by the recent edition of the VIM (VIM3) that stresses on the concepts associated to the terms, some suggestions are proposed and inconsistencies are identified, in order to facilitate the understanding and the dissemination of the document. These few suggestions for the next edition of the VIM also intended to standardize the terminology found in normative texts of different scientific fields which unfortunately does not necessarily tend to be consistent between them.

1. Introduction

In 2008, the Presidents of National Metrology Institutes (NMIs) of Portugal and Brazil, the Portuguese Institute for Quality (IPQ) and the National Institute of Metrology, Quality and Technology (Inmetro) respectively, agreed to publish a unique Portuguese version of 3rd edition of the International Vocabulary of Metrology (VIM3) [1]. This challenge seemed all the more feasible that a Portuguese Language Orthographic Agreement (AO90) between the Portuguese speaking countries, since 1990, was reinforced by a law decreeing its application from 2012 January 1, in all departments, organisms and entities of the Portuguese State. Shortly before, the translation of VIM3 into Spanish, under the auspices of the NMI of Spain, the Spanish Centre of Metrology (CEM), and with the collaboration of various Spanish speaking countries NMIs had been a success story as it turned available the VIM3 for the 2nd largest number of native speaking people on Earth [2]. What could happen with the Portuguese speaking community that is less numerous, although the largest number of native speaking people in South hemisphere? Concerning VIM3, what would be the consequences of more input being provided by new fields in metrology like Chemistry and Medical Science to its elaboration? What evolution followed the traditional concepts of measurement, error and measurement result with the introduction

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of the measurement uncertainty? These are some of the points that are approached in this communication.

2. The VIMs Portuguese translations

2.1. *Previous VIMs and their Portuguese translations*

The International Bureau of Weights and Measures (BIPM) is an intergovernmental organization that was created by the treaty called “The Convention of the Metre” in 1875. The latter also created the General Conference on Weights and Measures (CGPM), that is made up of delegates of the governments of the Member States and observers from the Associate States and that has a meeting in Paris, one year other four. In its 11th meeting, in 1960, the CGPM adopted the International System of Units, SI, with the rules for the practice of prefixes, the derived units and the base units and for the quantity calculus, setting the language of science, according to the famous I.Mills’ expression [3]. This settlement was put further on, in 1969, when the International Organization of Legal Metrology (OIML) published the first edition of the International Vocabulary of Legal Metrology (VIML) and its 2nd edition in 1978. But only in 1984, the first edition of the VIM was published under the responsibility of the BIPM, the OIML, the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). In Portugal, for historical matters, the 1st translation of VIML was released in 1983. It was followed, the year after, with the publication of the Portuguese version of VIM, by the Portuguese Institution responsible for National Organization of Metrology of that time.

After the approximately same time period necessary for the publication of 2nd edition of the VIML, in 1993, the 2nd edition of the VIM (VIM2) released also with the contributions of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC), the International Union of Pure and Applied Chemistry (IUPAC) and the International Union of Pure and Applied Physics (IUPAP) that joined themselves to the group of international Organizations at the origin of the 1st edition of VIM. The 3rd edition of the VIM (VIM3) was only published in 2007, for which the International Laboratory Accreditation Cooperation (ILAC) collaborated from 2005. In the meanwhile, in 2000, OIML published the most recent edition of VIML, but based on the VIM2. The then recently created NMI of Portugal, the IPQ, published the Portuguese version of the VIM2, in 1994 and, in 2009, the Portuguese version of the 2000 edition of VIML, taking into account the Portuguese version of VIM3, published in 2008. The NMI of Brazil, the Inmetro, published five versions of the Brazilian translation of the VIM2 and, in 2009 November, it published a Brazilian version of VIM3.

