Massive development in KRISS

The new mass comparator – the M_one – will improve Korea Research Institute of Standards and Science's (KRISS) development of its R&D department by producing better results.

KRISS was set up in 1975 as the central authority for the national standard system of Korea. Originally called Korea Standard Research Institute, it was renamed in 1991. Recently it was appointed as the National Metrology Institute of Korea (NMI) by the National Standards Act to represent Korea to the international communities of metrology.

Strengthening the nation's economy is the primary mission of KRISS, as well as improving the technological capabilities of Korea by developing and disseminating the national measurement standards and precision measurement technologies. KRISS also provides technical support and aids the development of industrial measurement and evaluation technology.

KRISS's division of Physical Metrology, the Mass and Force group, establishes and maintains the national primary standards for mass, volume and density. The divisions' objective is to support mass related standards such as force and pressure and to contribute to industry. Some of the research and development undertaken includes:

- Minimising uncertainties generated during mass comparison between the national kilogram prototype No. 72 and stainless steel standard weights. Liquid and solid density standards are maintained using a Zerodur sphere with an uncertainty of 2 ppm and a hydrostatic weighing system of high precision. Gas densities and PVT properties are measured employing a Burnett apparatus with an uncertainty of 0.02 %
- Participating in the international activities as a member laboratory of the Consultative Committee for the Mass and Related Quantities (CCM) and as a member of Mass & Force Technical Committee of International Measurement Confederation (IMEKO TC3), as well as joining the Key Comparison for mass standard steered by the BIPM
- Maintaining and disseminating the standards of mass, volume, density, pressure, force and torque

To determine the mass of an object with maximum accuracy, it is necessary to use mass comparators. When calibrating mass, the object to be determined is compared with a known reference (mass comparison). With the new generation of automated mass comparators, it is not only very accurate measurements that can be obtained but also the productivity of processes is considerably improved. KRISS has acquired mass comparators of varying capacities at its facilities.

Comparator balances have a very high resolution of up to 50 million points and are distinguished by extremely high repeatability. These two features allow comparative weighing between a known reference weight and an unknown test specimen even if the weight difference is minimal.

