
**Thermal spraying — Thermally sprayed
coatings — Symbolic representation on
drawings**

*Projection thermique — Revêtements appliqués par projection
thermique — Représentation symbolique sur les dessins*





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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 12671 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

Thermal spraying — Thermally sprayed coatings — Symbolic representation on drawings

1 Scope

This International Standard specifies how the symbolic representation of thermally sprayed coatings has to be indicated on drawings.

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 14232:2000, *Thermal spraying — Powders — Composition and technical supply conditions*

ISO 14919:2001, *Thermal spraying — Wires, rods and cords for flame and arc spraying — Classification — Technical supply conditions*

3 General

Coatings may be indicated with the general recommendations for technical drawings. To apply this symbolic representation will make sense in cases, where the thermally sprayed coating is very thin and/or may be built up by several dissimilar coatings one upon another.

The symbolic representation shall give clearly all necessary indications regarding the specific coating to be obtained without over-burdening the drawing with notes or showing an additional view or detail enlargement.

This symbolic representation includes an elementary symbol and one or more supplementary symbols and further complementary indications.

If a large number of instructions for producing the coating have to be mentioned, it is recommended to indicate the specific instructions on the drawing or to define them in a separate parts list, if applicable (see Figures 6 and 7).

4 Symbols

The elementary symbol shall indicate that this process deals with thermal spraying.

The following information shall be given by supplementary symbols:

- type of coating (bond or top coat);
- the spraying process and subsequent treatments.

The following requirements may be defined by further additional instructions:

- the coating thickness needed or the final coating thickness machined, respectively;
- the spray material to be used;
- surface condition;
- post-treatments of coating;
- a technical specification, which defines requirements necessary to complete the coating.

5 Position of the symbols on drawings

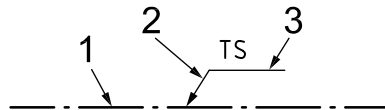
The complete symbol shall contain:

- the designation of the coating (outside the outline of the component);
- an arrow line;
- a reference line (continuous line) with the elementary symbol above it;
- instructions concerning the mode of coating, spraying process, coating thickness, spray material, surface condition, post-treatments, if applicable.

The arrow line and reference line form the complete reference mark. A tail (see Figure 2) can be added at the end of the reference line, to make a separate representation of bond and top coat possible.

The reference line shall preferably be drawn parallel to the bottom edge of the drawing, or if this is impossible, perpendicular to it.

The symbol for the thermally sprayed coating shall be indicated above the reference line (see Figure 1).



Key

- 1 designation of the coating (outside the outline of component)
- 2 arrow line
- 3 reference line
- TS thermally sprayed coating (elementary symbol)

Figure 1 — Mode of representation and elementary symbol

6 Designation of a thermally sprayed coating

Usually a designation consists of the following symbols and additional indications:

elementary symbol – supplementary symbol – symbol for process – spray material – coating thickness – post-treatment

The following abbreviations or designations, respectively, define the type of coating and specific procedures for post-treatments:

BC	Bond coat
TC	Top coat
ASP	As sprayed
F	Fused
D	Diffusion annealed
S	Sealed
M/C	Machined (roughness tolerances on drawing, see Clause 9)
X	Free choice of spraying process

NOTE The designations and abbreviations for thermal spraying are given in EN 657.

Example of designation 1:

TS – TC – APS – ISO 14232:2000, 12.4 – 250 – ASP

or

TS – TC – X – ISO 14232:2000, 12.4 – 250 ± 10 – ASP

where

TS	is the elementary symbol: thermally sprayed coating;
TC	is the supplementary symbol: top coat;
APS	is the symbol for spraying process: atmospheric-plasma-spraying;
ISO 14232:2000-12.4	is the spray material: powder according to ISO 14232:2000/code No. 12.4 (Al ₂ O ₃ -TiO ₂ 60 40);
250 ± 10	is the coating thickness: 250 µm (as sprayed according to the following indication “– ASP”);
ASP	surface remains in the as sprayed condition, no post-treatment indicated;
X	free choice of spraying process.

Example of designation 2:

TS – TC – PFS – ISO 14232:2000, 2.8 – 350 – F+M/C

or

TS – TC – X – ISO 14232:2000, 2.8 – 350 – F+M/C

where

TS	is the elementary symbol: thermally sprayed coating;
TC	is the supplementary symbol: top coat;
PFS	is the symbol for spraying process: flame-powder-spraying;
ISO 14232:2000-2.8	is the spray material: powder according to ISO 14232:2000/code No. 2.8 (NiCrBSi 83 10);
350	is the coating thickness: 350 µm (after machining according to following indications “– F+M/C”);
F+M/C	fused and machined;
X	free choice of spraying process.

