

Arc welding power sources, equipment and accessories —

Part 9: Specification for power sources for manual arc welding with limited duty

This European Standard EN 50060 has the status of a
British Standard

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Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Brief history	2
Text of EN 50060	5
National appendix W	Inside back cover
National appendix X	Inside back cover

National foreword

This Part of BS 638 has been prepared under the direction of the Welding Standards Policy Committee and is identical with European Standard EN 50060:1989 including amendment A1:1994.

It differs from previous Parts of BS 638 in being applicable to equipment intended, primarily, for the non-professional welding operator.

Other Parts of BS 638 are:

- *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 hand held torches and guns for MIG, MAG and TIG welding.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 30, 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.

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English version

Power sources for manual arc welding with limited duty

(include amendment A1:1994)

Source de courant pour soudage manuel à l'arc,
à service limité

inclut l'amendement A1:1994

Schweiß-stromquellen zum Lichtbogenhand-
schweißen für begrenzten Betrieb

enthält Änderungen A1:1994

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Brief history

The European Standard 50060 was prepared by TC 26A of CENELEC; it was submitted to the CENELEC members for formal vote and acceptance as European Standard (EN) by CENELEC.

Technical text

The text of the European Standard 50060 was approved by all CENELEC members with exception of Austria and Finland on 6 December 1988.

The following dates were fixed:

- date of announcement (doa) : 1989-07-01
- date of latest publication (dop) : 1990-01-01
- date of withdrawal of conflicting national standard (dow) : 1990-01-01

Foreword to amendment A1

This amendment to EN 50060:1989 was prepared by CENELEC Technical Committee TC 26A “Electric arc welding equipment”.

It was submitted to the CENELEC members for formal vote in september 1993 and and was approved by CENELEC as amendment A1 to EN 50060:1989 on 1994-03-08.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1995-03-15
- latest date of withdrawal of conflicting national standards (dow) 1995-03-15

For products which have complied with EN 50060:1989 before 1995-03-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2000-03-15.

Contents

	Page
Brief history	2
Section 1. General	
1 Scope	5
2 Object	5
3 Environmental conditions	5
4 Definitions	5
4.1 Power source for manual metal arc welding	5
4.2 Dual supply voltage welding power source	5
4.3 Thermal cut-out device	5
4.4 Reference electrode	5
4.5 Type test	5
4.6 Routine test	5
4.7 General visual inspection	5
4.8 Conventional value	5
4.9 Rated value	5
4.10 Welding current	6
4.11 Drooping characteristic	6
4.12 Duty	6
4.13 Conventional welding condition	6
4.14 No-load voltage	6
4.15 Rated no-load voltage (U_0)	6
4.16 Load voltage	6
4.17 Conventional load voltage (U_2)	6
4.18 Conventional welding current (I_2)	6
4.19 Rated maximum welding current (I_{2max})	6
4.20 Rated supply voltage (U_1)	6
4.21 Rated supply current (I_1)	6
4.22 Rated maximum supply current (I_{1max})	6
4.23 <i>Text deleted</i>	6
4.24 Operating temperature (θ_{off})	6
4.25 Maximum winding temperature (θ_{max})	6
4.26 Reset temperature (θ_{on})	6
4.27 Heating time from the cold state (t_c)	6
4.28 Heating time from the hot state (t_h)	6
4.29 Melting time (t_f)	6
4.30 Number of reference electrodes n_c	7
4.30a) Number of reference electrodes n_{c1}	7
4.31 Number of reference electrodes n_h	7
4.31a) Number of reference electrodes n_{h1}	7
4.32 Basic insulation	7

