INTERNATIONAL STANDARD

ISO 10135

Second edition
2007-11-15

Geometrical product specifications (GPS) — Drawing indications for moulded parts in technical product documentation (TPD)

Spécification géométrique des produits (GPS) — Indications sur les dessins pour pièces moulées dans la documentation technique de produits (TPD)

Reference number
ISO 10135:2007(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10135 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 10135:1994), which has been technically revised.

Introduction

This International Standard is a technical product documentation (TPD) standard (as prepared by ISO/TC 10), but also serves as a geometrical product specification (GPS) standard (as prepared by ISO/TC 213) and is to be regarded as a complementary process specific tolerance GPS standard (see ISO/TR 14638). It influences links 1 and 2 of the chain of standards on mouldings.

For more detailed information of the relation of this International Standard to other standards and the GPS matrix model, see Annex B.

Materials that are moulded to produce parts may exist in a solid, doughy or liquid form.

In order to produce parts by moulding, it is recognized that special consideration has to be made concerning the moulding process and the designs of the mould, which influence the design of the part.

It is often necessary to slightly change the intended geometry of a part in order to avoid surface imperfections (e.g. caused by sinks due to thermal contraction of material) and in order to enable the removal of the part from the mould. Different necessary mould components such as parting surfaces, gates, risers, vents, ejectors etc. can also produce undesired, but inevitable surface imperfections. Therefore, the resulting moulded part will exhibit deviations from the ideal geometric form. To control these deviations in order to achieve the intended function and to ensure that the moulded part can be reproduced when a mould shall be replaced (e.g. due to breakdown), it is necessary that such permissible deviations be able to be indicated and specified on technical drawings.

Moulded parts, cast parts and forged parts are parts produced by the use of a mould, e.g. by blowing, injection, casting or forging. For convenience, the use of the term “moulded part” in the text of this International Standard covers moulded or cast or forged parts.

The tolerance specified for a casting may determine the casting method. It is therefore recommended, before the design or the order is finalized, that the customer liaise with the foundry to discuss:

a) the proposed casting design and accuracy required;

b) machining requirements;

c) method of casting;

d) the number of castings to be manufactured;

e) the casting equipment involved;

f) datum target system according to ISO 5459;

g) casting alloy;

h) any special requirements, for instance, individual dimensional and geometrical tolerances, fillet radii tolerances and individual machining allowances.

Although the figures in this International Standard are presented in first angle projection, they could equally well have been presented using third angle projection.

Geometrical product specifications (GPS) — Drawing indications for moulded parts in technical product documentation (TPD)

1 Scope

This International Standard specifies rules and conventions for the indications of requirements for moulded parts on technical product documentation. It also specifies the proportions and dimensions of the graphical symbols used for this representation.

NOTE The figures in this International Standard merely illustrate the text and are not intended to reflect actual application. Consequently, the figures are simplified and are not fully dimensioned and toleranced, showing only the relevant general principles applicable in any technical area.

2 Normative references

The following referenced documents are indispensable for the application 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 128-22:1999, *Technical drawings — General principles of presentation — Part 22: Basic conventions and applications for leader lines and reference lines*

ISO 128-24:1999, *Technical drawings — General principles of presentation — Part 24: Lines on mechanical engineering drawings*

ISO 129-1:2004, *Technical drawings — Indication of dimensions and tolerances — Part 1: General principles*

ISO 406:1987, *Technical drawings — Tolerancing of linear and angular dimensions*

ISO 1101:2004, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out*

ISO 1302:2002, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

ISO 2692:2006, *Geometrical product specifications (GPS) — Geometrical tolerancing — Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR)*

ISO 5459:—[1)], *Geometrical product specifications (GPS) — Geometrical tolerancing — Datums and datum-systems*

ISO 7083:1983, *Technical drawings — Symbols for geometrical tolerancing — Proportions and dimensions*

