

The *mise en pratique* of the (new) definition of the kilogram (*mep*-kg)

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# We already have a *mep*-kg for the **present** definition. (this *mep* is very brief—less than 1 page)

See 8th edition of *SI Brochure*, Appendix 2

<http://www.bipm.org/en/publications/mises-en-pratique/kilogram.html>

The *mep*

- Restates the present definition of the kilogram based on the mass of the international prototype of the kilogram (IPK).
- Recalls storage conditions and cleaning procedures for the IPK, citing basic references from *PV CIPM* and *metrologia*.
- States the general need to correct mass comparisons for air buoyancy.
- States that dissemination to secondary standards is "a conceptually simple procedure".



**$m(\text{IPK}) \equiv 1 \text{ kg} \equiv \text{kg}$**

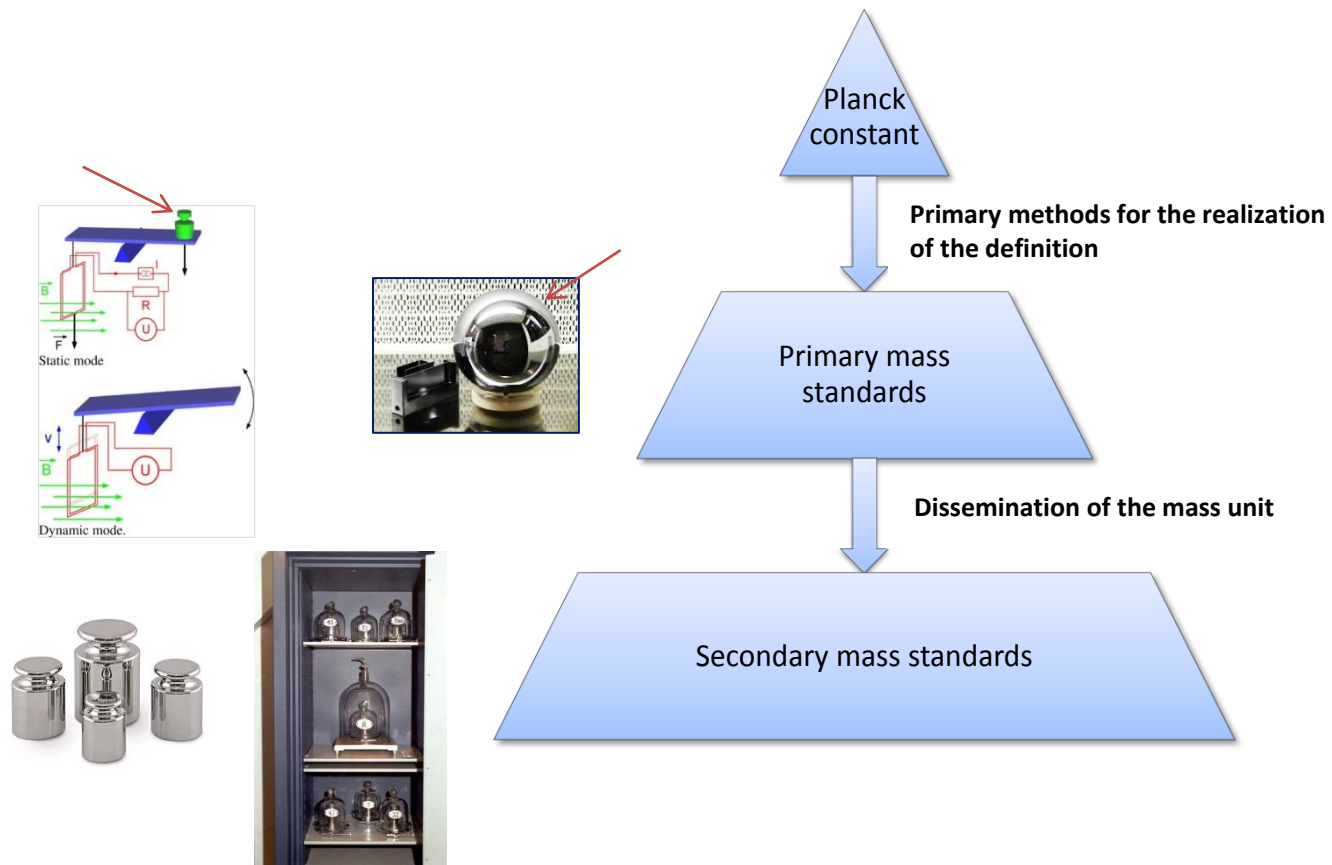
**The IPK is the primary realization of the SI kilogram.**

(The IPK is also the primary mass standard from which the kilogram is disseminated to secondary standards.)

