

FIELD OF ACTIVITY



Gravimetric Preparation Apparatus



Certification Equipment



Dynamic Generation Equipment

The Reference Gas Laboratory is responsible for the production, development and maintenance of the gas mixtures national primary standards, handling to do:

- preparation and certification of reference gas mixtures (ISO 6142 and ISO 6143);
- dynamic generation of reference gas mixtures (ISO 6145-10);
- calibrations;
- participation and coordination of interlaboratorial comparisons;
- to support the legal metrology.

SI UNIT

International System Base Unit of Amount of Substance:**mol**

definition:

mol is the amount of substance of a system that contains so many elementary entities how many the atoms that exist in 0,012 kilograms of carbon 12.

When the unit mol is used, the entities that we are counting should be specified. Those entities can be atoms, molecules, ions, electrons, or other particles, or still specified groupings of particles.

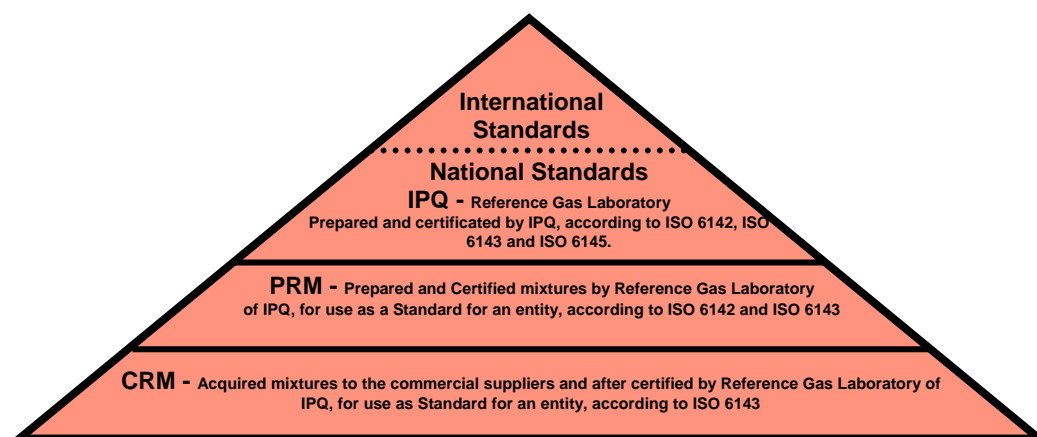
Through several types of laboratories techniques it was possible to count the number of existent atoms in 0,012 kg of carbon 12. Such counting created the Avogadro constant that is represented by N_A (or L) [$N_A = (6,022\ 141\ 5(10) \times 10^{23} \text{ mol}^{-1})$, according to "2002 CODATA Recommended Values"].

TRACEABILITY

Amount of Substance

The measurements traceability is done to national and international standards, guaranteed through the use of traceable equipment to the SI units and by the adoption of preparation and certification of gas mixtures methods in agreement with the applicable international standards.

The accuracy of the measurements made is proven through the participation in projects and in international comparisons, and it is demonstrated by the acceptance and inclusion in the Capacities of Measurement and Calibration (CMC) BIPM database for IPQ gas mixtures.

**Preparation and Certification of Reference Gas Mixtures:**

COMPONENT	RANGE (mol/mol)	RELATIVE UNCERTAINTY (%)
CO in N ₂	(0 to 4000) × 10 ⁻⁶ (0,4 to 5) × 10 ⁻²	(0,3 to 0,6) (0,5 to 0,9)
CO ₂ in N ₂	0 to 20 %	(0,2 to 0,5)
C ₃ H ₈ in N ₂	(0 to 1000) × 10 ⁻⁶ (0,1 to 5) × 10 ⁻²	(0,3 to 2,0) (0,2 to 0,6)
C ₂ H ₅ OH in N ₂	0 to 750 × 10 ⁻⁶	(0,4 to 2,0)
Automotive gases CO+CO ₂ +C ₃ H ₈	Typical values of each component	(0,5 to 1,5)
Natural Gas*	Typical values of each component	2,0
O ₂ in N ₂	(0 to 30) × 10 ⁻²	(0,4 to 2,0)
NO in N ₂	(0 to 1000) × 10 ⁻⁶	(0,4 to 0,7)
H ₂ S in N ₂	(0 to 200) × 10 ⁻⁶	(1,1 to 2,2)
NO ₂ in N ₂	(0 to 500) × 10 ⁻⁶	(1,0 to 1,2)
SO ₂ in N ₂	(0 to 500) × 10 ⁻⁶	(0,5 to 1,5)

* Certification only

Dynamic Generation:

COMPONENT	RANGE (mol/mol)	RELATIVE UNCERTAINTY
NO ₂ in air	(0 to 1000) × 10 ⁻⁹	5
SO ₂ in air	(0 to 1000) × 10 ⁻⁹	3

Calibrations:

EQUIPMENT	RANGE	UNCERTAINTY
Automotive Analyzers	(0,5 to 5) % in CO (6 to 14) % in CO ₂ (100 to 1000) ppm in C ₃ H ₈	IM Fraction
Environmental and Pollutant Gas Analyzers	Typical ranges	IM Fraction
Breath analyzer	0 a 3 g/L TAS	0,01 g/L

Metrological Control

EQUIPMENT	TESTS	Laws
Automotive Analyzers	Type Approval 1 st Verification	Portaria 20/2007 OIML R 99
Breath analyzer	Type Approval 1 st Verification Periodic Verification	Portaria 1556/2007 OIML R 126

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