

Specification for

# Welding primers and weld-through sealants, adhesives and waxes for resistance welding of sheet steel

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Welding Standards Policy Committee (WEE/-) to Technical Committee WEE/29, upon which the following bodies were represented:

- British Steel Industry
- Paintmakers Association of Great Britain Ltd.
- Railway Industry Association of Great Britain
- Society of Motor Manufacturers and Traders Ltd.
- Welding Institute
- Welding Manufacturers' Association (BEAMA Ltd.)
- Coopted members

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## Foreword

This revision of BS 4129 has been prepared under the direction of the Welding Standards Policy Committee and it supersedes BS 4129:1967, which is withdrawn. This standard specifies resistance welding requirements of welding primers and weld-through sealants, adhesives and waxes. It does not cover the protective properties of these materials. A series of tests, together with acceptance criteria, is also specified, covering the welding of these coatings on steel.

If a welding primer or weld-through sealant is to be applied to a preheated surface, compatibility with the pretreatment should be determined.

Welding primers may or may not be over-coated after welding, but weld-through sealants, which are used for their gap-filling properties, are not normally a base for a subsequent paint system. However, when welding primers or weld-through sealants do come into contact with a paint system, their compatibility should be determined.

The Health and Safety at Work etc. Act 1974 places a duty on manufacturers, designers and suppliers of substances and articles for use at work to ensure, so far as is reasonably practicable, that they are safe and without risk to health when properly used. It is also the employer's duty to take all reasonable measures to ensure the health and safety of persons at work.

Welding primers and weld-through sealants, adhesives and waxes are substances as defined by Section 6 of the Health and Safety at Work etc. Act 1974. Sufficient information regarding the uses for which these coatings have been formulated and tested should be available at places of work. The composition of the welding primer or weld-through sealant, adhesive or wax should be such that it does not cause risk to health or discomfort to personnel during application or by thermal degradation while welding, when used in accordance with the manufacturer's recommendations.

The cooperation of the paint industry in drafting this standard is acknowledged. It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This British Standard specifies requirements for the resistance welding characteristics of the following coatings:

- a) welding primers;
- b) weld-through sealants and adhesives;
- c) weld-through waxes.

The resistance welding processes suitable for welding primers and weld-through sealants, adhesives and waxes are spot, seam and projection welding.

NOTE 1 This standard specifies requirements for resistance stud welding but does not cover arc stud welding.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Definitions

For the purposes of this British Standard, the following definitions apply.

### 2.1

#### welding primer

a film material that is applied to an unpainted steel surface for protective purposes which does not have to be removed prior to welding and does not prevent the making of an acceptable weld

### 2.2

#### weld-through sealant

a mastic, gap-filling material that is applied prior to welding to an unpainted steel surface for non-pressure sealing purposes and does not prevent the making of an acceptable weld

### 2.3

#### weld-through adhesive

a polymer that is applied prior to welding to a primed or unpainted steel surface for the purpose of bonding but does not prevent the making of an acceptable weld

### 2.4

#### weld-through waxes

a material composed of esterified fatty acids that is applied to afford protection and act as a lubricant during pressing operations and which does not prevent the making of an acceptable weld

## 3 Classification

The weldable coatings covered by this British Standard are classified into the following four basic types according to whether they remain weldable for an indefinite or a limited period.

**Type A.** A primer, sealant, adhesive or wax that remains weldable after application for a limited period, usually less than 24 h under normal conditions.

**Type B.** A primer, sealant, adhesive or wax that remains weldable after application for a period of 1 week storage under normal conditions.

**Type C.** A primer, sealant, adhesive or wax that remains weldable after application for a period of 6 weeks storage under normal conditions.

**Type D.** A primer, sealant, adhesive or wax that remains weldable after application for an extended period of storage under normal conditions, the storage period being clearly marked.

NOTE Any thermal treatment that is applied to a treated article may reduce the weldability of the welding primer or weld-through sealant, adhesive or wax whether of type A, B, C or D.

## 4 Coating procedures

### 4.1 Sampling<sup>1)</sup>

For examination for compliance with this British Standard, representative samples of the welding primer or weld-through sealant, adhesive or wax measuring not less than 0.5 L shall be drawn either at the filling stage or from one or more original and previously unopened containers. The samples shall be placed in suitable, clean, dry, air-tight containers. The containers shall be so filled as to leave an ullage of not less than 15 % when closed. Each sample container so filled shall be marked with full details of the contents and the date of sampling. The samples shall be stored in accordance with the manufacturer's recommendations.

