INTERNATIONAL STANDARD

ISO 17652-2

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Welding — Test for shop primers in relation to welding and allied processes —

Part 2: Welding properties of shop primers

Soudage — Essai sur peintures primaires en relation avec le soudage et les techniques connexes —

Partie 2: Propriétés relatives au soudage des peintures primaires

Reference number
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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

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Foreword

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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 17652-2 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

ISO 17652 consists of the following parts, under the general title *Welding — Test for shop primers in relation to welding and allied processes*:

— *Part 1: General requirements*

— *Part 2: Welding properties of shop primers*

— *Part 3: Thermal cutting*

— *Part 4: Emission of fumes and gases*

Contents

Foreword

This document (EN ISO 17652-2:2003) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 “Welding and allied processes”.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

EN ISO 17652 consists of the following parts, under the general title: *Welding – Test for shop primers in relation to welding and allied processes:*

- *Part 1: General requirements*
- *Part 2: Welding properties of shop primers*
- *Part 3: Thermal cutting*
- *Part 4: Emission of fumes and gases*

Annexes A and ZA are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of this European Standard describes tests for assessing the influence of shop primers on the weldability. The following tests are detailed:

a) Rating test

This screening test provides a method of assessing the relative weldability of a shop primer of a specified thickness by making a standard weld and subsequently evaluating the severity of the resulting porosity. Rating tests are suitable for declaration by suppliers of the influence of particular shop primers and similar purposes;

b) Weldability test

This test describes a method for evaluating the weldability of welding consumables and shop primer combinations, using various arc welding processes. A standard size fillet is produced that enables comparison to be made. An overall assessment of the quality of the resultant weld is made. Weldability tests may be more closely related to actual conditions during production.

For precaution for protection of health, safety and environment during testing, see EN ISO 17652-1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 439, *Welding consumables - Shielding gases for arc welding and cutting.*

EN 440, *Welding consumables - Wire electrodes and deposits for gas shielded metal arc welding of non alloy and fine grain steels - Classification.*

EN 10025:1990, *Hot rolled products of non-alloy structural steels — Technical delivery conditions.*

EN 10238, *Automatically blast-cleaned and automatically prefabricated primed structural steel products.*

EN 10278, *Dimensions and tolerances of bright steel products.*

EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:1998)*.

EN ISO 6947, *Welds - Working positions - Definitions of angles of slope and rotation (ISO 6947:1993)*.

EN ISO 2808, *Paints and varnishes - Determination of film thickness (ISO 2808:1999).*

EN ISO 8501-1:2001*, Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:1988).*

prEN ISO 15609-1:2000, *Specification and approval of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO/DIS 15609-1:2000).*

EN ISO 17652-1:2003, *Welding - Test for shop primers in relation to welding and allied processes - Part 1: General requirements (ISO 17652-1:2003).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions in EN ISO 17652-1:2003 apply.

4 Rating test

4.1 Principle

This test provides a method of assessing the relative weldability of shop primers of a specified thickness by making a standard weld over a range of shop primers and subsequently evaluating the severity of the resulting porosity. Only one welding procedure is prescribed, using metal active gas welding (process 135 in accordance with EN ISO 4063).

The joint configuration and close fit-up are designed to give significant levels of porosity for reasons of differentiation and reproducibility.

The standard does not specify limits for acceptability as these depend on the practical application. It is expected that levels of porosity during practical applications will be lower than the levels measured during testing.

4.2 Preparation of test piece

10 test pieces shall be prepared for each shop primer. Each piece shall consist of two bright drawn mild steel plates in accordance with EN 10278.

The dimensions of the test pieces are as follows:

- 20 mm $\times$ 80 mm $\times$ 200 mm;
- 12 mm $\times$ 50 mm $\times$ 200 mm.

The parts shall have smooth, flat, undamaged surfaces, and any burrs on the edges shall be removed to ensure a good fit-up.

Both components shall be degreased and the larger component shall be coated on one side with shop primer prior to testing. The thickness of the shop primer shall be uniform and in accordance with the supplier's recommendation. Unless otherwise specified, the specimens can be welded after a drying period of at least 10 days at a surface temperature above 10^{o}C but below 40^{o}C and at a minimum air humidity of 50 %. Alternative conditions for storage shall be monitored and reported in the test report.

The thickness shall be checked, e.g. by use of small smooth steel plates or glass plates, see also EN ISO 2808.