7 Instruction when using a separate parts list

This instruction applies when a component is represented by one or more drawings and a separate parts list. In such a case, the coating will be indicated on the drawing only by a position number (see Figure 6). Any instructions regarding the coating, such as spraying process, coating thickness and its acceptable thickness deviation (especially if coatings consist of bond and top coat), spray material, surface condition, and post-treatments are to be defined in the parts list or by indicating a specific technical instruction (see Figure 6).

8 Instructions when the use of the spray process is protected by a patent

If a coating process shall be applied, but the use is protected by a patent (spraying procedure, spray material, process parameter, etc.), the trade name of this coating process may be indicated analogous to “Coating per special specification” (see Figure 7) as a supplementary symbol in the symbolic representation, or it may be defined via a position number in the pertinent parts list (see Figure 6).

9 Representation and dimensioning

The area of a component to be coated shall be indicated by a broad dashed-dot-line outside the outline of the component on the drawing. Where necessary, the size and position of the range of coating shall be defined by means of dimensions and tolerances on the drawing.

Areas, which are allowed to be coated, (e.g. outside the coating range) are to be indicated by a broad dashed line outside the component's outline.

Areas, which are not accepted to be coated, are not indicated (see Clause 10).

The dimension that locates the coating in relation to the front face of the work piece shall appear on the drawing only.

The dimensions of length and/or width shall appear on the drawing only.

Whenever a post-treatment is applied, the indication of the roughness tolerances shall be mentioned corresponding to the pertinent standard on the drawing close to the dimension.

Instructions regarding coating thickness or thickness of bond and top coat, respectively, are to be indicated together with further instructions in the symbolic representation or in the parts list. The coating thickness shall apply for the indicated condition (e.g. ASP = as sprayed; F = fused, M/C = machined, or in combination: F+M/C = fused and machined).

If no further instructions about acceptable deviations of coating thickness are mentioned, the general tolerances shall apply.

10 Supplementary instructions

Supplementary instructions may be necessary to define further particular characteristics by indicating them either in the symbolic representation or in a separate parts list.

Instructions containing specific instructions for execution of the preparation or spray procedure or thermal treatment or special sealing are preferably indicated behind the elementary symbol for the thermally sprayed coating with the pertinent specification number, or they will be indicated by their position number in the parts list (see Figure 7 and Table 1).

For workshop drawings only, a remark for applying masking may be given by a specific sign on areas which are not allowed to be coated (see Figure 5).

A remark, restricting the acceptable deviations from the nominal thickness, shall be added to the coating thickness, either on the drawing or in the parts list or an individual specification.

11 Examples

Figures 2 to 6 shows examples of the symbolic representation of thermally sprayed coatings. Figure 7 shows the designation for a thermally sprayed coating by using a position number. The technical instructions for the thermally sprayed coating shall be defined in the parts list.

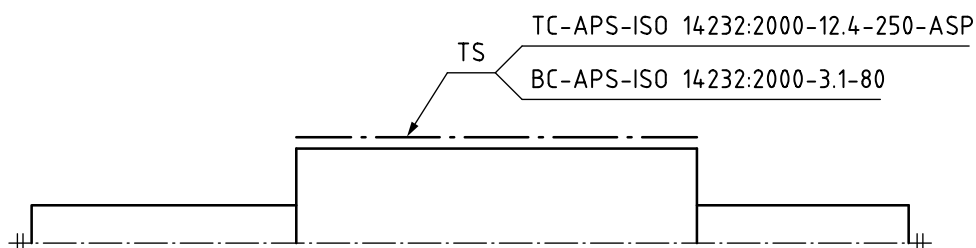


Figure 2 — Example for a thermally sprayed coating containing bond and top coat, applied by atmospheric-plasma-spraying, spray materials according to ISO 14232, coating surface remains in the as-sprayed condition

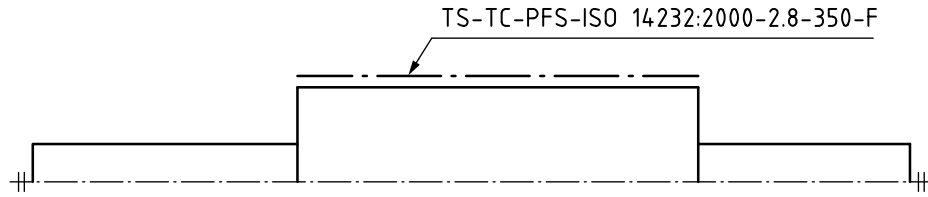


Figure 3 — Example for a thermally sprayed coating, top coat only, applied by flame-powder-spraying, spray material according to ISO 14232, thermally post-treated by fusing

