

Specification for

Chromium and chromium-nickel steel electrodes for manual metal-arc welding

UDC 621.791.753.037 + 621.3.036.6

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Welding Standards Committee (WEE/-) to Technical Committee WEE/39 upon which the following bodies were represented:

- Associated Offices Technical Committee
- British Railways Board
- British Shipbuilders
- British Steel Industry
- British Steel Industry (Wire Section)
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Process Plant Association
- Society of Motor Manufacturers and Traders Limited
- Water-tube Boilermakers' Association
- Welding Institute
- Welding Manufacturers' Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Constructional Steelwork Association
- United Kingdom Atomic Energy Authority

This British Standard, having been prepared under the direction of the Welding Standards Committee, was published under the authority of the Board of BSI and comes into effect on 28 September 1984

© BSI 04-1999

First published December 1957
First revision June 1970
Second revision September 1984

The following BSI references relate to the work on this standard:
Committee reference WEE/39
Draft for comment 82/72097 DC

ISBN 0 580 13951 4

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Information to be supplied by the purchaser	1
3 Classification	1
4 Dimensions and tolerances	1
5 Covering	1
6 Electrode identification	2
7 Initial and additional tests	2
8 Quality control	6
9 Retests	6
10 Packing, storage and marking	6
Appendix A Methods of test	7
Appendix B Suggested method of preparing etched specimens	10
Appendix C Health and safety publications	11
Figure 1 — Test piece and all-weld tensile test specimen	8
Figure 2 — Fillet weld test piece	9
Figure 3 — Dimensions of fillet weld	9
Table 1 — Tests required	2
Table 2 — Composition of weld metal	3
Table 3 — Mechanical properties	5
Table 4 — Dimensions of test piece and all-weld tensile test specimen	7
Table 5 — Heat treatment for all-weld test pieces	7
Table 6 — Fillet weld leg lengths	10
Publications referred to	Inside back cover

Foreword

This revision of this British Standard, which has been prepared under the direction of the Welding Standards Committee, supersedes BS 2926:1970 which is withdrawn.

The basic principles adopted in 1957, when this standard was first published, have been shown to be sound and have therefore been retained.

Two fundamental changes incorporated in the 1970 edition have also been retained. Reference has been made to relevant ISO standards in selecting dimensions and units and there is a coding system for indicating the type and characteristics of an electrode. That part which gives the composition code originated from the International Institute of Welding (IIW) and gives an immediate indication of the chemical composition of the deposited weld metal. In deciding the actual limits of the chemical compositions due account has been taken of IIW proposals and AWS/ASME requirements.

The opportunity has been taken in this revision to increase the range of electrodes and the layout has been made similar to that in other British Standards for electrodes.

The selection of electrodes should be made on the basis of the particular application and the user should consult the electrode manufacturer or other appropriate authoritative sources for guidance.

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 12, 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 a range of chromium and chromium-nickel steel covered electrodes for manual metal-arc welding and also lays down requirements regarding the quality control system at the manufacturer's works.

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

2 Information to be supplied by the purchaser

When ordering electrodes that comply with the requirements of this standard, purchasers shall state:

- the number and date of this British Standard, i.e. BS 2926:1984;
- the electrode classification (see clause 3), i.e. composition code plus covering code;
- whether chemical and/or mechanical test certificates are required for each batch of electrodes supplied (see clause 8);
- whether the delta ferrite content of the deposited weld metal is required to be determined (see 7.3.1);
- whether proof stress values in the all-weld tensile test are required (see 7.3.2);
- whether any additional residual elements not specified in Table 2 have to be controlled to specific limits for a particular application.

3 Classification

The classification of an electrode shall be indicated by the following coding in the order stated.

- Composition code* (see Table 2). The following symbols shall be used, as appropriate, each figure being separated from the next by a full point:
 - a figure indicating the chromium content;
 - a figure indicating the nickel content;
 - a figure indicating the molybdenum content;
 - the letter L indicating a low carbon content of 0.04 % and below;
 - the letter H indicating a high carbon content version;
 - the symbol Mn indicating a manganese content above 2.5 %;
 - the symbol Cu indicating an addition of copper;
 - the symbol Nb indicating an addition of niobium as a stabilizing element;
 - the symbol W indicating an addition of tungsten;

the symbol Mo indicating an addition of molybdenum below 1 %.

- Covering code*. The manufacturer shall identify the general characteristics of the covering by allocating the most appropriate of the following codes.