2.2. *Towards a possible unique Portuguese VIM3*

Contrarily to the Spanish language, the European Portuguese language with respect to the American one is similar to the European English language with respect to the one of the American continent. The G B Shaw’s aphorism, “England and America are two countries separated by a common language”, is also unfortunately valid for Portugal with respect to Brazil. Indeed, as they are built with approximately 400 000 words, English and Portuguese languages can be considered as languages of culture and the percentage of different words between English and American is about 10 %, which is the same difference that exists between Portuguese and Brazilian. However, throughout the twentieth century, some Orthographic Agreements have been made in order to create a unified orthography for the Portuguese Language. The most recent of them was signed in 1990 (AO 90). Considering a sampling of around 140 000 words, studies showed that 3,2 % of them were affected by the AO 90, changing the spelling of 1,0 % of Brazilian Portuguese (BP) words, whereas 1,6 % of the spelling of European Portuguese (EP) words changed. It seemed then to be possible to use the AO 90 to produce a unique Portuguese version of the VIM3.

2.3. *The produced VIM3 Portuguese version*

In 2012, a new VIM3 version was released that replaced the 2007 version by including the corrections published in 2010. The 2012 VIM3 version was translated in Portuguese by IPQ and Inmetro applying the AO 90 in order to try and solve all possible differences between EP and BP concerning syntactic, morphological (in case of difference, BP was preferred) and lexical matters. For the edition published in Portugal, when the EP and the BP terms are different, first appears the EP term followed by the BP one and a footnote explains in which entry each term is used. For the edition published in Brazil, the BP term is displayed first, followed by the EP one and a footnote has the same role as the European edition. As balance, it can be said that around 6 % of the approximately 410 terms of VIM 2012 were evidenced to be different.

In spite of all, let us now look at how the Portuguese VIM 2012 allowed to solving incoherence in Metrology as practised in countries of Portuguese language for decades. Portugal was one of the first countries to adopt the decimal metric system of units, in 1852. In that time, and following the wording of the decimal metric system, the multiple of unit by a factor one thousand had the prefix “kilo”. This lasted until the first orthographic reform, in 1911, when the k letter was put out of the primer, and the writing “quilograma” was admitted instead of “kilograma” for etymologic reason (although the spelling “quilo” comes from the ancient Greek word meaning one thousand, the original decimal metric system adopted symbol was k for the sake of simplicity and dissemination). In 1931, an agreement between the Academy of Sciences of Lisbon and the Brazilian Academy of Letters only maintained the k letter for the symbol of the factor one thousand, until the AO 1990 that reinserts the k letter in the primer, but allowing both the spellings “kilojoule” and “quilograma”. Among the Roman languages, only the Italian with “chilogrammo” and the Catalan with “quilogram” display such discrepancy between the symbol and the writing of the factor for one thousand. Fortunately, the Inmetro not only agreed for adopting the writing “kilogram” in the Portuguese VIM 2012 but also in 2012 edition of the Brazilian SI. These decisions will greatly help that in Portugal also the coherent writing be officially adopted back again.

Before the final publication of the VIM 2012 Portuguese version, the IPQ and the Inmetro launched a 3 months public consultation in the respective websites. Contributions were mainly auditors from the Chemical and Biological fields. The general suggestion of the contributors was for a greater proximity of the translation to the English terms than the French ones.. which was contradictory with the fact that Portuguese is a Romance language and, on the other hand, the fact that French is the official language of VIM3. A typical example of disagreement of the public contributors dealt with the translation of the term precision (*fidélité*, in French). As, in the VIM2, this term had disappeared, the IPQ team translated it by *fidelidade*, which is closer to the French word than *precisão*. Anyway, the great proportion of suggestions from the public consultation for the second word made accept both of them [4].

