

BS EN ISO 5826:2014



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Resistance welding equipment — Transformers — General specifications applicable to all transformers

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National foreword

This British Standard is the UK implementation of EN ISO 5826:2014. It supersedes BS EN ISO 5826:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/29, Resistance welding.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 75461 6

ICS 25.160.30; 29.180

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2014.

Amendments issued since publication

Date	Text affected
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English Version

**Resistance welding equipment - Transformers - General
specifications applicable to all transformers (ISO 5826:2014)**

Matériel de soudage par résistance - Transformateurs -
Spécifications générales applicables à tous les
transformateurs (ISO 5826:2014)

Widerstandsschweißeinrichtungen - Transformatoren -
Allgemeine Anforderungen anwendbar für alle
Transformatoren (ISO 5826:2014)

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

This document (EN ISO 5826:2014) has been prepared by Technical Committee ISO/TC 44 “Welding and allied processes” in collaboration with Technical Committee CEN/TC 121 “Welding and allied processes” the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by August 2014, and conflicting national standards shall be withdrawn at the latest by August 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 5826:2003.

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Endorsement notice

The text of ISO 5826:2014 has been approved by CEN as EN ISO 5826:2014 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding* and allied mechanical joining.

This third edition cancels and replaces the second edition (ISO 5826:1999), which has been technically revised.

Requests for official interpretations of any aspect of this standard should be directed to the Secretariat of ISO/TC 44/SC 6 via your national standards body, a complete listing of which can be found at www.iso.org.

Resistance welding equipment — Transformers — General specifications applicable to all transformers

1 Scope

This International Standard gives specifications applicable to the following types of transformers for use in resistance welding equipment:

- single-phase transformers for a.c. welding, typically operating at 50 Hz or 60 Hz;
- single-phase transformers with connected rectifier for d.c. welding, typically operating at 50 Hz or 60 Hz;
- single-phase inverter transformers with connected rectifier for d.c. welding, typically operating at 400 Hz to 2 kHz;
- three-phase transformers with connected rectifier for d.c. welding, typically operating at 50 Hz or 60 Hz.

For the purposes of this International Standard, the term *transformer* can refer to the transformer alone or with connected rectifier (transformer-rectifier unit).

This International Standard applies to transformers built to protection class I or II according to IEC 61140.

NOTE The requirements of this International Standard can be supplemented by other resistance welding transformer standards, e.g. ISO 22829 and ISO 10656.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 669, *Resistance welding — Resistance welding equipment — Mechanical and electrical requirements*

IEC 60085, *Electrical insulation — Thermal evaluation and designation*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

IEC 61140, *Protection against electric shock — Common aspects for installation and equipment*

ISO 17657-3, *Resistance welding — Welding current measurement for resistance welding — Part 3: Current sensing coil*

ISO 17657-4, *Resistance welding — Welding current measurement for resistance welding — Part 4: Calibration system*

ISO 17677-1, *Resistance welding — Vocabulary — Part 1: Spot, projection and seam welding*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17677-1 and ISO 669, and the following apply.

3.1

transformer-rectifier unit

transformer with connected rectifier

transformer incorporating a full-wave rectifier in its output circuit

3.2

input voltage

U_1

RMS value of the voltage applied to the primary terminals of the transformer

3.3

rated supply voltage

U_{1N}

RMS value of the supply voltage (applied to the input terminals) for which the transformer is constructed

Note 1 to entry: This voltage can be different from the mains voltage.

3.4

d.c. no load voltage

U_{2d}

for transformers, RMS value of the voltage at the output when a load resistance is connected across the output terminals

3.5

input current

I_1

RMS value of the current at the input terminals of the transformer

3.6

output current

I_2

RMS value of the current at the output terminals of the transformer

3.7

output current at a given duty factor

I_{2X}

RMS value of the current at the output terminals of the transformer at a duty factor, X

3.8

no-load input current

I_{10}

RMS value of the current at the input terminals of the transformer with open circuit output terminals

3.9

permanent input current

I_{1p} , I_{Lp}

maximum rated value of the current at the input terminals corresponding to the permanent output current

Note 1 to entry: The relationship between input and output currents depends on the type of transformer.

Note 2 to entry: I_{1p} is used for single-phase transformers; I_{Lp} is used for three-phase transformers.

3.10 permanent output current

 I_{2p}

highest output current on all settings of the regulator, for continuous operation (100 % duty factor)

[SOURCE: ISO 669]

Note 1 to entry: The permanent output current is a standardized parameter that is used for comparison and characterization between different transformers. The value of the permanent output current is dependent on the test conditions as described in this standard.

3.11 output current under load condition

 I_{2R} instantaneous RMS value of the output current delivered by the transformer with a load resistance, R

3.12 rated permanent apparent input power

 S_{1p} rated permanent apparent power calculated by $U_{1N} \times I_{1p}$

Note 1 to entry: Welding equipment permanent power, S_p , determined in accordance with ISO 669, may be different from its welding transformer rated permanent apparent input power, S_{1p} .

4 Symbols and abbreviated terms

The symbols used in this International Standard are listed in [Table 1](#).

