

**REPORT ON SCIENTIFIC ACTIVITIES AT THE INSTITUTO PORTUGUÊS DA QUALIDADE
IN CONSULTATIVE COMMITTEE FOR MASS AND RELATED QUANTITIES - CCM**

SUMMARY

1. Introduction	3
2. Relevant Publications	3
3. Master Thesis and Doctoral Dissertations	7
4. Participation in International Joint Research Projects	8
5. Development or Revision of Guides and Standards	8
6. Comparisons	9
7. CMCs	10
8. Trainings	10
9. EURAMET Guides	10
10. Conclusions	10

1. Introduction

The measurement infrastructure of Portugal is underpinned by its National Metrology Institute (NMI), who provides metrological traceability to the network of national accredited laboratories working in contact with the national industry, linking the SI units to the measurement reference standards, onto the working reference standards and to the measuring instruments.

The Portuguese Institute for Quality (IPQ) is a public institute with the mission to coordinate the Portuguese System for Quality and to support and stimulate activities aiming at the improvement of product and services quality to ensure accuracy and consistency of measurement, with impact in relevant areas such as health, environment, safety, energy, and industry, helping to secure a better quality of life across society.

As NMI one of IPQ's main duties is to develop and maintain the most accurate measurement standards, underpinning a national measurement system infrastructure of traceability throughout Portugal, by participating in R&D projects with other NMIs, academia and research centres.

Portugal was one of the original signatories of the Metre Convention. It has always been a national objective in the metrology framework to assure the development, application, and maintenance of the national standards of the measurement units and their traceability to the International System of Units (SI), fostering its dissemination nationwide.

The National Metrology has the following **Mission**:

“To guarantee the Accuracy and Traceability of measurement nationwide, aiming at the sovereignty of the Measurement National Standards, and to perform metrological control to the measuring instruments, to accommodate the needs of the national industry and of the society as a whole”.

and **Vision**:

“To be the mainstay of national competitiveness and welfare of citizens through a technologically advanced metrological framework” and “To be a national reference institution in the developing European metrology network, contributing to the European leadership in the context of the world economy”.

2. Relevant Publications

To promote and disseminate national metrological capabilities in the context of the activities in the field of CCM, they have been published several works, as follows:

Papers published in peer-reviewed journals:

- Afonso, J., Batista, E., Furtado, A., M. Álvares, R. Martins and I. Godinho, (2022) Calibration of an insulin pump by optical methods, *TMQ – techniques, methodologies and quality*, 13: 40-57. <https://publicacoes.riqual.org/ed13-40-57/>
- Malengo, A., Eppers, D., Akcadag, U. Y., Furtado, A., Schiebl, M., Vamossy, C., ... & Jintao, W. (2022). EURAMET Key Comparison EURAMET. MD-K4. 2020: Hydrometer calibration comparison from 600 kg/m³ to 2000 kg/m³. *Metrologia*, 59(1A), 07005. DOI 10.1088/0026-1394/59/1A/07005
- Furtado, A., Napoleão, A., Pereira, J., Moura, S., Quendera, R., & Pellegrino, O. (2022). Absolute salinity determination by oscillation-type densimetry and

refractometry. *International Journal of Metrology and Quality Engineering*, 13, 10. <https://doi.org/10.1051/ijmqe/2022007>