ISO 8062-1:2007, *Geometrical product specifications (GPS) — Dimensional and geometrical tolerances for moulded parts — Part 1: Vocabulary*

1) To be published. (Revision of ISO 5459:1981)

ISO 8785:1998, *Geometrical product specifications (GPS) — Surface imperfections — Terms, definitions and parameters*

ISO 13715:2000, *Technical drawings — Edges of undefined shape — Vocabulary and indications*

ISO/TR 14638:1995, *Geometrical Product Specifications (GPS) — Masterplan*

ISO 14660-1:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions*

ISO 14660-2:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 2: Extracted median line of a cylinder and a cone, extracted median surface, local size of an extracted feature*

ISO 81714-1:1999, *Design of graphical symbols for use in the technical documentation of products — Part 1: Basic rules*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8062-1, ISO 14660-1 and ISO 14660-2 and the following apply.

3.1
global specification
specification that applies to all features concerned

3.2
partial specification
specification which applies to a limited group of features concerned

4 Letter Symbols

For the purposes of this International Standard, the letter symbols given in Table 1 apply.

Table 1 — Letter Symbols

Letter symbol	Interpretation	Reference
C	Core	6.1
E	Ejector	6.2
FL	Flash	6.5
FLF	Flash free	6.5.3
G	Gate	6.2
H	Heat dissipation (chill markings)	6.2
M	Main	6.1
PRD	Part removal direction	6.9
R	Riser	6.2
S	Slider (side core)	6.1
SMI	Surface mismatch	6.4
TF	Taper (draft) to fit	6.7.5
TM	Taper –	6.7.3
TMD	Tool motion direction	6.8
TP	Taper +	6.7.3
V	Vent	6.2

5 Line conventions

Line types and line widths shall be in accordance with ISO 128-24:1999 (see also Table 2). Rules for the presentation of graphical symbols are given in Annex A.

Table 2 — Lines

Line type representation	Line type No. according to ISO 128-24	Application
———	01.2	Parting line of moulds in views
—·—·—	04.2	Parting lines of moulds in sections
		Indication of restricted area
—··—··—	05.1	Initial outlines prior to forming
		Outlines of the finished part within blanks
		Framing of particular fields/areas

6 Drawing indications for moulded parts

6.1 Parting surface

The parting surface between two shaping mould components is represented by the graphical symbol shown in Figure 1 a). Identification of fixed as well as movable mould parts is performed by filling in the particular half of the parting surface symbol as shown in Figure 1 b). The filled half represents the fixed mould part and the other half represents the movable part. For details of the symbol, see Figure A.1.

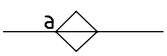
a) **b)**

Figure 1 — Graphical symbol for parting surface

Outside to the left of the upper half of the graphical symbol representing the parting surface a letter symbol may be added to indicate the type of parting surface as shown in Table 3, Figure 2 and Figure 3. For details of the symbol, see Figures A.1 and A.2.

Table 3 — Letter symbol for types of parting surface

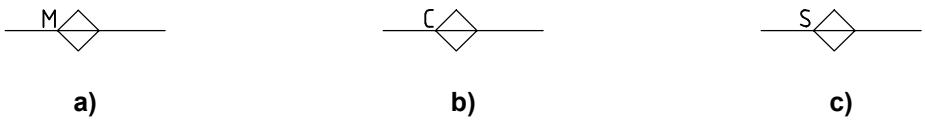
Letter symbol	Application
C	Parting surface for cores
M	Main parting surface of moulds
S	Parting surface for sliders



Key

a Position of the letter symbol for types of parting surface.

Figure 2 — Position of the letter symbol on the graphical symbol for parting surface



a) b) c)

Figure 3 — Indication of specific types of parting surfaces

The parting surface shall be indicated in views by a line in accordance with Table 2. The graphical symbol representing the parting surface shall be positioned preferably outside the outlines of the moulded part, on the parting line representing the parting surface (see Figure 4).