Table 1 — Symbols

Symbol	Description	Used in [section]
I_1	input current	3.5 , 9.3
I_{10}	no-load input current	3.8 , Clause 11
I_{1p}	rated permanent input current (single-phase transformers)	3.9 , 9.1 , Clause 12
I_{Lp}	rated permanent input current (three-phase transformers)	3.9 , 9.1
I_2	output current	3.6 , 9.3 , Annex C
I_{2p}	permanent output current at 100 % duty factor	3.10 , 9.1 , 9.3 , 16.2 , Annex C
I_{2R}	output current on load condition	3.11 , Clause 13
I_{2X}	output current at a given duty factor	3.7 , Annex C
m	mass	16.2
S_X	input power at a given duty factor	Annex C
S_{1p}	rated permanent apparent input power	3.12 , 9.1 , 16.2 , Annex C
Q	rated cooling liquid flow	Clause 14 , 16.2
R_1	initial resistance of a winding	9.3.5 , 9.4.3
R_2	resistance of a winding at end of heating test	9.4.3
T	Time	Annex C
t_1	on-load time	Annex C
T	cycle time	Annex C
U_1	input voltage	3.2 , Clause 13
U_{cc}	rated short-circuit voltage	Clause 12 , Annex C
U_{1cc}	input short-circuit voltage	Clause 12

Table 1 (continued)

Symbol	Description	Used in [section]
U_{1N}	rated supply voltage	3.3 , 9.1 , 9.3 , 10.2 , 10.3 , Clauses 11, 13, 16.2 , Annex C
U_{20}	a.c. no-load voltage	10.1 , 10.2 , 16.2
U_{2d}	d.c. no-load voltage	3.4 , 10.1 , 10.3 , 16.2
X	duty factor	9.3 , Annex C
X_m	duty factor of magnetic circuit	Annex C
Z_2	total impedance referred to output	Clauses 12 and 17
Δp	pressure drop of cooling liquid circuit	Clause 14 , 16.2
$\Delta\theta_{1,2}$	temperature differences	Annex C
θ	temperature	Annex C
θ_a	cooling medium temperature	9.4.3 , Annex B , Annex C
θ_m	equilibrium temperature	Annex C
θ_n	temperature when transformer starts to cool	Annex C
$\theta_{0,1,2}$	temperatures for calculation of thermal time constant or winding temperatures during heating test	9.3.5 , 9.4.3 , Annex C
τ	thermal time constant	Annex C
τ_2	thermal time constant at given on-load time	Annex C
τ_{2p}	thermal time constant at permanent output current	Annex C

5 Construction, additional equipment

5.1 Thermal protection

If the transformer and/or the rectifier are equipped with thermoswitches, they shall have a normally closed contact. The insulation shall be suitable for the test conditions prescribed in this standard.

5.2 Output current sensing coil

If the transformer is equipped with an output current sensing coil, the degree of protection of an externally mounted coil shall be IP 55.

The conversion coefficient shall be:

- 50 Hz mains frequency: 150 mV/kA with a load resistance of 1 000 Ω under full sine wave up to 80 °C;
- 60 Hz mains frequency: 180 mV/kA with a load resistance of 1 000 Ω under full sine wave up to 80 °C

The tolerance of the conversion coefficient after mounting in the transformer shall be $\pm 3\%$.

The current sensing coil shall be a Rogowski type. The internal resistance of the current sensing coil shall be 5 to 50 Ω . White and brown colour coding shall be used for the wiring.

6 Physical environment and operating conditions

6.1 General

Transformers shall be suitable for use in the physical environment and operating conditions as specified below.

When the physical environment and/or operating conditions are outside those specified below, an agreement may be needed between the supplier and the user, (see, for example, IEC 60204-1:1997, Annex B).

NOTE Examples of these conditions are: outdoor use, different altitude, different temperature of cooling medium, high humidity, unusually corrosive fumes, steam, excessive oil vapour, abnormal vibration or shock, excessive dust, unusual sea coast or shipboard conditions.

6.2 Ambient air temperature

Transformers shall be capable of operating correctly in an ambient air temperature between + 5 °C and + 40 °C.

In case of other maximum temperatures of the cooling medium, see [Annex B](#).

6.3 Humidity

Transformers shall be capable of operating correctly with a relative humidity up to 95 %.

Harmful effects of condensation shall be avoided by:

- appropriate design of the transformer (e.g. application of electrical potting or encapsulation);
- appropriate design of the winding equipment (e.g. built in heaters, air conditioners, drain holes);
- additional measures (e.g. cooling liquid temperature regulation).

6.4 Altitude

Transformers shall be capable of operating correctly at altitudes up to 1 000 m above mean sea level.

In case of other altitudes, see [Annex B](#).

NOTE At altitudes over 1 000 m, additional electrical safety considerations can be required: see IEC 60664-1.

6.5 Transportation and storage

Transformers shall be designed to withstand, or suitable precautions shall be taken to protect against, transportation and storage temperatures between – 25 °C and + 55 °C and for short periods not exceeding 24 h up to + 70 °C. Suitable means shall be provided to prevent damage from humidity, vibration and shock.

Consideration should be given to frost or freezing protection and draining of the cooling water before shipping or storage.

6.6 Provisions for handling

Transformers that weigh over 25 kg shall be provided with suitable means for handling by hoists, cranes or similar equipment such as threaded holes or lifting lugs as appropriate.