- Bissig, H., Büker, O., Stolt, K., Graham, E., Wales, L., Furtado, A., ... & Lötters, J. C. (2023). In-line measurements of the physical and thermodynamic properties of single and multicomponent liquids. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 39-50. <https://doi.org/10.1515/bmt-2022-0039>
- Furtado, A., Napoleão, A., Pereira, J., Moura, S., Quendera, R., & Pellegrino, O. (2022). Absolute salinity determination by oscillation-type densimetry and refractometry. *International Journal of Metrology and Quality Engineering*, 13, 10.
- Batista, E., Sousa, J. A., Álvares, M., Afonso, J., & Martins, R. F. (2022). Application of the front tracking method in micro flow measuring devices. *Measurement: Sensors*, 23, 100397. Niemann, A. K., Batista, E., Geršl, J., Bissig, H., Büker, O., Lee, S. H., ... & Knotek, S. (2023). Assessment of drug delivery devices working at microflow rates. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 51-65.
- Mills, C., Batista, E., Bissig, H., Ogheard, F., Boudaoud, A. W., Büker, O., ... & Lötters, J. (2023). Calibration methods for flow rates down to 5 nL/min and validation methodology. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 13-27.
- Metaxiotou, Z., Bissig, H., Batista, E., do Céu Ferreira, M., & Timmerman, A. (2023). Metrology in health: challenges and solutions in infusion therapy and diagnostics. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 3-12. Bissig, H., Büker, O., Stolt, K., Batista, E., Afonso, J., Zagnoni, M., ... & Schroeter, J. (2023). Calibration of insulin pumps based on discrete doses at given cycle times. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 67-77.
- Batista, E., Álvares, M., Martins, R. F., Ogheard, F., Geršl, J., & Godinho, I. (2023). Measurement of internal diameters of capillaries and glass syringes using gravimetric and optical methods for microflow applications. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 29-38.
- Silverio, V., Canane, P. A., Martins, T. A., Afonso, R., Cardoso, S., & Batista, E. (2023). Development of a microfluidic electroosmosis pump on a chip for steady and continuous fluid delivery. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 79-90.
- Batista, E., Bissig, H., & Klein, S. (2023). Medical flow and dosing measurement metrology in drug delivery. *Biomedical Engineering/Biomedizinische Technik*, 68(1), 1-2.
- Sousa, J. A., Batista, E., Demeyer, S., Fischer, N., Pellegrino, O., Ribeiro, A. S., & Martins, L. L. (2021). Uncertainty calculation methodologies in microflow measurements: Comparison of GUM, GUM-S1 and Bayesian approach. *Measurement*, 181, 109589.
- Batista, E., Sousa, J. A., Álvares, M., Afonso, J., & Martins, R. F. (2021). Development of an experimental setup for micro flow measurement using the front tracking method. *Measurement: Sensors*, 18, 100152. <https://doi.org/10.1016/j.measen.2021.100152>
- Batista, E., Furtado, A., do Céu Ferreira, M., Godinho, I., Álvares, M., Afonso, J., & Martins, R. F. (2021). Uncertainty calculations in optical methods used for micro flow measurement. *Measurement: Sensors*, 18, 100155. <https://doi.org/10.1016/j.measen.2021.100155>

- Graham, E., Thiemann, K., Kartmann, S., Batista, E., Bissig, H., Niemann, A., ... & Zagnoni, M. (2021). Ultra-low flow rate measurement techniques. *Measurement: Sensors*, 18, 100279. <https://doi.org/10.1016/j.measen.2021.100152>
- Graham, E., and Batista, E. (2021). Improving infusion dosing accuracy for patient safety. *Eur Pharmaceut Rev*, 26.

Papers published in Conferences Book of Proceedings, Magazines and others

- Batista, E. (2022,) Métodos de calibração aplicados às medições de volume, *Revista Medições e ensaios da SPMET* n.º 16
- Batista, E., Gala, J., Ribeiro, L., Almeida, N., Filipe, E., Martins, R., (2022). Padrão de medição de Microcaudal de fluidos, *Livro Engenharia XXI*
- Heeren, H., Silverio, V., Pecnik, C., Batista, E., (2022). Metrology challenges for microfluidics, *CMM international* n 15.2
- Neuvonen, P., Furtado, A., Moura, S., Laku, B., Malejczyk, E., Lenard, E., (2022). Good practice guide for the measurement of the density of liquids in industry, *Site IPQ* e <https://zenodo.org/record/6560044>
- Pellegrino, O., Furtado, A., Moura, S., Figueiredo, J., Pellegrino, O., Lenard, E., Malejczyk, E., Alisic, S., Alic, A., Rauch, J., Sariyerli, G., Akcadag, U., (2022). First density comparison on viscoelastic samples by HW, *Book of proceedings of IMEKO TC1-TC7-TC13-TC18 Symposium 2022 & MATHMET 2022 Joint Symposium*
- Akslli, B, Batista, E., Furtado, A., S. Moura, *et al.*, (2022). Whitepaper on the measurement of hydrophobicity, hydrophilicity, and wettability, <https://zenodo.org/record/7181091#.Y8GJYXbP1PY>
- Alvares, M., Batista, E., Martins, R., Godinho, I., (2021). Desenvolvimento de um sistema de medição de caudal com recurso a métodos óticos, *TMQ*, 11
- Quendera, R., Pellegrino, O., Moura, S., Abrantes, J., Cabral, V., Furtado, A., & e Sousa, J. A. (2021). Unified pH applied to standard seawater and NaCl solutions: preliminary studies. In 2021 *International Workshop on Metrology for the Sea; Learning to Measure Sea Health Parameters (MetroSea)* (pp. 11-15). IEEE. <http://dx.doi.org/10.1109/MetroSea52177.2021.9611626>
- Batista, E., Furtado, A., Pereira, J., Godinho, I., & Martins, R. F. (2021). Uncertainty calculation in nanoflow measurements using interferometry. In *ADVANCED MATHEMATICAL AND COMPUTATIONAL TOOLS IN METROLOGY AND TESTING XII* (pp. 142-148).
- Furtado, A., J. Afonso, Batista, E., and Martins, R. (2021). The effect of drugs rheological properties in the flow accuracy and uncertainty of infusion systems within the microflow range, *Book of proceedings of the 14th Annual European Rheology Conference, ESR – European Society of Rheology and Nordic Rheology Society 2021*
- Santos, F., Furtado, A., and Navas, H. (2021). IPQ high-pressure liquid density measuring device based on oscillation densimetry, *Book of proceedings of the International Metrology Congress- CIM 2021*
- Furtado, A., Afonso, J., Batista, E., Bissig, H., Graham E., Metaxiotou, Z., Büker, O., Kartmann, S., Lee, S., Martins, R. (2021). The effect of drugs rheological properties