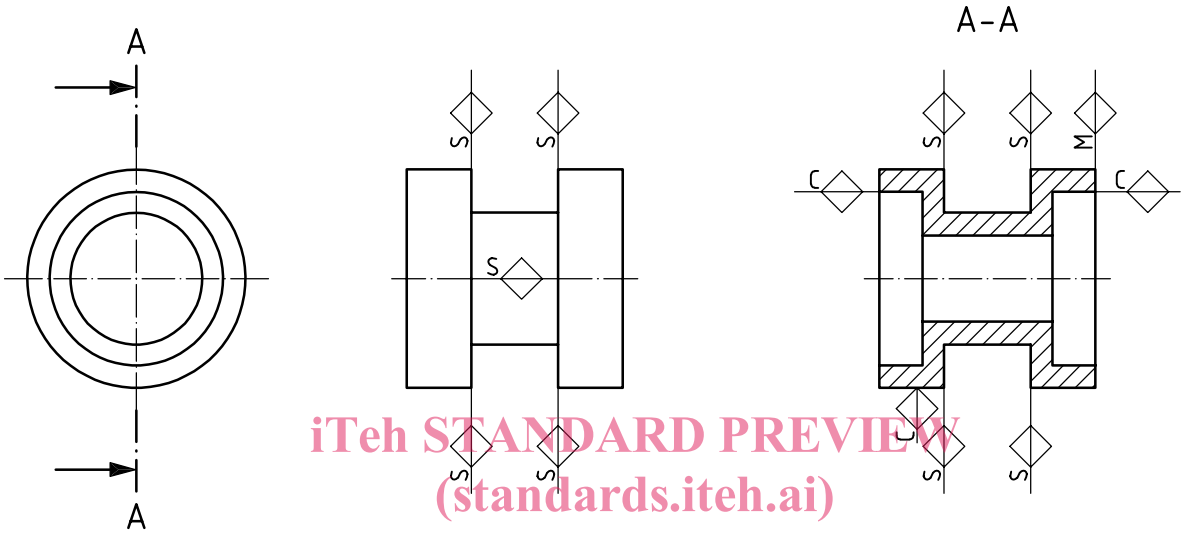


Figure 4 — Examples of the indication of parting surfaces

More than one graphical symbol may be used on a drawing to illustrate a single parting surface on a part.

If necessary, global specifications for maximum permissible mismatch and/or flash for all features intersected by a parting surface shall be indicated on the right hand side of only one of the graphical symbols used for illustrating the actual parting surface, see Figures 5 and 6. For more detailed information, see 6.4 and 6.5.

Key

a Position of the letter symbol for types of parting surface.

b Position of mismatch requirement.

c Position of flash requirement.

Figure 5 — Position of the possible indications on the graphical symbol for parting surface

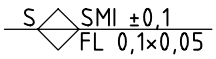
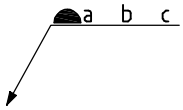


Figure 6 — Example of an indication of parting surface with specific type of parting surface, permissible mismatch and flash

6.2 Tool markings

When it is necessary to specify the size of the maximum permissible deflection caused by auxiliary mould components i.e. gates, risers, vents, ejectors and other types of tool markings, they shall be indicated by the graphical symbol shown in Figure 7. This shall be placed above a reference line (see ISO 128-22) connected to the feature by a leader line and an arrowhead, which is pointing to the surface as shown in Figure 8. The type of marking is indicated with a letter symbol according to Table 4 after the graphical symbol. If the type of markings is another than any of those listed in Table 4 the type shall be stated in full text/writing instead of a letter symbol. For details of the symbol, see Figure A.3.

Figure 7 — Graphical symbol for tool markings



Key

a Position of indication of type of marking.

b Position of indication of direction (elevated and/or depressed) using plus and minus signs.

