QUALITY CONTROL
ECONOMIC PROBLEMS OF METROLOGY

RAISING THE ROLE OF STANDARDS IN THE IMPROVEMENT
OF THE QUALITY OF MEASUREMENT MEANS FOR LINEAR
AND ANGULAR DIMENSIONS

G. D. Burdun, M. M. Banshtyk, and N. N. Markov

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The resolution of the Central Committee (TsK) of the Communist Party of the Soviet Union (KPSS) and the
Council of Ministers of the USSR "Raising the role of standards in the improvement of the quality of goods produced"
provides a definite direction to workers for the perfection and standardization of measurement means. It is possible
to mention several main directions in which work is unfolding in the raising of the quality and the technical level
of measurement means being produced. These include periodic reinspection of standards, an intensification of work
in determining and increasing the reliability and service life, and the analysis of the quality of measurement means
being produced and the evaluation of their technical level. The entire complex of work associated with raising the
quality and the technical level of domestic measurement means is being implemented by specialists of instrument
factories, the Bureau for Interchangeability in the Metalworking Industry (BV), and higher educational institutions.

Presently 180 governmental standards regulate the requirements for measuring means with respect to the
nomenclature produced by enterprises of the Ministry of the Machine Tool Building and Tool Industry of the USSR.
In the period 1971-1975 it is necessary to reexamine a fourth of all the standards published up to 1966. In addition,
for the set of standards "Unified System for Technological Preparation of Production" for the creation of which the
Gosstandart of the USSR is working in cooperation with ministries and departments, 14 standards must be developed.
For the conduct of this extensive work it is necessary to have the efforts not only of the organizations developing them
and the factories carrying out standardized production but also their customers, since it is precisely they who in a
comparatively short time will receive extensive material containing the drafts of the reconsidered standards and the
new standards. The conduct of this work at a high level requires rigorous conformity to GOST 1.0-68. In the reex-
amination of standards account will be taken of the work experience accumulated in industry, and into many stan-
dards will be introduced the requirements contained in recommendations of the Council for Economic Mutual Aid
(S但它) and the International Standards Organization (ISO).

In the development of new standards for the majority of measurement means the requirements applicable to
reliability and service life will be normalized. The basic reliability parameter is the maintenance of accuracy
with time; functional failures of these means are not specific and characteristic.

For measurement means the determination of a quantitative index of reliability is rather complicated, since
the majority of them do not have constant use conditions, and it is practically impossible to encompass all possible
conditions. To determine quantitative data for the reliability of all possible combinations of conditions of
measurement would require enormous expenses and money and time. The credibility of such determinations also
creates doubt due to the amount of required samples and the inconstancy of the technological process of manufactur-
ing measurement means.

Consequently, it is more reasonable to determine and normalize in standards for quantitative reliability ind-
exes (generated in measurement cycles) definite and limited conditions that are the most typical on "average" with
respect to the actual ones for the investigated measurement means. For such typical measurement conditions it is
possible more credibly to determine the quantitative reliability indexes and to introduce this with a measure of de-
finiteness into normative documents. Evidently, in many cases these data are desirably included for a certain

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period of time not into standards but into documentation sent to the customer for their wide production approval. As
data is accumulated the quantitative reliability indexes can be used for other measurement conditions.

Quantitative reliability indexes in tool factories are determined from the results of stand testing with maxi-
mum reproducibility of the working conditions of measurement means having given operating conditions, with re-
spect to use of measurement means subjected to monitoring at the users' enterprises, and with respect to user inquiry.
The specific operating conditions with respect to the reliability of measurement means and also the urgency of their
being made for limited periods of time in connection with the reexamination of standards have promoted the organi-
zation of specialized subdivisions on reliability in factories. These subdivisions operate under methodological direc-
tion of the Bureau of Interchangeability. On the basis of a typical regulation for reliability services, worked out by
the BV and approved by the Chief Directorate for the Production of Cutting and Measuring Tools and Instruments of
the Ministry of the Machine Tool Building and Tool Industry, factories are developing their own regulations. Reli-
ability subdivisions are in the chain of command of the chief engineer of a factory. They unite and coordinate all
work in the determination of the reliability of manufactured means.

Under direction of the BV annual coordination conferences on reliability are being carried out; they discuss
first-order work and designate those to execute the work. Reliability subdivisions have their difficulties: there is
not a sufficient number of specialists, and due to the large nomenclature of measurement means it is necessary to
have a large nomenclature of test stands.

One of the ways of raising the technical level and the quality of measurement means is the awarding of articles
the State Sign of Quality. In the period 1969-1971 seventeen articles were awarded the Sign of Quality. Among
these were ring length measures made of a hard alloy (the factories "Kalibr" and KRIN), lever-gear measuring heads
having scale divisions of 1 and 2 µ, photoelectric converters for automata (LIZ), sets of angular measures (ChZMI),
and some others. In the ninth five-year plan the State Sign of Quality was awarded to 41 types of measurement
means.

In the certification of measurement means for the Sign of Quality scientists from higher educational institu-
tions take an active part; as a rule they are the chairmen of the certification commissions.

A resolution of the TsK KPSS and the Council of Ministers of the USSR has given the Gosstandart of the USSR
the right of selective checking of the quality of articles and to designate for this work representatives of ministries
and other specialists. Co-workers of the BV, the Gosstandart of the USSR, or Laboratories for Governmental Surveil-
lance (LGN), in accordance with schedules approved by the Ministry of the Machine Tool Building and Tool Industry,
anually conduct factory checks for the observance of standards, technical conditions, and the quality of measure-
ment means produced.

The requirements for high accuracy and reliability of measurement means contained in standards for measure-
ment means can be implemented with high confidence only with a high technical level of design and manufacture
for them. Evaluation of the technical level of measurement means by the BV in cooperation with factories has been
carried out since 1965. They have evaluated the designs of measurement means, their technical parameters and use
indexes, and also the external appearance and packaging. The technical level is determined from all these indexes
separately. At the beginning of 1972 charts were made of the technical level of more than 200 basic forms of mass-
produced measurement means. It was established that about 90% of all considered measurement means have design
implementations corresponding to a modern technical level; however the external appearance and the packaging,
and in a number of cases, the technical parameters and use indexes, require improvement. On the charts are shown
measures directed to raising the technical levels of articles. They are included in the thematic plans of factories
and the BV. During 1966-1971 more than 650 different measures were introduced directed to raising the technical
level and the quality of measurement means. Removed from production were 60 typical sizes of measurement means
of obsolete design.

With the appearance of GOST 2.116-71 a new direction was defined for work in evaluating the technical level
of articles. For all mass-produced measuring means more than 350 charts of technical level were worked out and
used mainly to evaluate the technical level and the quality of articles in making production quality certifications
in three categories. However, the new charts of technical level shown in GOST 2.116-71 are insufficiently worked
out. It is desirable to reduce the number of indexes in new charts used to evaluate the technical level of an article,
since credible answers cannot be given for many of them.

The results of work in evaluating technical level were used in refining the kinds of means for measuring di-
ensions during 1971-1975 with respect to nomenclature of those produced by the Ministry of the Machine Tool