3. Some challenges for the VIM

3.1. Some basic terms

One of the main criticisms recorded by the VIM3 Online Survey [5], to which comments were able to be sent on the BIPM website during 4 months in 2012, was the difficulty that some readers had to understand and use the VIM3. This was surely not due to the lack of published comments and proposals about the VIM3 terms and concepts. For instance, interesting works have been issued about VIM3 definitions of basic terms like “quantity” and “measurement” [6 - 9]. For instance, VIM3 defines “quantity” as a property having “a magnitude that can be expressed as a number and a reference”, in opposition to the “nominal property”, which is defined as a property having “no magnitude”. Since “measurement does not apply to nominal properties” and the metrology is the “science of measurement and its application”, VIM3 does not apply to nominal properties. It can be observed that VIM3 settles a correspondence between quantity and nominal property, quantity value and nominal property value, measurement uncertainty and examination uncertainty and metrological traceability of a quantity value and traceability of a nominal property value [10]. Consequently, *stricto*

sensus following the apparent logic of VIM3 might lead to define the term “Examinology”, as the science of examination of nominal properties. Projects of Recommendation [11] and Guides [12, 13] were already produced and interestingly dealt with uncertainty and traceability for qualitative analysis or nominal property values issues, i.e. by introducing specific statistics associated to attributes. That is to say, the concepts of quantity value and attribute are clearly supported by the statistics that are fit for the kinds of property, which are not exclusively quantitative [13]. But coherence still needs to be reached among reference documents. For example, as the reference materials are either associated to nominal property value or to quantity value [1], ISO/REMCO [12] is expected to have proposals for the thematic. They interestingly consist on assigning the term “property value” to “quantity value” and the term “property attribute” to “nominal property value”, however they still do not have a clear concept associated to quantity and measurement.. A solution of the medical laboratories quality system ISO 15189 [14] is to only consider the term “examination” to deal with both nominal properties and quantities. Due to their evidenced importance in medical and chemical analysis, efforts to clarify and get coherent definitions of the concepts should be continued. Other interesting works that were published about the quantity and the type of quantity [15], about quantity and quantity value in VIM3 [16] and about measurement [17] deserve to be mentioned as fruitful contributions for future version of the VIM.

3.2. Mathematical modelling in Metrology

The growing acknowledged importance of mathematic tools in Metrology turned their use to be “official” by VIM3 publishing associated terms. In particular, there is a general trend of no return in Metrology for mathematical modelling, already initiated with the *Guide to the expression of uncertainty in measurement (GUM)* [18], continued by BIPM Guides about the propagation of distributions using Monte Carlo method [19 - 20] and by other BIPM Guides [21]. As a typical example, a new definition of calibration can be shortly analyzed. According to VIM3, calibration consists of two successive steps: first setting a correspondence between the indication of the measuring instrument (MI) under calibration and the reference values (from standards, for instance), then setting a relationship between the indication of the MI and the measurement result. In the Portuguese translation of VIM3, the new definition of calibration [22] facilitates understanding and implementing this new practice within the accredited laboratories, albeit arisen questions about the choice of the model, its physical meaning, their evaluation and the content of the calibration certificate that have to be solved [23].

When considering measurements involving Chemistry and Biology systems, with great number of entities, the mathematical modelling with analytical function (in the sense of the GUM chapter 8.) are still hard to be solved, even using the propagation of distributions, based on Monte Carlo method. Alternative methods may be used [24] and key terms and associated are referred also in VIM3. However, their definitions need to be coherent with those of ISO 3534-2:2006 and ISO 5725-1:1994 Standards [25].

4. Conclusion

For the sake of better dissemination in the Portuguese-speaking countries, a unique translation of the VIM3 was produced, for the first time, thanks to an Agreement between the Presidents of the NMIs of Portugal and Brazil. A recent officialised Orthographic Agreement between the majority of Portuguese-speaking countries helped its execution, in spite of some still impossible differences in the spelling of 10 % of the terms (as it is the case of the scientific words ending with *ião* in Portugal end with *ion* in Brazil). Anyway, the new logic of VIM in paying more attention to the concepts in VIM3 than the previous editions changed the meaning of measurement (from previously “determining a value of a quantity” to VIM3 “obtaining one or more values that can reasonably be attributed to a quantity”) [26] and evidenced the need to clarify concepts associated to the nominal property. The increasing importance of mathematical tools and of Chemistry and Medical Science in Metrology also challenged the applicability of the new definition of calibration and alternative methods to the GUM-

based Guides that are present in VIM3, the Portuguese translation of which gave a contribution for more scientists to be involved in.

5. References

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