INTERNATIONAL STANDARD

**ISO 28279**

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# Sintered metal materials — Determination of the level of cleanliness of powder-metallurgy parts

*Matériaux métalliques frittés — Détermination du niveau de propreté des pièces en poudres métalliques*



Reference number
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## Foreword

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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.

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ISO 28279 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*, Subcommittee SC 3, *Sampling and testing methods for sintered metal materials (excluding hardmetals)*.

# Sintered metal materials — Determination of the level of cleanliness of powder-metallurgy parts

## 1 Scope

This International Standard specifies the determination of the amount and nature of the surface contamination of powder-metallurgy (PM) parts (i.e. the level of cleanliness of PM parts).

## 2 Symbols and units

For the purposes of this document, the following symbols and units apply.

| Symbol | Explanation | Unit |
|---|---|---|
| $C$ | Amount of contaminant. | mg/part |
| $m_1$ | Mass of the as-received, dried 5 µm filter (4.4). | g |
| $m_2$ | Mass of the dried 5 µm filter (4.4) plus the contaminants. | g |
| $N$ | Number of parts taken for testing. | — |



## 3 Principle

PM parts are pressure-rinsed with a filtered solvent that is subsequently re-filtered in order to capture surface contaminants. The filtered residue is weighed and the contaminant particles are examined with a magnifying glass or stereomicroscope in order to determine their nature.

## 4 Apparatus

**4.1 Filter funnel**.

**4.2 Filtering flask**, with a minimum volume of 2 L.

**4.3 Vacuum pump**.

**4.4 Filter, 5 µm**, made of polyester (preferred material) or polyamide of diameter 20 mm to 50 mm (type of filter depending on the solvent).

**4.5 Filter, maximum 1 µm**, made of polyester (preferred material), polyamide or cellulose (type of filter material depending on the solvent) of diameter 20 mm to 50 mm.

**4.6 Analytical balance**, of capacity at least 20 g and 0,000 1 g accuracy.

**4.7 Petri-dish set**, (only the bottom portion).

**4.8** **Drying oven**, with a capability of at least 100 °C and 10 °C accuracy.

**4.9** **Desiccator**.

**4.10** **Pressure gun for liquids**.

**4.11** **Solvent (white spirit)**.

**4.12** **Stereomicroscope** (at least ×10 magnification) or **microscope**.

**4.13** **Glass microscope slides**.

**4.14** **Stainless-steel tongs**, with flat tips.

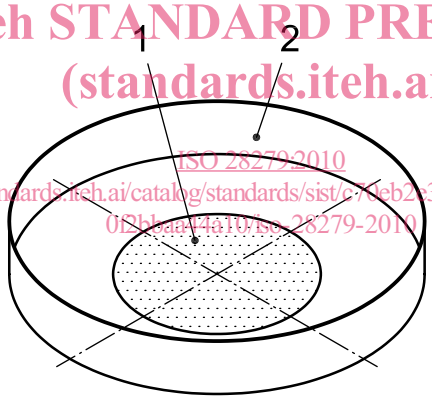
**4.15** **Gloves**, made of latex or another type of plastic depending on the solvent used. The gloves should be used in order to prevent contamination during handling.

## 5 Procedure

**5.1** Place the 5 µm filter (4.4) on the Petri dish (see Figure 1), and dry it in an oven (4.8) at 100 °C for at least 30 min.

The recommended filter mesh is 5 µm and other mesh should be agreed between the user and supplier.