NOTE For protection of the environment the degreasing of the test pieces should be done by immersing them in non-cycle hydrocarbon, aqueos cleaning agents or equivalent non-halogenated or halogen-free organic degreasing agent.

4.3 Procedure

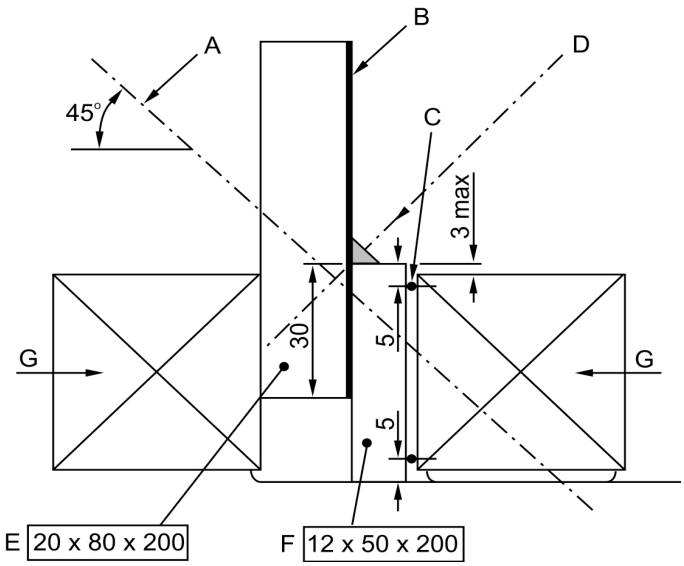
4.3.1 Welding

The specimens shall be clamped in a hydraulic vice over their entire length, the clamping force amounting to 10 kN ± 5 %, see Figure 1. At the point indicated soft-annealed copper wires of 2 mm diameter should be inserted. The vice shall be tilted to an angle of 45^{o} so that welding can proceed in the welding position PA in accordance with EN ISO 6947. Welding parameters shall be as stated in Table 1.

Table 1 - Rating test welding parameters

Parameter	Value
Welding process	135, see EN ISO 4063
Current	(250 ± 5 %) A
Voltage	(30 ± 5 %) V
Welding speed	(300 ± 5 %) mm/min
Shielding gas	C1: 100% CO_2, see EN 439
Gas flow rate	15 l/min to 20 l/min
Gas cup diameter	16 mm to 19 mm
Stick out	18 mm to 20 mm
Consumable, type	G3 Si 1, see EN 440
Consumable, diameter	1,2 mm
Polarity	+ on electrode

All dimensions in millimetres



Key

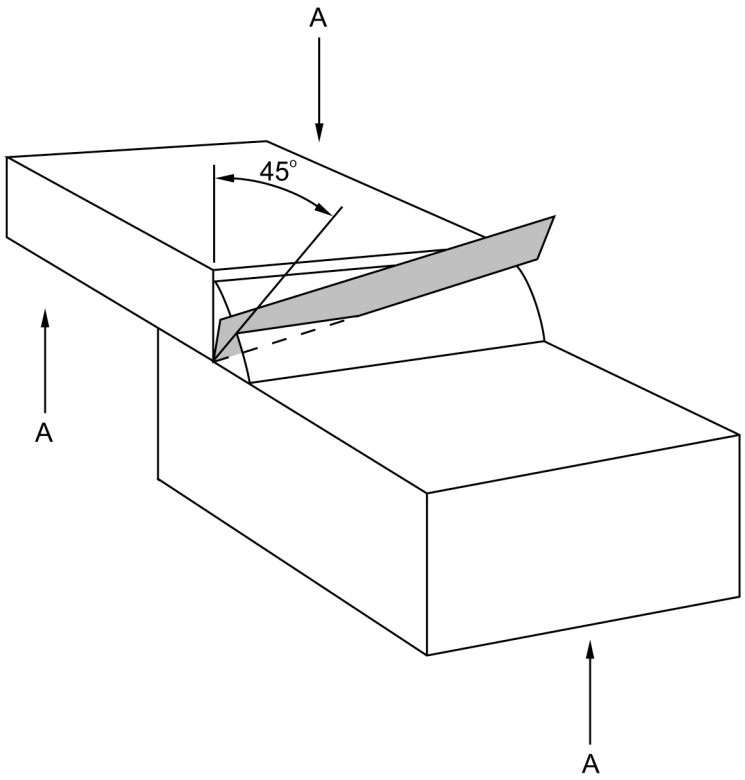
A Horizontal axis during welding
B Primed surface
C Soft-annealed copper wires — 2 mm
D Weld seam breakage angle
E Bright drawn steel plate (20 × 80 × 200)
F Bright drawn steel plate (12 × 50 × 200)
G Hydraulic clamps, 10 kN

Figure 1 - Arrangement of test pieces in rating test

4.3.2 Breaking of the test weld

Break open the test weld using three-point loading as shown in Figure 2. Reject the sample if the fracture does not bisect the weld joint.