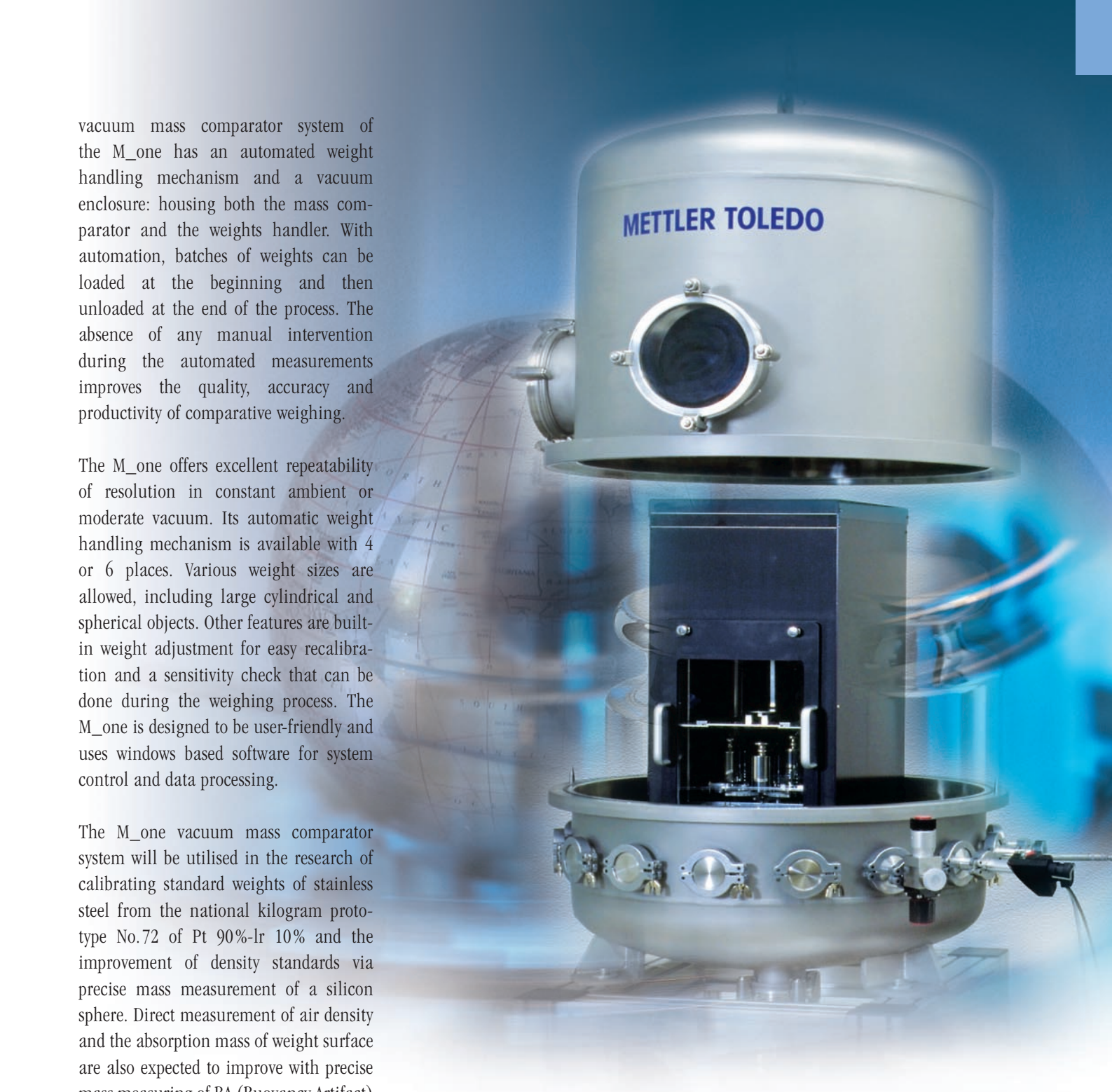
In addition to these comparators, an M_one mass comparator was installed in June 2003 as part of a programme to establish and maintain world-class national measurement standards. The

vacuum mass comparator system of the M_one has an automated weight handling mechanism and a vacuum enclosure: housing both the mass comparator and the weights handler. With automation, batches of weights can be loaded at the beginning and then unloaded at the end of the process. The absence of any manual intervention during the automated measurements improves the quality, accuracy and productivity of comparative weighing.

The M_one offers excellent repeatability of resolution in constant ambient or moderate vacuum. Its automatic weight handling mechanism is available with 4 or 6 places. Various weight sizes are allowed, including large cylindrical and spherical objects. Other features are built-in weight adjustment for easy recalibration and a sensitivity check that can be done during the weighing process. The M_one is designed to be user-friendly and uses windows based software for system control and data processing.

The M_one vacuum mass comparator system will be utilised in the research of calibrating standard weights of stainless steel from the national kilogram prototype No.72 of Pt 90%-lr 10% and the improvement of density standards via precise mass measurement of a silicon sphere. Direct measurement of air density and the absorption mass of weight surface are also expected to improve with precise mass measuring of BA (Buoyancy Artifact) and SA (Surface Artifact) in vacuum.

With this new installation, KRISS is one step closer to their vision of becoming one of the top 7 NMIs in the world by 2005. KRISS will continue to further its capability as the national metrology institute and to serve as a springboard for stepping up the national competitiveness level in the industry.



Balances	Model	Readability	Repeatability
5 g MC	UMT5	0.1 mg	0-2 g: 0.25 mg
20 g MC	AT21	1 mg	2 mg
1 kg Auto MC	HK 1000	1 mg	< 5 mg
1 kg MC	AT1005	0.01 mg	0.02 mg
10 kg Auto MC	AT10005	0.01 mg	0.015 mg
100 kg Auto MC	AT106H	1 mg	1.2 mg
100 kg MC	KCC100-2	0.05 g	0.15 g
500 kg MC	KC500-1	0.1 g	0-200 kg: 0.2 g
1 t MC	KC1000	1 g	0-500 kg: 2 g