	Page		Page
4.33 Supplementary insulation	7	8 Thermal protection	15
4.34 Double insulation	7	8.1 Construction of thermal cut-out device	15
4.35 Reinforced insulation	7	8.2 Location	15
4.36 Protection Class I equipment	7	8.3 Operation	15
4.37 Protection Class II equipment	7	8.4 Resetting	15
4.38 Clearance	7	8.5 Operating capacity	15
4.39 Creepage distance	7	8.6 Indication	15
4.40 Pollution	7	8.6.1 Filament signal lamps	15
4.41 Pollution degree 1	8	9 Connection to the main supply	15
4.42 Pollution degree 2	8	9.1 Supply voltage	15
4.43 Pollution degree 3	8	9.2 Power switch	15
4.44 Pollution degree 4	8	9.3 Supply cable	16
4.45 Micro-environment	8	9.3.1 Connection of Protection Class I welding power sources	16
4.46 Material group	8	9.3.2 Connection of Protection Class II welding power sources	16
Section 2. Requirements and tests		9.4 Input conductor terminals	16
5 Test conditions	9	9.4.1 Connection at the terminals	16
5.1 Type tests	9	9.4.2 Construction of the terminals	16
5.2 Routine tests	9	9.4.3 Fixing of the terminals	16
6 Protection against electric shock	9	9.4.4 Protective-conductor terminal	16
6.1 Insulation	9	9.5 Cable anchorage	16
6.1.1 Clearances and creepage distances	9	9.6 Dual supply voltage welding power source	17
6.1.2 Insulation resistance	10	10 Output	17
6.1.3 Dielectric strength	10	10.1 Rated no-load voltage	17
6.2 Protection against electric shock in normal service (direct contact)	11	10.2 Conventional load voltage for type tests	18
6.2.1 Capacitors	11	10.3 Minimum output duty	18
6.3 Protection against electric shock in case of a fault condition (indirect contact)	11	10.4 Maximum and minimum welding current	18
6.3.1 Protection Class I	11	10.5 Control of the welding current	18
6.3.2 Protection Class II	12	10.6 Welding output connections	18
6.3.3 Isolation of input and welding circuit	12	10.6.1 Location of socket outlets	18
6.3.4 Insulation between input and welding circuit	12	10.6.2 Outlets openings	18
6.3.5 Placing of internal conductors	12	10.6.3 Welding cable anchorage	18
6.3.6 Movable coils and cores	12	10.7 Electrode holders	18
7 Thermal rating	12	11 Mechanical requirements	19
7.1 Heating test	13	11.1 Impact resistance	19
7.2 Methods of temperature measurement	13	11.2 Carrying means	19
7.2.1 Thermometer method	13	11.3 Drop withstand	19
7.2.2 Resistance method	14	11.4 Tilting stability	19
7.3 Limits of temperature	14	12 Rating plate	19
7.3.1 Windings	14	12.1 Description	20
7.3.2 External surfaces	14	12.2 Contents	21
7.3.3 Rectifier elements	15		

	Page
12.3 Tolerances	22
13 Control plate	22
14 Other use than welding	22
15 Instructions for use	22
Appendix A Test pins	23
Appendix B Screws and connections	24
Appendix C Dual voltage welding transformer	25
Appendix D Impact hammer	26
Appendix E Examples of rating plates	27
Appendix F Examples of control plates	28
Appendix G Repairs of welding power sources	29
Appendix H Publications referred to	29
Figure 1 — Temperature curve of windings	14
Figure 2 — Measurement of peak values	19
Figure 3 — Principle of the rating plate	20
Figure 4 — 50 mm test pin	23
Figure 5 — 15 mm test pin	23
Figure 6 — Example of circuit diagram of a dual voltage welding transformer and voltage change over switch	25
Figure 7 — Impact hammer	26
Figure 8 — Example of a rating plate	27
Figure 9 — Example of a subdivided rating plate	27
Figure 10 — Example of a control plate	28
Figure 11 — Example of a control plate of a dual voltage welding power source	28
Table I — Minimum clearances and creepage distances for basic insulation and supplementary insulation	9
Table II — Dielectric test voltages and insulation resistances	11
Table III — Conventional values based on the reference electrode	13
Table IV — Limits of temperature for windings ($\Theta_{\max}$)	14
Table V — Torque	17

Section 1. General

1 Scope

This standard is applicable to welding power sources for manual metal arc welding with limited duty with covered stick electrodes.