B (Basic)	This letter indicates a covering containing large proportions of limestone and fluorspar.
BR (Basic Rutile)	This code indicates a covering containing large proportions of limestone, fluorspar and rutile.
R (Rutile)	This letter indicates a covering containing a large proportion of rutile and little fluorspar.
AR (Acid Rutile)	This code indicates a covering containing large proportions of rutile and siliceous materials.
MP (Metal Powder)	For electrodes in which the core wire is not of chromium-nickel austenitic or chromium steel and where the bulk of the alloying elements are supplied through the covering the letters MP shall be used after the covering codes B, BR, R, and AR.

4 Dimensions and tolerances

4.1 Size

The size of an electrode shall be the specified nominal diameter of the core wire and shall be selected from the following range:

1.6, 2, 2.5, 3.2, 4, 5, 6, 6.3, 8 and 10 mm

The core wire diameter shall be within ± 3 % of the nominal diameter with a maximum tolerance of ± 0.1 mm.

4.2 Length

The length of an electrode shall be within ± 2 mm of the nominal value specified by the manufacturer.

5 Covering

The covering shall be free from defects which will adversely affect the operation of the electrode when used under the correct conditions.

The gripped end of each electrode shall be free from covering for a minimum distance of 15 mm and a maximum distance of 40 mm.

6 Electrode identification

The electrode composition and covering codes (see clause 3) shall be printed or imprinted on the covering of each electrode as near as possible to the gripped end.

When electrodes are used in accordance with the manufacturer's recommendations, the printing or imprinting shall survive contact incidental to normal handling, transport and storage and shall remain legible on electrodes and stub ends.

NOTE Requirements for the marking of packages of electrodes are given in 10.2.

7 Initial and additional tests

7.1 General

All tests using electrodes suitable for use on a.c. or d.c. shall be carried out on a.c. supply at the minimum open circuit voltage claimed by the manufacturer. Tests on all other electrodes shall be carried out on d.c. supply electrode positive.

7.2 Initial tests

7.2.1 General. The initial tests specified in Table 1 shall be carried out by the methods given in Appendix A. These comprise the initial tests to which each type or reformulated type of electrode shall be subjected. Although it is not expected that every batch of electrodes will be subjected to the initial tests the manufacturer shall ensure that every batch is capable of passing the initial tests.

NOTE The purchaser may require that some or all of the tests are carried out on batches supplied to him (see clause 8).

7.2.2 Chemical analysis. The material obtained by the method described in A.1 shall show on analysis a chemical composition that complies with the requirements of Table 2.

7.2.3 All-weld tensile test. The mechanical properties obtained from the test specimen prepared as described in A.2 shall be in accordance with those specified in Table 3.

7.2.4 Fillet weld test. The prepared and etched faces of the weld and parent metal from the test piece obtained by the method described in A.3 shall be free from cracks and the weld shall be reasonably free from undercutting, overlap, porosity and slag inclusions.

The fillet weld leg lengths and convexity shall be determined by actual measurement to the nearest 0.5 mm on a section laid out with scribed lines as shown in Figure 3, the difference in leg lengths being not more than 1.5 mm. For the purpose of this standard the smaller leg length shall be used. The fillet weld leg length shall be in accordance with Table 6 and the convexity shall not exceed the value determined from Figure 3.

NOTE The fillet weld test has been selected to demonstrate the suitability of the electrodes for positional welding, but this should not be taken to imply a restriction to fillet welds.

7.3 Additional tests

7.3.1 Ferrite content

NOTE 1 Several of the weld metals covered by this standard have significant quantities of delta ferrite in their microstructures. This is to reduce solidification cracking susceptibility. The amounts present vary with the composition and field of application of the electrode.

No requirements are specified in this standard for limits of delta ferrite content of the deposited weld metal. Both the acceptable limits and the method of testing are matters for agreement between the purchaser and the manufacturer [see clause 2 d)].

NOTE 2 One method of testing which is widely used is detailed in AWS A4.2 - 74 "Standard procedure for calibrating magnetic instruments to measure the delta ferrite content of austenitic stainless steel weld metal".

7.3.2 Proof stress. No requirements are specified in this standard for proof stress values. These are a matter for agreement between the purchaser and the manufacturer [see clause 2 e)].

NOTE As a guide, 1 % proof stress values would be at least 60 % of the minimum tensile strengths specified in Table 3.

Table 1 — Tests required

Size of electrode mm	Covering code	Position of welding		
		Chemical analysis	All-weld tensile test	Fillet weld test
1.6 2 2.5	All	Flat	—	—
3.2	All	Flat	Flat	Vertical and overhead
4	B, BR	Flat	Flat	Vertical and overhead
4	R, AR	Flat	Flat	Horizontal/vertical
5 6 6.3	All	Flat	Flat	Horizontal/vertical
8 10	All	Flat	Flat	Flat