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Powders for powder metallurgical purposes — Sampling

Poudres pour emploi en métallurgie des poudres — Échantillonnage

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Foreword

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ISO 3954 was prepared by Technical Committee ISO/TC 119, *Power metallurgy*, Subcommittee SC 2, *Sampling and testing methods for powders (including powders for hardmetals)*.

This second edition cancels and replaces the first edition (ISO 3954:1977), which has been technically revised.

Powders for powder metallurgical purposes — Sampling

1 Scope

This International Standard specifies procedures for the sampling of powders for powder metallurgical purposes.

It also covers the splitting of the sample into the quantity required for testing.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply (see also Figure 1).

2.1
lot
quantity of powder processed or produced under conditions that are presumed uniform

2.2
increment
quantity of powder obtained by a sampling device at one time from a single lot

2.3
gross sample
quantity of powder, adequate for the tests to be performed, consisting of all the increments taken from a single lot

2.4
composite sample
blended entire gross sample or part thereof

NOTE 1 Alternatively, it may be obtained by splitting the lot.

NOTE 2 However it is obtained, it is essential that it be thoroughly blended.

2.5
test sample
quantity of powder taken from the composite sample for determining a single property or for preparing test pieces

NOTE It is normally taken by splitting the composite sample.

2.5.1
test portion
definite quantity of powder drawn from the test sample (or, if both are the same, from the composite sample) and on which the test is carried out

2.5.2
test piece
test specimen
object of specified form prepared from a test sample

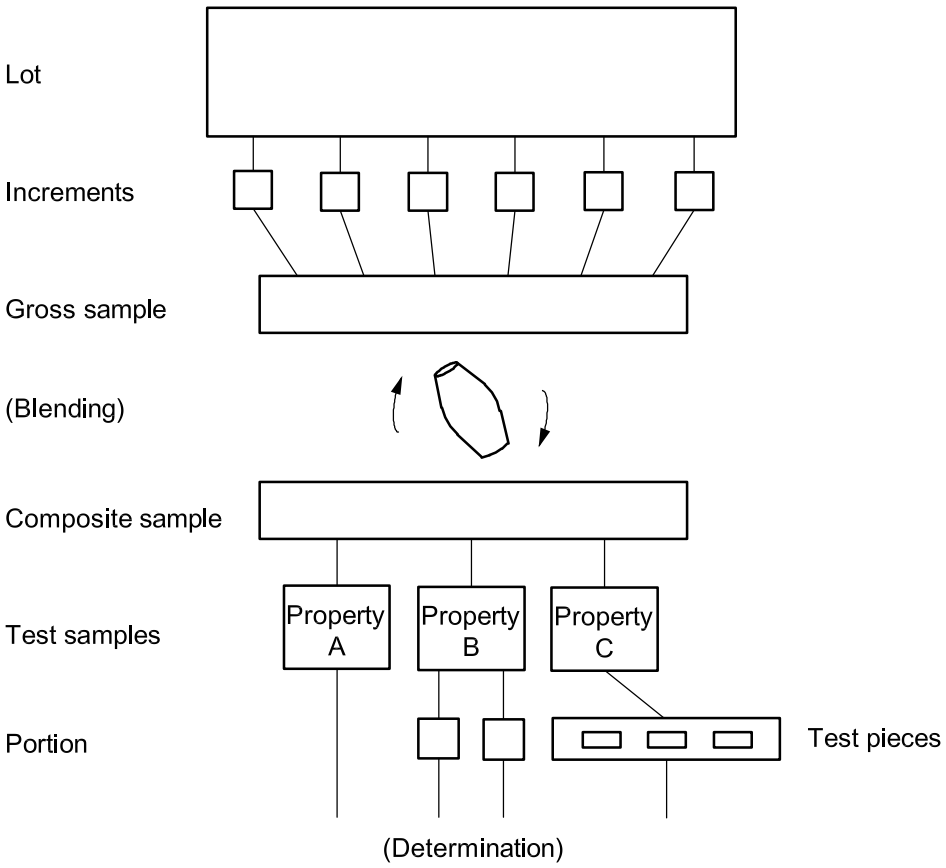


Figure 1 — Sampling scheme

3 Number of increments

3.1 Sampling during discharge in a continuous stream

If the entire lot is discharged in a continuous stream through an opening, it may be sampled during discharge. In such a case, increments shall be taken at regular intervals during the entire discharge period. The number of increments shall depend on the accuracy desired. At least three increments shall be taken, one during the time taken to discharge the first third of the lot, one half-way through the discharge period and one during the time taken to discharge the last third.

