



Expert commentary

BS EN ISO 2692:2021 — Geometrical product specifications (GPS) — Geometrical tolerancing — Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR) techniques

Iain Macleod, Managing Director, Iain Macleod Associates Ltd



...making excellence a habit.  Documents
Document Sharing Hub

Contents

	Page
1 Overview	1
1.1 Reasons for change	1
1.2 Summary	1
2 Main commentary	2
2.1 Scope	2
2.2 Normative references	2
2.3 Terms and definitions	2
2.4. Maximum Material Requirement, MMR, and Least Material Requirement, LMR	2
2.5 Rules	4
2.6. Reciprocity requirement (RPR)	5
2.7. Informative annexes	6
3 Wider context	6
4 Conclusion	6
5 Further reading	7
Author	7
Technical reviewers	8
Disclaimer	8

Summary of pages

This document comprises a front cover, and inside front cover, pages i to ii, pages 1 to 8, an inside back cover and a back cover.

THIS PAGE DELIBERATELY LEFT BLANK

1 Overview

BS EN ISO 2692:2021 is the fourth edition of this standard.. It revises and replaces the third edition, BS EN ISO 2692:2014.

BS EN ISO 2692 describes the rules for the use of certain modifying symbols which are used with geometrical specifications for the definition of mechanical parts. These modifiers are used to extend the functionality defined in [BS EN ISO 1101:2017](#) - Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out. The purpose of these modifiers is to enable geometrical specifications to represent functional requirements more effectively by taking into account the combined effects of size and geometrical requirements.

The modifying symbols are:

Ⓜ - used to define the Maximum Material Requirement (MMR)

Ⓛ - used to define the Least Material Requirement (LMR)

Ⓡ - used to define the Reciprocity Requirement (RMR).

The MMR can be used to ensure that parts will fit together, while the LMR can be used to maintain minimum wall thicknesses and machining allowances on parts (this is not an exhaustive list of uses). These modifiers allow boundaries, known as Maximum Material Virtual Condition and Least Material Virtual Condition boundaries, to be defined for a feature. By defining the boundary condition as the specification requirement, the size and geometrical properties which are constrained by the boundary are permitted greater variability, as reduced variation in one property may permit a corresponding increase in variation in the other. This helps to ensure that parts which are fit for purpose are not unnecessarily rejected, and will usually lead to an increase in productivity.

1.1 Reasons for change

A new facility to directly indicate the Maximum Material Virtual Size and Least Material Virtual Size for a feature has been introduced. . This facility will make the system more flexible and easier for users to understand.

The rules have been clarified and extended to ensure that they conform to ISO GPS principles, and to cover the use of modifiers CZ, SZ and SIM which have been introduced into the ISO GPS systems after publication of the third edition of this standard (see BS EN ISO 1101:2017 and BS EN ISO 5458:2018).

Improvements to the language and explanations in the text have been made throughout.

1.2 Summary

- The facility for direct indication of Maximum Material Virtual Size and Least Material Virtual Size has been introduced.
- The rules given in the standard have been re-written for clarity, and to ensure conformance with ISO GPS principles.
- Rules for the use of CZ and SZ modifiers have been added.
- An explanation of how MMR and LMR requirements can be used in a simultaneous requirement, using the SIM modifier, has been added.
- An extensive range of examples have been included in the annex to illustrate the use of these modifiers.