

Arc welding power sources, equipment and accessories —

Part 5: Specification for accessories

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Committees responsible for this British Standard

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- Association of Supervisory and Executive Engineers
- British Shipbuilders
- Department of Trade and Industry — Mechanical Engineering and Manufacturing Technology Division (Mmt)
- Electric Cable Makers' Confederation
- Electricity Supply Industry in England and Wales
- Health and Safety Executive
- Water-tube Boilermakers' Association
- Welding Institute
- Welding Manufacturers' Association (BEAMA Ltd.)

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Foreword

This part of BS 638 has been prepared under the direction of the Welding Standards Committee. It is a revision of the 1966 edition of BS 638, which is now withdrawn, and takes into consideration the International Standards that have been published in the interim, particularly ISO 700:1982. It was considered that any future alignment with internationally agreed standards would be facilitated if BS 638 were published in several parts, which in any case should also make for easier use and comprehension of the standard. Consequently, BS 638 has been divided into the following parts:

- *Part 1: Specification for oil cooled power sources for manual, semi-automatic and automatic metal-arc welding and for TIG welding;*
- *Part 2: Specification for air cooled power sources for manual metal-arc welding with covered electrodes and for TIG welding;*
- *Part 3: Specification for air cooled power sources for semi-automatic and automatic metal-arc welding;*
- *Part 4: Specification for welding cables;*
- *Part 5: Specification for accessories;*
- *Part 6: Specification for safety requirements for construction;*
- *Part 7: Specification for safety requirements for installation and use;*
- *Part 8: Specification for electrode holders and handheld torches and guns for MIG, MAG and TIG welding.*

Subclause 4.1 in this Part of BS 638 has been superseded by BS EN 60974-5:2002, *Arc welding equipment — Wire feeders*.

This part of BS 638 implements the requirements laid down in CENELEC Harmonization Document 433 (1982).

Attention is drawn to the relevant safety requirements in BS 638-6 and BS 638-7.

The assistance of the Welding Manufacturers' Association (Arc Welding Plant Section) and the Health and Safety Executive in the drafting of this part is acknowledged.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 to iv, pages 1 to 31 and a back cover.

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Section 1. General

1.1 Scope

This part of BS 638 specifies requirements for accessories intended for use in arc welding processes.

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

1.2 Definitions

For the purposes of this part of BS 638, the following definitions apply. For other relevant terms the definitions in BS 499-1 apply.

NOTE All the electrical quantities specified in the definitions are those obtained under steady state conditions.

1.2.1

voltage reducing device (voltage reducing system)

a device or system that automatically reduces the no-load voltage appearing at the output terminals of a welding power source during intervals when welding is not being performed and automatically restores the voltage to its unreduced value during welding

1.2.2

coupling device

a device to connect two flexible welding cables or to connect a flexible welding cable to a welding power source or to welding equipment

1.2.3

cable coupler

a device to connect two flexible welding cables consisting of two parts, which can be asymmetrical or symmetrical, as follows:

- a) **asymmetrical cable coupler** [see Figure 1(a)], consisting of
 - i) a *connector* (1), which is the female part;
 - ii) a *plug* (2), which is the male part;
- b) **symmetrical cable coupler** [see Figure 1(b)], consisting of two plug-connectors (3).

NOTE When using a symmetrical cable coupler, special care should be taken to make the correct connection.

1.2.4

equipment coupler

a device to connect a flexible welding cable to a welding power source or welding equipment, consisting of

- a) either:
 - i) a *plug* (2), which is connected to the flexible welding cable; and
 - ii) a *socket outlet* (4), which is connected to the welding power source or the welding equipment;
 [see Figure 1(c)];
- b) or:
 - i) a *connector* (1), which is connected to the flexible welding cable; and
 - ii) an *appliance inlet* (5), which is connected to the welding equipment;
 [see Figure 1(d)].

NOTE The socket outlet and appliance inlet can be of the same shape in the case of a symmetrical equipment coupler (6, 3) [see Figure 1(e)]. See also note to 1.2.3.