in the flow accuracy and uncertainty of infusion systems within the microflow range, *Book of proceedings of the International Metrology Congress- CIM 2021*

- Quendera, R., Furtado, A., Pellegrino, O., Moura, S., Abrantes, J., Cabral, V. and Alves e Sousa, J. (2021). Unified pH applied to standard seawater and NaCl solutions: preliminary studies, *Book of proceedings of the International Workshop on Metrology for the Sea – MetroSea*, <https://ieeexplore.ieee.org/document/9611626>

Oral/poster communications presented in conferences

- Batista, E., Martins, R.F., Silvério, V., Godinho, I., Calibration methodologies developed towards reliable micro and nanoflow measurements, IMEKO TC1+TC7+TC13+TC18 & MATHMET Joint SYMPOSIUM/Porto, 31 August 2022
- Furtado, A., Moura, S., Abrantes, J., Figueiredo, J., Pellegrino, O., Lenard, E., Malejczyk, E., Alisic, Š., Alic, A., Rauch, J., Sariyerli, G., Akcadag, Ü., First density comparison on viscoelastic samples with hydrostatic weighing method, ISEP, Porto, 1 September, 2022.
- Batista, E., Silverio, V., Ogheard, F., Pecnik, C., Becker, H., Niemann, A., MFMET project - Establishing metrology standards in microfluidic devices, FLOMEKO 2022, 3 November 2022
- Batista, E., Bissig, H., Morgan, J., Niemann, A., Timmerman, A., Ogheard, F., MeDDII - Metrology for Drug Delivery project – results and impact, FLOMEKO 2022, 3 November 2022
- Batista, E., Sousa, J. A., Saraiva, F., Silvério, V., Martins, L., Lopes, A., Martins, R. F., A Importância da Rastreabilidade na Metrologia Dimensional em Sistemas Microfluídicos, 8.º ENCONTRO NACIONAL DA SPMET, online, 15 November 2023
- Furtado, A. & Moura, S., EMPIR 17RPT02 rhoLiq - 4th Project Meeting, On-line, 3 February 2022
- Furtado, A. & Moura, S., Final Meeting of EURAMET Project rhoLiq, Hybrid, 27 April 2022
- Furtado, A., Workshop of EURAMET Project rhoLiq Hybrid, 28 April 2022
- Batista, E., Metrology supports microfluidic fabrication and testing Online, Webinar – MFA, 5 May 2022
- Batista, E., Development of an experimental setup - a Primary System for micro the Measurement of Nano-flow measurement using the front tracking method, Rates of Liquids, IMEKO 2021, online, August 2021
- Batista, E., Uncertainty calculations in optical methods used for micro flow measurement, IMEKO 2021, online, August 2021
- Batista, E., Measurement of internal diameters using gravimetric and optical methods for microflow applications, CIM 2021, Lyon, September 2021
- Furtado, A., Afonso, J., Batista, E., Bissig, H., Graham E., Metaxiotou, Z., Büker, O., Kartmann, S., Lee, S., Martins, R., The effect of drugs rheological properties in the flow accuracy and uncertainty of infusion systems within the microflow range, International Metrology Congress- CIM 2021, Online, 7 to 9 September 2021
- Quendera, R., Furtado, A., Pellegrino, O., Moura, S., Abrantes, J., Cabral, V. and Alves e Sousa, J., Unified pH applied to standard seawater and NaCl solutions:

- preliminary studies (Prize of conference best article), International Workshop on Metrology for the Sea – MetroSea, Online, 4 to 6 October 2021
- Furtado, A., EMPIR Project 17RPT02 rhoLiq - Establishing traceability for liquid density measurements, CCM Working Group Density and Viscosity, Online via Zoom, 19 April 2021
 - Batista, E., Traceability and accuracy in infusion medical devices, HMD Metrology Day, 20 May 2021
 - Batista, E., MeDD II - Aims, Partners, Methods, 14th Lübeck Workshop “Low Liquid Flows in Medical Technology, Online, 15 September 2021
 - Furtado, A., Report of the Subcommittee Density and Viscosity, EURAMET TC-M Subcommittee Density and Viscosity
 - Furtado, A., Progress report on activities of TCM-SC-Density&Viscosity, Technical meeting and EURAMET TC-M Annual Meeting, Online via MS Teams Meeting, 27 October 2021
 - Furtado, A., Afonso, J., Batista, E., and Martins, R., The effect of drugs rheological properties in the flow accuracy and uncertainty of infusion systems within the microflow range, 14th Annual European Rheology Conference ESR – European Society of Rheology and Nordic Rheology Society 2021 – Cyberspace, 13 to 15 April 2021
 - Batista, E., *et al*, Flow measurements in a lab-on-a-chip device: metrological traceability and accuracy, CIM 2021, Lyon September 2021
 - Ogheard, F., Batista, E., *et al.*, A new EURAMET EMPIR Project: establishing metrology standards, CIM 2021, Lyon September 2021
 - Santos, F., Furtado, A., and Navas, H., IPQ high-pressure liquid density measuring device based on oscillation densimetry, International Metrology Congress- CIM 2021, Online, 7 to 9 September 2021

3. Master Thesis and Doctoral Dissertations

IPQ has collaboration with several Portuguese Universities, promoting the orientation of Master thesis and Doctoral dissertations. This gives the opportunity to develop the research activities and to broaden our services.

- Elsa Batista. Innovative contributions on calibration methodologies towards reliable microflow measurements, FCT/UNL, PhD 22 February 2022. <http://hdl.handle.net/10362/134197>
- Joana Afonso. Validation of methodologies for the calibration of rate measuring instruments by optical methods, FCT-NOVA Master, 22 July 2022
- João Figueiredo. Unidade Curricular “Programa de Introdução à Prática Profissional”, FCT-NOVA PIPP 2022
- André Lopes, “Medição de caudal e volume utilizando métodos gravimétrico e óticos no âmbito da saúde” FCT/UNL Master student 2022

4. Participation in International Joint Research Projects

Since 2007, IPQ has had an important role in several European research projects, to push forward knowledge transfer and better and more robust metrological procedures to ensure measurement quality. Considering mass and related quantities, IPQ has been involved in the following R&D activities, namely in the European Metrology Programme for Innovation and Research (EMPIR), in the European Partnership on Metrology (EPM) projects and in the European Metrology Networks (EMN) in the scope of EURAMET:

Number	Name	IPQ Participants	Starting year
EMN (AdvanceManu)	European Metrology Network for Advanced Manufacturing	Fernanda Saraiva Isabel Spohr Elsa Batista João Abrantes	2021
EMN Energy gases	European Metrology Network for Energy Gases	Florabela Dia Elsa Batista	2019
17RPT02 rhoLiq	Establishing traceability for liquid density measurements	Andreia Furtado, Sara Moura	2018
18HLT08 MeDDII	Metrology for drug delivery	Elsa Batista, Andreia Furtado, Sara Moura, Maria do Céu Ferreira	2019
20NRM02 MFMET	Establishing Metrology Standards in Microfluidic Devices	Elsa Batista, Andreia Furtado, Sara Moura, Fernanda Saraiva	2021
20NRM06 SApHTIES	Metrology for standardised seawater pH measurements in support of international and European climate strategies	Raquel Quendera; Olivier Pellegrino; Andreia Furtado; Sara Moura	2021
21GRD07	PlasticTrace Metrological traceability of measurement data from nano- to small-microplastics for a greener environment and food safety	Raquel Quendera, Andreia Furtado, Olivier Pellegrino	2022

