

**TECHNICAL PROTOCOL
EURAMET L-K7.2014
(EURAMET PROJECT 1320)**

LINE SCALE BILATERAL COMPARISON

DRAFT A.3

10 September 2014

1 DOCUMENT CONTROL

Version Draft A.1 : 04 July 2014

Version Draft A.2 : 08 July 2014

Version Draft A.3 : 10 September 2014 (Change to EURAMET L-K7. 2014)

2 INTRODUCTION

The comparison is organised within the EU-Indonesia Trade Support Programme II, Sub-project Number APE12-06b, "Improvement of traceability of Metrology and Calibration measurements of Puslit KIM".

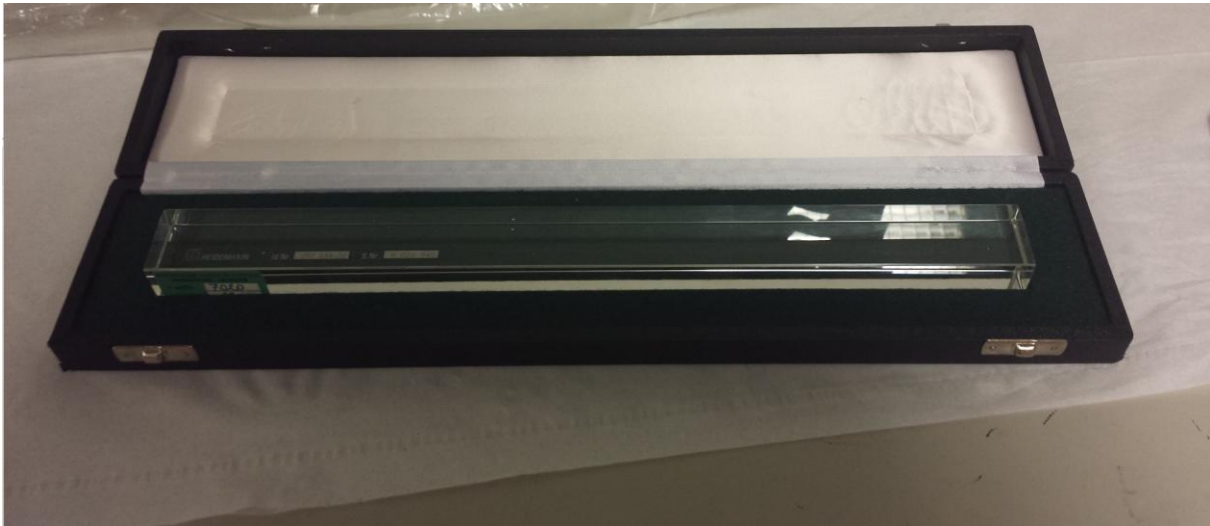
Two National Metrology Institutes take part in this comparison: LNE (France) and KIM-LIPI (Indonesia).

LNE is acting as the pilot laboratory and in this function is responsible for providing the travelling standard, the evaluation of the measurement results and the final report.

The comparison will be accomplished in accordance with the EURAMET Guidelines on Conducting Comparisons and BIPM Guidelines for Planning, Organising, Conducting and Reporting Key, Supplementary and Pilot Comparisons.

3 MEASUREMENT ARTEFACT

The measurement artefacts is a high precision glass scale from HEINDENHAIN belonging to LNE (ref manufacturer 297 634-02, sn 9 026 940) of 300 mm long with a line each millimeter.



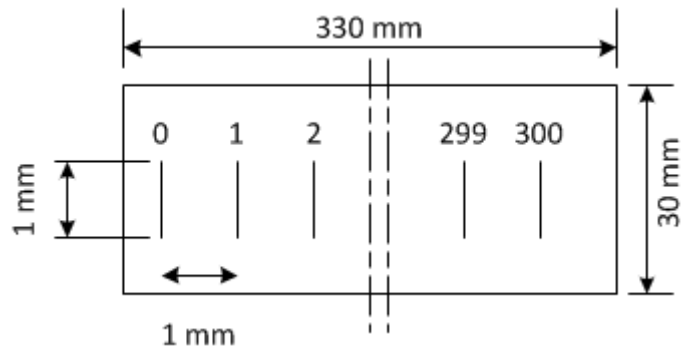


Figure 1 : Heindenhein linescale dimensions.

