

BILATERAL COMPARISON REPORT

LNE – KIM-LIPI

CALIBRATION OF A MASS STANDARD AT 50 kg
EURAMET n° 1315 – Final report

No. P109029/1

Requesting party:

INDONESIAN INSTITUTE OF SCIENCES
(Puslit KIM-LIPI)
Kompleks PUSPIPTEK, Cisauk-Tangerang,
Banten, 15314
(INDONESIA)

Object:

Bilateral comparison of the true mass calibration
of an identified sample : MET 50 kg 7.

1. INTRODUCTION

This report aims to provide the result of a bilateral comparison between the KIM-LIPI and LNE. The support used for the comparison is a mass standard of a nominal value of 50 kg.

KIM-LIPI has requested this bilateral comparison to validate its calibration methods.

LNE has monitored the comparison as follows :

1. The mass standard was initially calibrated by the LNE.
2. It was calibrated by the KIM-LIPI.
3. It was calibrated once again by LNE to verify the mass drift.

2. PARTICIPATING LABORATORIES

Laboratory	Address	Technical referent
KIM-LIPI	INDONESIAN INSTITUTE OF SCIENCES (Puslit KIM-LIPI) Kompleks PUSPIPTEK, Cisauk-Tangerang, Banten,15314 (INDONESIA)	Ms Nur Tjahyo Eka Ms Renanta Hayu
LNE	1, rue Gaston Boissier 75724 Paris CEDEX 15 FRANCE	Mr Paul-André MEURY Mr Tanguy MADEC

3. COMPARISON SCHEME

The calibration method used is called "**mass to mass**". It consists in determining the true mass of a mass standard (M) by comparing it to the true mass of a mass standard (E). This comparison is carried out with a mass comparator following a BORDA double substitution scheme.

The weighing procedure used is the EMME.

Report continued on the following page

4. LNE CALIBRATION PROTOCOL

Measurand	True mass
Nominal value	50 kg
Support(s) used for comparison	MET 50 kg 7
Target uncertainty for the reference value	5.6 mg (k=2)

For more details see the full protocol name "Protocol for the Euramet 1315 mass standard comparison".

5. MASS STANDARDS CHARACTERISTICS

The travelling standard (Fig. 1) is made from stainless steel X 18 M 25 W and was manufactured by the company ZWIEBEL. It is cylinder with a circular fork groove. This standard is identified by a serial number engraved on the top plane face. A handling fork was supplied with this standard. Its characteristics are shown in the table below.

Parameter	Value	expanded uncertainty (95% coverage)
Density at 20°C	7 987.2 kg.m ⁻³	1.4 kg.m ⁻³
Magnetic susceptibility	3.30 x10 ⁻³	0.60 x10 ⁻³
Height	224.8 mm	0.20 mm
Diameter	190.0 mm	0.20 mm
Height of centre of gravity above base	110.9 mm	0.40 mm



Figure 1 - The travelling standard used for the comparison.

6. TRANSPORT CONDITIONS

The mass standard was packaged in a special case intended for this purpose.

Each time, the packing or unpacking was carried out either in the initial or in the final laboratory by a qualified member of staff.

7. DOCUMENT(S)

- Protocol for the Euramet 1315 mass standard comparison
- LNE calibration certificate of the mass standard previously mentioned in §5: No. P121267/25 of the 2014/10/4.
- Full copy of result calibration in attachment e-mail from Mr Renanta Hayu of 2014/10/31.
- LNE calibration certificate of the mass standard : No. P121267/41 of the 2014/10/4.

Report continued on the following page

8. COMPARISON RESULTS

The normalized error E_N for the calibrated mass was based on the original certificates.

It is calculated as follows :

$$E_N = \frac{(M[KIM LIPI] - M[LNE])}{\sqrt{(U_M^2[KIM LIPI] + U_M^2[LNE])}}$$

- E_N : Normalized error
- $M[KIM LIPI]$: True mass resulting from the customer calibration (mg)
- $M[LNE]$: True mass resulting from the LNE calibration (mg)
- $U_M[KIM LIPI]$: Expanded uncertainty (k=2) of the true mass resulting from the customer calibration (mg)
- $U_M[LNE]$: Expanded uncertainty (k=2) of the true mass resulting from the first LNE calibration (mg)

Calibration Date	Nominal value	Identification of the mass	Certificate no. or doc reference	True mass	Calibration uncertainty (k=2)	Normalized error E_N
From 2014/7/3 to 2014/7/16	50 kg	MET 50 kg 7	P121267/25	50.000 052 8 kg	5.6 mg	+ 0.91
From 2014/8/25 to 2014/9/8			e-mail of 2014/10/31	50.000 062 kg	8.4 mg	

Upon return of the mass to France, a new calibration was performed. The drift observed is not significant : -1.0 mg.

Report continued on the following page

9. CONCLUSIONS

The analysis of the results based on the normalized errors is carried out as follows:

Value of the normalized error	Consequence
$ E_N \leq 1$	The results obtained by the laboratory are acceptable.
$ E_N > 1$	The results are not acceptable, and the laboratory is responsible for searching the cause

The table of normalized error is established as follows (see §8):

Nominal value	Identification of the mass	Normalized error	Criterion $ E_N \leq 1$
50 kg	MET 50 kg 7	+ 0.91	YES

The results obtained by the laboratory for this bilateral comparison are acceptable.

End of report