5. Development or Revision of Guides and Standards

- ISO/TC 84/WG 11 Syringes - revision of standard ISO 7886-2 - Sterile hypodermic syringes for single use — Part 2: Syringes for use with power-driven syringe pumps
- ISO/TC 48/WG 4 Working group Liquid Handling Devices – Manual and Semi-Automatic – revision of standard ISO 8655 - Piston-operated volumetric apparatus, being project leader from part 1,6 e part 9, published in 2022
- ISO TR 20461 - Determination of uncertainty for volume measurements made using the gravimetric method, being project leader, published in 2023,
- ISO/TC 48/WG 7 Working group Volumetric instruments- revision of standard ISO 4787, being project leader, published in 2021
- ISO/TC WG5 "Liquid Handling Devices- Automatic" – new development of standards ISO 23783 - Automated liquid handling systems, part 1 to 3, published in 2022
- IEC TC62/MT 23 Infusion Pump Device Committee – revision of IEC 60601-2-24:2012 - Medical electrical equipment - Part 2-24: Particular requirements for the basic safety and essential performance of infusion pumps and controllers
- ASTM E41.01 group - revision of ASTM E542 - Standard Practice for Calibration of Laboratory Volumetric Apparatus, published in 2022

- Good Practice Guide for the Measurement of the Density of liquids in industry, 2022, site IPQ and <https://zenodo.org/record/6560044>
- Whitepaper on the measurement of hydrophobicity, hydrophilicity and wettability, 2022, <https://zenodo.org/record/7181091#.Y8GJYXbP1PY>
- AMMI TIR 101 – Fluid delivery performance testing for infusion pumps, published in 2021
- ISO 22916 - Microfluidic devices — Interoperability requirements for dimensions, connections and initial device classification, published in 2021
- ISO/ TS 6417 "Microfluidic pumps – Symbols and performance communication
- Translation of BIPM document: *The International System of Units*, WG IPQ - INMETRO. 2021

6. Comparisons

The requirements of CIPM-MRA includes the participation in interlaboratorial comparisons and the implementation of a Quality Management System, based on EN ISO/IEC 17025. The Quality Management System of IPQ - National Metrology Laboratory is evaluated annually by peers, within the framework of the EURAMET project # 1123 - On site peer review.

IPQ, as a signatory of CIPM-MRA, has its measurement and calibration capabilities in the KCDB database, published under the auspices of BIPM. The following list details the main interlaboratory comparisons made in recent years:

Identification of the comparison	Parameters / Measurement range	Results	Execution date	Date of report Draft B ou Final
EURAMET.M.F-K3	500 kN and 1 MN	Satisfactory results	2013-06-21	2022-08-31
EURAMET project 1479	1000 L prover tank	Satisfactory results	2019-10-17 and 2022-06-03	2022-12-02
EURAMET project 1508	Intercomparison of ultra-low liquid flow rates in range below 100 nL/min	Satisfactory results	2020-07-14 and 2021-02-15	2022-02-04
EURAMET 1522 (EURAMET.M.D-K2.1)*	Key comparison on density determination of liquids by hydrostatic weighing	Waiting for Draft B	2021	2023
EURAMET 1523 (EURAMET.M.D-K2.2)*	Key comparison on density determination of liquids by using oscillation type density meters	Waiting for Draft B	2021	2023
CCM.D-K5 (EURAMET 1440)	Comparison on density determination of liquid samples using oscillation-type density meters	Reception of 2 nd batch of samples / measurement phase	2022	2023-01
EURAMET.M.M-S11	EURAMET Supplementary Comparison of Mass Standards 20 kg	Waiting for Draft Report (2023)	2022	2023
COOMET.M.M-S6	COOMET Supplementary Comparison of Mass Standards 20 kg	Waiting for Draft Report	2022	2023
EURAMET.M.M-K7	EURAMET Comparison of Stainless-Steel Multiples and Sub-Multiples of the Kilogram: 5 kg, 100 g, 10 g, 5 g, 500 mg	Waiting to perform measurements	2023	
EURAMET Pilot Study "Surface tension of liquids"	Comparison on the surface tension determination of liquid samples	Postponed to January - May 2023		

7. CMCs

The 34 CMCs for the technical committee of Mass and related quantities are covered by the Quality System and may be found on the KCDB website at:

<https://kcdb.bipm.org/appendixC/search.asp?reset=1&met=M>.

