LINEAR AND ANGULAR MEASUREMENTS

STANDARDIZATION OF LINEAR MEASUREMENTS

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The introduction of the metric system into the Soviet Union necessitated replacing the old measures of length used in industry and commerce by the new metric units, the creation of new standard measures in the Soviet Union, and the development of measuring instruments for testing these. In carrying out the corresponding scientific-technical operations of metrical reformation the Principal Bureau of Weights and Measures has found it expedient to develop a series of technical norm documents establishing rules for the construction, testing, and applications of measures and measuring instruments. These documents constitute a basis for the future standardization of length measures and measuring instruments.

With the industrialization of the Soviet Union and the development of home-based engineering activities, the need for accuracy in linear measurements has greatly increased. The Principal Bureau is not only developing documents relating to length measurements but also establishing norms for the actual methods of technical measurements. The problem of using simple, unified, but reasonably accurate and reliable measuring methods in industry has in particular arisen.

A Calibration Laboratory set up in 1924 developed systems, principles, and methods for ensuring the uniqueness of such measures. Rules were devised for measurements based on the use of standard gages in various undertakings. The testing of end-type and master gages was made obligatory in 1927.

Plane-parallel end-type length gages form the basis for linear measurements in industry; hence the development of one of the most important state standards (OST 85000-39) was extremely important in ordering the whole measuring economy of the country. The standard introduced five categories of standard end gages and established the corresponding measuring methods and accuracies. Also defined in this way were the basic principles underlying the construction of testing devices for standard end gages and for the working gages used in industrial undertakings.

In making metrological provision for engineering, machine-building, and instrument making, the testing organizations, and industrial laboratories were greatly assisted by the 1941 publication of the Commercial-Instrument Reference Book "Testing Measuring Devices in Engineering". Apart from instructions as to the testing of plane-parallel end-type length gages, calibration devices for shafts and apertures, various types of measuring instrument, and opticomechanical measuring devices, the reference book also gave rules for the organization of testing systems used in measuring geometrical dimensions in engineering work and made recommendations as to the choice of measuring devices in engineering, with an indication of their limiting errors. The documents also defined rules for the execution of linear measurements in relation to the accuracy specified. The documents in this reference book subsequently acted as a basis for the development of State Standards.

The Standard relating to plane-parallel end-type length gages was revised in 1959. In the new All-Union State Standard 9038-59 "Plane-parallel end-type length gages, basic parameters and technical requirements", only the technical requirements for end gages were left. The metrological sections of the former Standard OST 85000-39 were combined into Instruction 100-60 regarding the testing of plane-parallel end-type length gages.

The level of accuracy characterizing linear measurements in industry is continuously increasing, and the accuracy of measuring devices has to keep pace with this. On reconsidering All-Union State Standard 9038-59 in 1973, the requirements as to the accuracy of manufacturing end gages were therefore made considerably more rigorous. Hence in revising Instruction 100-60 of All-Union State Standard 8.166-75 ("State standard instruction:

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plane-parallel end-type length gages, testing methods and devices, general principles") the permissible errors of the measuring methods are greatly reduced, especially as regards gages of the first and second categories. Formulas for the accuracy of standard length gages are established in accordance with the requirements imposed upon the primary State standard meter and upon the testing arrangements for length gages (All-Union State Standard 8.020-75).

At the present time all the instructions as to methods of testing standard and working end-type length gages are being converted into Standards.

The new standards for plane-parallel end-type length gages in general correspond to the international norms indicated in the recommendations of the Comecon organization and also the 1973 recommendation of the Internation Organization for the Unification of Measurements MOZM No. 30.

In connection with the signing of the Convention on Comecon Standards it has been decided to convert the Comecon recommendations regarding end gages into Comecon standards.

The use of exact ruled length gages in industry extended considerably after the war and the production of these was started in various undertakings. In view of this, All-Union State Standard 12069-66 ("Ruled length gages") was developed, establishing the technical requirements for the production of ruled gages of four types and six classes of accuracy. As regards accuracy, ruled gages of classes 0 and 1 correspond to the level of plane-parallel end gages of the highest classes.

Used in accordance with the new testing arrangements of All-Union State Standard 8.020-75 ("State Standard Instruction: primary State standard of the unit of length and testing arrangements for length-measuring systems"). plane-parallel end-type and ruled length gages are employed as working standards and serve to transmit the unit of length from the primary standard meter to the working gages and measuring instruments of all classes of accuracy. This Standard also provides for the use of highly accurate rings as standard measures for testing devices used in measuring internal dimensions.

Apart from the foregoing length-gage Standards, which constitute the principal means of ensuring the unity of linear measurements throughout the whole country, several tens of special Standards relating to gages and measuring instruments as well as methods of testing these have been developed and are in practical service.

Soon it will be necessary to convert a large number of Instructions and methodical recommendations concerning testing methods into Standards, and also to develop new State Standards for the latest linear measuring devices (including those of the automatic type), as well as methods of testing these, under laboratory conditions and directly in industry. In addition to this it will be necessary to unify measuring methods and geometrical dimensions. This work will have to be carried out by departmental institutes and undertakings with the participation of various units of the metrological service.