

## New tools for unique geometrical tolerancing implemented in recently published GPS standards

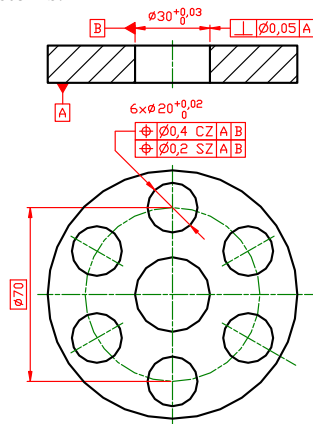
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**Summary.** The ISO GPS system delivers graphic symbols for communication between designers, production engineers and metrologists that enables exchange information of the functional requirements for components. In industry, especially automotive, the use of outsourcing and subcontracting is increasing, so the need for unique specification is of particular importance. The fourth edition of the standard ISO 1101 *Geometrical Product Specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out* have been published on the 1st February 2017. The objective of this paper is to indicate the principle changes and improvements in the standard as well as to justify why just only after five years the standard have been significantly enriched by additional concepts and symbols. The attempt is also made to evaluate the practical usefulness of particular symbols for the designers for clear communication how far the geometry of the actual component may be away from its nominal CAD model. On the other hand the purpose of the paper is to assess how the new symbols can provide the measurements reproducibility, particularly reproducibility of measurements performed by coordinate measuring systems.

A geometrical specification indication consists of a tolerance indicator, optional plane and feature indications and optional adjacent indications. Concept of auxiliary feature indications was introduced in the ISO 1101:2012, but in the ISO 1101:2017 such indication is preferred in order to have similar indications in 2D and 3D drawings. In the ISO 1101:2017 standard the set of specification elements for the second section of the tolerance indicator i.e. zone, feature and characteristic section is significantly enlarged. It seems that two modifiers CZ (Combined Zone) and SZ (Separate Zones) that indicate how a specification applies to several features are of particular importance.



**Fig. 1.** Two position tolerance indicators for six hole pattern with modifiers CZ and SZ.