1.2.5

rewirable plug or connector

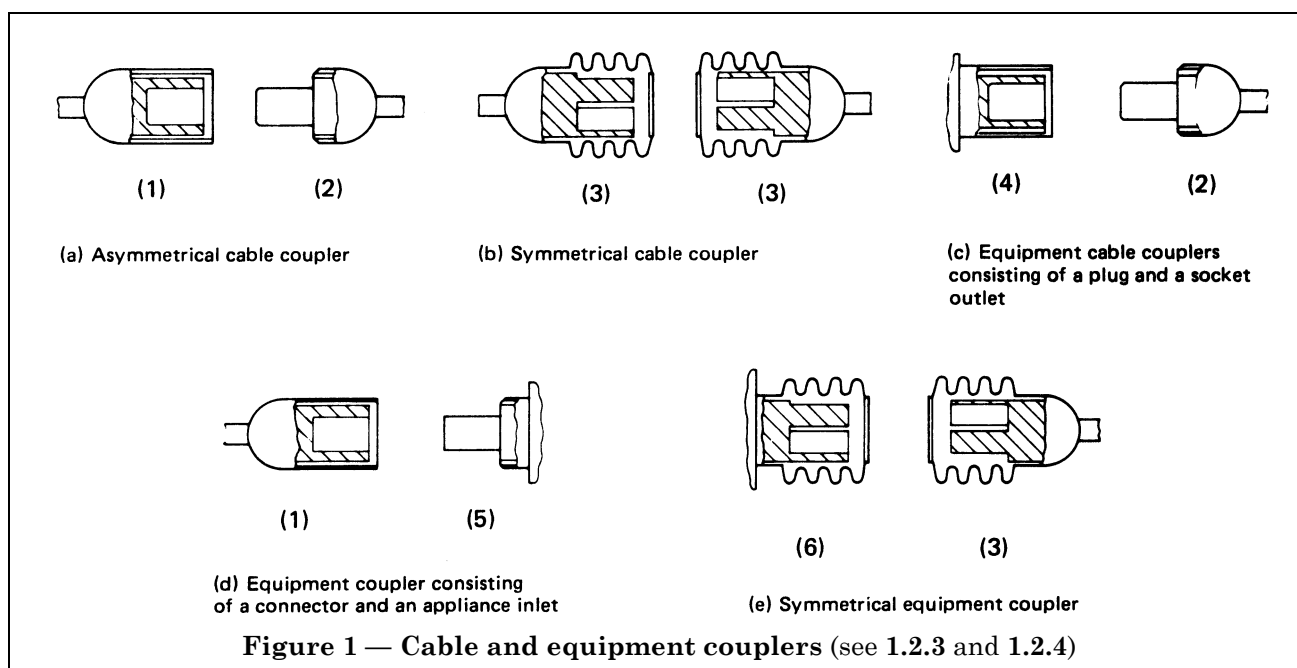
a plug or a connector so constructed that the flexible welding cable may be replaced

1.2.6

non-rewirable plug or connector

a plug or a connector so constructed that the flexible welding cable cannot be separated from the accessory without making it completely useless

- 1.2.7 retaining means**
mechanical arrangement that holds a plug or a connector in position when it is in proper engagement and prevents its unintentional withdrawal
- 1.2.8 rated current of coupling device**
current carrying capacity of the coupling device at a duty cycle of 60 % (see BS 638-2 and BS 638-3), as specified by the manufacturer
- 1.2.9 distribution box**
a device, incorporating sockets, which enables the output of a multiple operator transformer to be connected by plugs to the specified number of individual current regulators
- 1.2.10 paralleling device**
a device to connect, in parallel, supplies from two or more sources to feed into a common arc
- 1.2.11 welding current return clamp**
a clamp which is attached to, or in contact with, the work piece, in close proximity to the weld to form a welding current return path to the power source
- 1.2.12 quiver**
an electrically heated portable container with a maximum capacity of 8 kg of electrodes and arranged to be worn or carried by the user and intended to keep the electrodes dry



- 1.2.13 electrode drying/storage oven**
an electrically heated container of one of the following types:
- type (a)*, in which electrodes can be dried or stored, up to temperatures of 250 °C to ensure that the surface coating is free of moisture;
- type (b)*, in which electrodes can be dried to the extent that the combined moisture in the coating of electrodes is removed by heating up to 500 °C.

