Reference Materials are an integral part of a laboratory's quality assurance programme to provide confidence that the measurement process is working as expected. They may be used for method validation, calibration, quality control including ongoing monitoring of equipment, training, and method comparisons.

Material Types:

- ### Certified Reference Materials (CRM)

A CRM must contain one or more properties that are traceable to an accurate realisation of the unit in which the property is expressed. This is termed Metrological Traceability. A certificate stating the property values and their associated uncertainties MUST accompany a CRM.

CRMs are normally used for calibration, method validation, methodology verification, and less frequent instrument checks needed for quality control. The accuracy, precision, and metrological traceability of the certified reference values means they can be used for specific method validation and optimisation. The confidence in the certified reference values is very high, as the uncertainty includes every known component of variability including the standard error of the assigned value, homogeneity and stability.

It is important to read the documentation that accompanies a CRM carefully as not all properties provided in a CRM certificate are certified.

- ### Reference Materials (RM)

These too, are used for similar purposes to CRMs, but the properties provided lack the rigorous procedures required for certification, which can include metrological traceability to a single method. Accurate uncertainty budgets for homogeneity and / or stability may not be known, however both have been established as appropriate for the intended use. Due to the lower cost of RMs compared to CRMs, they can also be used for training, and more frequent instrument checks. But the lack of metrological traceability means RMs are not generally suitable for calibration, or critical method validation. They can be very useful for ongoing monitoring of test and equipment performance and training purposes. A Reference Material Data Summary is provided for each material. This summary may have two different types of values which are defined by the rigor of characterisation, metrological traceability and uncertainty evaluation:

1) **Reference/Assigned Values**. These values are well characterised using sound analytical methods from gold standard laboratories. They may lack the metrological traceability of a single method and may include a provision for homogeneity and stability built into the uncertainty budget instead of comprehensive budgets obtained for the specific material. The Assigned Value may be accompanied by a measurement uncertainty or standard deviation.

2) **Indicative Values**. These values are supplementary and for information only. They may lack sufficient data, measurement uncertainty and metrological traceability may not be fully established. They are not suitable for purposes that require a high degree of precision or confidence in the assigned value.

The selection of the appropriate material lies with the user. The cost, the quantity, and the confidence in the assigned values of the material should all be taken into consideration, as well as its purpose. Global Proficiency recommend that all users of GP's RMs are familiar with and use materials in compliance with, ISO 33403:2024 *"Reference Materials – Requirement and recommendations for use"*.

Global Proficiency's Reference Materials

Global Proficiency is accredited to ISO 17034:2016 *"General Requirements for the Competence of Reference Material Producers"*. Procedures for the selection, handling, and description of Reference Materials have been developed in accordance with this Standard.

- ### Certified Reference Materials (CRM)

  Global Proficiency's characterisation strategy for Certified Reference Materials is based on the selection of operationally-defined quantitative measurands using a network of competent laboratories to ensure appropriate traceability and sufficient reliability. The characterisation process considers the contribution to the uncertainty of the assigned value from multiple sources including product homogeneity (considering inherent product variability as well as mixing), product stability during both storage and transport, and method reproducibility. Technical information relating to test methods and equipment, and laboratory performance are carefully considered as part of the characterisation process.

  Global Proficiency currently provides a Whole Milk Powder Certified Reference Material offering certified values for %Protein (Kjeldahl x 6.38) and %Gravimetric Fat. Please visit www.global-proficiency.com for further information.

- ### Reference Materials

  Following presentation in Proficiency Testing rounds, material batches are assessed for suitability as matrix Reference Materials. Assessment of the suitability of a RM takes account of the quality of test results (including blind duplicates where available), the distribution of test data for each test (or method), accreditation status, performance and the strength of consensus between participating laboratories, and the apparent homogeneity and stability of the material. The Assigned Value is accompanied by an expanded measurement uncertainty based on *n* results, and the test methods used to establish the assigned value.

Example

Test Name	n Values	Assigned Value	Expanded [1] Uncertainty	k	Range	Methods
Ash (%)	47	4.73	± 0.01	2.00	4.71 - 4.74	APHA 15.041 (Mod), BS1743 (Mod), GB5009.4 (Method I), NZTM3.4.2, NZTM3.4.4, TGA
Fat RG (%)	73	28.57	± 0.04	2.00	28.52 - 28.61	GB5009.6 (Method III), ISO 1736/IDF 9, ISO 23318/IDF 249, NIR, NMR, NZTM3.6.3
pH (pH units)	75	6.76	± 0.01	2.00	6.75 - 6.77	APHA 15.022, APHA 15.022 (Mod), APHA 18.022, AS2300.1.6, Not Specified, NZTM3.2.8
WPNI (mg/g SNF)	30	1.4	± 0.1	2.00	1.3 - 1.5	AS2300.4.8, Not Specified, NZTM3.15.6

Global Proficiency offers a wide range of reference materials in the following categories:

- **Organic – Foodstuffs:** Dairy Products, Infant formula and UHT Milk
- **Environmental – Soils and Sludges:** Soils & Acid Sulphate Soils
- **Environmental – Plant Material:** Plants

Only analytes that pass strict characterisation criteria are provided as reference values on the Data Summary.

- **Indicative Values**

  These are also produced using data from Proficiency Testing rounds. The Assigned Value is provided alongside an associated Assigned Range that corresponds to +/- 2 standard deviations of *n Values* around the consensus *Assigned Value* (approximately 95% confidence interval for a normal distribution).

Example

Test Name	n Values	Assigned Value	Assigned Range
Ash (%)	20	5.71	5.62 -5.80
Fat RG (%)	24	27.81	27.61 -28.00
Free Fat - in powder (%)	17	2.18	2.06 -2.30

CONTACT US TO DISCUSS YOUR REQUIREMENTS

enquiries@global-proficiency.com

or visit our website at

www.global-proficiency.com

ACCREDITED REFERENCE MATERIAL PRODUCER