The scale is made of glass (B 270) with a given value of CTE $\alpha = 9.4 \cdot 10^{-6} \text{ K}^{-1}$ given by the manufacturer. A standard uncertainty of $1 \cdot 10^{-6} \text{ K}^{-1}$ should be taken for the uncertainty budget.

The graduation line thickness of $4 \mu\text{m}$. The overall dimensions on the scale are 330 mm for total length, 30 mm for the width and 20 mm for thickness. The line scale is contained one a wooden box.

4 HANDLING THE ARTEFACT

4.1 General handling

Open the wooden box carefully and only in clean environment. Use clean room gloves in order to handle the scale and **never** touch the top surface of the scale. It is not allowed to use any type of glue or wax for fixing the scale. When not in use, place the scale back into its container to avoid dust or dirt deposits.

4.2 Cleaning

Cleaning should be avoided! No cleaning of the scales should be tried besides blowing away dust particles using dry, clean air or other clean gases. Especially, rubbing the surface with soft tissues or any other firm physical contact will possibly damage the line structures of the standards. Application of solvents such as acetone or alcohol has to be avoided.

If it is necessary to clean the scale before the measurement, please contact with pilot.

4.3 Temperature measurement of the artefact

For temperature measurement of the artefact, it is not allowed to fix the temperature sensor to the artefact using any type of glue or wax or clamping fixture because it will be the cause of severe contamination or deformation of the artifact. It is recommended to measure the temperature of the dummy material or the mounting fixtures.

4.4 Storage

Use original transportation container to avoid dust deposits. Always try to keep the artefact under good measuring room conditions, i.e. within the room, where it gets calibrated.

5 MEASURAND

The measurand is the distance between the center line position of the reference line [position 0] and the center line position of the measured line. Measurement should be performed in the central axe defined by lines.

6 MEASUREMENT INSTRUCTIONS

Before calibration, the line scale must be inspected for damage. No cleaning of the scale should be tried besides blowing away dust particles using dry, clean air or other clean gases.

It is recommended to support the measurement objects at the Airy points, held only by their gravity forces. If additional clamping of the scale is required during measurement, e.g. because of a fast moving carriage, it is recommended to lightly pinch the scale on the sides at one of the Airy support points. The participants are asked to describe the line scale support.

The measurement result to be reported is the distance from the zero line to the measured line at 20°C according table 1.

Distance range	Pitch
0 to 10 mm	1 mm
10 to 300 mm	10 mm

Table 1 : *Distances to measure*

The air and material temperatures during measurement should be reported also.

7 MEASUREMENT UNCERTAINTY

The uncertainty of measurement shall be estimated according to the ISO Guide to the Expression of Uncertainty in Measurement. (GUM) and the complete uncertainty budget must be reported.

8 REPORTING OF RESULTS

A report should be sent to the pilot laboratory within one month after the measurements are completed. The report should include:

- Description of the measurement method
- The reference standard
- The traceability to the SI
- The results of the quantities to be measured
- The associated standard uncertainties, the effective degrees of freedom and the expanded uncertainties.
- The uncertainty budget.

9 TRANSPORTATION

The travelling standard must be transported in the original case and protected from mechanical loads, vibration etc. for transport by plane.

10 CIRCULATION SCHEME

The agenda of the calibration is given in the following Table :

Laboratory	Scheduled time
LNE 1 st	August 2014
KIM LIPI	September 2014
LNE 2 nd	October 2014

Table 2 : *Timetable of the comparison*

11 CONTACT

Pilot Laboratory : Laboratoire National de Métrologie et d'Essais (LNE)
1, Rue Gaston Boissier
75724 PARIS Cedex 15
France

Contact : Mr. José Salgado
Tel : +33 (0)1 40 43 39 57
Fax : +33 (0)1 40 43 37 37
Email : jose.salgado.@lne.fr

KIM LIPI : Pusat Penelitian Kalibrasi, Instrumentasi, dan Metrologi
Lembaga Ilmu Pengetahuan Indonesia (Puslit KIM-LIPI)
Kompleks PUSPIPTEK Gedung 420
Tangerang Selatan,
Banten Indonesia

Contacts: Ms. Nurul Alfiyati
Tel : +62-21-7560533 ext 3078
Fax : +62-21-7560568
Email : nurul@kim.lipi.go.id