NOTE The actual temperatures used should be in accordance with the electrode manufacturer's instructions.

1.2.14**wire drive feed unit**

a device designed to feed solid or flux-cored wire into an arc at a rate that can be adjusted to the relevant welding conditions to provide a filler metal

1.2.15**semi-automatic metal-arc welding**

an arc welding operation, using a consumable wire electrode, in which some of the welding variables are automatically controlled but manual guidance is necessary

1.2.16**inlet guide**

a device that guides the wire from the reel to the wire drive

1.2.17**outlet guide**

a device that guides the wire from the wire drive to the welding gun

1.2.18**insulated wire drive system**

a drive system where drive rolls and wire guides are the only components at the same potential as the welding wire

1.2.19**planetary drive**

a device consisting of a number of skewed rolls or spheres, contained in a housing which rotates round the wire, that are skewed to impart linear motion to the wire

1.2.20**uninsulated wire drive system**

a drive system where components other than drive rolls and guides (i.e. shafts, castings, motors and gearboxes, etc.) are at the same potential as the welding wire

1.2.21**wire reel cover**

a cover, preferably made of insulating materials, to protect the wire from dust and moisture, etc.

1.2.22**wire reel (spool, rim or coil)**

a carrier for the filler wire

1.2.23**CO₂ heater**

a device for heating carbon dioxide in order to maintain the temperature of the gas at a suitable working level

1.3 Temperature of the cooling medium

Welding accessories shall be capable of carrying out their welding operation without exceeding the following temperature limits.

maximum ambient air temperature	40 °C
daily average ambient air temperature	30 °C
yearly average ambient air temperature	20 °C
minimum ambient air temperature	-10 °C

Section 2. Accessories associated with the power source

2.1 Power factor correction capacitors

Power factor correction capacitors shall be as specified in BS 1650 and in the relevant clauses of BS 638-1, BS 638-2 and BS 638-3.

2.2 Voltage reducing device

2.2.1 The device shall permit only a reduced voltage to be available at the electrode holder or welding cable when welding is not in progress. When the electrode is applied to the work, the device shall apply the full open circuit voltage to the welding circuit so that the arc may be struck and the normal load voltage developed across the arc.

2.2.2 When the arc is extinguished the device shall disconnect the open circuit voltage from the welding circuit and re-apply the reduced voltage in not more than 500 ms.

2.2.3 The reduced voltage shall be obtained by means of a double wound transformer but not by means of a tapped choke, auto transformer or potentiometer. The device shall operate reliably and the reduced voltage shall not exceed 42 V r.m.s. a.c.

2.2.4 The device shall be designed so that if any of the components fails, either open circuit or short circuit, it will not permit the normal open circuit voltage of the power source to be available at the electrode holder or welding cable.

2.2.5 There shall be visual indication that the device is operating correctly.

2.2.6 The device shall be free standing, or shall be suitable for attachment to a power source or to a current control reactor or suitable for incorporating within the casing of a power source.

2.2.7 If not otherwise protected, the device shall be weatherproof to class IP 23 in accordance with BS 5490.

2.3 Coupling devices

2.3.1 General

The requirements in this clause shall apply to coupling devices for the connection of two flexible welding cables or the connection of flexible welding cables to welding equipment. They shall apply to coupling devices designed to carry out manually all the operations of connection and disconnection without using tools¹⁾.

Plugs and sockets for use with distribution boxes shall be manufactured to the dimensions specified in Appendix A.

NOTE This clause does not apply to coupling devices used in applications such as plasma welding and cutting, underwater welding or for use at a temperature below -10°C .

2.3.2 Rating

The rating of the couplers shall be confirmed by the test described in 2.3.5.5 in which the rated current is used as the test current.