The weld shall be broken at a temperature of approximately 150°C to 250°C so that the pore boundaries are clearly visible.



Key

A Three-point loading

Figure 2 — Breaking of the test weld

NOTE The weld can usually be broken without pre-notching as shown in Figure 2. In case the fracture does not occur, the bisecting angle of the weld pre-notching by sawing as shown in Figure 2 should be used.

4.4 Examination and determination of porosity

Do not take into consideration pores where the largest diameter is less than 0,5 mm. Perform the evaluation at a magnification in which pores larger than 0,5 mm (largest diameter) can be measured. However, the magnification shall be no less than 10 times. Evaluate a length of 100 mm, excluding 60 mm from the start and 40 mm from the end of the specimen.

The following shall be determined and recorded:

- the number of pores larger than 0,5 mm n;
- the total pore area determined F (mm^2);
- the mean area of individual pores F/n (mm^2).

NOTE Area of a single pore can usually be determined from a measurement of the largest and smallest diameter, assuming an elliptical shape.

4.5 Test report

A report shall be compiled for each test, detailing, as a minimum the following:

a) that the test has been carried out in accordance with this standard;

b) the customer and contract number, if appropriate;

c) the testing organisation, if appropriate;

d) the location and date of test;

e) an identification of the test piece(s);

f) shop primer designation;

g) the welding process and consumables, as appropriate;

h) the coating thickness applied (as supplied);

i) the surface condition before welding;

j) the welding parameters (WPS or other document reference);

k) the weld evaluation criteria;

l) the number of pores larger than 0,5 mm n;

m) the total pore area determined F (mm^2);

n) the mean area of individual pores F/n (mm^2).

Annex A provides an example of a test report.

5 Weldability test

5.1 Principle

This test details conditions for assessment of the weldability of a shop primer coating on steel, using arc welding processes.

The conditions achieved by applying a force at specified positions along the joint result in a fillet joint with “zero gap”. It is considered that this results in porosity levels are not encountered in practice (unless zero gap is specified and achieved).

However, by setting conditions known to give “worst-case” pore formation, the test is reproducible and can be used to assess the weldability in a consistent way.

A fillet weld has been chosen as typical of the type of weld encountered in practice.

This test allows comparisons to be made between different shop primers using the welding procedure appropriate for the task, or between the different welding procedures using a specific shop primer.

5.2 Preparation of test piece

Each test piece shall consist of two strips of steel having the following dimensions:

- for submerged arc welding; minimum 1000 mm long, 80 mm to 100 mm wide, and minimum 12 mm thick;
- for all other processes: minimum 500 mm long, 80 mm to 100 mm wide, and minimum 10 mm thick.

The base material shall be grade S275 of EN 10025:1990. The parts shall have smooth, flat, undamaged surfaces, and any burrs on the edges shall be removed to ensure a good fit-up.

The test pieces shall be uniform and abrasively blasted until SA 2½ (EN ISO 8501-1:2001) and coated with shop primer in accordance with the supplier's recommendations for the type of shop primer being assessed. The thickness of the shop primer shall be uniform and in accordance with the supplier's recommendation. Unless otherwise specified, the specimens can be welded after a drying period of at least 10 days at a surface temperature above 10°C but below 40°C and at a minimum air humidity of 50 %. Alternative conditions for storage shall be monitored and reported in the test report.

The thickness shall be checked e.g. by use of small smooth steel plates or glass plates. See also EN ISO 2808 and EN 10238.

NOTE Additional tests can be required for sections that have the bottom edge of the vertical plate primed.