These welding power sources

- a) are limited to a rated maximum welding current of 160A.
- b) are fitted with a thermal cut-out device.
- c) have performance based on the number of reference electrodes, capable of being melted with the welding power source in the cold and hot state and
- d) carry on their rating plate a declaration of the fuse size necessary for the maximum output.

This standard is not applicable to rotating welding power sources or welding power sources with remote control or welding power sources incorporating frequency conversion.

NOTE Inverter type welding power sources are excluded from this standard on the grounds that

- a) there are not yet available methods to test the safety of them,
- b) they cause considerable harmonic distortions to the supply.

2 Object

This standard specifies safety requirements for the construction and relevant performance requirements and describes test methods to verify compliance.

3 Environmental conditions

Welding power sources shall be capable of carrying out their welding operation when the following conditions prevail:

- a) Range of the temperature of the ambient air:
 - during welding: $-10\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$.
 - during transport and storage: $-25\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$.

NOTE The values given on the rating plate are based on $20\text{ }^{\circ}\text{C}$. If the ambient air temperature is higher, the duty will become less, i.e. the number of electrodes, capable of being melted from the cold state (n_c) or from the hot state (n_h) will become less.

- b) Relative humidity of the air: up to 90 % at $20\text{ }^{\circ}\text{C}$.
- c) Ambient air, free from abnormal amounts of dust, acids, corrosive gases or substances etc. other than those generated by the welding process.

4 Definitions

4.1

power source for manual metal arc welding

a power source with drooping characteristic for supplying electrical energy to the welding arc

NOTE In the following text, the term "welding power source" is used.

4.2

dual supply voltage welding power source

a welding power source which may be supplied alternatively by two different supply voltages (e.g. 220 and 380 V)

4.3

thermal cut-out device

a device, by means of which the temperature of the welding power source is limited by automatic interruption of the input or output current being reset automatically

4.4

reference electrode

an electrode of the type E 43 R according to ISO 2560, whose diameter, fusible length and welding current are given in Table III, Clause 7.1

4.5

type test

a test of one or more devices made to a given design, to check if the design complies with the requirements of the standard concerned

4.6

routine test

a test made on each individual device during or after manufacture to check if it complies with the requirements of the standard concerned

4.7

general visual inspection

a visual inspection to verify that there are no apparent faults

4.8

conventional value

a standardized value that is used as a measure of a parameter for the purposes of comparison, calibration, testing etc.

NOTE Conventional values do not necessarily apply during the actual welding process.

4.9

rated value

a quantity value assigned, generally by the manufacturer, for a specified operating condition of a component, device or equipment

4.10**welding current**

the current delivered by a welding power source during welding

4.11**drooping characteristic**

an external static characteristic of a welding power source which, in its normal welding range, is such that, as the current increases, the voltage decreases by more than 7V/100A

4.12**duty**

the schedule of operating conditions to which the welding power source is subjected

NOTE In this standard, the duty is expressed by the number of reference electrodes n_c (see Clause 4.30) and n_h (see Clause 4.31).

4.13**conventional welding condition**

a condition of the welding power source in the hot state defined by a conventional welding current driven by the corresponding conventional load voltage through a conventional load at rated supply voltage and frequency

NOTE The conventional load for testing purposes replaces the arc welding electrode and the arc by a practically non-inductive constant resistive load having a power factor not less than 0.99.

4.14**no-load voltage**

the voltage between the output terminals of a welding power source when the external welding circuit is open

4.15**rated no-load voltage (U_0)**

the no-load voltage at rated supply voltage and frequency

4.16**load voltage**

the voltage between the output terminals of a welding power source, when it is delivering current

4.17**conventional load voltage (U_2)**

the load voltage of a welding power source having a specified linear relationship to the conventional welding current (see Clause 10.2)

4.18**conventional welding current (I_2)**

the current delivered by a welding power source to a conventional load at the corresponding conventional load voltage

