TECHNICAL REPORT

ISO/TR 23605

Second edition
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Technical product specification (TPS) — Application guidance — International model for national implementation

Spécification technique de produits (TPS) — Lignes directrices d'application — Modèle international pour mises en oeuvre nationales

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This second edition cancels and replaces the first edition (ISO/TR 23605:2009), which has been technically revised.

The main changes to the previous edition are as follows:

— a general update in line with the revised ISO GPS matrix, ISO 14638:2015;

— the category of 'global' standards has been removed, as per ISO 14638:2015, with standards now categorized as 'fundamental' or 'general' ISO GPS standards;

— new, amended and/or revised standards have been added or updated throughout the document, including in Annex A, which lists all cross-referenced standards;

— a new Annex B, 'Withdrawn standards', provides a list of all previously current ISO/TC 213 standards referred to in this document.

Introduction

Industry in all developed countries worldwide is showing an increasing tendency to focus on design and assembly activity and to contract out the manufacture of its components, and such procedures are unlikely to be constrained by national borders. Alongside this, many companies are extending their dependence on computerized systems and thereby reducing the opportunity for human intervention in manufacturing processes.

One effect of these parallel trends is the exposure of the limitations of some traditional specification processes, which highlights the urgent need for enhanced detail and accuracy in specifying the manufacture of technical products. This is coupled with the requirement to reduce ambiguity and the opportunity for interpretation at both manufacturing and verification stages.

This document is drafted with the sole objective of facilitating this improvement in technical product specification (TPS) through the application of established International Standards and International Standards under development.

A primary objective of the responsible ISO committees is to ensure that the necessary tools to enable the preparation of detailed, accurate specifications are available. Their activity covers seven complementary generic subject areas:

— methodology for design implementation;

— geometrical product specification;

— graphical representation (engineering drawings/diagrams and 3-D modelling);

— verification (metrology and precision measurement);

— technical documentation;

— electronic formats and controls;

— related tools and equipment.

There are two ISO Technical Committees responsible for identifying and evaluating requirements for International Standards relating to the preparation, presentation and validation of technical specifications in the field of mechanical engineering and for the drafting of any such standards for which a genuine need is established. Their combined work programmes address the requirements for standardization in such technical specifications at all stages from the preparation of design concepts for physical realization to the validation of finished products.

Technical product documentation (TPD) is the province of ISO/TC 10, with the scope to develop, co-ordinate and maintain International Standards for TPD, “including technical drawings, manually produced or computer based for technical purposes throughout the product life cycle, to facilitate preparation, management, storage, retrieval, reproduction, exchange and use”.

Although this committee is founded on the more traditional discipline of engineering drawing, its remit extends to include the presentation of all forms of specification for technical products, whatever the media selected to carry that specification. In particular, this includes the graphical representation and annotation of the output of 3-D modelling programmes. The work of ISO/TC 10 is closely linked to that of ISO/TC 213 (see below) and the closest practicable liaisons are maintained, both at the policy-making level and between the working groups.

ISO/TC 213 is the Technical Committee responsible for the development of standards for geometrical product specifications (GPS). Its primary objective is the development and promotion of an integrated system for specification and verification of workpiece geometry that can function as an enhanced engineering tool for product development and manufacturing. Such a system is essential as companies move ahead rapidly with new technologies, new manufacturing processes, new materials and technically advanced products, in the environment previously known as international outsourcing.

This document sets out the format and overall content of a specification for the preparation of all forms of TPS. It is designed to facilitate the development of national standards for the definition, specification and graphical representation of technical products and includes cross-references to a range of International Standards (the core range) judged to be essential to the achievement of international compatibility between such national standards (see Annex A and see Annex B for a list of withdrawn ISO/TC 213 standards). This core range of cross-referenced standards incorporates those prepared not only by ISO/TC 213 but also by other relevant ISO Technical committees, principally ISO/TC 10. It is intended that this model be adopted, in its entirety, by national standards bodies as the basis for their national standards in the field of mechanical engineering specification. Attention is drawn to the fact that its structure provides for the addition of supplementary information by way of commentary and recommendation where national requirements make such addition appropriate, provided that any such additions are not in conflict with the published International Standards.