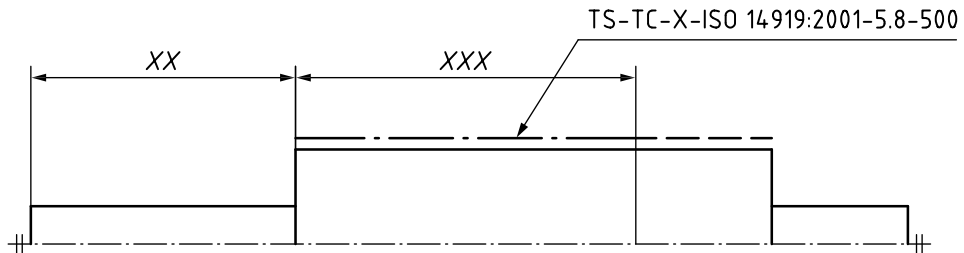
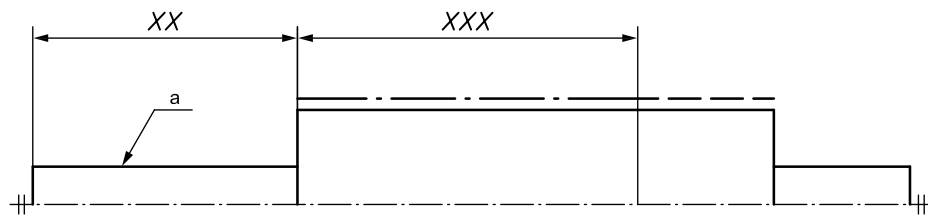


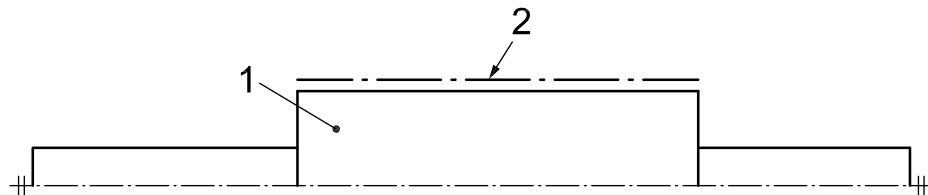
Figure 4 — Example for a thermally sprayed coating, top coat only, free choice of spray process, spray material according to ISO 14919, areas coated (— · — · — · — ·), areas not allowed to be coated (without marking) and such areas which may be coated (-----)



Key

a masked

Figure 5 — Example indicating masking to protect a part of the surface against undesired coating (for workshop drawings only)



Key

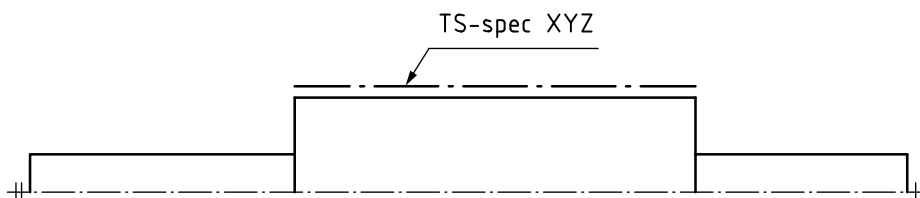
1 and 2 position numbers, see Table 1

NOTE The technical instructions are defined by a spraying-procedure specification. Its identification number should be indicated in the parts list linked to the pertinent position number.

Figure 6 — Example for a thermally sprayed coating

Table 1 — Example of parts list concerning presentation in Figure 6

Position number	Subject	Identification number	Revision	Mass, kg
1	Shaft	ABC 111000	–	150,0
2	Coating	TS 4711	–	4,5



NOTE Specific indications are defined in an individual technical instruction (e.g. “spec XYZ”). Analogous to that, the Trade Name of a thermal spraying process, when use is protected by a patent, may be indicated here.

Figure 7 — Example for a thermally sprayed coating

Bibliography

- [1] EN 657, *Thermal spraying — Terminology, classification*
- [2] ISO 128-24, *Technical drawings — General principles of presentation — Part 24: Lines on mechanical engineering drawings*
- [3] ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