4.19**rated maximum welding current ($I_{2\max}$)**

the maximum value of the conventional welding current that can be obtained at the conventional welding condition from a welding power source at its maximum setting

4.20**rated supply voltage (U_1)**

the supply voltage for which the welding power source is constructed

4.21**rated supply current (I_1)**

the supply current to the welding power source at a conventional welding condition

4.22**rated maximum supply current ($I_{1\max}$)**

the maximum value of the rated supply current

4.23 *Text deleted***4.24****operating temperature (θ_{off})**

the temperature of the welding power source windings when the thermal cut-out device operates (see Figure 1)

4.25**maximum winding temperature (θ_{max})**

the maximum allowable value of the operating temperature (see Table IV)

4.26**reset temperature (θ_{on})**

the temperature of the welding power source windings, when the thermal cut-out device resets (see Figure 1)

4.27**heating time from the cold state (t_c)**

the time for heating up the welding power source windings from the cold state (20 ± 2) °C to the operating temperature θ_{off} at conventional welding condition (see Figure 1)

4.28**heating time from the hot state (t_h)**

the time for heating up the welding power source windings from the reset temperature θ_{on} to the operating temperature θ_{off} at conventional welding condition (see Figure 1)

4.29**melting time (t_f)**

the conventional time to melt one reference electrode at the conventional welding current I_2

4.30**number of reference electrodes n_c**

the number of reference electrodes capable of being melted with the welding power source starting from the cold state (20 ± 2) °C without operation of the thermal cut-out device; this number is calculated by the formula given in Clause 7.1

4.30a)**number of reference electrodes n_{c1}**

the number of reference electrodes capable of being melted within the first hour with the welding power source starting from the cold state (20 ± 2) °C; this number is calculated by the formula given in 7.1

4.31**number of reference electrodes n_h**

the number of reference electrodes capable of being melted with the welding power source at the hot state starting from resetting, without operation of the thermal cut-out device; this number is calculated by the formula given in Clause 7.1

4.31a)**number of reference electrodes n_{h1}**

the number of reference electrodes capable of being melted during one hour with the welding power source at the hot state starting from resetting; this number is calculated by the formula given in 7.1

4.32**basic insulation¹⁾**

insulation of live parts, the failure of which causes a risk of electric shock

4.33**supplementary insulation¹⁾**

independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation

4.34**double insulation¹⁾**

insulation comprising both basic insulation and supplementary insulation

4.35**reinforced insulation¹⁾**

single insulation of live parts intended to provide protection against electric shock not less than that provided by double insulation

NOTE It is not implied that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

4.36**protection Class I equipment¹⁾**

equipment with basic insulation between live parts and exposed conductive parts with bonding of exposed conductive parts to a means for connection of an external protective conductor

NOTE Protection Class I equipment may have parts with double or reinforced insulation.

4.37**protection Class II equipment¹⁾**

equipment in which the protection against indirect contact does not rely on basic insulation only, but in which additional dispositions are provided to avoid a fault between live parts and the accessible surface

4.38**clearance**

the shortest distance in air between two conductive parts

NOTE For the purpose of determining a clearance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it were covered by a metal foil wherever it can be touched by the standard test finger according to IEC 529.

4.39**creepage distance**

the shortest distance along the surface of an insulating material between two conductive parts

NOTE For the purpose of determining a creepage distance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it were covered by a metal foil wherever it can be touched by the standard test finger according to IEC 529.

NOTE to Clause 4.38 and 4.39. Creepage distances and clearances are measured through the joint between two parts of an insulating barrier except when:

- either the two parts forming the joint are bonded together by heat sealing or other similar means at the place where this is of importance,
- or the joint is completely filled with adhesive at the necessary places and the adhesive bonds to the surfaces of the insulating barrier so that moisture cannot be absorbed into the joint,
- or the joint is sealed in such a way that it may be considered tight for the expected life of the welding power source.

4.40**pollution**

any addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity

NOTE The following four degrees of pollution in the micro-environment are established:

¹⁾ NOTE This definition may be amended on publication of the next edition of IEC Publication 536.