

A New Era of Measurement with the Redefined Kilogram

In November 2018, the State Parties to the Metre Convention, or simply “Member States,” voted to change the International System of Units (SI). The change ruled that the system would no longer rely on physical objects and instead be determined by constants of physical science, such as the speed of light.

Currently, there is just one “true” kilogram used for every measure of mass on Earth. The International Prototype Kilogram (IPK), a cylinder of platinum-iridium, is locked securely in a vault within the International Bureau of Weights and Measures in France. Used to calibrate mass standards only once every 40 years, the IPK is treated with extreme care.

Yet even the “true” kilogram can undergo a change in mass. Because the IPK is a physical object, it is prone to wear, meaning it can lose—or gain—mass at any time. Yet since the IPK serves as the only true kilogram, there can be zero scientific uncertainty when the measurement is recorded.

Constants of nature, however, are allowed to have uncertainty in their value to compensate for errors that can occur in an experimental measurement. Following the vote by the Member States, scientists will use fixed values for constants such as Planck and Boltzmann to define the seven SI base units. The new SI redefines the kilogram by using an exact value for the Planck constant and the definition of the meter and second (already based on constants).



Up until the SI redefinition in 2019, the National Institute of Standards and Technology (NIST) housed and maintained America's official mass standards. Pictured above, the K20 kilogram mass standard served as the primary prototype national standard.

Although marketplace consumers are unlikely to notice any immediate effects of the change, manufacturers of scientific instruments may need to update their products in the near future.

The redefinition of the kilogram makes it possible to perform more precise, accurate measurement science without requiring calibration with the IPK. The kilogram's new definition will promote more accurate measurements of milligram and microgram masses. Measurement scalability will improve, as measuring with physical objects can decrease accuracy at smaller or larger sizes than the standard.

Rice Lake's metrology labs are prepared to continue to serve our customers with NIST traceability and precise calibration services. Learn more about our metrology labs at www.ricelake.com/metrology-services