The relationship between the cross-referenced standards is formally structured within this document. Additionally, an overview of the international standardization of geometrical product specification, explaining the concept and providing a matrix of the relevant standards, can be found in ISO 14638.

Standards developed in the field of GPS form an interrelated standards structure providing fundamental rules for geometrical specification (see Annex C).

In this document, the GPS standards are applied in conjunction with the presentational TPD standards to construct a comprehensive system for TPS.

It is appropriate to apply TPS principles throughout the development of a product, i.e. in design, manufacturing, metrology and verification, and it will be found that consistent application will lead to reduced ambiguity and misunderstanding, which in turn will provide faster, more controlled "release-to-market" times, with significantly fewer restarts and reduced requirement for corrective action.

Technical product specification (TPS) — Application guidance — International model for national implementation

1 Scope

This document provides a list of all ISO geometrical product specification (GPS) and technical product documentation (TPD) standards for technical product specifications (TPS) in the mechanical engineering field. The document operates as an index to the many ISO standards applicable to a TPS by means of cross-reference, and, where appropriate, the subject references are supplemented by commentary and recommendations considered to be of significance but which are not otherwise covered.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10209:2012, *Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10209:2012 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
technical product documentation
TPD
means of conveying all or part of a design definition or specification of a product

3.2
technical product specification
TPS
technical product documentation comprising the complete design definition and specification of a product for manufacturing and verification purposes

Note 1 to entry: A TPS, which can contain drawings, 3-D models, parts lists or other documents forming an integral part of the specification, in whatever format they are presented, can consist of one or more TPDs.

4 Fundamental and general standards underpinning ISO/TR 23605

4.1 The GPS matrix

The GPS matrix (see Annex C) embodies the concept of 'fundamental' and 'general' standards that underpin or influence the whole TPS process. This principle is adopted in this document, and the following standards are identified as being fundamental or general standards for this purpose.

NOTE The category of 'global' ISO GPS standards has been removed from ISO 14638, the ISO GPS matrix standard. ISO GPS standards which had previously been categorized as global ISO GPS standards are now categorized as either fundamental or general ISO GPS standards.

ISO 1, *Geometrical product specifications (GPS) — Standard reference temperature for the specification of geometrical and dimensional properties*

ISO 8015, *Geometrical product specifications (GPS) — Fundamentals — Concepts, principles and rules*

ISO 10579, *Geometrical product specifications (GPS) — Dimensioning and tolerancing — Non-rigid parts*

ISO 14253-1, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for verifying conformity or nonconformity with specifications*

ISO 14253-2, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification*

ISO 14253-3, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 3: Guidelines for achieving agreements on measurement uncertainty statements*

ISO/TS 14253-4, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 4: Background on functional limits and specification limits in decision rules*

ISO 14978, *Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment*

ISO/TR 16015, *Geometrical product specifications (GPS) — Systematic errors and contributions to measurement uncertainty of length measurement due to thermal influences*

ISO 16610 (all parts), *Geometrical product specifications (GPS) — Filtration*

ISO 17450-1, *Geometrical product specifications (GPS) — General concepts — Part 1: Model for geometrical specification and verification*

ISO 17450-2, *Geometrical product specifications (GPS) — General concepts — Part 2: Basic tenets, specifications, operators, uncertainties and ambiguities*

ISO 17450-3, *Geometrical product specifications (GPS) — General concepts — Part 3: Toleranced features*

ISO 17450-4, *Geometrical product specifications (GPS) — Basic concepts — Part 4: Geometrical characteristics for quantifying GPS deviations*

ISO 18391, *Geometrical product specifications (GPS) — Population specification*

ISO 22432, *Geometrical product specifications (GPS) — Features utilized in specification and verification*

ISO 25378, *Geometrical product specifications (GPS) — Characteristics and conditions — Definitions*

In addition, the principles addressed in the following documents are considered to underpin the provisions of this document:

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

4.2 Standard reference temperature

The standard reference temperature for TPS and verification is 20 °C (see ISO 1).