3.2 Sampling from powders packaged in containers

Unless otherwise agreed, the number of containers listed in Table 1 shall be selected at random from the lot when samples are taken from powder packaged in containers. One or more increments shall be taken from every selected container to provide a gross sample. If containers holding different quantities are included in the lot, the containers selected shall be from the lot and the number of increments taken from every selected container shall be in proportion to the content of the container.

Table 1 — Sampling from containers

Number of containers in the lot	Number of containers from which increments shall be taken
1 to 5	All
6 to 11	5
12 to 20	6
21 to 35	7
36 to 60	8
61 to 99	9
100 to 149	10
150 to 199	11
200 to 299	12
300 to 399	13
For every additional 100 containers or portion thereof in the lot, one additional container shall be sampled.	

4 Sampling

4.1 General

Increments shall be taken in such a manner that the composite sample represents the lot as accurately as possible.

NOTE Demixing may occur at any time when a batch of powder is set in motion, for example when filling containers, emptying containers, during transportation or if subjected to vibration during storage.

All the surfaces of a sampling device that come into contact with the powder shall be smooth and clean.

4.2 Sampling procedures

4.2.1 General requirements

The sampling procedure shall be such that the powder properties are not changed. Whenever possible, procedure 4.2.2 should be preferred over procedure 4.2.3.

4.2.2 Sampling during discharge in a continuous stream

The dimensions of the sampling container at right angles to the stream of powder shall exceed the cross-section of the stream by an ample margin. They shall be large enough so that no overflow of powder occurs when collecting the sample.

The sampling container shall be exposed to the powder stream and withdrawn in such a manner that all portions of the stream have an equal chance of entering it.

NOTE The simplest method of achieving this is to move a container of rectangular cross-section across the stream at constant speed.

The gross sample thus obtained shall be blended by rotating for 10 to 15 revolutions at 15 rpm to 30 rpm in order to obtain the composite sample.

4.2.3 Sampling from packaged containers using sampling thieves

4.2.3.1 Different types of sampling thief can be used. The length of the thief shall be such that it allows extraction of powder from all levels in the container. The design depends on the flow properties of the powder from which the sample is to be taken. One type of sampling thief is shown in Figure 2.