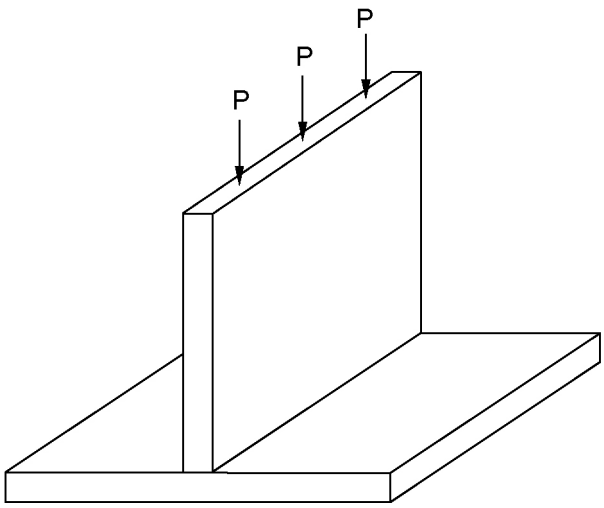
For each series of tests, a control test piece shall be prepared as above, but without the application of shop primer, and welded before the onset of flash rusting.

5.3 Procedure

5.3.1 General

For each series of tests, the unprimed control piece shall be welded before the primed test pieces, using the same welding procedure.

Set up the test pieces and apply sufficient pressure (see Figure 3) to ensure that the root gap is less than 0,05 mm, as verified by, e.g. a feeler gauge.



Key

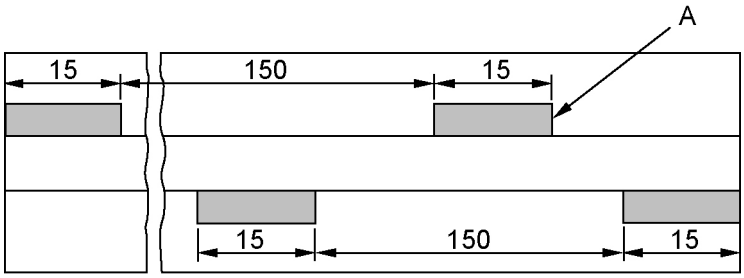
P Clamping force

Figure 3 — Positions at which pressure is applied

5.3.2 Tack welding

Tack weld the test pieces at each end on alternate sides. Use tacks that are approximately 15 mm long, at a spacing of approximately 150 mm, to give an even distribution. Carry out additional tacking at equal distances on alternative sides, as shown in Figure 4. Mark the position of all tack welds to ensure that they are not included in the subsequent evaluation. Release the pressure to remove the test piece, ensuring the gap does not surpass 0,05 mm.

All dimensions in millimetres



Key

A Tack weld

Figure 4 — Positions of tack welds

5.3.3 Welding

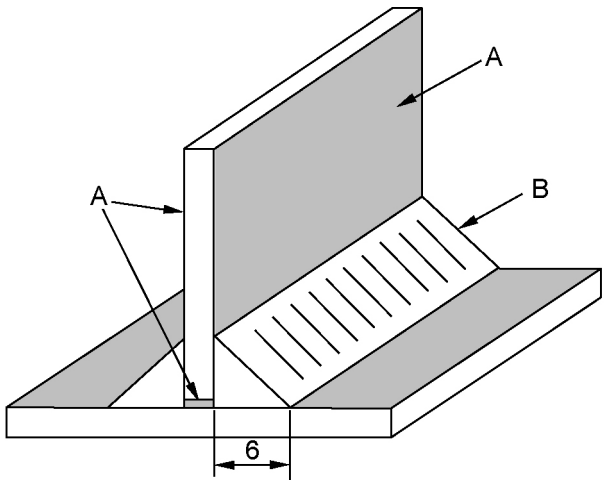
Weld the test piece in the welding position PB in accordance with EN ISO 6947, with one pass on each side, to give a 6 mm leg length *z*.

NOTE Both sides should not be welded simultaneously (unless staggered) but within 30 min of each other.

Select welding parameters, including travel speed, to take account of production conditions and requirements. Record the welding parameters in a welding procedure specification, e.g. as given in annex A of prEN ISO 15609-1:2000.

NOTE — A completed test piece is shown schematically in Figure 5.

