
**Vitreous and porcelain enamels —
Determination of fluidity behaviour —
Fusion flow test**

*Émaux vitrifiés — Détermination du comportement de fluidité — Essai
d'écoulement*



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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 4534 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

This second edition cancels and replaces the first edition (ISO 4534:1980), which has been technically revised. The revised edition allows for the use of flow plates, other than unglazed ceramic tiles, such as enamelled steel or cast iron which is common practice in some countries.

Introduction

The fusion flow test specified in this International Standard is a comparative method which can be carried out with simplified equipment to provide data on the fluidity behaviour of molten enamel. The results from this test allow conclusions on the flow properties of the enamel to be inferred in a much simpler manner than is possible from the results of the much more expensive measurements made using the usual viscosity-measuring instruments.

The results of extensive tests¹⁾ have shown that there is a well-defined relationship between the results of the flow test and the viscosity-temperature curve, so that the flow test could also be used as an absolute method. However, more effort would be required to enable the various laboratories to obtain comparable results of similar quality than when using the method for comparative purposes.

When using this method, the reference (comparison) enamel must be similar to the enamel to be tested, as the fluidity behaviour of the various types of enamel might vary considerably from one type to another.

This document is a preview generated by EVS

1) Dekker, P. Calculation of viscosity-temperature curves for porcelain enamels from the flow-button test. *Journal of the American Ceramic Society*, **48** (1965), 6, pp. 319 to 327.

Vitreous and porcelain enamels — Determination of fluidity behaviour — Fusion flow test

WARNING — This International Standard calls for the use of substances and/or procedures that may be injurious to health if adequate safety measures are not taken. This International Standard does not address any health hazards, safety or environmental matters associated with its use. It is the responsibility of the user of this International Standard to establish appropriate health, safety and environmentally acceptable practices and take suitable actions for any national and international regulations. Compliance with this International Standard does not in itself confer immunity from legal obligations.

1 Scope

This International Standard specifies a comparative method of determining the fluidity behaviour of vitreous and porcelain enamels in the viscous condition during firing. It is not intended for use as an absolute method.

2 Principle

The test samples are dried or wet-ground in accordance with the processing conditions. Cylindrical specimens of specified mass are pressed from the enamel powder, or the dried enamel slip, and from the reference enamel agreed upon between the parties concerned.

The test specimens are placed in a laboratory furnace at an agreed temperature on an unglazed ceramic tile in the horizontal position and melted to hemispherical shape. The tile is tilted to permit the enamel to flow at a specified angle and for an agreed time period.

The length flow number, F_l , and the breadth flow number, F_b , are calculated on the basis of the flow lengths and flow breadths of the test specimens.

3 Material and apparatus

3.1 Reference enamel, to be agreed upon by the parties concerned, having similar fluidity behaviour to the enamel to be tested.

3.2 Ball mill.

3.3 Evaporation device, for example, a hot-air oven, a hot plate, a sand bath.

3.4 Mortar.

3.5 Pestle.

3.6 Balance, with an accuracy of 0,01 g.

3.7 Press, able to generate a pressure of at least 5 N/mm², with a cylindrical mould having an internal diameter of 8 mm to 10 mm for preparation of the test specimens.