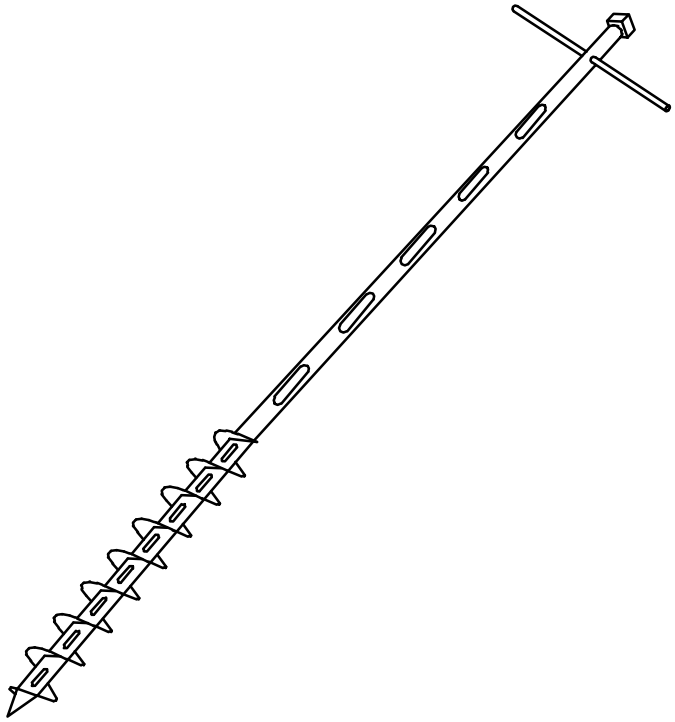


Figure 2 — Sampling thief

4.2.3.2 The sampling thief shown in Figure 2 is suitable only for loosely packed powder with a high flowability. It comprises an inner and an outer tube with closed ends and longitudinal slit-shaped windows positioned so that they are opened and closed successively as the tubes are twisted relative to each other. The tubes shall fit each other loosely enough for twisting not to be hindered by the largest particles encountered.

The sampling thief shall be inserted all the way to the bottom of the container with the windows closed. It is recommended that it be inserted in the direction that was vertical during transportation and storage. When the thief has reached the bottom, the windows shall be opened so that the thief is filled from bottom to top, after which the windows shall be closed and the thief withdrawn. The contents of the thief shall be emptied into the gross sample container.

If the depth of powder is greater than the height of the windows of the thief, more than one increment shall be taken so that the powder is sampled at every depth, the number of increments being a multiple of the ratio of the depth of the powder to the height of the windows.

4.2.3.3 A second type of sampling thief comprises a single tube with an open end. It is suitable for powders that remain inside the tube when it is withdrawn. This condition may be fulfilled by selecting a suitable tube diameter.

This type of sampling thief shall be inserted slowly all the way to the bottom of the container. It is recommended that it be inserted in the direction that was vertical during transportation and storage. When the thief has reached the bottom, it shall be withdrawn and its contents emptied into the gross sample container.

4.2.3.4 If demixing has occurred in the direction in which the thief is inserted, errors will occur if the thief does not withdraw an equal quantity from every stratum.

To reduce the effect of demixing at right angles to the direction of thief insertion, the points of insertion shall be distributed as representatively as possible. For example, if several increments are taken from the contents of a single cylindrical container, the number of increments taken at each distance from the axis of the container shall be proportional to that distance.

If only one increment is taken from the contents of a cylindrical container, the thief shall be inserted at a distance from the centre equal to 0,7 of the radius of the container, provided the container was filled through an opening above the central axis of the container. If the opening was at another location, and in the case of non-cylindrical containers, a place which is equally representative shall be chosen for sampling.

4.2.3.5 The gross sample thus obtained shall be blended by rotating for 10 to 15 revolutions at 15 rpm to 30 rpm in order to obtain the composite sample.

4.2.4 Sampling by splitting the lot

The device and procedure mentioned in 4.3 are used for splitting the lot. This method is generally suitable for small lots.

4.3 Sample splitting

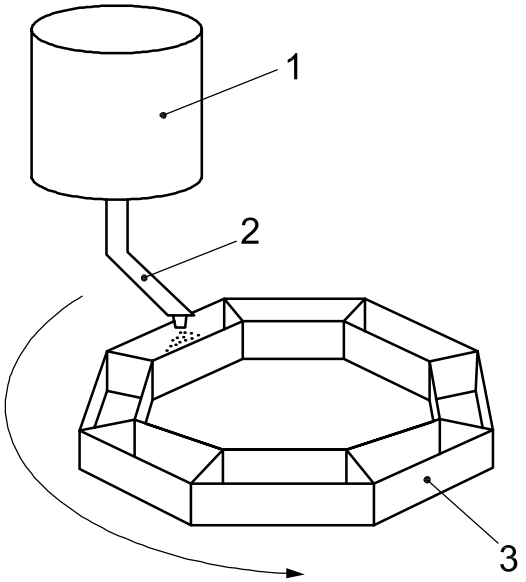
The device used for splitting samples shall be of the proper size for the amount of powder being split so that handling losses may be disregarded and contamination minimized. The following devices have been found suitable:

— a spinning riffler; see Figure 3;

— a sample splitter; see Figure 4;

— a rotary sample splitter; see Figure 5;

— a rotating-cone splitter; see Figure 6.



