CURRENT STATUS OF THE ISO STANDARDIZATION OF ACCURACY DETERMINATION PROCEDURES FOR SURVEYING INSTRUMENTS

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ABSTRACT

The ISO (International Organization of Standardization has the goal of creating globally-valid standards. The terms of reference for the committee ISO/TC 172/SC 6 "Optics and optical instruments – Geodetic and surveying instruments" embrace the standardization of terminology, requirements and test methods of geodetic and surveying instruments, their components and accessories. SC 6 is also active in the standardization of quality parameters for instruments and accessories.

The following standards worked out by SC 6 have been published so far:

ISO 9849 Vocabulary. This standard defines terms relating to geodetic field instruments, their essential components and various accessories.

ISO 12858-1 Ancillary devices for geodetic instruments – Part 1: Invar levelling staffs. For these precision staffs, quality relevant parameters and tolerances have been defined.
ISO 12858-2 Ancillary devices for geodetic instruments – Part 2: Tripods. The components connecting the instruments to the tripods are standardized and a minimum requirement in dimensions and stability has been defined.
ISO 12857 Field procedures of determining accuracy – Part 1: Levels – Part 2: Theodolites – Part 3: EDM-Instruments. This standard describes test procedures that enable the empirical standard deviation of a given parameter to be determined and used as a criterion for the measure of precision of an instrument. The purpose of this standard is to make it possible to compare the achievable precision of different instruments or alternatively the precision of one instrument at different times. To enable these comparisons, test procedures were established that largely exclude external influences.

For the interpretation of the results, each part of the standard contains statistical tests to decide if the calculated experimental standard deviation is smaller than or equal to the theoretical standard deviation.

Parallel to the standards indicated in TC 172/SC 6, standards from ISO/TC 59/SC 4 "Building construction – Limits and fits in building construction" were also compiled; they include suggested test procedures for instruments used to carry out measurements on construction sites.

ISO 8322 Building construction – Measuring instruments – Procedures for determining accuracy in use – Part 1: Theory – Part 2: Measuring tapes – Part 3: Optical levelling

instruments – Part 4: Theodolites – Part 5: Optical plumbing instruments – Part 6: Laser instruments – Part 7: Instruments when used for setting out – Part 8: EDM-instruments.

These standards outline test procedures for a particular instrument with its accessories to determine if it can achieve the specified accuracy and if it is suited for a given measuring task.

Although the goal here is different from that expressed in the test standards of TC 172/SC6, the test procedures proposed are in some respects similar. However, by virtue of their complexity, non of the test procedures suggested to date are suitable for the periodical routine inspection of survey equipment on a construction site. In order to improve the situation and not work on parallel tracks, a joint working group (JWG) was formed to rework ISO 12857 and ISO 8322 and to create a single standard. After reaching agreement with the standard committees TC 172/SC 6 and TC 59/SC 4, JWG was integrated into TC 172/SC 6. Meaning that in future for test procedures for surveying instruments only TC 172/SC 6 is responsible.

The standards currently being worked on by TC 172/SC 6 are in DIS (Draft international standard) or FDIS (Final draft international standard) status.
The main work is concentrated on the new ISO 17123: Field procedures for testing geodetic and surveying instruments. This standard describes new test procedures for levels, theodolites, EDM instruments, Total stations and Rotating lasers. In a first part, a simplified procedure is described which is normally intended for checking whether the error of a given equipment is within a specified maximum permissible error or if the measure of precision of the instrument has changed since the last test. In a second part, the full test procedures described in ISO 12857 to determine the best achievable measure of precision of a particular instrument and its ancillary equipment were taken over.

More and more contractors of large survey projects demand that the responsible surveyor provide a manufacturer issued certificate confirming the accuracy of the instrument to be used. In this case, the customer may obtain two different certificates from Leica Geosystems. The producer certificate O which certifies that the instrument in question has been tested and meets the specifications in accordance with the user manual or the producer certificate M which provides the actual experimental standard deviation after being put through the relevant test procedures.

The demand for suitable testing procedures for geodetic instruments is on the rise.
The reasons are increasing demands on safety and accuracy of geodetic measurements and the need for certificates confirming the accuracy of the instruments to be used. It is therefore necessary to create standards for test procedures that can be applied in the field without excessive effort. In this connection, it is important that specialists from as many countries as possible participate in the standardization work of ISO TC 172/SC6 and that the standards for test procedures, as outlined here, are applied widely.

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