**Key**

1 filter

2 Petri dish

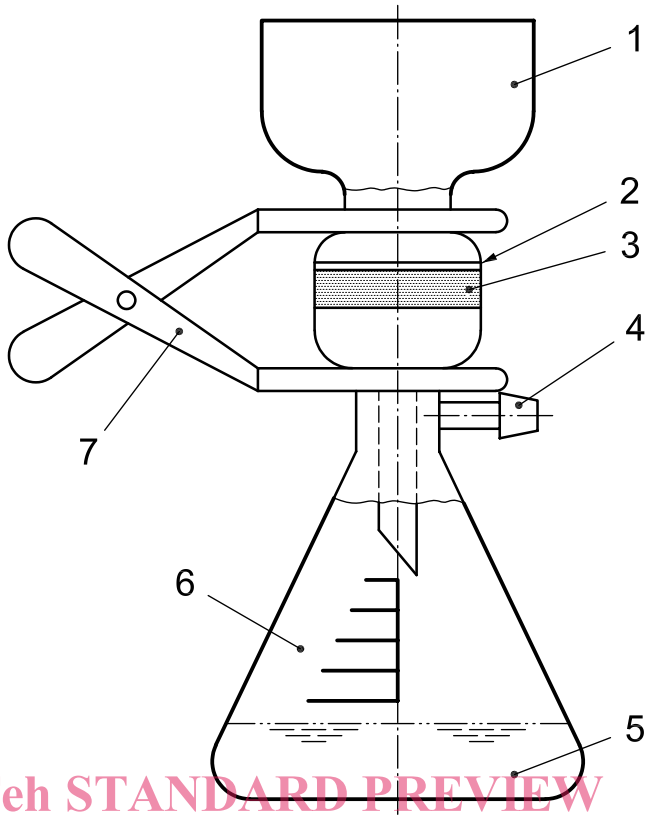
**Figure 1 — Filter ready to be dried**

**5.2** Transfer the Petri dish and filter to the desiccator (4.9), and cool it to room temperature.

**5.3** Weigh the dried filter to the nearest 0,000 1 g with an analytical balance (4.6), and record the mass $m_1$.

**5.4** Filter at least 2 L of white spirit solvent by using the filtering flask and the vacuum pump (see Figure 2), with the maximum 1 µm filter (4.5) (see Figure 2). Keep this filtered solvent in a clean glass bottle previously cleaned with pure solvent.

The recommended solvent is white spirit and any other solvent should be agreed between the user and supplier.






**Key**

1 filter funnel
2 filter
3 porous plate
4 vacuum-pump connection
5 filtered solvent
6 filtering flask
7 clips



**Figure 2 — System for cleaning the solvent and/or filtering the contaminants**

**5.5** Take a number of parts so as to have a total surface area of at least 1 000 $cm^2$, and note the total number of parts $N$. Take care not to contaminate the PM parts during handling.

In case of difficulty in reaching 1 000 $cm^2$ of surface because the part is too big or too small, the surface area should be agreed between the user and supplier.

**5.6** Rinse the parts with the pressure gun (4.10) by using 1 L of filtered solvent, at a pressure of (200 ± 50) kPa, and save the solvent after rinsing. Ensure that the solvent wets all surfaces of the PM parts during this operation.

NOTE Both parties can decide if a pressure gun should be used. In some cases, an extraction technique based on ultrasound might be suitable.

**5.7** Filter the contaminated solvent by using the glass filtering flask (4.2) and the vacuum pump (4.3) using the same system as shown in Figure 2, with the previously dried and weighed 5 µm filter (4.4). The filter now has collected the contaminants from the PM parts.

**5.8** Using the same vacuum system, rinse the residues and the 5 µm filter (4.4) with 200 ml of clean, filtered solvent (4.11) in order to remove any trapped oil.

**5.9** Place the filter with residues on the Petri dish (4.7) and dry it in the oven (4.8) at 100 °C for at least 30 min (same system as shown in Figure 1). Then transfer the Petri dish and filter to the desiccator (4.9), and cool to room temperature.

**5.10** Weigh the filter with residues to the nearest 0,000 1 g in an analytical balance, and record the mass $m_2$.

**5.11** Place the filter with residues between two glass microscope slides (4.13) (see Figure 3), and visualize the particles by means of the stereomicrocope with at least ×10 magnification power or a microscope (4.12). Note the nature of the contaminants and their size taken at maximum length/diameter.

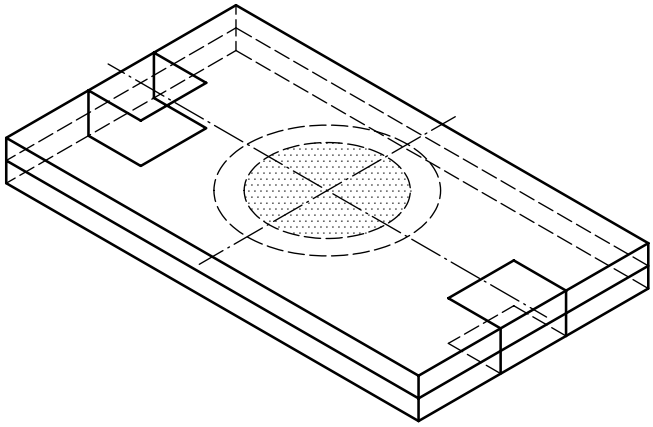


**Figure 3 — Filter ready to be observed by means of a stereomicroscope or microscope**

## 6 Expressions of results



**6.1** The amount of contaminant, $C$, in milligrams per part, is calculated as follows:

$$C = \frac{m_2 - m_1}{N} \times 1\,000$$



**6.2** The nature of the contamination is expressed as the maximum size of each contaminant particle, in micrometres (µm), and its nature.

## 7 Test report

The test report should include the following information:

a) a reference to this International Standard; i.e. ISO 28279:2010;

b) the name or designation of the parts tested;

c) the amount of contaminant, $C$, in milligrams per part;

d) the size of the maximum particle of each type of contaminant observed, in micrometres;

e) the nature of the contaminant.

This International Standard specifies a unique way for determining the contamination. Any variation regarding the filter mesh, the type of solvent, or the extraction method, should be agreed between the two parties. If the application of the part is in vacuum or under a pressure exceeding 10 hPa, an ultrasonic extraction technique can be used, except for material that can be chemically attacked by ultrasound (such as aluminium). In this case, both parties should agree to use the same type of ultrasonic device, and they should agree on the frequency of the ultrasound and the extraction time.