Key

1 powder hopper
2 vibratory chute
3 spinning riffler

Figure 3 — Spinning riffler (schematic)

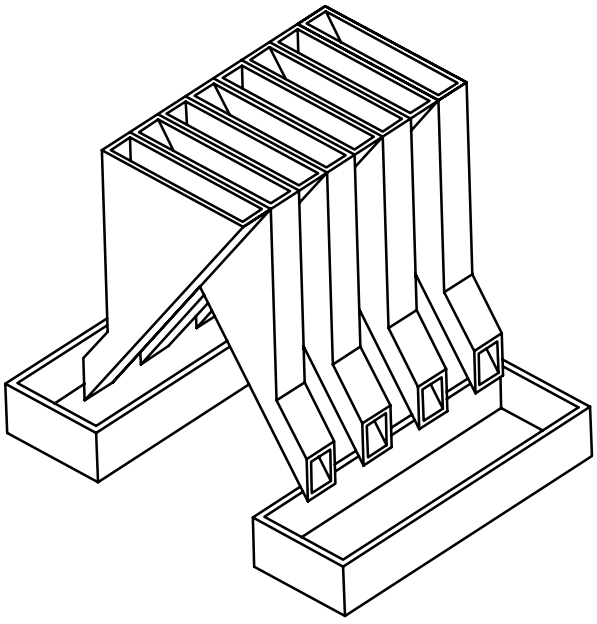
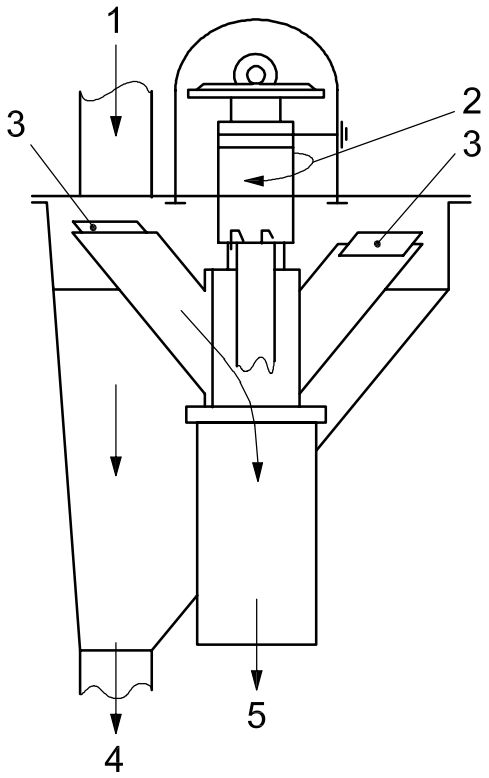


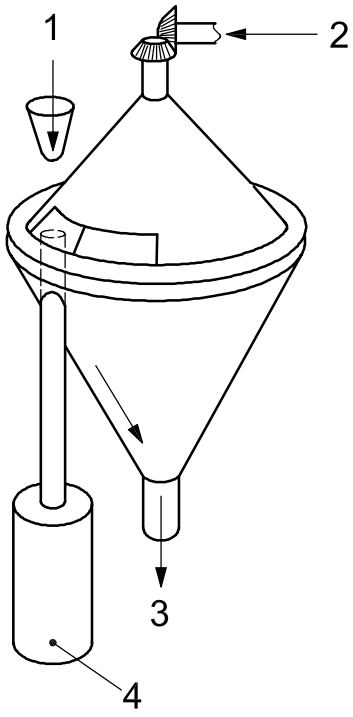
Figure 4 — Sample splitter



Key

1 feed
2 speed of rotation 15 rpm to 50 rpm
3 cutter
4 rejected material
5 sample

Figure 5 — Rotary sample splitter



Key

1 feed
2 speed of rotation 60 rpm
3 rejected material
4 sample

Figure 6 — Rotating-cone splitter

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