

INTERNATIONAL STANDARD

ISO
4588

Second edition
1995-12-15

Adhesives — Guidelines for the surface preparation of metals

Adhésifs — Lignes directrices pour la préparation de surface des métaux



Reference number
ISO 4588:1995(E)



Documents
Document Sharing Hub

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.

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.

International Standard ISO 4588 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 4588:1989), which has been technically revised.

© ISO 1995

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 the publisher.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Adhesives — Guidelines for the surface preparation of metals

1 Scope

This International Standard describes the usual procedures for the laboratory preparation of metal surfaces for adhesive bonding and testing of the bond. Prebonding surface treatments are given for the following materials:

- a) aluminium and aluminium alloys;
- b) chromium;
- c) copper and nickel and their alloys;
- d) magnesium and magnesium alloys;
- e) steel (mild);
- f) steel (stainless);
- g) tin;
- h) zinc and zinc alloys.

Mechanical treatments such as grit blasting are widely applicable, but it is not possible to present one chemical method that is applicable to all metals. Several methods are listed so that the user will have a greater choice in selecting a treatment appropriate to a particular metal.

The surface treatments described comprise degreasing and cleaning methods, mechanical cleaning (abrasion), chemical cleaning (etching) and chemically based surface modification techniques. When used together, these treatments should normally be used in the following order: cleaning to remove gross contamination, then abrasion and finally etching to achieve the optimum surface for bonding. Alternative sequences may, however, be used, especially when the surface is to be chemically modified. In such

cases, the sequence used shall be clearly described in the test report.

WARNING — The procedures described do not necessarily detail all the precautions necessary for health and safety in a particular country. Because of the hazardous nature of some of the chemicals used, national and local legislative requirements for safe handling and disposal of these materials shall be observed. Refer to the material safety data sheet prior to use for details of the hazard and the personal-protection equipment to be used. (See also clause 7.)

2 Handling and storage

2.1 Handling

All parts shall be handled as little as possible during and after processing and before bonding, and the use of bare hands shall be avoided. Use clean hand coverings that will not contaminate the surface, such as lint-free cotton and nylon fabric gloves, and handle parts by edges or non-treated areas.

2.2 Storage conditions

2.2.1 In the laboratory

Prepared surfaces shall be stored at $23\text{ °C} \pm 2\text{ °C}$ and $(50 \pm 5)\%$ relative humidity, except for metals such as carbon steels which cannot sustain these conditions without prejudicial oxidation. If necessary, the air shall be filtered to remove dust.

The time between, and conditions of, surface preparation and bonding are critical. For sensitive surfaces, the storage time shall not exceed 8 h and parts shall be covered with or wrapped in unbleached kraft paper or other suitable coverings. When possible, prepared

surfaces shall be stored in a conditioned container without surface contact.

2.2.2 At industrial production facilities

Economic and practical considerations may prevent production facilities from following laboratory practice. Nonetheless, the possibility of re-contamination must be borne in mind and its consequences taken into account.

3 Initial preparation

3.1 Cleanliness

Do not carry out contaminating operations in the work area. Painting or other spraying operations, processes using powder materials, the presence of oil vapours from pumps and other machinery, the spraying of mould release agents, etc., are especially detrimental.

3.2 Preliminary cleaning

Remove ink markings or printed identifications from the metals by wiping with a cloth wetted with an appropriate solvent such as acetone, methyl ethyl ketone (butan-2-one) or a permitted hydrocarbon mixture.

3.3 Degreasing

NOTE 1 Solvent degreasing was included as a standard method in the previous edition of this International Standard. For health and safety as well as environmental reasons, however, this method is no longer recommended. An alternative method such as alkaline degreasing should prove to be equally satisfactory.

3.3.1 Detergent degreasing

Scrub the joint surfaces in a solution of liquid detergent. Wash with clean, hot water and allow to dry thoroughly — preferably in a stream of hot air from e.g. a domestic forced-air heater.

NOTE 2 Non-ionic detergents generally give good results.

3.3.2 Alkaline degreasing

Alkaline degreasing is an alternative to detergent degreasing.

The ingredients are selected from sodium or potassium hydroxide, carbonates, phosphates, borates, complexing agents (such as EDTA, gluconates,

heptonates, polyphosphates and cyanides) and organic surfactants. They may be used hot or cold, with or without an applied current which may be either anodic or cathodic. The joint surfaces shall be washed very thoroughly, possibly followed by neutralization to remove any residual traces of the alkaline cleaner.

NOTE 3 The cleaning action is based on the saponifying and emulsifying properties of aqueous alkalis, which are often reinforced by sequestering, complexing and surface-active agents. It is also effective in removing soaps and salts.

3.3.2.1 Strongly alkaline cleaners

These cleaners may contain any of the ingredients given in 3.3.2 above. Heavy-duty types may contain a high proportion of caustic alkali.

Strongly alkaline cleaners shall be used as soak cleaners or used electrolytically, preferably anodically, and are suitable for use on all metals except aluminium, lead, tin and zinc, each of which is attacked by strong alkalis. Simultaneous cleaning and etching of aluminium in caustic soda or other alkaline solutions may be employed only when agreed between the various suppliers (of the metal, the cleaning agent, the adhesive, etc.) and shall be strictly controlled.

NOTE 4 Metallic soaps can be removed by strongly alkaline cleaners.

3.3.2.2 Mild alkaline cleaners

Mild alkaline cleaners shall be used as soak or spray cleaners.

They are suitable for all metals. They are essentially free from strong alkali and may contain inhibitors such as silicates to prevent the metal being attacked.

Applied current may be used in immersion applications, but is less effective than with strongly alkaline cleaners.

3.3.3 Ultrasonic degreasing

This treatment may be employed when appropriate and is generally used for the preparation of small specimens.

4 Abrasion

Abrasion may be used as the principal surface treatment, or prior to etching, to remove oxide and to roughen the surface.