In 2022 two new CMCs were published in the KCDB for flow measurements using the interferometric method, from 0.0003 mL/h to 0.12 mL/h with uncertainties of 2.7 to 1.3 %.

8. Trainings

The expertise and experience in some fields of activity have been used in the organization of some training actions, given by IPQ staff to colleagues of other laboratories, including NMI, namely:

- Training on “Requisitos Gerais de Competência para Laboratórios: NP EN ISO/IEC 17025:2018”, IPQ, 21 and 22 December 2022 and 2021, Elsa Batista and Florbela Dias
- Training on “SIM workshop on support medical testing equipment”, online, 9 November 2022, Elsa Batista/SIM
- Training on “Revisão do referencial normativo no âmbito da calibração e ensaios de instrumentos de medição de volume (ISO 8655 e ISO 4787)”, online, 27 June 2022, Elsa Batista/RELACRE
- Boas práticas de utilização e manutenção de recipientes de volume graduados no âmbito dos SMDCs, 6 and 7 June 2022, IPQ, Elsa Batista and Mario Condeço
- Training on Calibration of micropipettes, 17 and 18 February 2022, IPQ, Elsa Batista
- Final Workshop ofEMPIR rhoLiq project 17 RPT02, 28 April 2022, IPQ
- Training on “Standard test measures calibration and uncertainty”, July 2021, Online, Elsa Batista
- EURAMET - COOMET training course on small volume comparisons, 18-19 October 2021, Online, Elsa Batista

9. EURAMET guides

- Wolfgang Schmid (EURAMET), Michela Segal (INRIM, Italy), Elsa Batista (IPQ, Portugal), Beat Jeckelmann, 1 April 2021, EURAMET Guide on comparisons - nº 4, EURAMET

10. Conclusions

In line with IPQ’s mission and vision, it is our intention to continue promoting existing collaborations in the domains of metrology and to establish other collaborations that prove necessary for the development of technical and scientific activities, multi-disciplinary, that may enhance the impact of the national metrology.

In the volume and flow laboratory one of the main challenges is the development of new infrastructures to allow traceability to drug delivery devices already in the market. This will be done

within the EMPIR project MeDD II, coordinated by IPQ, and the new project MFMET of Call 2020, also coordinated by IPQ. It is also one of our main missions to foster and promote the knowledge transfer within the medical and metrological community. The participation in these projects allowed the revision of one CMC and the submission of two new ones in the liquid flow field. New services to clients are now available for the calibration of drug delivery devices and flow meters down to 5 nL/min. The IPQ volume and flow laboratory is very engaged in training activities in volume and flow areas, at national and international level. Also, several external peer reviews were requested by NMIs from other RMOs such as INACAL and INTI.

All these scientific activities, in the various sub-domains, are also interconnected by a horizontal EMPIR project 17NRM05 – EMUE related to the evaluation of measurement uncertainties whose output will provide for the BIPM JCGM 110 document. IPQ is involved as task leader in a few activities related to the evaluation of measurement uncertainty in those areas. This project was approved under the umbrella of MATHMET, a European Centre of Mathematics and Statistics, now also a European Metrology Network, where IPQ is a full member since 2017.

IPQ also ensures the traceability of small volume instruments used by pharmaceutical companies and, proving tanks and standards test measures that are used for verification of water meters, gas meters and meter for liquids other than water.

Having as a main goal to assure the traceability in these domains at national level and to promote and develop the national metrology activity, it is essential to consider the following aspects:

- On one hand, the consolidation of synergies to foster interdisciplinary cooperation, between the scientific and technological community and the society.
- On the other hand, bearing in mind the present national metrology infrastructure, the main priorities are the reinforcement of the technical and scientific staff and find the necessary investment to permit to continue facing current metrological progress and challenges, increasing the capability of the national measurement infrastructure, underpinned by traceable measurement standards of high accuracy, building knowledge and competence for the emergent society demands, thus providing the country with the means and resources necessary for the quality of life and national economy development.