Where additional activators, solvents, diluents, etc. are necessary, they shall be sampled at the same time and in a like manner to provide a suitable quantity for test purposes.

### 4.2 Mixing

Before application, the primer, sealant, adhesive or wax shall be thoroughly mixed, where applicable, in accordance with the manufacturer's recommendations.

### 4.3 Application of material to test specimen

Adhesives that are generally stored at low temperatures prior to use in order to prolong shelf-life shall be brought to the working temperature prior to application. The material shall then be applied in accordance with the manufacturer's instructions.

NOTE The primer may be applied by roller coating, brushing, dipping or spray techniques.

<sup>1)</sup> See also BS 3900-A1.

In all cases, the thickness of the material shall be measured.

#### 4.4 Testing

Test pieces shall be classified at the end of the weldable period in accordance with clause 3.

### 5 Welding and test procedures

#### 5.1 General

The following tests shall be carried out to demonstrate that the welding primer or weld-through sealant, adhesive or wax does not prevent production of satisfactory spot welds:

- a) contact resistance;
- b) electrical continuity;
- c) weldability:
  - 1) weldability lobe;
  - 2) consistency;
- d) flammability;
- e) toxicity/fume levels.

NOTE 1 For ease of assessment, spot welding is specified as it is the most widely used resistance welding technique and requires the most stringent application.

NOTE 2 The electrode should be checked to establish the number of welds that can be made before the weld quality falls below  $4\sqrt{t}$  (where  $t$  is the thickness of a single sheet (in millimetres) (see 5.9.1).

Two series of test shall be carried out:

- i) one series at the end of the drying or cure period, consisting of the tests for electrical continuity, flammability, toxicity/fume levels and contact resistance;
- ii) the second series at the end of the weldable period, consisting of the tests for electrical continuity, contact resistance and weldability.

#### 5.2 Test specimens

Test specimens shall be of cold reduced sheet steel or strip of thickness 1.0 mm, complying with CR1 or CR2 quality of BS 1449 with a GP finish. Test specimens shall be free from rust and scale and shall be degreased with a suitable solvent prior to application of the primer, sealant, adhesive or wax. The dimensions of the test specimens for contact resistance, electrical continuity and weldability tests shall be as specified for the shear test specimen in BS 1140.

#### 5.3 Application of coating

The welding primer or weld-through sealant, adhesive or wax shall be applied in a manner and to a thickness recommended by the manufacturer.

Coated current record test specimens shall consist of one piece coated on both sides and two outer pieces coated on the faying surfaces only (see Figure 1).

Coated shear test specimens shall be coated on the faying surfaces only.

Specimens for the electrical continuity test shall be coated on both sides.

#### 5.4 Measurement of surface coating

Appropriate instrumentation or techniques shall be used to measure the thickness of the coatings on the ferrous base to an accuracy of + 3 %.

#### 5.5 Type of machine

All tests shall be made on a single-spot, pedestal welding machine that is in accordance with Appendix A of BS 1140:1980 and shall be equipped with a synchronous timing control.

The welding electrodes shall be of copper alloy of sufficient cross-sectional area and strength to carry the welding current and electrode force without overheating, deformation or excessive deflection. The electrode material shall comply with the relevant requirements of BS 4577. Electrode dimensions shall comply with BS 4215 where applicable. For the test programme the electrodes shall be straight and the initial electrode tip diameter,  $D$ , shall be as given by the following equation:

$$D = 5\sqrt{t}$$

where:

$D$  is the initial tip diameter in mm;

$t$  is the single sheet thickness in mm.

#### 5.6 Machine settings

The machine settings, which shall be checked before, maintained during and checked after welding the test specimens, shall be as follows:

|                 |                                                 |
|-----------------|-------------------------------------------------|
| welding force   | : 1.4 kN                                        |
| welding current | : 6.5 kA approximate <sup>a</sup>               |
| welding time    | : 9 cycles                                      |
| squeeze time    | : sufficient to achieve 90 % of electrode force |
| hold time       | : 10 cycles                                     |

<sup>a</sup> The current given is for guidance only and may be adjusted in accordance with the application. The force and time should be set up as stated.

#### 5.7 Contact resistance tests

In carrying out contact resistance measurements the test procedure shall be strictly adhered to and all electrical connections in the circuitry shall be secure.

The contact resistance test shall be carried out in accordance with Appendix A.