# Overview of **Draft** (v. 9.0) of the *mep*-kg **after** redefinition. It is 18 pages long.

See document **CCM/15-02A**

[http://www.bipm.org/cc/CCM/Allowed/15/02A\\_MeP\\_kg\\_141022\\_v-9.0\\_clean.pdf](http://www.bipm.org/cc/CCM/Allowed/15/02A_MeP_kg_141022_v-9.0_clean.pdf)



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## 1. Introduction

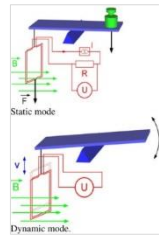
### 1.1 Definition of the kilogram

### 1.2 Traceability chains for mass metrology

Present focus is on dissemination from 1 kg; *mep* will be updated as needed.

## 2. Primary methods to realize the definition of the kilogram

### 2.1 Realization by comparing electrical to mechanical power



$$m_x = h \left( \frac{b f^2}{4} \right) \frac{1}{g v}$$

### 2.2 Realization by the X-ray-crystal-density method

$$m_s = N m_a(^{28}\text{Si}) \quad N = 8 \frac{V_s}{a(^{28}\text{Si})^3} \quad \longrightarrow \quad m_s = h N \frac{m_a(^{28}\text{Si})}{h}$$



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## 3. Dissemination of the mass unit

### 3.1 *Dissemination from a particular realization of the kilogram*

Pilot Study; BIPM.M-K1 (ongoing key comparison); CIPM MRA

### 3.2 *Dissemination from the BIPM ensemble of reference mass standards*

24th CGPM (2011)



## 4. Continuity with the previous definition of the kilogram

### 4.1 *The role and status of the international prototype*

## 5. References

many ref. placeholders will cite a focus issue of *metrologia*

# A series of Annexes follows :

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## **A1. History leading to the redefinition of the kilogram**

## **A2. Traceability to units derived from the kilogram**

A2.1 *Coherent derived units expressed in terms of base units  $kg\ m^p\ s^q$*

A2.2 *Electrical units*

A2.3 *Units involving the kelvin and the candela*

A2.4 *Atomic, subatomic and molecular units*

A2.4.1 What has changed

A2.4.2 What has not changed

## **A3. Maintenance of primary realizations**

## **A4. Maintenance of mass correlation among artefacts calibrated by NMIs or DIs realizing the kilogram (optional)**

# A closer look at Section 3: Dissemination of the mass unit

## 3.1 Dissemination from a particular realization of the kilogram (a)

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- ◆ The dissemination of the mass unit is based on **primary mass standards** obtained from the realization of the kilogram definition.
- ◆ All **relevant influences on a primary mass standard must be considered** for the maintenance and dissemination of the mass unit...
- ◆ The BIPM in coordination with the CCM organizes an **on-going BIPM key comparison**, BIPM.M-K1, for laboratories with primary realization methods.
- ◆ The **CCM decides** the required periodicity of laboratory participation in BIPM.M-K1 in order to support relevant calibration and measurement capabilities (CMCs).



## 3.1 Dissemination from a particular realization of the kilogram (b)

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- ◆ **In cases where compliance with the CIPM MRA is required**, it is essential that mass standards are traceable to primary mass standards of a participant in BIPM.M-K1 that has relevant CMC entries or, **in the case of the BIPM**, suitable entries in its calibration and measurement services as approved by the CIPM. **[CIPM-MRA]**
- ◆ **Dissemination of the mass scale is validated** for all NMIs/DIs and the BIPM **through the traditional types of key comparisons** organized prior to the [new] definition of the kilogram. **[CIPM-MRA]**
- ◆ **Results of all key comparisons are published in the KCDB** in accordance with the rules of CIPM MRA and may be used in support of NMI/DI claims of its calibration and measurement capabilities (CMCs) and the BIPM claims listed in its calibration and measurement services. **[CIPM-MRA]**

# History of draft 9.0

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- ◆ A document history comprises last pages of the draft.

**History begins with draft 1.0, dated 10.06.2010...**

**...Through CCM Workshop on the *mep*: 21-22.11.2012, where draft 6.0 was debated. Comments were henceforth tracked and dealt with explicitly using a standard template...**

**...To draft 9.0, dated 10.12.2014 "Following comments and suggestions received on draft 8.7 and actions of the 25th meeting of the CGPM (2014)"**

**Approval of the final version at the next meeting of the CCM: 15-19.05.2017**