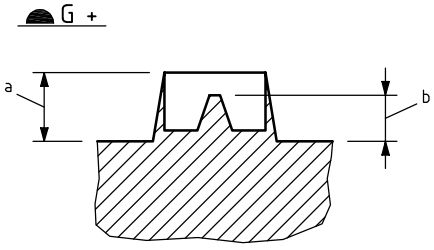
c Position of indication of dimension.

Figure 8 — Indication of tool marking symbol used with leader and reference lines

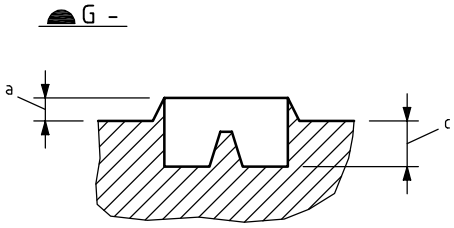
Table 4 — Letter symbol for types of tool marking

Letter symbol	Type of marking
E	Ejector markings
G	Gate markings
H	Heat dissipation (chill markings)
R	Riser markings
V	Vent markings

A plus and/or minus sign shall be indicated after the letter symbol or the text indicating the type of tool marking, see Figure 9. A plus sign is used if the tool marking shall be elevated above the adjacent surface of the moulded part as shown in Figure 9 a). A minus sign is used if the tool marking shall be depressed below the adjacent surface of the moulded part as shown in Figure 9 b). The plus and minus sign is used when elevation or depression is permitted.



a) Elevated tool marking



b) Depressed tool marking

a Flash height.

b Elevation.

c Depression.

Figure 9 — Example of the interpretation of the combined flash and gate requirement

The maximum permissible local deviation of the tool mark from the surface may be indicated by adding values after the plus and/or minus sign, see Figure 10. The value representing the maximum permissible rise above, and/or depression below, the surface shall always be stated.

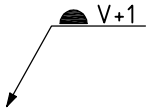


Figure 10 — Example of tool marking symbol

If it is necessary to specify the maximum permissible area, this area shall be indicated in brackets after the value of the maximum permissible rise above, and/or depression below the surface, i.e.:

— as a diameter on the surface of the moulded part [Figure 11 a)] by one value or

— by two values representing the dimensions of a rectangle on the surface of the moulded part [Figure 11 b)] where the first value represents the direction in the plane of the drawing and the second value represents the direction orthogonal to the plane of the drawing.

a) As a diameter **b) As a rectangle**

Figure 11 — Example of tool marking symbols used with specification of maximum permissible area and deflection area

Values for maximum permissible flash can be specified on the right hand side of the graphical symbol for tool marking below the reference line, see 6.5 and Figure 12.

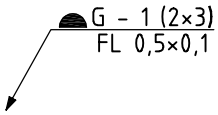


Figure 12 — Example of indication of permissible limit of flash at an ejector marking

The location of tool markings on the surface of a moulded part shall be indicated and toleranced in accordance with ISO 1101.

6.3 Special ejector markings identifier

If necessary for recognition purposes, the ejector markings shall be specifically indicated on the drawing. The graphical symbol shown in Figure 13 shall be used. For details of the symbol, see Figure A.4.

Figure 13 — Graphical symbol for identifying ejector marking

The special graphical symbol for identifying ejector marking may be used together with the tool marking symbol for specifying maximum permissible elevation and or depression as shown in Figure 14.

