Calculation of the Consensus Value for the Kilogram 2026

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CCM Task Group on the Phases for the Dissemination of the kilogram following redefinition*
(CCM-TGPfD-kg)

Summary

The adjustment derived from the 2026 consensus value for the SI unit of mass, the kilogram, has been determined to be:

1 kg - 12 µg with a standard uncertainty of 20 µg

That is the Consensus Value Adjustment [1] to the global mass scale is -12 µg with respect to the mass value of the International Prototype Kilogram (IPK) as defined prior to the 2019 redefinition of the SI. That means that the mass of the IPK today, based on the consensus value adjustment is 1 kg – 12 µg. (The 2026 consensus value is 5 µg lower than the consensus value of 2023).

Traceability for the SI unit of mass will be taken from the 2026 consensus value of the kilogram commencing 1st March 2026.

Action required

To achieve consistency with the 2026 consensus value, **all NMIs would need to reduce the mass value of their national prototype by 12 µg with respect to the mass value based on the IPK prior to 2019, or by 5 µg with respect to the consensus value (adjustment) of 2023**. It is recommended to all NMIs to state clearly on their certificates the traceability to the Consensus Value 2026, for example, using the following sentence "The calibration results stated in this certificate are based on the Consensus Value of the kilogram commencing 1st March 2026." **The adoption of the consensus value of 2026 requires no further adjustment to the published CMCs of NMIs**.

1. Background

The Consultative Committee for Mass and Related Quantities (CCM) decided in 2017 that the use of a consensus value for the dissemination of the kilogram is necessary due to the discrepancy in the values produced by the realisation experiments (Kibble balance and X-ray crystal density experiments). The determination and implementation of the kilogram consensus value has been agreed by the CCM TGPfD-kg. Details of the calculation and use of the consensus value and the dissemination process can be found in [2] and [3].

2. Basis of the consensus value

Determination of the consensus value for the kilogram is based on an arithmetic (non-weighted) mean of the results of the last three comparisons of kilogram realisation experiments. For the 2026 consensus value these are:

- The Key Comparison Reference Value (KCRV) of the first CCM Key Comparison (CCM.M-K8.2019) [4]
- The Key Comparison Reference Value (KCRV) of the second CCM Key Comparison (CCM.M-K8.2021) [5]
- The Key Comparison Reference Value (KCRV) of the third CCM Key Comparison (CCM.M-K8.2024) [6].

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https://www.bipm.org/en/committees/cc/ccm/wg/ccm-tgpfd-kg/members

	Value (1 kg +) / µg	Standard Uncertainty / µg
KCRV of the first CCM.M-K8 (2019)	-18.8	*8.1*†
KCRV of the second CCM.M-K8 (2021)	-15.2	*7.4*†
KCRV of the third CCM.M-K8 (2024)	-10.7	*6.4*†
Calculated arithmetic mean	-14.9	

† These uncertainties are given for information only and are not used in the calculation of the consensus value.

Thus, using the agreed calculation methodology the consensus value (adjustment) for a kilogram would be 1 kg – 15 µg. This would represent a change of – 8 µg with respect to the previous consensus value, which was 1 kg – 7 µg. However, as described in the CCM detailed note on the dissemination process after the redefinition of the kilogram, "changes in the consensus value between consecutive Key Comparisons will be reviewed and, if necessary, limited to ± 5 µg". This limit on the change in the consensus value is intended to ensure its temporal stability by reducing its sensitivity to changes in the (evolving) realisation experiments and variations in the group of NMIs participating in the periodic comparisons. A review was undertaken by the CCM-TGPfD-kg and it was decided to limit the change to - 5 µg, thus giving a value of 1 kg - 12 µg for the 2026 consensus value. This maintains an acceptable stability for the consensus value from 2023 to 2026 and should also ensure that changes in the value after subsequent Key Comparisons are small.

REFERENCES

[1] Guide to the Consensus Value of the kilogram, CCM-TGPfD-kg, Guide to the Consensus Value of the kilogram

[2] CCM detailed note on the dissemination process after the redefinition of the kilogram, CCM detailed note on the dissemination process after the redefinition of the kilogram

[3] Report on the Calculation of the CCM Consensus Value for the Kilogram 2026, M Stock, S Davidson, available on the BIPM web site: www.bipm.org

[4] M. Stock, *et al*., "Report on the CCM key comparison of kilogram realizations CCM.M-K8.2019", *Metrologia* **57** (2020) Tech. Suppl., 07030

[5] M. Stock *et al*., "Final report on the CCM key comparison of kilogram realizations CCM.M-K8.2021", *Metrologia* **60** (2023) Tech. Suppl., 07003

[6] M. Stock *et al*., "Final report on the CCM key comparison of kilogram realizations CCM.M-K8.2024", ccm-m-k8-2024