NOTE 1 For the specification and rating of arc welding cables, see BS 638-4.

NOTE 2 Welding cables, of which the coverings are not capable of withstanding a conductor temperature of 85°C , will be damaged if the coupling devices are used at the rating given in an ambient temperature of 40°C and above.

2.3.3 Construction

2.3.3.1 Coupling devices shall have a covering such that live parts are fully insulated when the two parts are coupled.

2.3.3.2 A retaining means shall be provided to prevent any unintentional withdrawal.

NOTE If possible, indicating marks, for instance two lines opposite each other, should show by visual inspection that the retaining means has functioned.

2.3.3.3 Coupling devices shall be designed so that, in the coupled position, no foreign particles liable to cause a hazard of electric shock can enter gaps.

¹⁾ Terminals, cable shoes, wing nuts, etc., insulated or not, are excluded from this part of BS 638.

2.3.3.4 No exposed conductive parts, such as screws, pins, etc. shall come in contact with live parts.

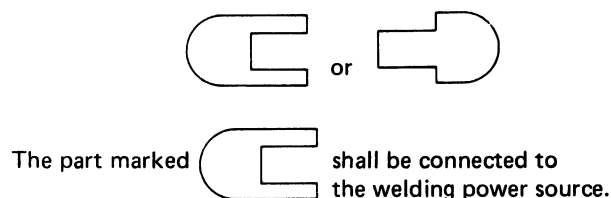
2.3.3.5 Parts designed to carry welding current and likely to be live after disconnection shall be recessed to a depth of at least 10 % of the internal diameter of the insulation with a minimum depth of 2 mm, with respect to the insulating body.

NOTE Insulation should be able to withstand normal service conditions so that the dimensions of the recess are maintained during the life of the device.

2.3.3.6 Cable entries shall be so designed as to prevent damage to the welding cable, due to flexing. The covering of the cable shall enter the coupling device to a depth of at least twice the outer diameter of the welding cable, with a minimum insertion of 30 mm.

2.3.3.7 Coupling devices complying with **2.3.3.6** shall be capable of accepting welding cables of the maximum cross-sectional area specified in **2.3.5.5** and at least the next size smaller in the series.

2.3.3.8 Each part of a symmetrical coupling device shall be clearly and indelibly marked, as follows:



2.3.4 Test requirements

2.3.4.1 Access to live parts. When the tests are carried out as specified in **2.3.5.2**, it shall not be possible to come in contact with live parts of a coupling device when coupled.

2.3.4.2 Mechanical characteristics. The mechanical characteristics shall be as follows.

- a) *Cable fixing.* When the tests are carried out as specified in **2.3.5.3**, the welding cable shall not separate from the plug or the connector.
- b) *Crush strength.* When the tests are carried out as specified in **2.3.5.4**, with the cable coupler tested in any position with respect to the surface to which the force is applied, the insulation shall not be destroyed and mechanical functioning shall not be impaired.

2.3.4.3 Temperature rise. When the tests are carried out as specified in **2.3.5.5**, the following temperature rises shall not be exceeded:

- a) external surface: 40 K;
- b) junction of welding cable and plug or connector: 45 K.

NOTE These values are temperature rises in relation to the ambient air temperature (maximum 40 °C).

2.3.4.4 Resistance to weld spatter. The insulation shall be capable of withstanding the effects of a normal amount of weld spatter without igniting or being completely penetrated. When the tests are carried out as specified in **2.3.5.6**, the heated rod shall not penetrate into the insulation more than 1.5 mm and shall not contact live parts. If the gases are flammable, the burning shall stop as soon as the heated rod is removed.

The penetration shall be measured from the outer surface of the main body of the insulation, excluding ribs and other protrusions.

2.3.4.5 Insulation characteristics. The insulation characteristics shall be as follows.

- a) *Insulation resistance.* When the tests are carried out as specified in **2.3.5.7**, the measured insulation resistance shall be not less than 2 MΩ.
- b) *Dielectric strength.* When the tests are carried out as specified in **2.3.5.8**, no flashover or breakdown shall occur.