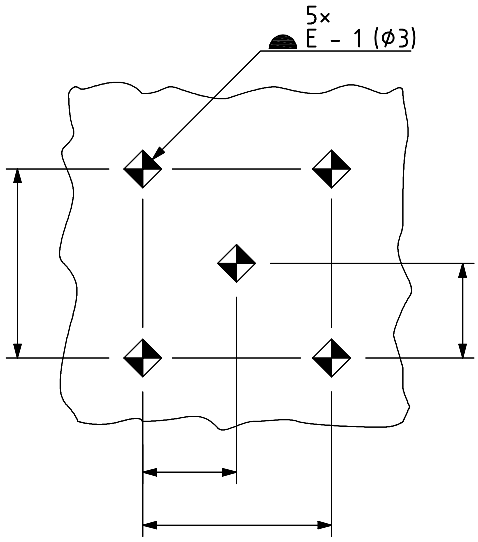


Figure 14 — Example of the use of the special ejector markings identifier together with the tool marking symbol

6.4 Mismatch

6.4.1 General

Surface mismatch may appear on real features and is formed by more than one mould component at the location where the parting surface intersects the features. Surface mismatch may be generated e.g. by a main parting surface, a slider, a tooling insert or a parting surface between two mating cores etc.

Examples of surface mismatch caused by dimensional, linear and rotational mismatch are given in Figures 15, 16 and 17 respectively.

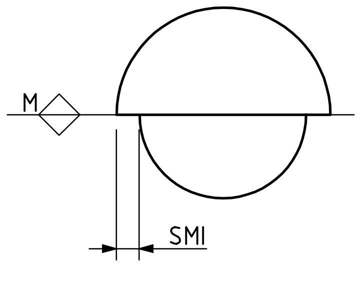
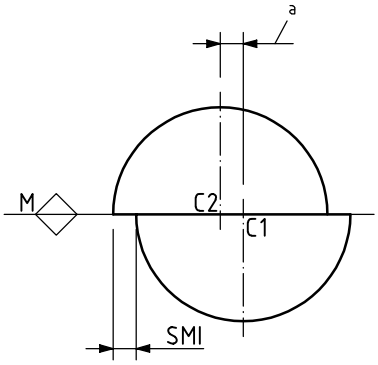
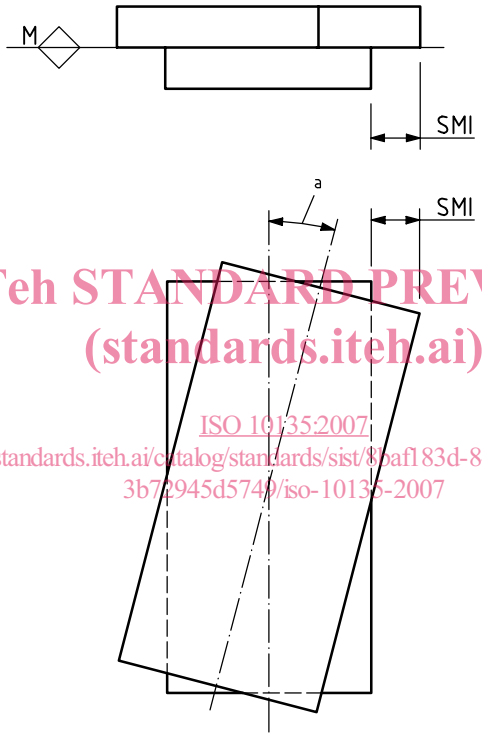


Figure 15 — Surface mismatch (SMI) caused by dimensional mismatch between two mating mould components



a Linear mismatch.

Figure 16 — Surface mismatch caused by linear mismatch between two mating mould components



a Rotational mismatch.

Figure 17 — Surface mismatch caused by rotational mismatch between two mating mould components

Since mismatch is an undesirable product of a moulding process, it may be necessary to control its appearance by specifying the maximum permissible surface mismatch.

6.4.2 Maximum permissible surface mismatch, SMI

6.4.2.1 General

If it is necessary to specify the maximum permissible surface mismatch, the graphical letter symbol shown in Figure 18 shall be indicated.