Dimension in millimetre



Key

A Primed surface
B Weld

Figure 5 — Test piece for weldability test

5.4 Weld evaluation

5.4.1 Visual examination

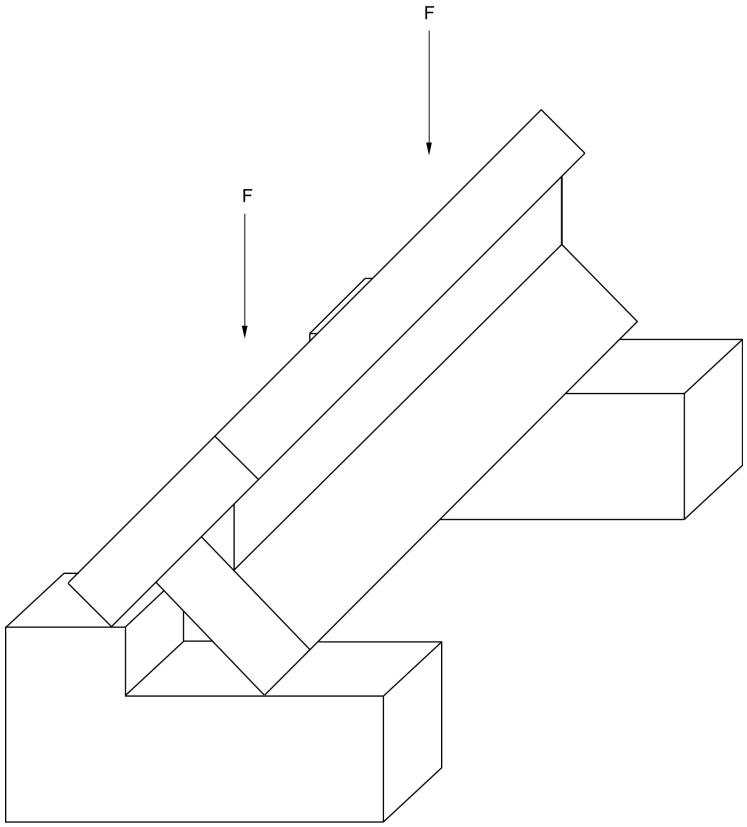
Visually examine the weld against the specified acceptance criteria required by the application.

5.4.2 Internal examination

Remove three, 100 mm long, sections from between the tacks. Remove the first deposited weld bead.

NOTE It is permissible to remove the first deposited weld bead before the sections are taken for many welding processes.

Break the sections as shown in Figure 6. Evaluate the sections against the quality levels for the relevant imperfections. Visually examine the fracture surface against the specified acceptance criteria required by the application.



Key

F Breaking force

Figure 6 — Weld evaluation

5.5 Test report

A report shall be compiled for each test piece, detailing, as a minimum the following:

a) that the test has been carried out in accordance with this standard;

b) the customer and contract number, if appropriate;

c) the testing organisation, if appropriate;

d) the location and date of test;

e) an identification of the test piece(s);

f) shop primer designation;

g) the welding process and consumables, as appropriate;

h) the coating thickness applied (as supplied);

i) the surface condition before welding;

j) the welding parameters (WPS or other document reference);

k) the weld evaluation criteria.

Annex A
(informative)

Example of a test report for rating test of weld properties of shop primers

Declaration: The rating test has been carried out in accordance with EN ISO 17652-2: "*Welding – Test for shop primers in relation to weldability – Part 2: Welding properties of shop primers*".										
Claiment:				**Testing organisation:**						
Contract number:				**Location and date:**						
Shop primer designation:				**Test piece identification:** **(E.g.: A1, A2,…..,A10)**						
Coating thickness:		**Surface condition before welding:**				**Weld evaluation criteria:**				
Consumable:		**Shielding gas:**				**Gas cup diameter:**				
Welding parameters										
Test piece	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Current (A)										
Voltage (V)										
Weld. speed (mm/min)										
Gas flow (l/min)										
Stick-out (mm)										
Measurement of pores										
Number of pores larger than 0,5 mm *n*:										
Total pore area determined F (mm^2)										
Mean area of individual pores F/n (mm^2)										
Mean values										
Number of pores larger than 0,5 mm *n*:		**Total pore area determined F (mm^2)**				**Mean area of individual pores F/n (mm^2)**				
Test responsible:			**Date:**			**Signature of test responsible:**				
Special conditions:										

Annex ZA
(informative)

Corresponding International and European Standards for which equivalents are not given in the text

At the time of publication of this standard, the editions of the following documents were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. Members of ISO and IEC maintain registers of currently valid International Standards.

EN 10025 ISO 630 – *Structural steels – Plates, wide flats, bars, sections and profiles*

ICS 25.160.10

Price based on 11 pages