5 Expression of the concept

Before specifying a technical product, the broad requirement should be established, with particular attention being paid to the functions that the product will be expected to fulfil. The conceptual design intent can then be depicted in the form of a design layout, scheme or simplified computer-generated model, although this will not normally be used in the detailed technical product document for manufacturing purposes.

The importance of this stage cannot be over-emphasized. Clear understanding of the purpose and function intended for the eventual product, knowledge of the requirements of the available manufacturing methods and awareness of relevant verification procedures will help to ensure that the degree of complexity of the specification is appropriate and adequate.

It is not the aim of this document to attempt to instruct or constrain the design process. It is, however, of the greatest importance that the designer present the product of the design process, i.e. the TPD set containing the TPS, in a manner that avoids ambiguity and any risk of misunderstanding or misinterpretation. For this reason, it is imperative that the designer be familiar with the guidance within this document and aware of the increased precision that its use can bring.

For these and many other reasons, management of the overall design process can be complex, and it is strongly recommended that designers familiarize themselves with published standards in this field.

6 Types of documentation

6.1 General

The technical product document should, if practicable, be of a type listed in one of the following standards and be prepared in accordance with any corresponding recommendations therein:

ISO 7573, *Technical product documentation — Parts lists*

ISO 10209, *Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation*

ISO 16792, *Technical product documentation — Digital product definition data practices*

6.2 Commentary and recommendations

6.2.1 Combined drawing

For some TPS, it might be appropriate to display an assembly, item list and constituent details, drawn separately, all on the same drawing (see ISO/TS 8062-2).

6.2.2 Document list (drawing list)

For some TPS, it may be appropriate to provide a list of all graphical representations and selected specifications required to build a particular assembly, from which it derives its title and primary identifier.

7 Relationship between design definition and interpretation

7.1 Targeting of a TPD

When producing a TPD for manufacturing purposes, there can be benefits in giving consideration to how it will be interpreted:

— including more detail than is necessary for the manufacturing operation can increase the risk of misinterpretation;

— including requirements which are beyond the capability of the manufacturing process will lead to an increase in non-compliance.

7.2 Uncertainty of specification

However much care is invested in the preparation of a TPS, there will inevitably be areas of uncertainty, both within the specification and between the specification and the verification processes. To ensure that the uncertainty is minimized, the principles applied should conform to the following standards:

ISO 8015, *Geometrical product specifications — Fundamentals — Concepts, principles and rules*

ISO 17450-1, *Geometrical product specifications (GPS) — General concepts — Part 1: Model for geometrical specification and verification*

ISO 17450-2, *Geometrical product specifications (GPS) — General concepts — Part 2: Basic tenets, specifications, operators and uncertainties*

ISO/TS 23165, *Geometrical product specifications (GPS) — Guidelines for the evaluation of coordinate measuring machine (CMM) test uncertainty*

ISO/TR 16015, *Geometrical product specifications (GPS) — Systematic errors and contributions to measurement uncertainty of length measurement due to thermal influences*

7.3 Extraction

ISO 14406, *Geometrical product specifications (GPS) — Extraction*

8 Presentation media

The presentation of the drawings should conform to the following standards:

ISO 5457, *Technical product documentation — Sizes and layout of drawing sheets*

ISO 7200, *Technical product documentation — Data fields in title blocks and document headers*

ISO 16016, *Technical product documentation — Protection notices for restricting the use of documents and products*

9 Scales

Scales should conform to:

ISO 5455, *Technical drawing — Scales*