SMI

Figure 18 — Graphical letter symbol for maximum permissible surface mismatch

The value of the maximum permissible surface mismatch shall be given with a sign as shown in Table 5 and in Figure 19 specifying the permissible direction in relation to the corresponding part of the feature to which the graphical letter symbol is indicated, see Figures 20 and 21:

Table 5 — Sign for SMI

+	(plus)	elevation
–	(minus)	depression
±	(plus-minus)	elevation and/or depression

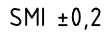


Figure 19 — Example of an indication of maximum permissible surface mismatch

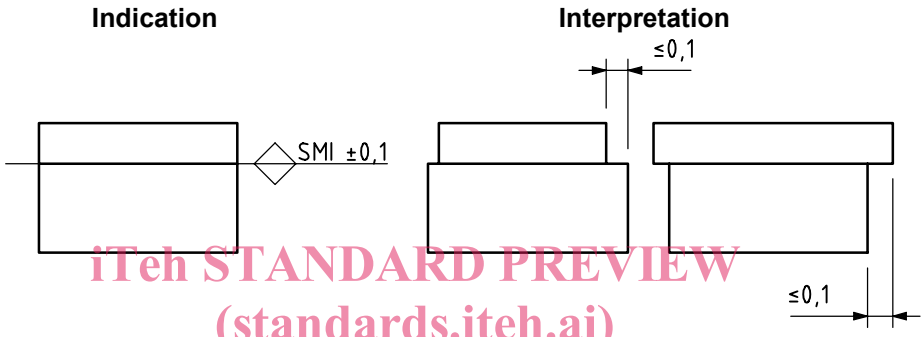
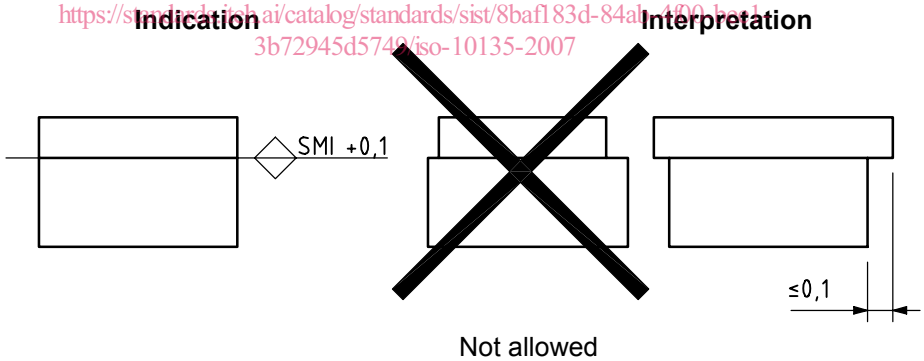
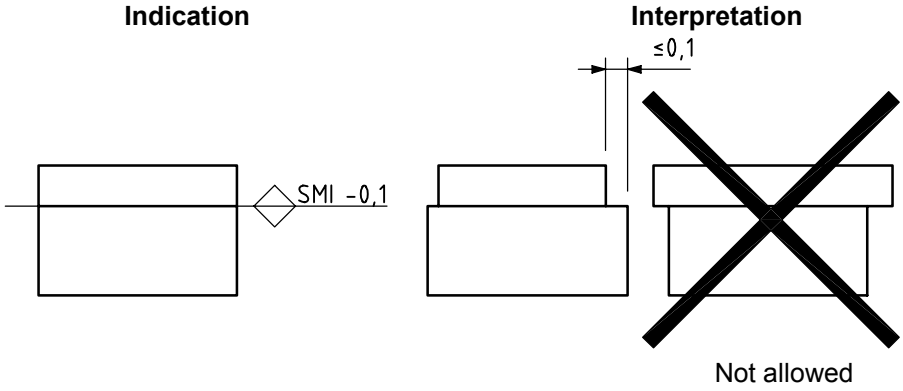


Figure 20 — Permissible surface mismatch (SMI) between two mating mould components when specified with ± sign on the upper mould component



a) Permissible surface mismatch with + (plus) sign



b) Permissible surface mismatch with – (minus) sign

Figure 21 — Permissible surface mismatch (SMI) between two mating mould components when specified on the upper mould component