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# International Standard



# 3995

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## **Metallic powders — Determination of green strength by transverse rupture of rectangular compacts**

*Poudres métalliques — Détermination de la résistance de comprimés rectangulaires à cru*

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3995 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*.

ISO 3995 was first published in 1977. This second edition cancels and replaces the first edition, of which it constitutes a minor revision.

# Metallic powders — Determination of green strength by transverse rupture of rectangular compacts

## 1 Scope and field of application

This International Standard specifies a method for the determination of green strength by measuring the transverse rupture strength of compacts of rectangular cross-section.

## 2 Principle

Subjection of a compact pressed from metallic powder to a uniformly increasing transverse force under controlled conditions until fracture occurs. Determination of the transverse rupture strength, or green strength as used herein, as the stress, calculated from the flexure formula, required to break the compact as a simple beam supported near the ends and applying the force midway between the fixed centre of supports.

The green strength is determined on compacts either having a particular density or after compaction at a specific compacting pressure.

## 3 Apparatus

**3.1 Die**, preferably of cemented carbide or alternatively of tool steel, and two punches for producing rectangular test pieces with dimensions according to clause 4. An example of a design for tooling is shown in figure 1.

**3.2 Press**, capable of applying forces up to about 300 kN with a minimum accuracy of  $\pm 2\%$  and adjustable to permit an even increase of the force at a rate no higher than 50 kN/s.

**3.3 Balance**, capable of weighing the compacts to an accuracy of  $\pm 0,01$  g.

**3.4 Micrometer or other suitable measuring device**, for measuring the dimensions of the compacts to an accuracy of  $\pm 0,01$  mm.

**3.5 Fixture for testing**, having two support cylinders (rollers) with a fixed distance between them and a load cylinder (roller). All three cylinders shall be  $3 \pm 0,1$  mm in diameter and

shall be made of hardened steel with a hardness of at least 700 HV, or of hardmetal. The cylinders shall be mounted parallel and the distance between the centres of the support cylinders shall be  $25 \pm 0,2$  mm, measured with an accuracy of  $\pm 0,1$  mm. The load cylinders shall be mounted midway between the support cylinders.

The mounting of the cylinders shall be such as to account for the permitted deviation from parallelism of the top and bottom faces of the test piece.

A diagrammatic arrangement of a typical test fixture is shown in figure 2.

**3.6 Loading device**, which may be either of the following:

**3.6.1 A compression testing machine** capable of determining the breaking force with a minimum accuracy of  $\pm 2$  N.

**3.6.2 A loading beam apparatus** to properly locate the test piece and which is capable of applying a breaking force through a lever arrangement. The applied force can be exerted by various systems, an example of which is given in figure 3. The applied force on the test piece shall be calculated to an accuracy of  $\pm 2$  N.

## 4 Sampling

The quantity of the test sample shall be chosen to give three test pieces with the dimensions 10 to 13 mm wide, at least 30 mm long and 5,5 to 6,5 mm thick. The thickness of the test piece shall be uniform within 0,1 mm over the distance between supports. If necessary, preliminary tests should be made in order to establish the quantity of powder which is needed to fulfil this requirement.

## 5 Procedure

### 5.1 Cleaning of the die and punches

Wipe the die cavity and the punches with soft and clean paper towelling soaked with an appropriate solvent such as acetone. Allow the solvent to evaporate.