

NMISA Mass and Related Quantities Report

Developments

- NMISA in collaboration with NPL-UK is developing a table-top Kibble balance to be used to realise the kilogram in the future.
- A new 20 kN.m torque comparator machine capable of disseminating traceability in torque by comparison method, with measurement uncertainty of 0.03%.
- New force capabilities in the lower ranges. The calibration scope is extended from 100 N -1000 N range to 50 N - 5000 N, using deadweight machine, with an improved measurement uncertainty of 0.03 % to 0.008 %.
- Upgraded the 50 kN Deadweight machine and Hydraulic amplified machines, to improve uncertainties and provide new capabilities of tension measurements above 200 kN.

Comparisons

Identifier	Range	Field	Pilot/Link/Reference	Status
AFRIMETS.M.FF-K4.2015	100 μ L	Fluid flow (volume of liquid)	NIS, IPQ	Completed - 2020
AFRIMETS.M.F-S2	(100 - 500) kN	Force	KEBS, PTB	Completed - 2021
AFRIMETS.M.M-K7	(0.5 - 5) kg	Mass	NIS, METAS	Completed - 2022
AFRIMETS.M.D-S4	(0.65-0.7 & 1.2 -1.25) kg/m ³	Density (Hydrometers)	NIS, CENAM	Completed – 2022
CCM.T-K2.1	(10 & 20) kN.m	Torque	NMIJ	Measurement completed
AFRIMETS.M.FF-S1	(50 -5 000) mL/min	Fluid Flow (gas flow rate)	NMISA, NRIM	Measurements Completed
AFRIMETS.M.P-S2	(10 - 110) kPa	Pressure	NMISA	Measurements completed

Unregistered Comparisons			
Description	Range	Field	Status
Bilateral With INMETRO (Brazil)	100 Nm – 1000 Nm	Torque	Completed- 2020
Bilateral with TUBITAK UMI (Turkey)	100 N – 1000 N	Force	Completed - 2020
Bilateral with CENAM (Mexico)	500 MPa	Pressure	Measurement completed
Palmarosa, RCIL No 2021-2022-0632	0.8894 & 0.8864	Relative Density @ 20 °C & @ 25 °C	Completed - 2022

Training and Workshops

NMISA continues to assist the region to improve metrology skills, knowledge, competency and build capacity among member states. Training and workshop were facilitated such as volume metrology course presented at Malawi Bureau of standard in April 2023. Facilitated the SADC MET Mass ILC closing workshop hosted by SIRDC-NMI in Harare, Zimbabwe in January 2023.



- NMISA participated in the PTB Round and Established workshop in August 2022, where a presentation was provided on the mass and volume measurements performed on the Si-Sphere over a period of about eight months.

Publications

Dlamini, S., Sibisi, M., Matosse, J., Aydemir, B., Vatan, C., Dizdar H. (2020). NMISA's new 5 kN deadweight force standard machine. ACTA IMEKO, 9(5), 85 – 87

Dlamini, M. (2022). Thermal Mass Flow Controller Induced Temperature Fluctuations in a Gas Flow Calibration Line at NMISA, FLOWMEKO, the 19th International Flow Measurement Conference, Chongqing China.

Matosse, J., Dlamini, S., Sibisi M., R. S. Oliveira, R.S., de Oliveira S. P., Filho J. T. (2022). Torque bilateral comparison between NMISA and INMETRO, IMEKO 24th TC3, 14th TC5, 6th TC16 and 5th TC22 International Conference, Cavtat-Dubrovnik, Croatia.

Mndebele, L.F., Mametja, T.G., Sonntag, C., Sibisi, M., Karsten, A. (2022). Using a mobile kibble balance to explain physics principles in education, Proceedings of SAIP, <https://events.saip.org.za/event/225/attachments/3393/4897/SAIP%202022%20Proceedings%20978-0-6397-426-1.pdf>